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# GTD-1000Ex(M)

## Instruction Manual



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Read in detail for correct use.

# Gas & Flame Detection System

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When abnormalities occur after purchasing the product,  
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**We sincerely thank you for purchasing the product of Gastron Co. Ltd.**

Our Gastron Co.,Ltd. is a company specialized in Gas detector and Gas Monitoring System, being recognized by many consumers due to the best quality and use convenience. We always enable you consumers to find desired products nearby and are ceaselessly studying and striving for development of Gas detectors satisfying customers. From now on, solve all anguishes concerning Gas detector with the products of Gastron Co. Ltd, We Gastron Co. will take a responsibility and give you satisfaction.

In the present instruction manual, operation method for Gas detector as well as simple methods for maintenance and repair, etc. are recorded. If you read it in detail and keep it well, for reference when you have questions, then it will give you much help.

- For accurate operation of Gas detector, check up and calibrate for more than once in every 6 months.  
(\* KOSHA GUIDE : P-135-2013 / Refer to 8.3 Test, Calibration Section 13)
- For accurate operation of Gas detector, checkup and calibration with calibration gas before measurement is recommended.
- When not calibrated, it may cause malfunction of the equipment due to problems resulting from Sensor aging.
- When the present instrument should be dismantled, those with professional skills for Gas detector should conduct the operation.
- For power supply cable, wire specifications should be determined by referring to the item of "Length of installed cable".
- For the contents on checkup and calibration of Gas detector, please use our company's engineering department, e-mail, or web site.

The present product and the product manual can be changed without advance notice for performance improvement and use convenience of the product.

\* KOSHA GUIDE : P-135-2013

Calibration must be performed at a frequency requested by the manufacturer and shall be performed quarterly when the calibration period is not specified.

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GTD-1000Ex(M) flammable gas detector has been developed to detect gas leaked from industrial sites and various flammable gases generated from factories, gas storages, and manufacturing processes that produce or use toxic gases and to prevent accidents in advance.

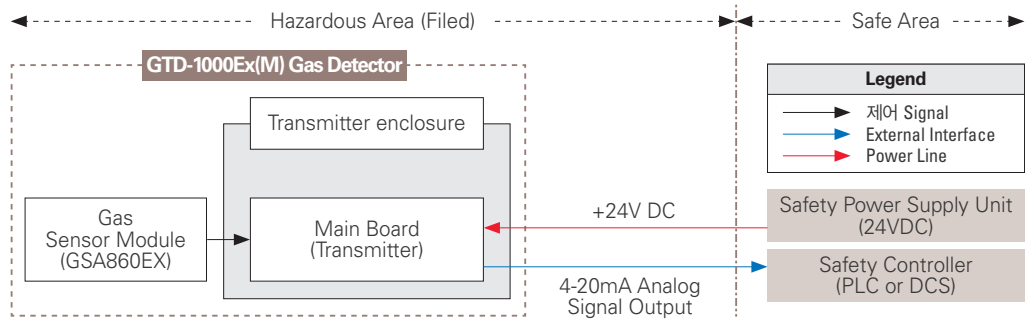
GTD-1000Ex(M) flammable gas detector is installed in areas with gas leak hazards and continuously monitors gas leak. It provides DC 4-20 mA standard output signal and RS-485 network signal. Also, DC 4~20 mA standard output enables transmission distance of the output signal between detector and receiver at maximum 2,500 m (when using cables with CVVS or CVVSB 1.5 sq or higher). RS-485 network signal can be transmitted up to 1,000 m (when using a designated cable for RS-485). GTD-1000Ex(M) flammable gas detect must be used at a height below 1,000 m above sea level.

2. Configuration

Body of GTD-1000Ex(M) is made of Aluminum alloy and the gas sensor module is made of stainless steel. It consists of a complete explosion-proof enclosure (Ex d IIC T6). This product can be installed in all areas prone to flammable gas leak and explosion hazards.

Internal configuration consists of 1 terminal PCB board that outputs measurements externally (DC 4-20 mA, RS-485). External configuration consists of detector part that monitors gas leak and cable inlets.

It can perform calibration using detachable display (LCD or OLED), therefore maintenance is convenient.



[Figure 1. GTD-1000Ex(M) Overview]

3.1. Basic Specifications

ITEMS	SPECIFICATION	
Measuring Type	Diffusion	
Measuring Method	· Catalytic Cell) · Thermal Conductivity Cell · Heated-semiconductor Cell	
Detectible Gas	Flammable gas	
Measuring Range	0~100% LEL	
Accuracy	≤ ±3% / Full Range	
Zero Drift	≤ 2% / Full Range	
Response Time	90% of full Scale in less than 15 sec	
Approvals Classification	KCs: Ex d IIC T6, T5, T4, IP65	
Basic Interface	Analog 4-20mA current interface	
RS-485 Interface	RS-485 MODBUