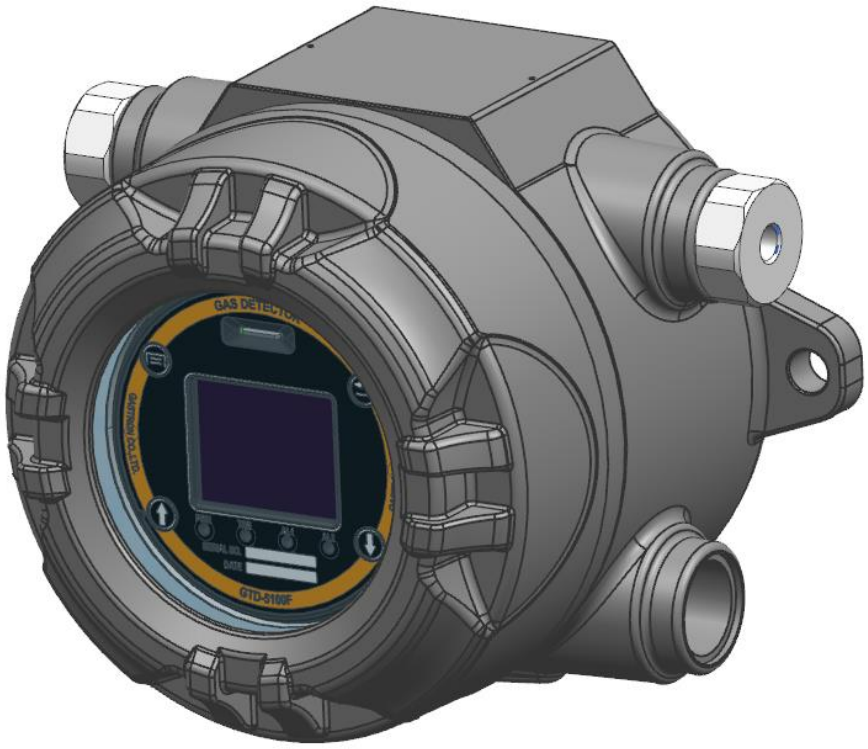
Gas Leak Alarm Design, Development, Production, Installation and Additional Services

DOC NO.GT-07220030500

GTD-5100F
Instruction Manual

Revision: 1.16



Please read Manual carefully for correct use.

Thank you for purchasing the product of GASTRON.

As a gas detector and gas monitoring system specialist, GASTRON has won consumers' recognition for the top-tier quality and convenience of products. As a trustworthy partner for consumers, GASTRON is continuously researching for and dedicating effort to developing gas detectors that meet customer needs. From now on, solve all your gas detector-related troubles with GASTRON's product. GASTRON is committed to bringing full satisfaction to customers.

This Manual contains directions for using GTD-5100F gas detector and a simple maintenance method, etc. Please read the Manual carefully and refer to it whenever you have questions while using the product.

Should you experience any problem after purchasing the product, please contact GASTRON using the information below.

- Address: 23, Gunpocheomdansaneop 1-ro, Gunpo-si, Gyeonggi-do, Korea
- Tel : 031-490-0800
- Fax : 031-490-0801
- **URL : www.gastron.com**
- **e-mail : gastron@gastron.com**

Note

- **If the product is not calibrated, problems caused by sensor aging can lead to malfunction.**
- **Dismantling of the product must be conducted by a person with professional skills for gas detectors.**
- **For details of gas detector inspection and calibration, please contact Technology Division of GASTRON through email or refer to the company website.**

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1. Overview

In industrial sites, a wide range of gases including flammable and toxic gases, freon gas, and organic compound gas are used. To prevent gas leakage in the sites, gas detectors are installed and operated.
However, for semiconductor production facilities, gas detectors are used for each of the diverse types of gas, such as C4F6, CH2F2, CH3F, C5F8, COS, CH4, and CO, resulting in the issues of high product cost and difficulties in product installation and maintenance. In addition, ethanol, isopropyl alcohol, and FC-3283, etc., which are used as cleaning agents, interfere in gas detector measuring, and become a major cause of the detector malfunction. To address the issues, GTD-5100F (the “detector” hereinafter) has been developed to safely detect multiple types of gas, such as flammable, toxic, freon, and organic compound gases, through application of technologies to prevent malfunction caused by interfering gas in the course of gas measuring.

The key features of the product are as follows:

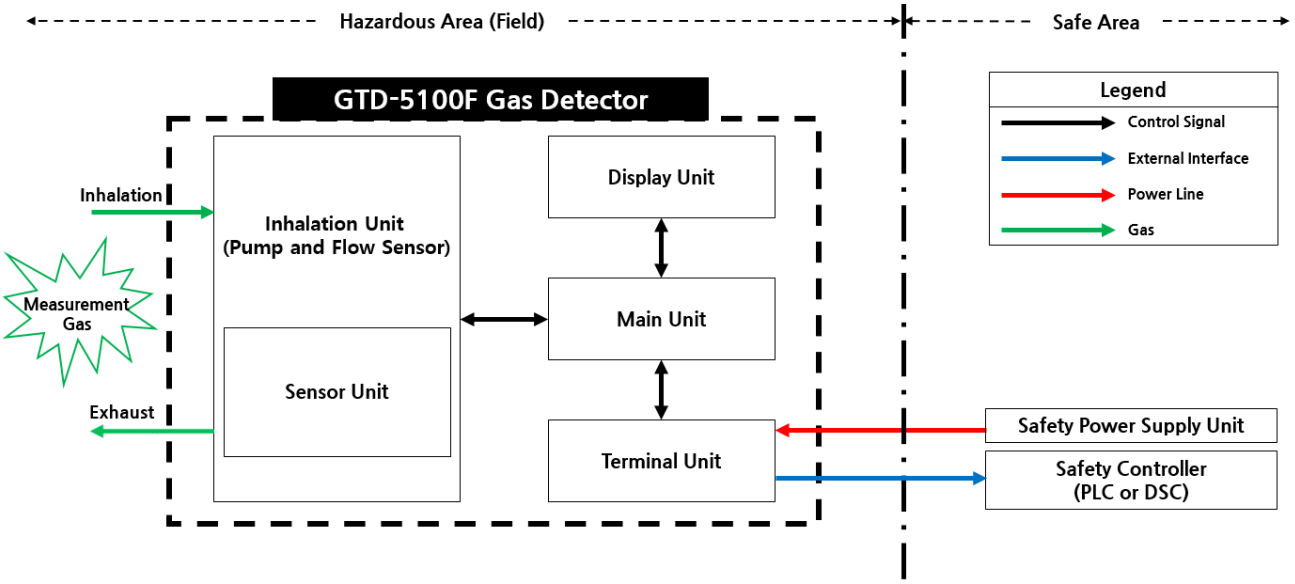
- Display cover mounted through rotation in four directions (90°, 180°, 270°, 360°)
- Algorithm to prevent malfunction caused by interfering gas (IPA, ethanol, FC3283, and other alcohol-type gases) other than gas for measuring applied
- Swiftly detecting gas leakage with built-in high-performance pump
- Automatic flow control function available
- Various detection principles applied to measure flammable, toxic and freon gases from low to high concentrations
- Data and event log function available
- 1:1 dialog-type setting method using color graphic TFT LCD
- Self-diagnosis function available
- Two-stage alert issue and one error display per gas type, display at relay contact point
- 4-20mA current interface display per gas type
- Convenient monitoring system establishment through RS-485 Modbus and PoE Modbus TCP communication
- External setting using magnetic bar

[Figure 1. GTD-5100F Gas Detector]

2. Structure

The detector can be installed in areas with risk of gas leakage.
Gas from hazardous area is directly sucked into the detector through diaphragm pump, and detected in the sensor unit. A flow sensor is built in to keep the flow level set by diaphragm pump.

The main unit handles all controls, and the detector information, such as gas concentration and status information, is displayed in the field and outside through display unit and terminal unit.
According to the terminal unit interface, it is divided into standard terminal unit for 4 - 20mA (analog) and RS-485 detection, and the Ethernet-based PoE terminal unit.



[Figure 2. GTD-5100F Overview]

3. Specifications

3.1. Basic Specifications

ITEMS	SPECIFICATION
Measuring Type	Auto Sampling type
Measuring Type	2.0” Color TFT (176RGBx220)
Measuring Method	• NDIR / Optical Cavity • Electrochemical / Cartridge • Catalytic / Cartridge • Semiconductor / Cartridge • Photoionization detector(PID) / Cartridge
Detectible Gas	• Combustible Gas • PFC series (C4F6, CH2F2, CH3F, C5F8) • CO, COS and various toxic gases
Measuring Range	• RANGE : 0 ~ 9999 • Refer to ‘[Table.17 Gas List]’ * Inquire GASTRON for special gas.
Accuracy	≤ ±3% / Full Range
Zero Drift	≤ 2% / Full Range
Response Time)	Varying by sensor module and flow, refer to sensor specifications or contact GASTRON for special gas
Pump Type	Diaphragm Pump
Flow Rate	Inlet: 100~ 1,000mL/min (Normal 500 mL/min)
Gas Intake Distance (Gas Sample Line)	Less than 30m (1/4" Tube)
Approvals Classification	ATEX/IECEX: - Ex db IIC T6 for Tamb = -20℃ to +60℃

		- Ex db IIC T5 for Tamb = -20℃ to +75℃ - IP65 KFI : R-R-G99-GTD-5100F(KC EMC) UL : Class I Div. 1 Group A,B,C and D T6 Ta= -20˚C to 60˚C T5 Ta= -20˚C to 75˚C	
Default Interface	**Standard**	Analog 4-20mA current interface, RS-485, Relay	
	PoE	PoE Interface, Relay	
Warranty		Transmitter	2Year
		Sensor	1Year

3.2. **Mechanical Specifications**

ITEMS	SPECIFICATION
Explosion Proof type	Explosion-proof enclosure
Dimension	Standard type : 195(W) x 139(H) x 154(D) mm
Weight including Sensor	Standard type : 4kg
Mounting type	Wall mount
Mounting Holes	Hole : (Ø 11 ±0.1) x 2ea
Cable inlet	3/4” PF,PT,NPT (Basic SPEC.PF3/4”), only NPT Approved by UL
Tube **(Sample gas vent / inlet)**	1/4" Teflon Tube
Body material	CASE: Alloy Steel Casting
	SHAFT: STS304

3.3. **Electrical Specifications (Standard Terminal Unit)**

ITEMS	SPECIFICATION	
Input Voltage(Standard) **※ Customer supplied PSU must meet requirements IEC1010-1 and CE Marking requirements.**	Absolute min: Nominal: Absolute max: Ripple maximum allowed:	16V 24V 32V 1V pk-pk
Max Wattage	Max: Electrochemical Sensor Type: Catalytic Sensor Type: IR Sensor Type:	10.4W @+24 VDC 8.0W @+24VDC 9.0W @+24VDC 9.6W @+24VDC
Analog output Current	0-22mA(500 ohms max load) All readings ± 0.2mA Measured-value signal: 4mA(Zero) to 20mA(Full Scale)	
	Fault: Function: 0-100% LEL: 100-109%LEL: Over 110% LEL:	0mA – 2.5mA 3mA 4mA – 20mA 20mA – 21.4mA 22.0mA
Analog output current ripple & noise max	±20uA	
Relay contact	Alarm1, Alarm2, Fault Relay Rated 2 A @ 30VDC or 2 A @ 125 VAC **Resistive load, CAT II**	
Wiring requirement	Analog : CVVS or CVVSB with shield RS485 : STP (Shielded Twisted Pair)	
Cable Connection Length	Analog : 2500m RS485 : 1000m	
EMC Protection	Complies with EN50270	

3.4. Electrical Specifications (PoE Terminal Unit)

ITEMS	SPECIFICATION	
Input Voltage	48 V Power-over-Ethernet IEEE 802.3af compliant, 37 to 57V CLASS 0 (0.44 ~ 12.95W)	
Max Wattage	Max: Electrochemical Sensor Type: Catalytic Sensor Type: IR Sensor Type:	11.2W @ +48 V 8.4W @+48VDC 9.2W @+48VDC 10.1W @+48VDC
Relay contact	Alarm1, Alarm2, Fault Relay Rated 2 A @ 30VDC or 2 A @ 125 VAC	

3.5. Environmental Specifications

ITEMS	SPECIFICATION	
Operation Temperature	Main Unit	-10℃ to 60℃
Storage Temperature	Main Unit	-20℃ to 65℃
Operation Humidity	Main Unit	5 to 99% RH (Non-condensing)
Pressure Range	90 to 110KPa	
Max. air velocity	6m/s	
Overvoltage category	II	
Pollution degree	2	
Altitude	Up to 2000 meters	

3.6. Ordering Information

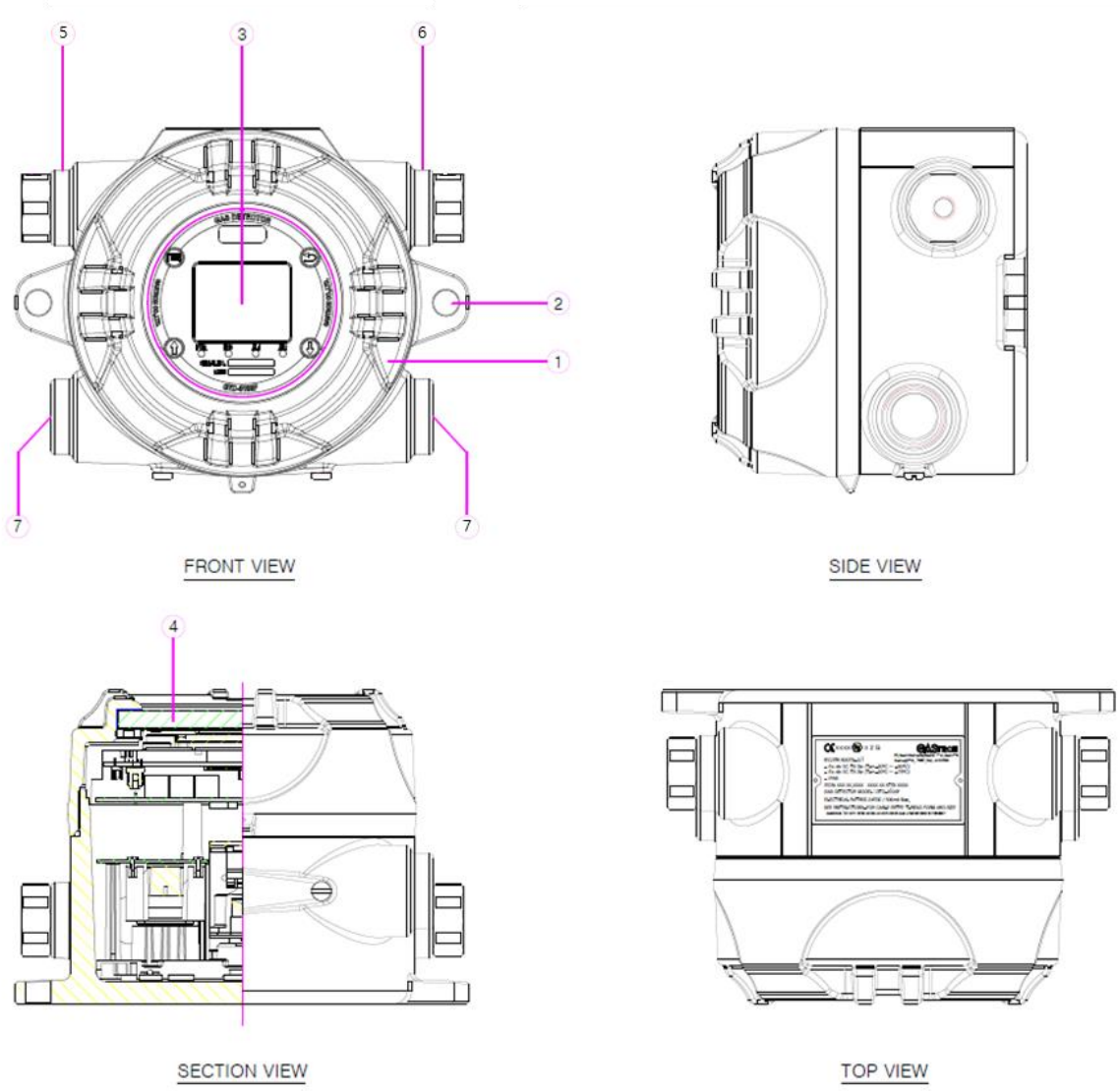
Please put an order according to model code description below.

- GTD-5100F-X-Y
  - GTD-5100F : Standard Model Name
  - X : Power option (STD, POE)
    - STD : Option 1, GTD-5100F-STD-Y, DC supply power input (16~32V)
    - POE : Option 2, GTD-5100F-POE-Y, Power over Ethernet (37~57V)
  - Y : Sensor type (OT, CT, OC)
    - OT : Option 1, GTD-5100F-X-OT, Optical cavity
    - CT : Option 2, GTD-5100F-X-CT, Cartridge
    - OC : Option 3, GTD-5100F-X-OC, Optical cavity + Cartridge

- Ordering Model Name
  - GTD-5100F-STD-OT
  - GTD-5100F-STD-CT
  - GTD-5100F-STD-OC
  - GTD-5100F-POE-OT
  - GTD-5100F-POE-CT
  - GTD-5100F-POE-OC

4. Name and Description of Each Part

4.1. Components

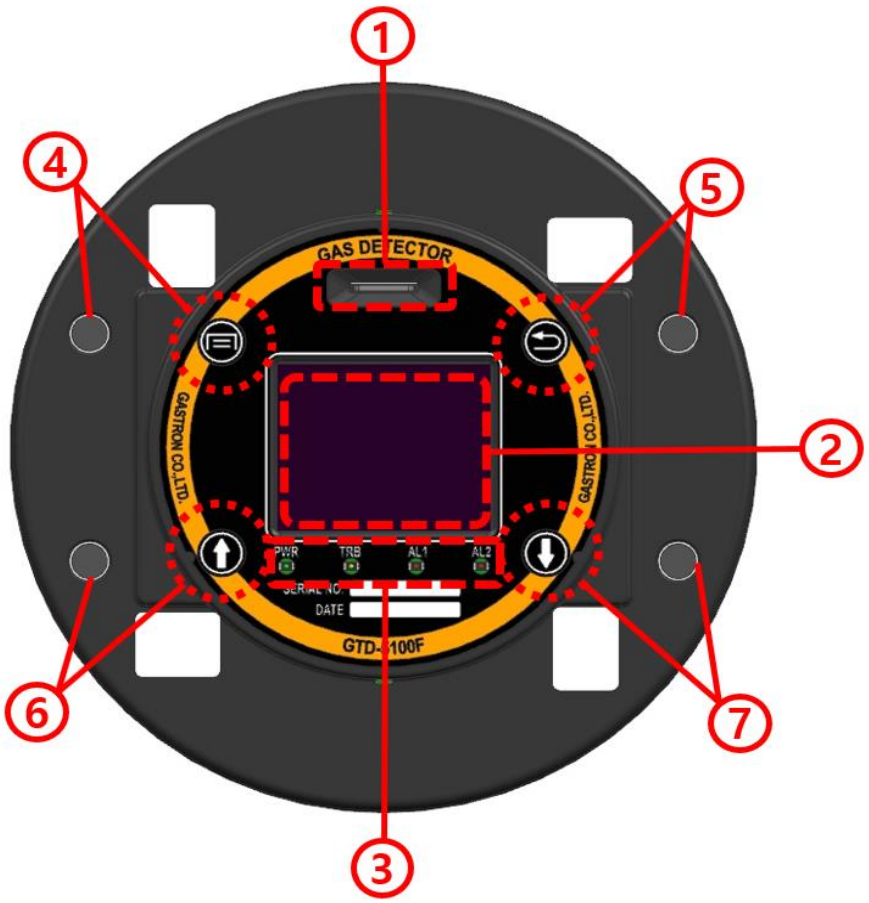


[Figure 3. **GTD-5100F Components**]

No	Name	Descriptions
1	Case Body & Cover	Provide protection against external environmental change and impact
2	Mount Hole	Mounting hole used for fixing case
3	Front Display	Display detector status information (Refer to 4.2 for details)
4	Window Glass	Show display status information.
5	Gas Inlet	Sample gas inlet port (1/4” tube) (Metric thread only for using gas inlet)
6	Gas Outlet	Sample gas outlet port (1/4” tube) (Metric thread only for using gas outlet)
7	Cable Gland & EX Plug	Power and signal cable inlet port / Explosion-proof EX plug (NPT thread only for using cable entry)

[Table 1. Description of GTD-5100F Components]

4.2. **Front Display Configuration**



[Figure 4. Front Display Configuration]

No.	Name	Descriptions
1	SD Card	SD card for F/W upload insertion port
2	LCD Display	Display information on gas concentration and current state, and parameter settings, etc.
3	Status Information LED	• PWR (Power): LED turned on when power is supplied • TRB (Trouble): LED turned on when fault occurs • AL1 (Alarm1): LED turned on when detection is made by Alarm1 setting • AL2 (Alarm2): LED turned on when detection is made by Alarm2 setting
4	Function Key (Tact, Magnet, LED)	• Menu entering and individual mode selection function, save settings • Dotted Line: LED for magnet switch and input status
5	Reset Key (Tact, Magnet, LED)	• When individual mode is selected, enter mode in a level higher, and cancel settings • Dotted Line: LED for magnet switch and input status
6	Up Key (Tact, Magnet, LED)	• Select value above cursor and increase settings in individual mode • Dotted Line: LED for magnet switch and input status
7	Down Key (Tact, Magnet, LED)	• Select value below cursor and decrease settings in individual mode • Dotted Line: LED for magnet switch and input status

[Table 2. Description of Front Display Configuration]

5. Installation

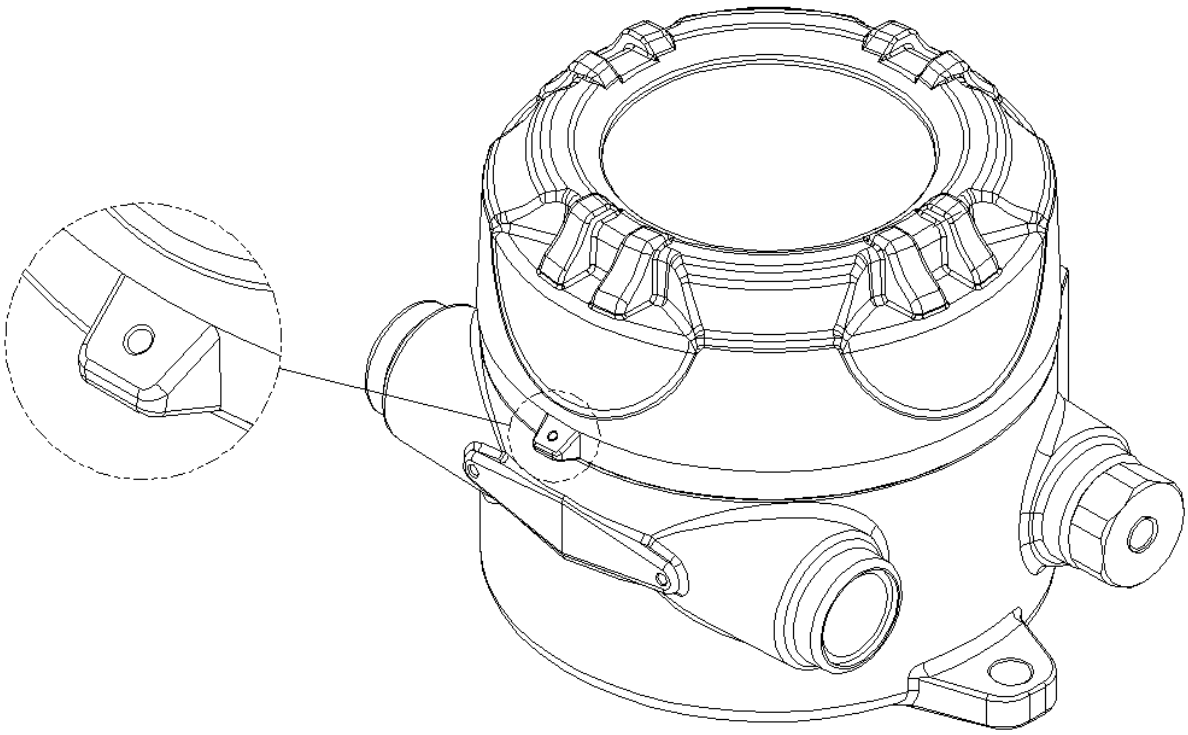
- The cover of the detector installed in a worksite must not be opened or handled by persons other than the authorized, or a person in charge of installation and repair from the head office. Otherwise, serious human and property damage can be caused due to fire or explosion, etc. In addition, make sure to check for any remaining explosive gas and flammable substances around the work area, and cut off the power before starting operation.

⚠

➢ CAUTION: If the configuration settings in the equipment differ from the cartridge connection state, it can cause malfunction and occurrence of fault.

5.1. Housing Cover Separation

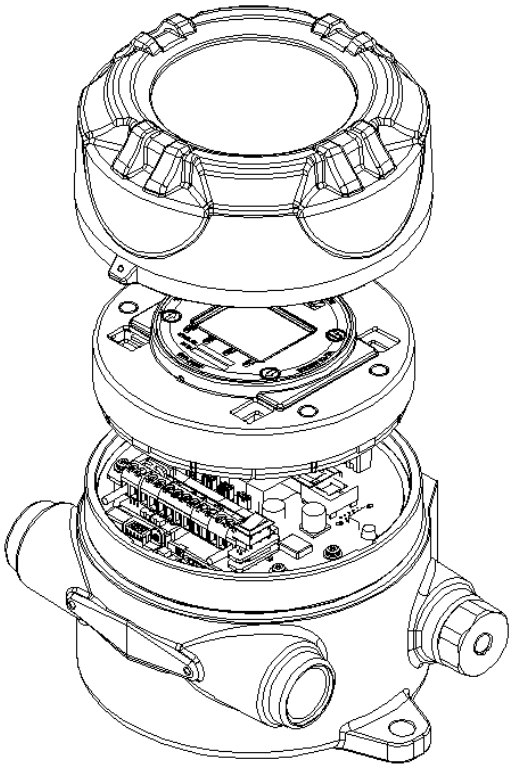
- Turn the set screw for fixing cover to the body (M4 x 1) using a hexagonal wrench (M2) three - four times in anticlockwise direction. Then, turn the detector cover in anticlockwise direction to separate the cover. Once the cover is separated, the LCD is revealed.



[Figure 5. Set Screw]

- After separating the cover, separate the display cover in the following order:

① Grab the handle of the display cover and pull to separate it from the body.
② To fix it back on after separation, turn it by 90˚. (**90°**, 180°, 270°, 360° / Figure 7)
③ When the display cover is separated, the terminal PCB is fixed on the housing unit.

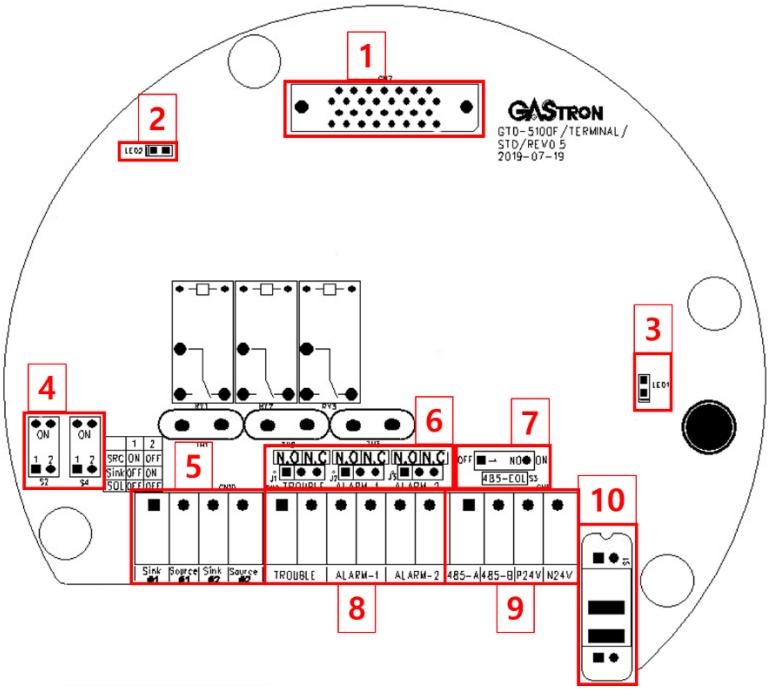


[Figure 6. Display Cover Separation Method]

[Figure 7. Display Cover Turning]

5.2. Terminal Unit Structure and External Connection Pin Map

5.2.1. Standard Terminal Unit Structure

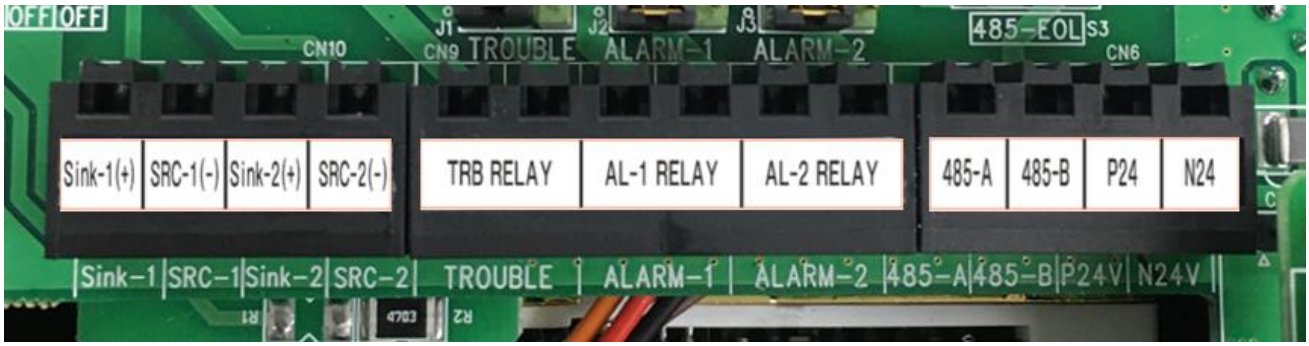


[Figure 8. Standard Terminal PCB Layout]

No.	Description
1	Main PCB Connector
2	LED for system power supply state
3	LED for external input voltage state
4	Current interface mode setting switch
5	Current interface terminal (CH1, CH2)
6	Relay Selection jumper
7	RS-485 terminating resistance selection switch
8	Trouble, Alarm1, Alarm2 relay terminal
9	Power, RS485 terminal
10	System on/off switch

[Table 3: Information of Standard Terminal PCB Main Components]

5.2.2. Standard Terminal Pin Map and Description

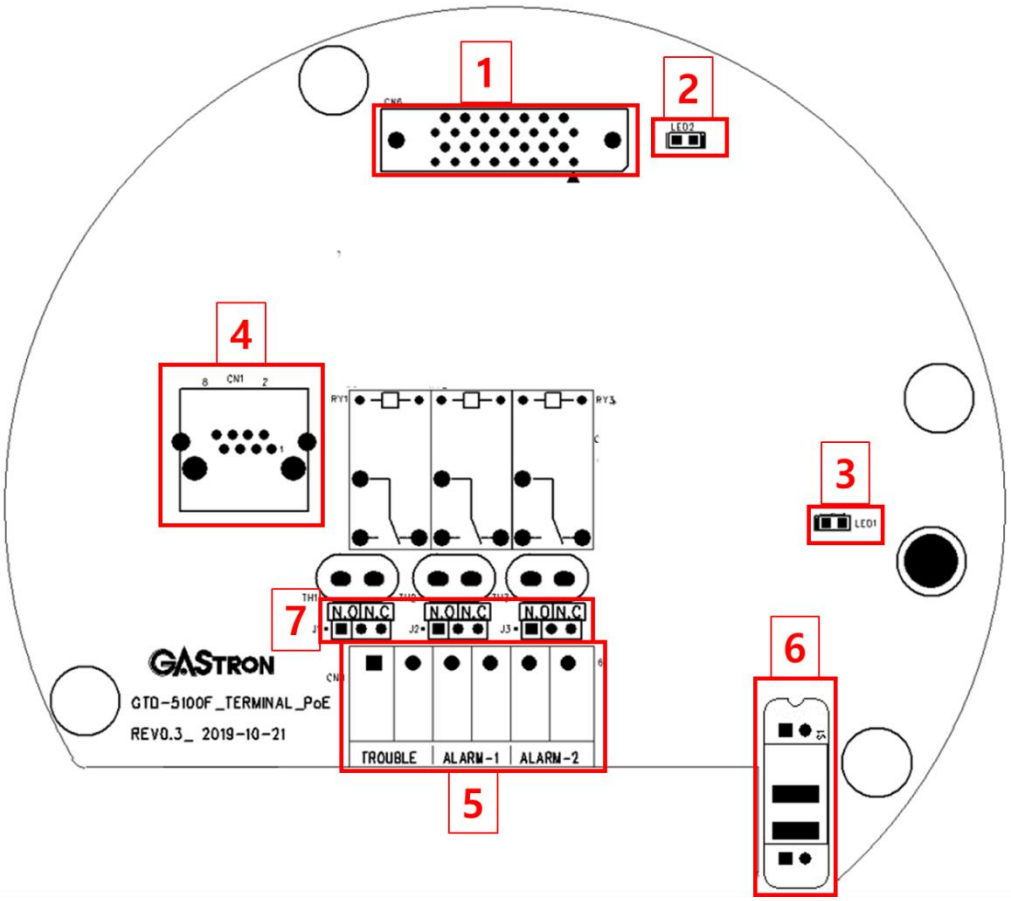


[Figure 9. Standard Terminal Layout]

Ref. No.	Name	Description
CN10	Sink-1(+)	• CH1 4~20mA Sink Mode Output • CH1 4~20mA Isolation Mode '+'
	SRC-1(-)	• CH1 4~20mA Source Mode Output • CH1 4~20mA Isolation Mode
	Sink-2(+)	• CH2 4~20mA Sink Mode Output • CH2 4~20mA Isolation Mode '+'
	SRC-2(-)	• CH2 4~20mA Source Mode Output • CH2 4~20mA Isolation Mode '-'
CN9	TRB RELAY	• Trouble relay output terminal • Output mode decided by trouble jumper settings
	AL-1 RELAY	• Alarm1 relay output terminal • Output mode decided by Alarm1 jumper settings
	AL-2 RELAY	• Alarm2 relay output terminal • Output mode decided by Alarm2 jumper settings
CN6	485-A	• RS485(A) terminal
	485-B	• RS485(B) terminal
	P24V	• +24V/POWER (+)
	N24V	• GND/POWER (-)

[Table 4. Power and Signal Terminal Description]

5.2.3. PoE Terminal Unit Structure

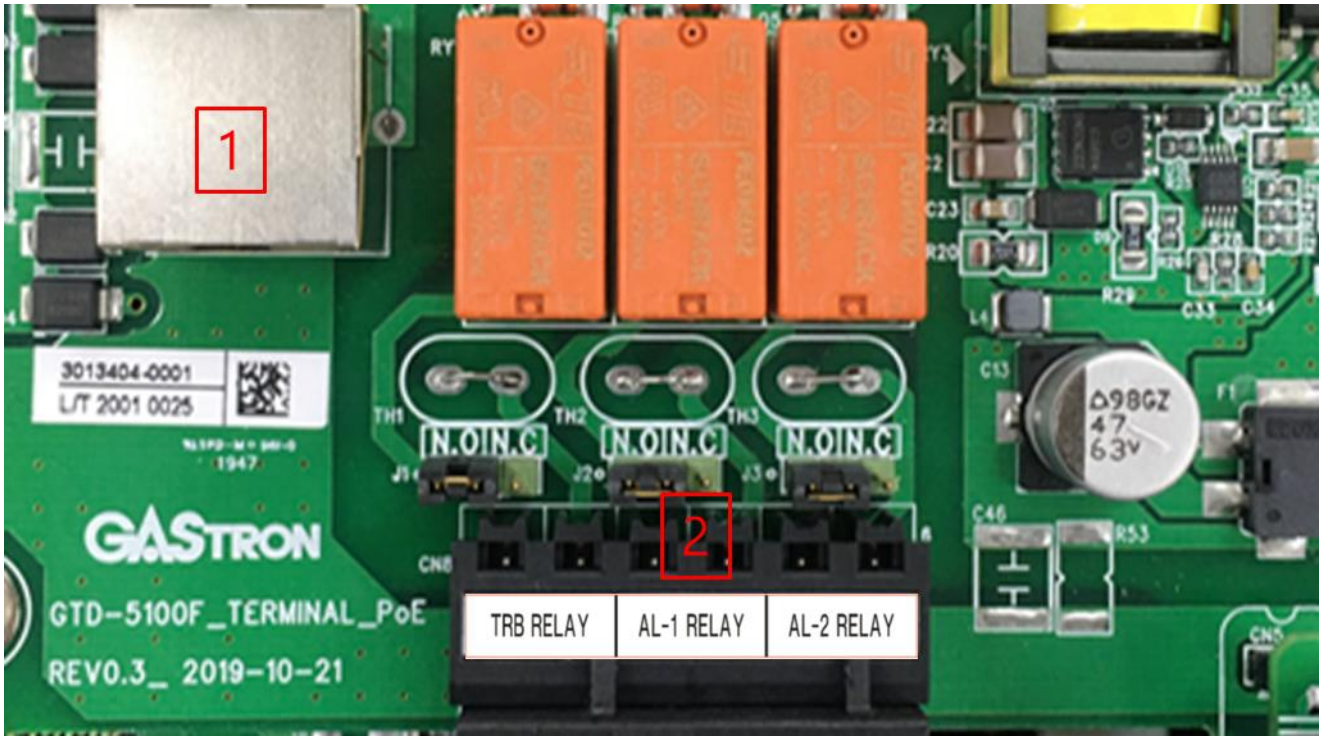


[Figure 10. PoE Terminal PCB Layout]

No.	Description
1	Main PCB Connector
2	LED for system power supply state
3	LED for external input voltage state
4	PoE Input Connector (RJ-45)
5	Trouble, Alarm1, Alarm2 relay terminal
6	System on/off switch
7	Relay Selection jumper

[Table 5: Information of PoE Terminal PCB Main Components]

5.2.4. PoE Terminal Pin Map and PoE Connector Description



[Figure 11. PoE Terminal Layout]

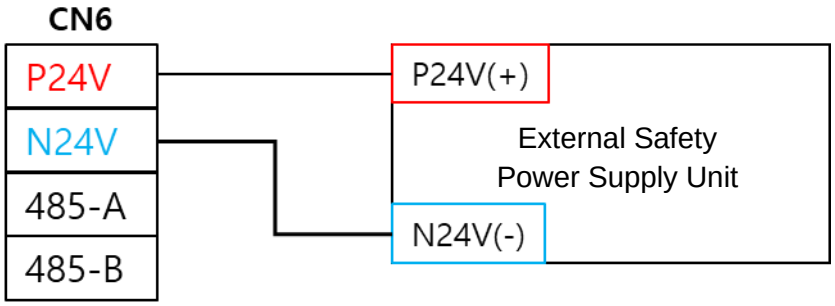
No.	Name	Description
1	PoE Connector (RJ-45)	• Connected for PoE communication and power supply
2	TRB RELAY	• Trouble relay output terminal • Output mode decided by trouble jumper settings
	AL-1 RELAY	• Alarm1 relay output terminal • Output mode decided by Alarm1 jumper settings
	AL-2 RELAY	• Alarm2 relay output terminal • Output mode decided by Alarm2 jumper settings

[Table 6: Information of PoE Terminal PCB Main Components]

5.3. Power Configuration

- ※ Cut off power before connecting power terminal

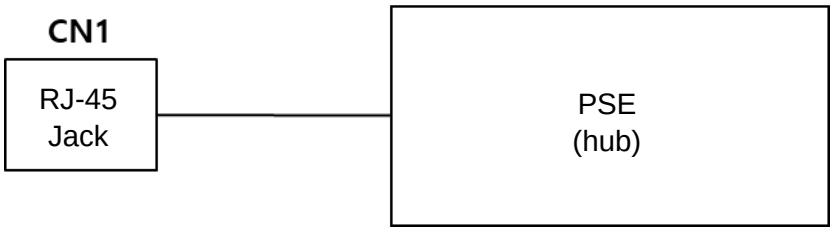
5.3.1. Standard Terminal Unit



[Figure 12. STD Terminal Power Wiring]

- Shield cable of 1.5sq or higher must be used.
- To use external power (DC24V), connect it to “CN6” terminal of terminal unit as shown in the figure.

5.3.2. PoE Terminal Unit



[Figure 13. PoE Terminal Power and Communicating Wiring]

- Connect PSE and the detector using LAN cable (CAT5 cable or equivalent RJ45).

5.4. 4-20mA Current Interface Setting

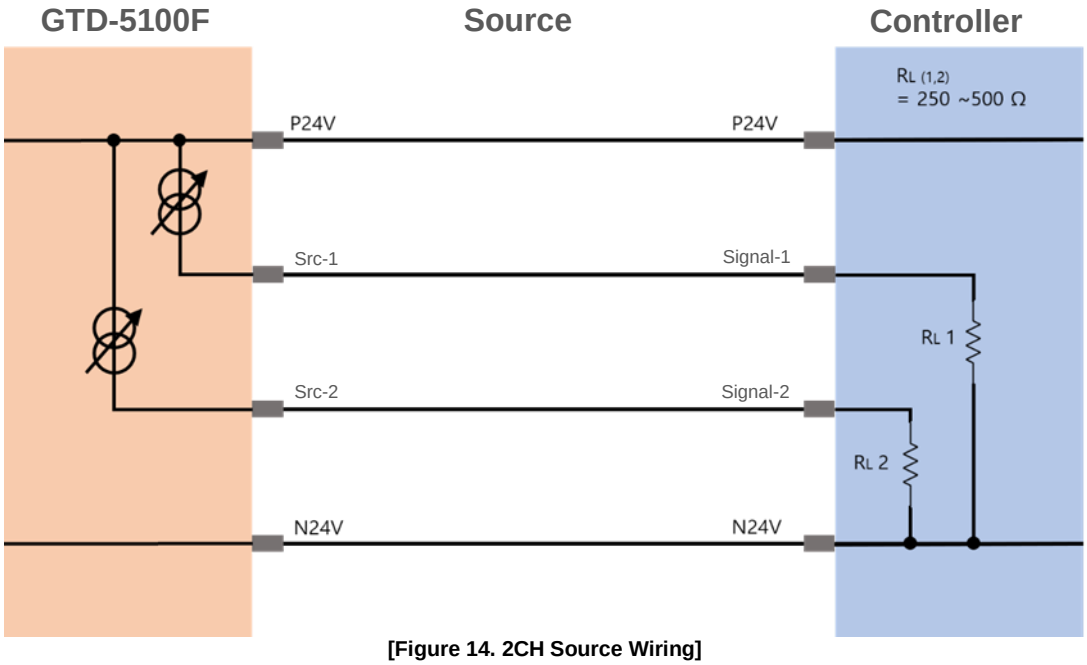
- For the detector, current interface output can be set as sink, source, or isolated by using CH1 SW and CH2 SW of terminal PCB.

CH No. / Configuration	CH1		CH2	
	1	2	1	2
SRC(Source)	ON	OFF	ON	OFF
Sink	OFF	ON	OFF	ON
ISO	OFF	OFF	OFF	OFF

[Table 7. Current Interface Switch Setting]

- The total load resistance of 4-20mA output including the input impedance of equipment for connection must be kept below 500 ohms.
- The minimum loop impedance is 200 ohms and the maximum is 500 ohms.
- In 1CH detection mode, switch adjustment and cable connection are carried out for 1CH only. In 2CH detection mode, switch adjustment and cable connection are applied to both 1CH and 2CH.
- It applies only to the standard terminal unit.

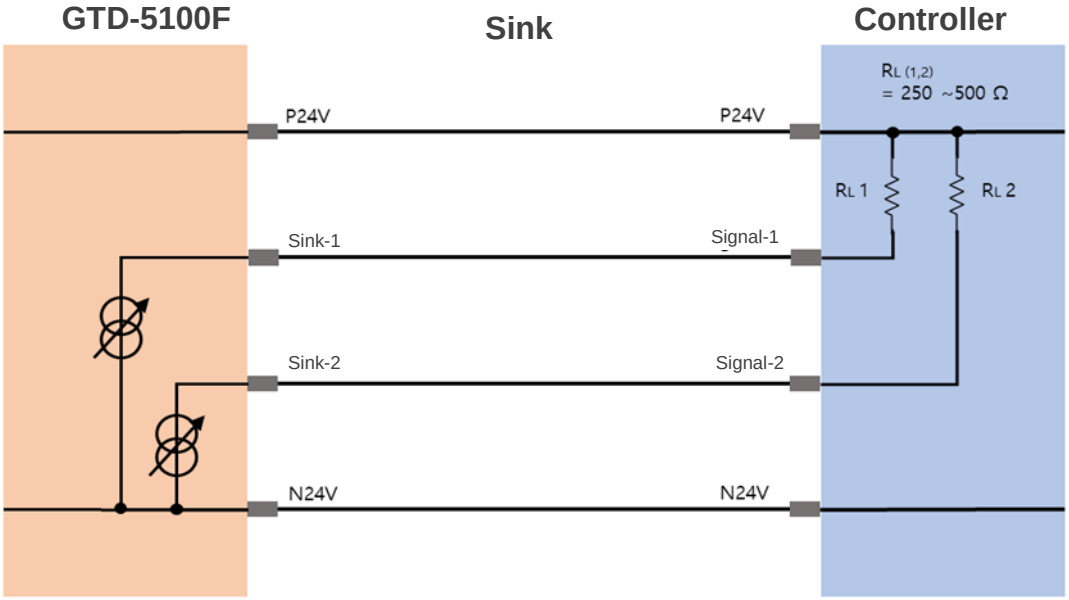
5.4.1. Source Configuration Wiring



[Figure 14. 2CH Source Wiring]

- Adjust switch to SRC (Source) by referring to [Table 7].
- Connect cable for gas channel by referring to [Figure 14].
- EX) 1CH - SRC connection settings
  1. CH1 switch → “1 = ON,” “2=OFF” switch adjustment
  2. Connect cable to “SRC-1(-)” terminal

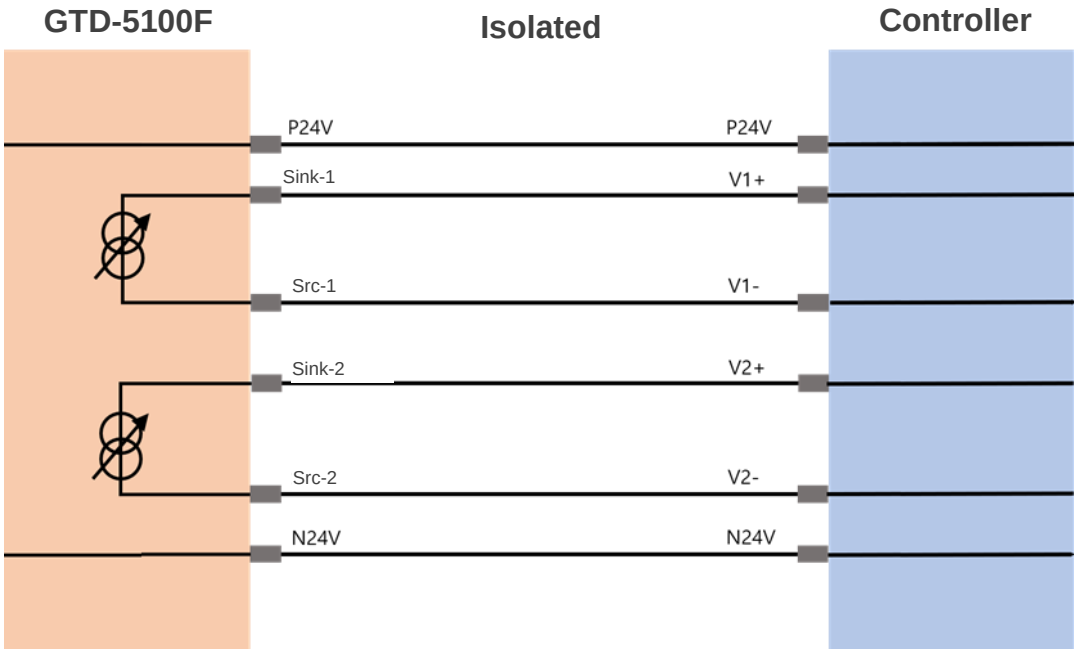
5.4.2. Sink Configuration Wiring



[Figure 15. 2CH Sink Wiring]

- Adjust switch to Sink by referring to [Table 7].
- Connect cable for gas channel by referring to [Figure 15].
- EX) 1CH - Sink connection settings
  1. CH1 switch → “1 = OFF,” “2=ON” switch adjustment
  2. Connect cable to “Sink-1(+)” terminal

5.4.3. Isolated Configuration Wiring



[Figure 16. 2CH Isolated Wiring]

- Adjust switch to ISO by referring to [Table 7].
- Connect cable for gas channel by referring to [Figure 16].
- EX) 1CH - Isolated connection settings
  3. CH1 switch → “1 = OFF,” “2=OFF” switch adjustment
  4. Connect positive (+) cable to “Sink-1(+)” terminal, and negative (-) cable to “SRC-1(-)” terminal

5.4.4. 4-20mA Current Output Information

Detector State	4-20 mA Output
Fault	0mA
0 ~ 100%	4mA ~ 20mA
100% ~ 109%	20mA ~ 21.4mA
110% or more	22mA
Maintenance	3mA
※ 100% = High Scale (H/S)	

[Table 8. Current Output Information]

5.5. **Alarm Relay Terminal Configuration**

- Applied to both standard and PoE terminal units
- For mode settings, refer to “Relay Selection Jumper” in [Table 4] and [Table 6].
- Connect to terminal unit according to each function.

Alarm Terminal	Mode Settings	
TRB RELAY	Normal Open Mode	“TROUBLE”(J1) - Jumper N.O connection
	Normal Close Mode	“TROUBLE”(J1) - Jumper N.C connection
AL1 RELAY	Normal Open Mode	“ALARM-1”(J2) - Jumper N.O connection
	Normal Close Mode	“ALARM-1”(J2) - Jumper N.C connection
AL2 RELAY	Normal Open Mode	“ALARM-2”(J3) - Jumper N.O connection
	Normal Close Mode	“ALARM-2”(J3) - Jumper N.C connection

[Table 9. Alarm Relay Configuration]

5.6. **RS-485 Terminal Configuration**

- Applied to standard terminal unit only
- Connect to MODBUS Master terminal of 485-A and 485-B by referring to [Table 4].
- Use dedicated cable for RS-485.
- For detectors located at both ends of communication line, select “ON” for terminating resistance switch.

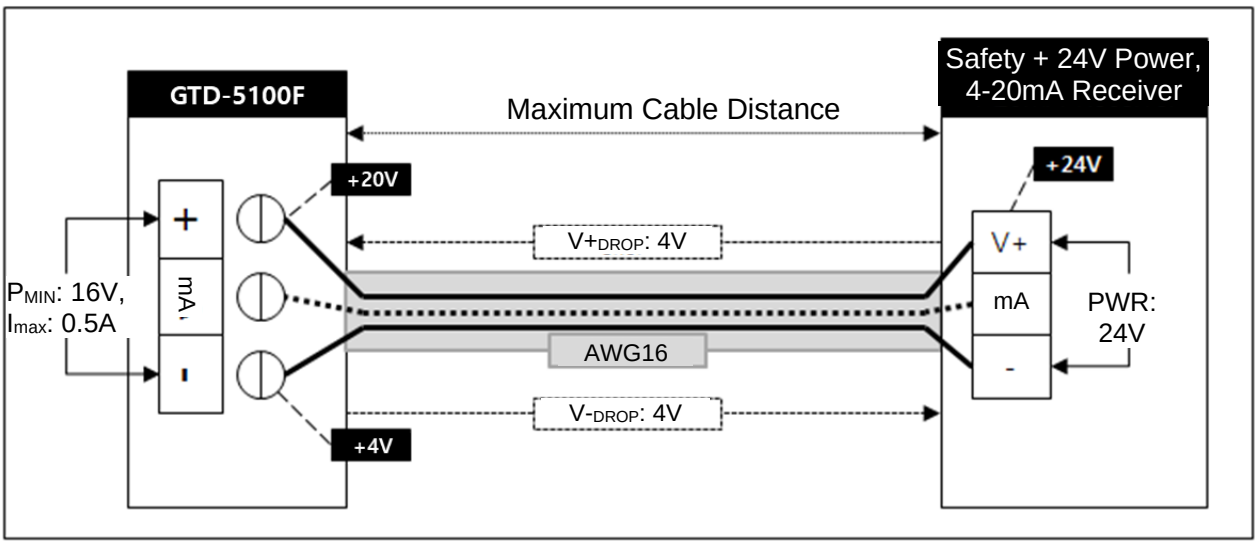
  Refer to [Figure 8].

Equipment Terminal Name	Master Terminal Name	Remarks
485-A	“TRXD+,” “A” or “P”	
485-B	“TRXD-” “B” or “N”	

[Table 10. RS-485 Terminal Configuration]

5.7. **Cable Installation Distance**

- The maximum distance between GTD-5100F and power supply is determined by wire specifications.
- Max. Installation Distance = VMAXDROP ÷ IMAX ÷ WIRER/m ÷ 2
  - ✓ VMAXDROP: Maximum Power Loop Voltage Drop (= Power supply voltage – min operating voltage)
  - ✓ IMAX: Maximum current value of GTD-5100F
  - ✓ WIRER/m: The resistance of the wire (ohms/meter value available in wire manufacturer’s specification data sheet),
- The example of installation distance using 24V power supply and 16AWG is as follows:
  - ✓ GTD-5100F minimum operating voltage = 16 Vdc
  - ✓ VMAXDROP = 24 – 16 = 8V
  - ✓ IMAX = 0.5A (500mA)
  - ✓ 8 ÷ 0.5 ÷ 0.01318 ÷ 2 = 606.980m ≒ 600m



[Figure 17. Cable Max distance]

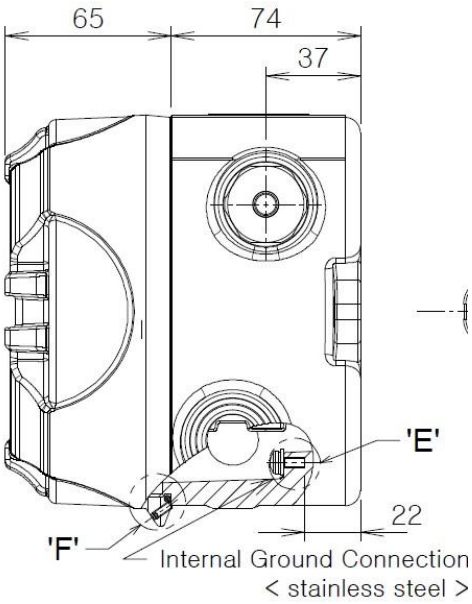
- The power cable installation distances according to cable classification are as follows:

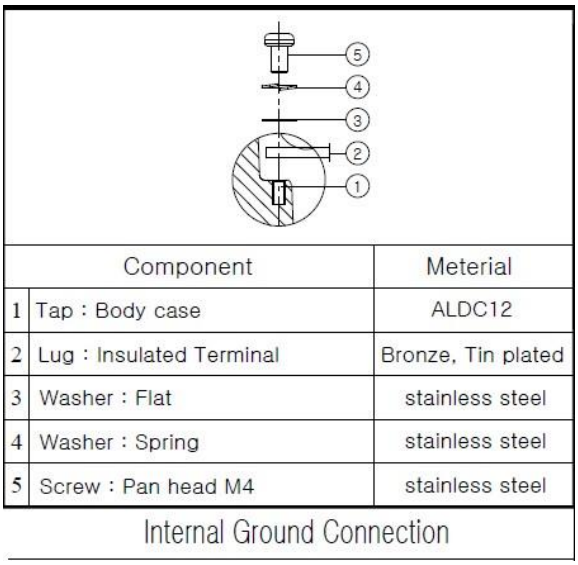
AWG	mm²	Copper resistance (ohms/m)	Meters	Feet
12	3.31	0.00521	1535	5036
14	2.08	0.00828	966	3169
16	1.31	0.01318	606	1988
18	0.82	0.02095	381	1250
20	0.518	0.0333	240	787

[Table 11. Power Cable maximum distance]

5.8. **Connection for earthing**

- For the explosion-proof in the explosive atmospheres, an earthing conductor should be connected as below.





	Component	Meterial
1	Tap : Body case	ALDC12
2	Lug : Insulated Terminal	Bronze, Tin plated
3	Washer : Flat	stainless steel
4	Washer : Spring	stainless steel
5	Screw : Pan head M4	stainless steel

Internal Ground Connection

- The internal grounding terminal shall be used, external grounding used for ATEX certification only.

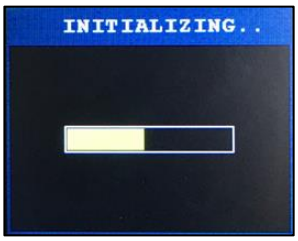
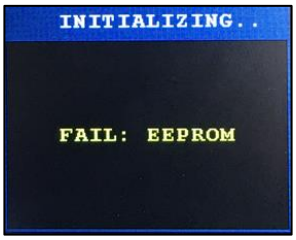
5.9. **Blanking Unused Cable Entry**

- Use the appropriate explosion proof type blanking element to close any unused entry.
- Unused opening – One UL Listed (EBNV) plug shall be provided and closed for one of unused supply connection opening (NPT).

6. Operation

6.1. Power On

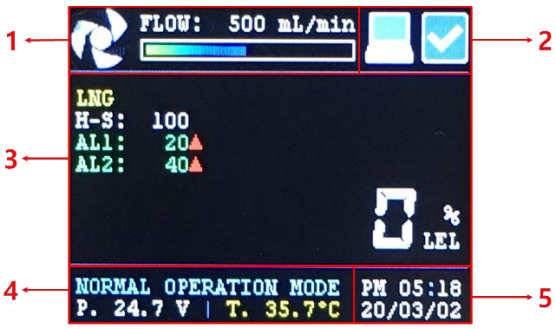
- After checking wiring, power and voltage, turn on power switch at the front.
- When PWR (Power) LED (GREEN) is turned on and warm-up is completed following initializing, configuration, and self-test, gas measuring mode is started.
- The warm-up for self-test requires approximately 900 seconds.

	➢ This screen is displayed for approx. 3 seconds when power switch is turned on.
 	➢ Detector H/W initializing and self-test are conducted. ➢ If a problem occurs during H/W initializing, FAIL is displayed, and inspection is required.
	➢ CARTRIDGE, CAVITY-IR, and Firmware Version information of MAIN are displayed. For the unconnected sensor, DISABLE is displayed. ➢ Type is displayed in OPTION No according to option switch settings. (no function).
	➢ SENSOR LEVEL, IR SOURCE POWER and FLOW CONTROL function test and warm-up are conducted. ➢ If the menu color changes to red during test, and the test is stopped, inspection is required as it indicates a problem in the respective function. ➢ When function test and warm-up are completed, gas measuring mode is started.

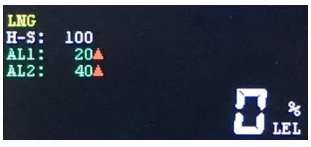
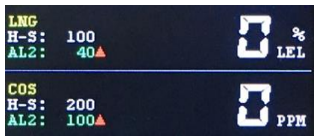
6.2. Measuring Mode

6.2.1. Display LCD Configuration

- In measuring mode, the gas measurements and various information about the detector operation are displayed in real time.

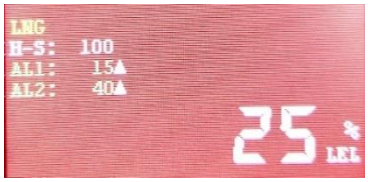
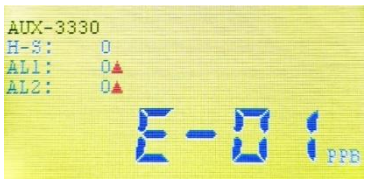


[Figure 18. Measuring Mode]

No.	Figure	Name	Description
1		Flow information	• Flow: Current flow • Icon: Speed changing according to flow • Graph: Displays amount of flow used in comparison to max. flow
2		System state icon	 • Normal operation state
			 • Filtering state - When interfering gas is detected - In case of deviation from set flow by ± 20% - When sensor is in warm-up - In case of a problem in sensor signal - In case sensor temperature deviates from operating temperature
		Communication state icon	• Icon blinking during Ethernet or RS-485 communication
3		Gas information (1 gas for measuring)	• Name of gas for measuring • H-S: High scale • AL1: First alarm operation standard and direction • AL2: Second alarm operation standard and direction (If there are two gases for measuring, “AL1” and “AL2” are alternately displayed) • Displays real-time gas concentration measured
		Gas information (2 gases for measuring)	
4		• Operating mode status information - Normal Operation Mode: Normal operation state - Lock Mode: Key locked • P. xx.xV: Input voltage information • T. xx.x°C: Temperature inside detector information
5		Time information	• Displays system time

[Table 12. Measuring Mode Screen Configuration]

6.2.2. Screen Configuration by Gas Concentration

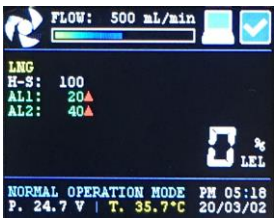
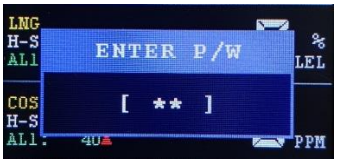
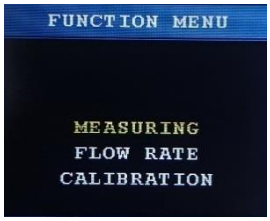
	➢ Normal Measuring State: • Measured gas concentration 0% - less than AL1
	➢ Alarm1: • When measured gas concentration is AL1 or higher • “AL1 LED” turned on
	➢ Alarm2: • When measured gas concentration is AL2 or higher • “AL2 LED” turned on
	➢ Over: • When measured gas concentration is higher than high scale by 110% or more • “OVER” displayed
	➢ System error • When problem occurs in the detector • “E-XX” displayed, “TRB LED” turned on (Refer to 8.1 Fault List)

6.3. Key Lock Function and Fault

	➢ Lock mode • Click “Reset” key for three seconds in gas measuring mode to start lock mode. • External input keys are not recognized. • Click “Reset” key for three seconds in lock mode to exit lock mode.

➢ Switch defect function loss
- If the read switch (or tact switch) is kept in short state for a certain period of time (approx. 10 minutes or longer) due to external impact or a part defect, it is decided as switch defect, and the switch function is lost.
- When the state is cleared, the function is automatically restored.

6.4. **Function Setting (Function Menu) and Control**

	➢ Click “FUNC” key for 2 seconds in measuring mode to enter password input stage.
	➢ Password input • “Password” input window is opened. • The default value set at factory release is “00 (** == 00).” It can be changed within “00 - 99.” • Enter password and click “FUNC” key to enter the function setting menu.
	➢ Function setting menu • The cursor position is displayed in yellow. • If no input is made, gas measuring mode is started in approx. 60 seconds.

- The information on key input for menu control is as follows:

Classification	Short Key Input	Long Key Input
Function (FUNC)	• Open menu • Enter • Move to the next cursor position • Select and un-select	• Move to the last cursor position • Open environment settings menu
Reset	• Return to previous menu • Move to previous cursor position	• Move to the first cursor position
Up	• Move to the top of menu (list) • Increase (number) • Change	• Increase number fast
Down	• Move to the bottom of menu (list) • Decrease (number) • Change	• Decrease number fast

[Table 13. Key Input Control Information]

7. Setting Function

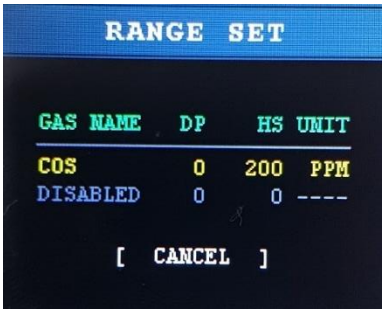
7.1. Setting Mode Configuration

Level 1	Level 2	Description
MEASURING	RANGE	Set high scale and unit of gas for measuring
	ALARM	Set conditions for the first and second alarms
	CROSS SCALE	Set relative sensitivity of sensor
FLOW RATE	CALIBRATION	Calibrate flow
	TARGET FLOW	Set output flow
	TROUBLE	Set flow trouble time
INTERFACE	POE	Set Ethernet environment (PoE terminal unit only)
	RELAY	Set relay environment
	RS485	Set RS-485 environment (standard terminal unit only)
	mA CALIBRATION	Calibrate mA (standard terminal unit only)
	mA ZERO OFFSET	Calibrate mA offset (standard terminal unit only)
SYSTEM CONFIG	CALENDAR	Set date and time
	PASSWORD	Change password
TEST	mA OUTPUT	mA output test (Standard Terminal Only)
	RELAY	Relay output test
	DISPLAY	LCD screen test
	GAS SIMULATION	Gas simulation test
Factory	**Factory Mode**	

[Table 14. Internal Environment Settings]

7.2. Measuring Setting

7.2.1. Range Setting (Location: MEASURING → RANGE)



High Scale and Unit Setting for Gas for Measuring

Classification	Description
GAS NAME	➢ Gas for measuring set • If there are two gases for measuring “DISABLED” is activated.
DP	➢ Set decimal point of gas concentration • Set point within “0 - 3”
HS	➢ Set maximum value of measuring range (high scale) • Setting range varies according to DP
UNIT	➢ Set measuring unit • Select from “PPB, PPM, %LEL, and %VOL”

➢ When “CANCEL” is changed to “SAVE,” click "SAVE".
➢ For the default value, refer to "[Table 17. Gas List]".

※ Setting change above is not recommended, If the setting is changed, measuring accuracy can be lowered.

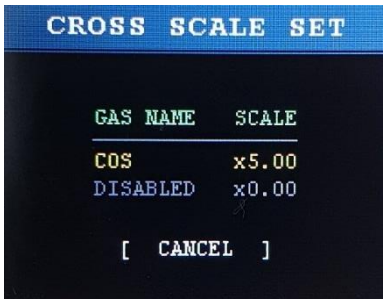
7.2.2. Alarm Setting (MEASURING → ALARM)

Set conditions for the first and second alarms

Classification	Description
GAS NAME	➢ If there are two gases for measuring, set the next gas name by using “UP” or “DOWN” key
1st	➢ Set conditions for first alarm
2nd	➢ Set conditions for second alarm
LEVEL[xxx]	➢ Set alarm threshold value • Set value within “1% - 100%” based on high scale
DEAD[%]	➢ Set dead band • Set hysteresis from alarm issue to clearing • Set value within “0% - 10%”
DELAY[SEC]	➢ Set alarm delay time • Set time within “0sec - 30sec”
LATCH	➢ Set latch activation/deactivation
DIRECTION	➢ Set direction of alarm operation

➢ When “CANCEL” is changed to “SAVE,” click "SAVE".
➢ For the default value, refer to "[Table 17. Gas List]".

7.2.3. Cross Scale Setting (MEASURING → CROSS SCALE)



Setting Relative Sensitivity of Sensor

Classification	Description
GAS NAME	➢ Name of gas for measuring • If there are two gases for measuring “DISABLED” is activated.
SCALE	➢ Set scale • Set scale within “x0.01 - x5.00”

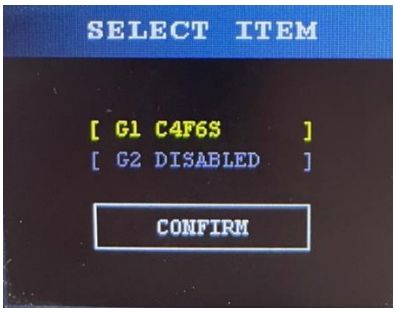
➢ When “CANCEL” is changed to “SAVE,” click "SAVE".
➢ EX) If the gas set is LNG, refer to the relative sensitivity ratio when measuring isobutane.

7.2.4. Gas Name Setting (MEASURING → GAS NAME → GAS1)

Setting Name of Gas for Measuring

- How to change gas name
  1. Set name of gas for measuring to change
  2. When “CANCEL” is changed to “SAVE,” click “SAVE”.

7.2.5. Gas Name Initializing (MEASURING → GAS NAME → INIT)

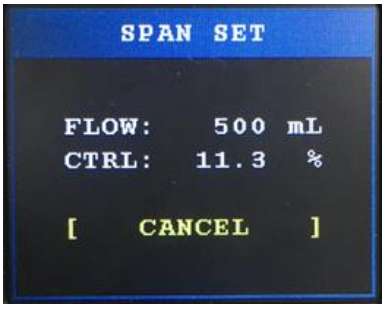


Initializing Name of Gas for Measuring

- How to change gas name
  1. Select name of gas for measuring to initialize
  2. Select “CONFIRM” and save by changing “NO” to “YES”.

7.3. Flow Rate Mode

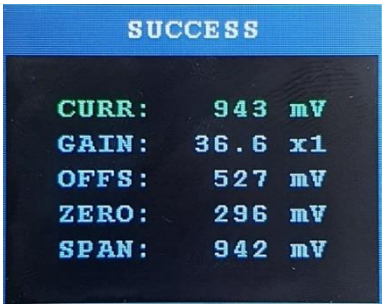
7.3.1. CALIBRATION (FLOW RATE - CALIBRATION)



Flow Calibration

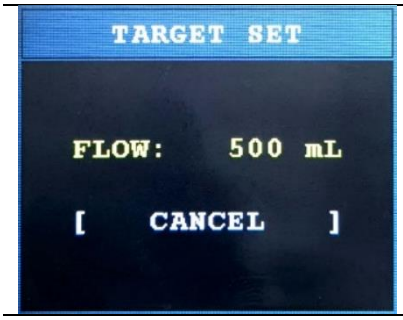
Classification	Description
FLOW	➢ Set calibration flow • Set flow within “100mL - 1000mL”
CTRL	➢ Set pump unit control calibration count • Set value within “0.0% - 30.0%”

➢ Calibration method
1. Connect flow meter and detector (inlet recommended)
2. Set flow for calibration
3. Adjust “CTRL” value so that the flow meter displays calibration flow
4. When “CANCEL” is changed to “PROGRESS,” click "PROGRESS" for automatic flow calibration.



➢ Calibration completion screen
➢ "TARGET FLOW" value is changed to the calibration flow value.

7.3.2. TARGET FLOW SET UP (FLOW RATE – TARGET FLOW)



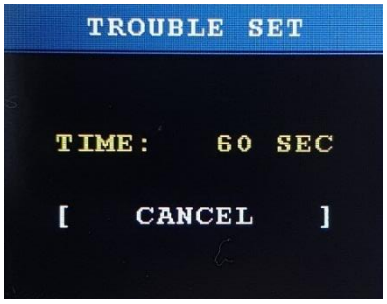
Output Flow Setting

Classification	Description
FLOW	➢ Set target flow • Set flow within “100mL - 1000mL”

➢ When “CANCEL” is changed to “SAVE,” click "SAVE".
➢ The set flow is displayed.

※ With target flow setting, the accuracy can be lowered. Therefore, calibration is recommended.

7.3.3. TROUBLE (FLOW RATE – TROUBLE)



Flow Trouble Time Setting

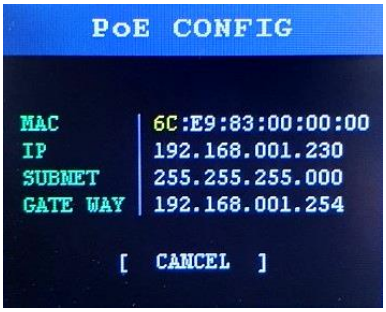
Classification	Description	Default Value
TIME	➢ Set retention time until trouble occurrence • Set time within “5sec - 60sec”	30 sec

➢ “TROUBLE” occurs when the current flow exceeds the set flow by ±20%, and is maintained for the set period of time or longer.
➢ When current flow returns to be within ±20% of the set value, “TROUBLE” is automatically cleared.
➢ When “CANCEL” is changed to “SAVE,” click "SAVE".

7.4. Interface Mode

- Menus Applied to Standard Terminal Unit: RELAY, RS485, mA CALIBRATION, mA ZERO OFFSET
- Menus Applied to PoE Terminal Unit: PoE, RELAY

7.4.1. PoE (INTERFACE → PoE)

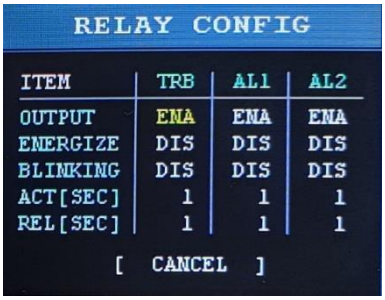


Ethernet Environment Setting (PoE Terminal Unit Only)

Classification	Description
MAC	➢ Change prohibited (applied at product release)
IP	➢ Set IP address • Set IP address within “0 - 255”
SUBNET	➢ Set subnet mask • Set subnet mask within “0 - 255”
GATEWAY	➢ Set gateway • Set gateway within “0 - 255”

➢ When “CANCEL” is changed to “SAVE,” click "SAVE".

7.4.2. RELAY (INTERFACE → RELAY)

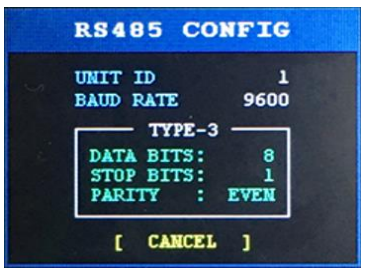


Relay Environment Setting

Classification	Description	Initial Value
TRB	➢ Set trouble relay	
AL1	➢ Set first alarm relay	
AL2	➢ Set second alarm relay	
OUTPUT	➢ Set relay activation/deactivation	Enable
ENERGIZE	➢ Select ENERGIZE application ➢ Relay coil operates according to the application state • Enable: Normal “ON”, Event “OFF” • Disable: Normal “OFF”, Event “ON”	Disable
BLINKING	➢ Set relay signal blinking activation/deactivation at event occurrence	Disable
ACT [SEC]	➢ Set relay on-time when blinking is activated • Set relay on-time within “1 sec - 60 sec”	1 sec
REL [SEC]	➢ Set relay off-time when blinking is activated • Set relay off-time within “1 sec - 60 sec”	1 sec

➢ When “CANCEL” is changed to “SAVE,” click "SAVE".

7.4.3. RS485 (INTERFACE → RS485)

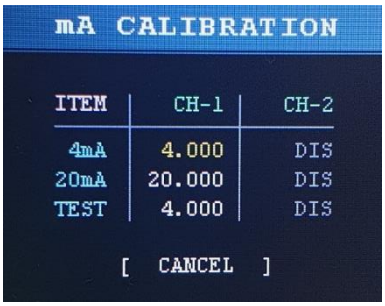


RS-485 Environment Setting (Standard Terminal Only)

Classification	Description	Initial Value
UNIT ID	➢ Set Unit ID • Set ID within “1 - 247”	1
BAUD RATE	➢ Set communication speed • Select from “2400, 4800, 9600, 19200, 38400, 57600, and 115200” • Initial value is “9600”.	9600

	TYPE	➢ Set communication data structure • Divided into 6 types according to stop bit count and parity • Stop Bit: “1 or 2” • Parity: “None, Odd, Even”	TYPE-3 Data : 8 Stop : 1 EVEN
	➢ When “CANCEL” is changed to “SAVE,” click "SAVE".		

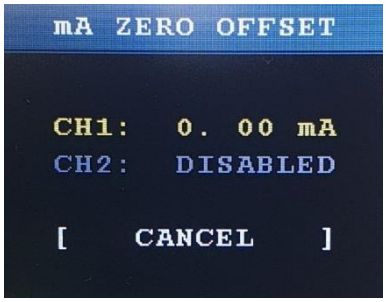
7.4.4. mA CALIBRATION (INTERFACE → mA CALIBRATION)



mA Calibration (STD Only)

- Calibration method
  1. Configure mA circuit (Refer to “5.4 4-20mA Current Interface Setting”)
  2. Select “4mA” and set input value in reception unit
  3. Select “20mA” and set input value in reception unit
  4. Change “TEST” value and compare it with input value in reception unit
  5. When “CANCEL” is changed to “SAVE,” click "SAVE".
- If there are two gases for measuring, “CH-2” is activated.

7.4.5. mA Zero Offset (INTERFACE→mA OFFSET)

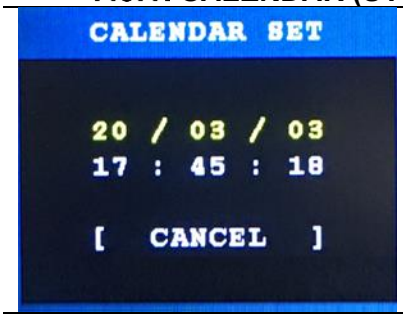


mA Offset Calibration (STD Only)

- Proceed with mA offset calibration when the compensation is necessary (recommended to complete mA calibration first)
- Calibration method
  1. Select compensation value by checking value in reception unit
     Setting Range: “-2.000mA - 2.000mA”
  2. After changing the set value, recheck value in reception unit
  3. When “CANCEL” is changed to “SAVE,” click "SAVE".
- If there are two gases for measuring, “CH2” is activated.

7.5. SYSTEM Mode

7.5.1. CALENDAR (SYSTEM → CALENDAR)



Date and time setting

- Date and time change
  1. Set the current date and time
  2. When “CANCEL” is changed to “SAVE,” click "SAVE".

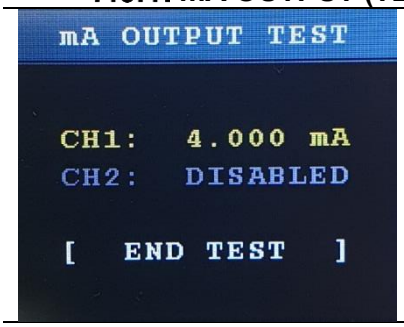
7.5.2. PASSWORD (SYSTEM → PASSWORD)

Password Setting

- How to change password
  1. Set a new password between “00 - 99”
  2. When “CANCEL” is changed to “SAVE,” click "SAVE".

7.6. Test Mode

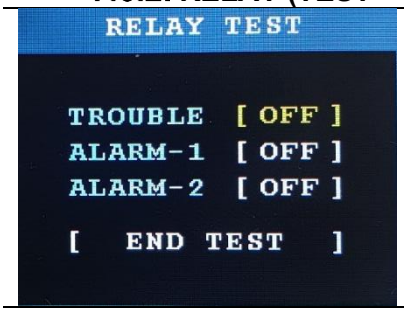
7.6.1. mA OUTPUT (TEST → mA OUTPUT)



mA Output Test (Standard Terminal Only)

- mA output can be set in this menu.
  Output Setting Range: “0.500mA - 22.000mA”
- If there are two gases for measuring, “CH2” is activated.

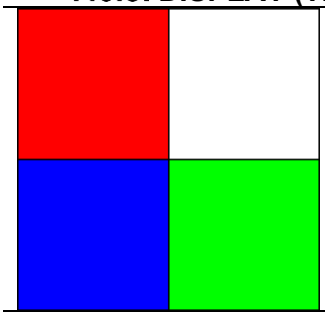
7.6.2. RELAY (TEST → RELAY)



Relay Output Test

- Check for normal relay operation
  Check relay operation by changing “ON/OFF”

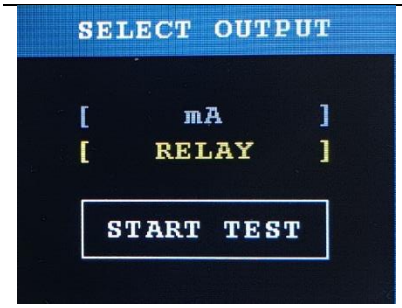
7.6.3. DISPLAY (TEST → DISPLAY)



LCD Screen Test

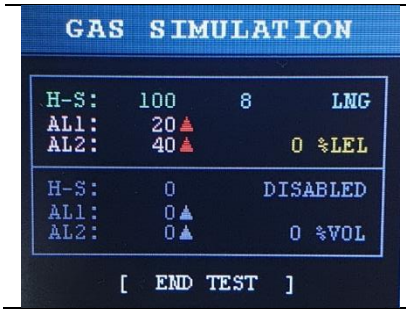
- Check display (LCD) pixels and color state.
- When “FUNC” key is entered, R (red), G (green), B (blue), and W (white) are displayed sequentially.
- Exit display test mode by using “RESET” key.

7.6.4. GAS SIMULATION (TEST – GAS SIMULATION)



Gas Simulation Test

- Test method
  1. Select output items (mA, relay)
     - When selection is made, the background is displayed in blue.
     - For POE terminal unit, mA is deactivated.
     - LED (TRB, AL1, AL2) is displayed by default.
  2. Select “START TEST”



- Setting Range:
  - Based on H/S, setting range can be adjusted in 10% unit.
  - OVER
  - ERROR
- Check selected output according to concentration setting
  - 4 - 22 mA
  - Relay (TRB, AL1, AL2)
  - LED (TRB, AL1, AL2)

7.7. Factory Setting Mode

- CAUTION: Refer to Factory Manual for factory setting mode. Random modification by user can cause detector malfunction.

8. Troubleshooting

⚠ ➢ CAUTION: In case of the failure of a part or a physical failure, repair must be conducted by Gastron or a person certified by Gastron.

8.1. Fault List

[Table 15: Fault Codes & Recovery List]

Fault	Description & Condition
E-1	Unable to control internal system
E-7	sensor output deterioration due to optical path contamination
E-11	sensor unit communication defect
E-13	EEPROM communication data defect
E-21	Flow kept below 80% of set flow
E-22	Flow exceeding and kept over 120% of set flow
E-30	Gas measurement -10% or less
E-31	Power supply defect
E-40	source output defective
E-41	sensor output saturated in minimum or maximum value
E-42	sensor output in offset drift state
E-43	sensor unit operating temperature below or exceeding the specified temperature
E-47	sensor signal instable
E-50	Unmeasurable state continued over a long period

8.2. Recovery List

[Table 16. Recovery List]

Fault	Maintenance Guide
E-1	Replace main unit
E-7	Replace sensor unit
E-11	Check the cable connection state or for cable disconnection
E-13	Replace main unit if symptom recurs after system rebooting
E-21	Check for dust filter and flow path blocking, and replace main unit if there is no problem in the flow path
E-22	Re-administer flow calibration, and replace main unit if symptom recurs
E-30	Re-administer gas calibration, and replace sensor unit if symptom recurs
E-31	Check power supply, and replace main unit if there is no problem
E-40	Replace sensor unit
E-41	Replace sensor unit
E-42	Replace sensor unit
E-43	Install product considering operating temperature, Replace sensor unit if there is no environmental issue
E-47	Identify cause of filtering
E-50	Identify cause of and handle unmeasurable state

9. List of Measuring Gas and Default Setting Value

No.	GAS NAME	High Scale	Unit	AL1 value	AL2 value	Flow Rate (mL/min)	Interfering Gas Filtering
1	LNG	100	%LEL	20	40	500	O
2	CH4	100	%LEL	20	40	500	O
3	COS	200	PPM	25	100	500	O
4	C4F8	2000	PPM	500	1000	500	O
5	C5F8	2000	PPM	500	1000	500	O
6	C4F6	2000	PPM	500	1000	500	O
7	CH2F2	2000	PPM	500	1000	500	O
8	TEOS	100	PPM	10	20	700	O
9	CH3F	2000	PPM	500	1000	500	O
10	SFA-1	100	%LEL	25	50	500	O
11	IPA	3000	PPM	200	400	500	O
12	4MS	100	%LEL	25	50	500	O
13	C4F6S	2000	PPM	500	1000	500	O
14	ECH	100	%LEL	25	50	500	O
15	NF3	200	PPM	10	20	700	O
16	N2O	4000	PPM	500	2000	500	X
17	C4H10	100	%LEL	20	40	500	X
18	CO	5.00	%VOL	1.00	2.00	500	X
		2.00		0.40	0.80		
		1.00		0.20	0.40		
19	CO2	5.0	%VOL	1.0	2.0	500	X
		1.0		0.25	0.5		
		5000	PPM	1000	2000		

[Table 17. GAS List]

10. Interface Configuration

10.1. MODBUS RTU & TCP Address map

Address	Register Name	Data Type	Description	
Read & Write Coils				
1	CH1 Remote Test Mode Reset	bit	1 = End test mode (resume measuring)	
2	CH1 Remote Test Mode Set	bit	1 = Enter test mode (fix measurement in high scale)	
3	CH2 Remote Test Mode Reset	bit	1 = End test mode (resume measuring)	
4	CH2 Remote Test Mode Set	bit	1 = Enter test mode (fix measurement in high scale)	
Read Discrete Input				
10001	CH1 Alarm-1 Active	bit	1 = True, 0 = False	
10002	CH1 Alarm-2 Active	bit	1 = True, 0 = False	
10003	CH1 Trouble(Fault) Active	bit	1 = True, 0 = False	
10004	CH1 Maintenance Mode	bit	1 = True, 0 = False	
10005	CH1 Test Mode	bit	1 = True, 0 = False	
10006	CH1 Calibration Mode	bit	1 = True, 0 = False	
10007	Reserved	bit	Always '1'	
10008	CH1 toggle bit	bit	Repeated at request, 0 -> 1 -> 0 -> 1 -> 0 -> 1 ·····	
10009	CH2 Alarm-1 Active	bit	1 = True, 0 = False	
10010	CH2 Alarm-2 Active	bit	1 = True, 0 = False	
10011	CH2 Trouble(Fault) Active	bit	1 = True, 0 = False	
10012	CH2 Maintenance Mode	bit	1 = True, 0 = False	
10013	CH2 Test Mode	bit	1 = True, 0 = False	
10014	CH2 Calibration Mode	bit	1 = True, 0 = False	
10015	Reserved	bit	Always '1'	
10016	CH2 toggle bit	bit	Repeated at request, 0 -> 1 -> 0 -> 1 -> 0 -> 1 ·····	
Read input registers				
30001	CH1 Detector Status-1	unsigned int	BIT0	Self-test (1 = True, 0 = False)
			BIT1	Warm-up (1 = True, 0 = False)
			BIT2	Normal Operation (1 = True, 0 = False)
			BIT3	Maintenance Mode (1 = True, 0 = False)
			BIT4	Test Mode (1 = True, 0 = False)
			BIT5	Trouble(Fault) Active (1 = True, 0 = False)
			BIT6	Trouble(Fault) Relay Energized (1 = True, 0 = False)
			BIT7	Reserved
			BIT8	Alarm-1 Active (1 = True, 0 = False)
30001	CH1 Detector Status-1	unsigned int	BIT9	Alarm-1 Relay Energized (1 = True, 0 = False)

			BIT10	Alarm-2 Active (1 = True, 0 = False)
			BIT11	Alarm-2 Relay Energized (1 = True, 0 = False)
			BIT12	Range Over (1 = True, 0 = False)
			BIT13	Interference Gas Detection (1 = True, 0 = False)
			BIT14	Reserved
			BIT15	Reserved
30002	CH1 Trouble (Fault) Code	unsigned int	BIT 0~7	0 = Normal State, 1~255 = Trouble(Fault) State
			BIT 8~15	Reserved
30003	CH1 Decimal Point & Unit	unsigned int	BIT0	xxxx
			BIT1	xxx.x
			BIT2	xx.xx
			BIT3	x.xxx
			BIT4	PPB
			BIT5	PPM
			BIT6	%LEL
			BIT7	%VOLUME
			BIT 8~15	Gas Number (0~255)
30004	CH1 Measured Gas Concentration Lower Word	float		
30005	CH1 Measured Gas Concentration Upper Word	float		
30006	CH1 Measured Gas Concentration	unsigned int	(Ex: 30.0 %VOL = 300)	
30007	CH1 Alarm-1 Set Point Lower Word	float		
30008	CH1 Alarm-1 Set Point Upper Word	float		
30009	CH1 Alarm-1 Set Point	unsigned int	(Ex: 30.0 %VOL = 300)	
30010	CH1 Alarm-2 Set Point Lower Word	float		
30011	CH1 Alarm-2 Set Point Upper Word	float		
30012	CH1 Alarm-2 Set Point	unsigned int	(Ex: 30.0 %VOL = 300)	
30013	CH1 High Scale Lower Word	float		
30014	CH1 High Scale Upper Word	float		
30015	CH1 High Scale	unsigned int	(Ex: 30.0 %VOL = 300)	
30016	CH1 Reserved			
30017	CH1 Reserved			
30018	CH1 Reserved			
30019	CH1 Reserved			
30020	CH1 Reserved			
30021	CH2 Detector Status-1	unsigned int	BIT0	Self-test (1 = True, 0 = False)

			BIT1	Warm-up (1 = True, 0 = False)
			BIT2	Normal Operation (1 = True, 0 = False)
			BIT3	Maintenance Mode (1 = True, 0 = False)
			BIT4	Test Mode (1 = True, 0 = False)
			BIT5	Trouble(Fault) Active (1 = True, 0 = False)
			BIT6	Trouble(Fault) Relay Energized (1 = True, 0 = False)
			BIT7	Reserved
			BIT8	Alarm-1 Active (1 = True, 0 = False)
			BIT9	Alarm-1 Relay Energized (1 = True, 0 = False)
			BIT10	Alarm-2 Active (1 = True, 0 = False)
			BIT11	Alarm-2 Relay Energized (1 = True, 0 = False)
			BIT12	Range Over (1 = True, 0 = False)
			BIT13	Interference Gas Detection (1 = True, 0 = False)
			BIT14	Reserved
			BIT15	Reserved
30022	CH2 Trouble(Fault) Code	unsigned int	BIT 0~7	0 = Normal State, 1~255 = Trouble(Fault) State
			BIT 8~15	Reserved
30023	CH2 Decimal Point & Unit	unsigned int	BIT0	xxxx
			BIT1	xxx.x
			BIT2	xx.xx
			BIT3	x.xxx
			BIT4	PPB
			BIT5	PPM
			BIT6	%LEL
			BIT7	%VOLUME
			BIT 8~15	Gas Number (0~255)
30024	CH2 Measured Gas Concentration Lower Word	float		
30025	CH2 Measured Gas Concentration Upper Word	float		
30026	CH2 Measured Gas Concentration	unsigned int	(Ex: 30.0 %VOL = 300)	
30027	CH2 Alarm-1 Set Point Lower Word	float		
30028	CH2 Alarm-1 Set Point Upper Word	float		
30029	CH2 Alarm-1 Set Point	unsigned int	(Ex: 30.0 %VOL = 300)	
30030	CH2 Alarm-2 Set Point Lower Word	float		
30031	CH2 Alarm-2 Set Point Upper Word	float		
30032	CH2 Alarm-2 Set Point	unsigned int	(Ex: 30.0 %VOL = 300)	
30033	CH2 High Scale Lower Word	float		

30034	CH2 High Scale Upper Word	float		
30035	CH2 High Scale	unsigned int	(Ex: 30.0 %VOL = 300)	
30036	CH2 Reserved			
30037	CH2 Reserved			
30038	CH2 Reserved			
30039	CH2 Reserved			
30040	CH2 Reserved			
30041 ~ 30084	Reserved			
30085	CH1 Detector Status-2	unsigned int	BIT0	Trouble (Fault) (1 = True, 0 = False)
			BIT1	Sensor Cartridge Error (1 = True, 0 = False)
			BIT2	Flow Error (1 = True, 0 = False)
			BIT3	Internal Communication Error (1 = True, 0 = False)
			BIT 4~15	Reserved
30086	CH2 Detector Status-2	unsigned int	BIT0	Trouble (Fault) (1 = True, 0 = False)
			BIT1	Sensor Cartridge Error (1 = True, 0 = False)
			BIT2	Flow Error (1 = True, 0 = False)
			BIT3	Internal Communication Error (1 = True, 0 = False)
			BIT 4~15	Reserved
30087 ~ 30088	Reserved			
30089	Heart beat	unsigned int	Increased at request, 0 -> 1 -> 2 -> 3 ····· -> 65535 -> 0 -> 1 ·····	
30090	Reserved			
30091	Detector Serial Number-1	unsigned int	BIT0~7	1'st Character (Ex: GTD-5100FN = 'G' = 0x47)
			BIT8~15	2'nd Character (Ex: GTD-5100FN = 'T' = 0x54)
30092	Detector Serial Number-2	unsigned int	BIT0~7	3'rd Character (Ex: GTD-5100FN = 'D' = 0x44)
			BIT8~15	4'th Character (Ex: GTD-5100FN = '-' = 0x2D)
30093	Detector Serial Number-3	unsigned int	BIT0~7	5'th Character (Ex: GTD-5100FN = '5' = 0x35)
			BIT8~15	6'th Character (Ex: GTD-5100FN = 'x' = 0x78)
30094	Detector Serial Number-4	unsigned int	BIT0~7	7'th Character (Ex: GTD-5100FN = '0' = 0x30)
			BIT8~15	8'th Character (Ex: GTD-5100FN = '0' = 0x30)
30095	Detector Serial Number-5	unsigned int	BIT0~7	9'th Character (Ex: GTD-5100FN = '(' = 0x28)
			BIT8~15	10'th Character (Ex: GTD-5100FN = 'F' = 0x46)
30096	Detector Serial Number-6	unsigned int	BIT0~7	11'th Character (Ex: GTD-5100FN = ')' = 0x29)
			BIT8~15	Reserved
Read & Write Holding Registers				
40001	CH1 Detector Status-1	unsigned int	BIT0	Self-test (1 = True, 0 = False)

			BIT1	Warm-up (1 = True, 0 = False)
			BIT2	Normal Operation (1 = True, 0 = False)
			BIT3	Maintenance Mode (1 = True, 0 = False)
			BIT4	Test Mode (1 = True, 0 = False)
			BIT5	Trouble(Fault) Active (1 = True, 0 = False)
			BIT6	Trouble(Fault) Relay Energized (1 = True, 0 = False)
			BIT7	Reserved
			BIT8	Alarm-1 Active (1 = True, 0 = False)
			BIT9	Alarm-1 Relay Energized (1 = True, 0 = False)
			BIT10	Alarm-2 Active (1 = True, 0 = False)
			BIT10	Alarm-2 Active (1 = True, 0 = False)
			BIT11	Alarm-2 Relay Energized (1 = True, 0 = False)
			BIT12	Range Over (1 = True, 0 = False)
			BIT13	Interference Gas Detection (1 = True, 0 = False)
			BIT14	Reserved
			BIT15	Reserved
40002	CH1 Trouble(Fault) Code	unsigned int	BIT 0~7	0 = Normal State, 1~255 = Trouble(Fault) State
			BIT8~15	Reserved
40003	CH1 Decimal Point & Unit	unsigned int	BIT0	xxxx
			BIT1	xxx.x
			BIT2	xx.xx
			BIT3	x.xxx
			BIT4	PPB
			BIT5	PPM
			BIT6	%LEL
			BIT7	%VOLUME
			BIT8~15	Gas Number (0~255)
40004	CH1 Measured Gas Concentration Lower Word	float		
40005	CH1 Measured Gas Concentration Upper Word	float		
40006	CH1 Measured Gas Concentration	unsigned int	(Ex: 30.0 %VOL = 300)	
40007	CH1 Alarm-1 Set Point Lower Word (Write)	float		
40008	CH1 Alarm-1 Set Point Upper Word (Write)	float		
40009	CH1 Alarm-1 Set Point (Write)	unsigned int	(Ex: 30.0 %VOL = 300)	
40010	CH1 Alarm-2 Set Point Lower Word (Write)	float		
40011	CH1 Alarm-2 Set Point Upper Word (Write)	float		
40012	CH1 Alarm-2 Set Point	unsigned int	(Ex: 30.0 %VOL = 300)	

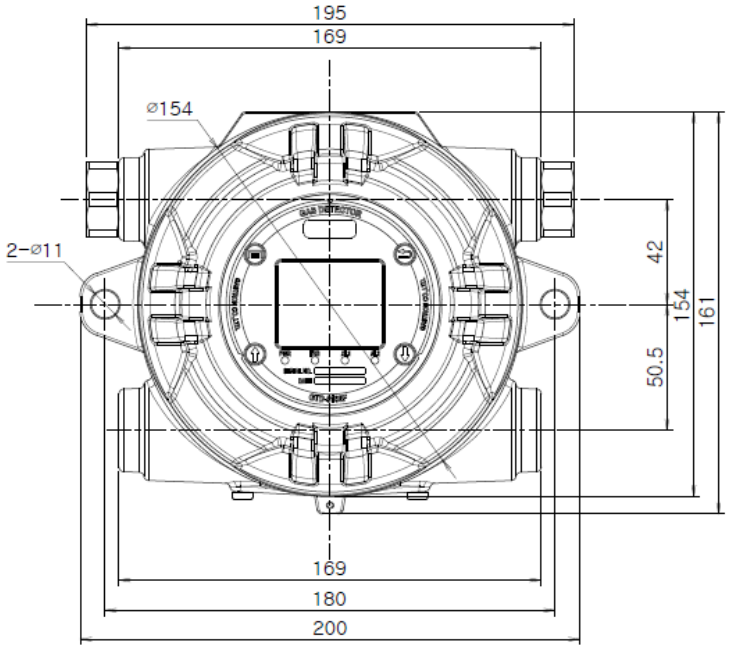
	(Write)			
40013	CH1 High Scale Lower Word	float		
40014	CH1 High Scale Upper Word	float		
40015	CH1 High Scale	unsigned int	(Ex: 30.0 %VOL = 300)	
40016	CH1 Reserved			
40017	CH1 Reserved			
40018	CH1 Reserved			
40019	CH1 Reserved			
40020	CH1 Reserved			
40021	CH2 Detector Status-1	unsigned int	BIT0	Self-test (1 = True, 0 = False)
			BIT1	Warm-up (1 = True, 0 = False)
			BIT2	Normal Operation (1 = True, 0 = False)
			BIT3	Maintenance Mode (1 = True, 0 = False)
			BIT4	Test Mode (1 = True, 0 = False)
			BIT5	Trouble(Fault) Active (1 = True, 0 = False)
			BIT6	Trouble(Fault) Relay Energized (1 = True, 0 = False)
			BIT7	Reserved
			BIT8	Alarm-1 Active (1 = True, 0 = False)
			BIT9	Alarm-1 Relay Energized (1 = True, 0 = False)
			BIT10	Alarm-2 Active (1 = True, 0 = False)
			BIT11	Alarm-2 Relay Energized (1 = True, 0 = False)
			BIT12	Range Over (1 = True, 0 = False)
			BIT13	Interference Gas Detection (1 = True, 0 = False)
			BIT14	Reserved
			BIT15	Reserved
40022	CH2 Trouble(Fault) Code	unsigned int	BIT0~7	0 = Normal State, 1~255 = Trouble (Fault) State
			BIT8~15	Reserved
40023	CH2 Decimal Point & Unit	unsigned int	BIT0	xxxx
			BIT1	xxx.x
			BIT2	xx.xx
			BIT3	x.xxx
			BIT4	PPB
			BIT5	PPM
			BIT6	%LEL
			BIT7	%VOLUME
			BIT8~15	Gas Number (0~255)

40024	CH2 Measured Gas Concentration Lower Word	float		
40025	CH2 Measured Gas Concentration Upper Word	float		
40026	CH2 Measured Gas Concentration	unsigned int	(Ex: 30.0 %VOL = 300)	
40027	CH2 Alarm-1 Set Point Lower Word (Write)	float		
40028	CH2 Alarm-1 Set Point Upper Word (Write)	float		
40029	CH2 Alarm-1 Set Point (Write)	unsigned int	(Ex: 30.0 %VOL = 300)	
40030	CH2 Alarm-2 Set Point Lower Word (Write)	float		
40031	CH2 Alarm-2 Set Point Upper Word (Write)	float		
40032	CH2 Alarm-2 Set Point (Write)	unsigned int	(Ex: 30.0 %VOL = 300)	
40033	CH2 High Scale Lower Word	float		
40034	CH2 High Scale Upper Word	float		
40035	CH2 High Scale	unsigned int	(Ex: 30.0 %VOL = 300)	
40036	CH2 Reserved			
40037	CH2 Reserved			
40038	CH2 Reserved			
40039	CH2 Reserved			
40040	CH2 Reserved			
40041 ~ 40084	Reserved			
40085	CH1 Detector Status-2	unsigned int	BIT0	Trouble(Fault) (1 = True, 0 = False)
			BIT1	Sensor Cartridge Error (1 = True, 0 = False)
			BIT2	Flow Error (1 = True, 0 = False)
			BIT3	Internal Communication Error (1 = True, 0 = False)
			BIT4~15	Reserved
40086	CH2 Detector Status-2	unsigned int	BIT0	Trouble(Fault) (1 = True, 0 = False)
			BIT1	Sensor Cartridge Error (1 = True, 0 = False)
			BIT2	Flow Error (1 = True, 0 = False)
			BIT3	Internal Communication Error (1 = True, 0 = False)
			BIT4~15	Reserved
40087 ~ 40088	Reserved			
40089	Heart beat	unsigned int	Increased at request, 0 -> 1 -> 2 -> 3 ····· -> 65535 -> 0 -> 1 ·····	
40090	Reserved			
40091	Detector Serial Number-1	unsigned int	BIT0~7	1'st Character (Ex: GTD-5100FN = 'G' = 0x47)
			BIT8~15	2'nd Character (Ex: GTD-5100FN = 'T' = 0x54)
40092	Detector Serial Number-2	unsigned int	BIT0~7	3'rd Character (Ex: GTD-5100FN = 'D' = 0x44)
			BIT8~15	4'th Character (Ex: GTD-5100FN = '-' = 0x2D)

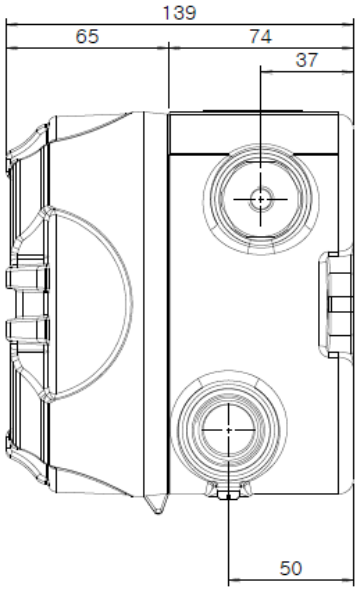
40093	Detector Serial Number-3	unsigned int	BIT0~7	5'th Character (Ex: GTD-5100FN = '5' = 0x35)
			BIT8~15	6'th Character (Ex: GTD-5100FN = 'x' = 0x78)
40094	Detector Serial Number-4	unsigned int	BIT0~7	7'th Character (Ex: GTD-5100FN = '0' = 0x30)
			BIT8~15	8'th Character (Ex: GTD-5100FN = '0' = 0x30)
40095	Detector Serial Number-5	unsigned int	BIT0~7	9'th Character (Ex: GTD-5100FN = '(' = 0x28)
			BIT8~15	10'th Character (Ex: GTD-5100FN = 'F' = 0x46)
40096	Detector Serial Number-6	unsigned int	BIT0~7	11'th Character (Ex: GTD-5100FN = ')' = 0x29)
			BIT8~15	Reserved

[Table 18. MODBUS RTU & TCP Address Map]

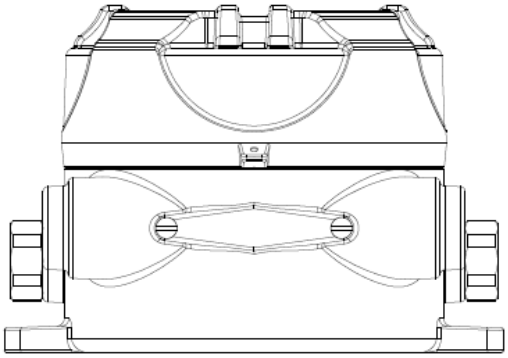
11. Outline Drawing and Dimensions



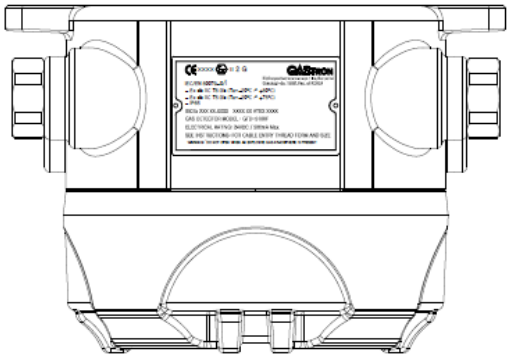
FRONT VIEW



SIDE VIEW



SECTION VIEW



TOP VIEW

[Figure 19. Outline Drawing and Dimensions]

12. Pre-installation Notes

12.1. Selection of Installation Location (According to the Occupational Safety and Health Act)

Gas leak alarm must be installed in the following locations:

- Around chemical facilities and auxiliary facilities with a risk of gas leakage, such as compressor, valve, reactor, and pipeline joint installed inside or outside of a building where flammable and toxic substances are handled
- Around manufacturing facilities with ignition sources, such as heating furnace, that are prone to gas retention
- Around the joints of facilities for flammable and toxic substance charging
- Substation, switchboard room, and control room, etc. located in explosion-proof area
- Other locations that are especially prone to gas retention

12.2. Selection of Installation Location (According to the High-pressure Gas Safety Control Act)

The gas detector of a gas leak alarm must be installed as close to an area with a risk of gas leakage as possible. However, in areas where direct gas leakage is not expected, but that are prone to retention of the leaked gas, gas detector must be installed in one of the following locations:

- Outside of a building, the gas leak alarm must be installed in a location that is prone to gas retention with consideration given to the wind direction, wind velocity, and specific gravity of gas, etc.
- Inside of a building, the gas leak alarm must be installed at the bottom of the building if specific gravity of the gas subject to detection is higher than air, and at the top of the building or near the ventilation if specific gravity of the gas is lower than air.
- The alarm of a gas leak alarm must be installed in areas where gas detectors are installed and workers are permanently stationed.

12.3. Caution for Installation

The locations where electrical malfunction can be caused by rain, etc. must be avoided for installation. It is recommended to install product in locations where maintenance is facilitated as periodic maintenance is required. Areas with a risk of vibration or impact can affect the output values. Therefore, installation in locations subject to vibration or impact must be avoided. The product must be installed with the sensor unit in the direction of gravity.

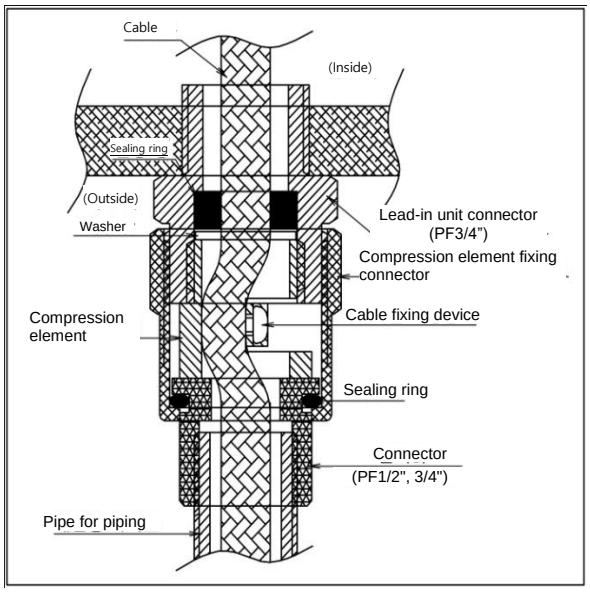
- This product is in an explosion-proof structure, and belongs to the GROUP II targeting gas and steam in general business establishments and chemical plants. Therefore, it can be used in the ZONE 1 (ONE) - Type 1 hazardous zones and ZONE 2 (TWO) - Type 2 hazardous zones.
- The permitted temperature is 85℃ or less, which applies to T6.

  The ambient temperature must be in the range from -20℃ to 60℃..
- The permitted temperature is 100℃ or less, which applies to T5.

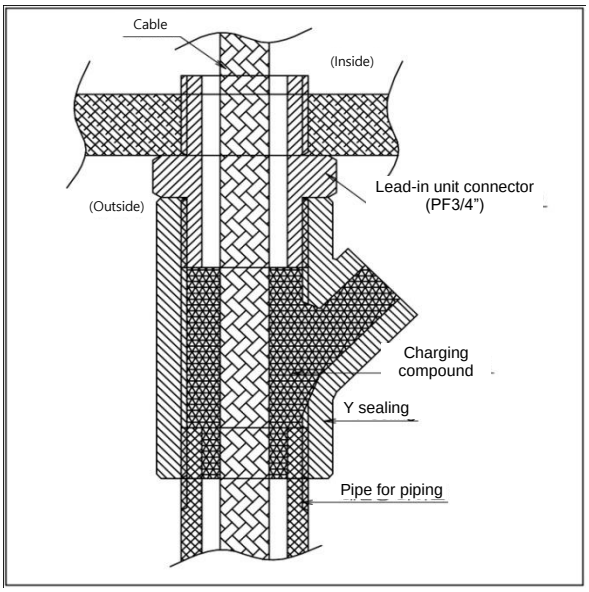
  The ambient temperature must be in the range from -20℃ to 75℃
- Installation Height: 1,000m or less above sea level
- Relative Humidity: 5% - 99% (non-condensing)
- Installation Location: Indoor or outdoor
- Explosive Ignition Point of Target Gas or Steam: Ex d IIC T6
- For the wiring operation, explosion-proof cable glands must be used at the cable inlets, or, for wiring work in metallic wire ducts, the wire ducts must be sealed in order to prevent flame from spreading when transferring gas, etc. through the wire duct for less than 50mm or in case of explosion. In addition, for all materials including those applied to the unused inlets, safety certification must be obtained.
- For connection between this product and the wire duct, at least five screw threads must be connected.
- The working condition must meet the [Standards for Selection, Installation, and Repair, etc. of Wiring, etc. for Electrical and Mechanical Instruments of Explosion-proof Structure in Business Establishments].
- To reduce the risk of ignition of hazardous atmospheres, disconnect the equipment from the supply circuit before opening enclosure. Keep assembly tightly closed when in operation.
- To reduce the risk of ignition of hazardous atmospheres, the conduit run must have a sealing fitting connected within 18 in. of the enclosure.
- Field-wiring terminal shall be marked “Use copper conductors only”.
- Classified as to fire, electrical shock and explosion hazards only.
- The outer jacket of the POE cable shall be removed during compound sealing within the conduit.
- All the wires should be spread and separated so that they can be evenly sealed.

- Environment temperature of working of epoxy mold : 15 ~ 25℃

UL : Class I Div. 1 Group A,B,C and D
T6 Ta= -20˚C to 60˚C, T5 Ta= -20˚C to 75˚C



[Figure 20. Pressure Packing Type]



[Figure 21. Y Sealing Compound]

13. Revision Records

Version	Contents	Date
1.0	First revised	Mar 05, 2020
1.1	Modified list of gas for measuring (TEOS)	Mar 25, 2020
1.2	Changed specifications	Jul 06, 2020
1.3	Partially modified content	Aug 21, 2020
1.4	Partially modified content, corrected typing errors	Jan 06, 2021
1.5	Changed logo	Feb 25, 2021
1.6	Added gas name function	Apr 23, 2021
1.7	Modified list of gas for measuring and error code information	Apr 14, 2022
1.8	Modified by UL approval	Jan 04, 2023
1.9	Modified by UL approval	Apr 28, 2023
1.10	Modified by UL approval(Modified Max wattage)	May 17, 2023
1.11	Modified by UL approval(added cautions for installation)	Jun 20, 2023
1.12	Modified by UL approval(added information about work of epoxy mold)	Sep 26, 2023
1.13	Modified by UL approval(added information about earthing grounding)	Oct 26, 2023
1.14	Modified by UL approval(added information about installation POE cable and UL listed plug for Unused opening)	Oct 31, 2023
1.15	Contents partially revised	Dec 18, 2023
1.16	Contents partially revised	Jul 15, 2024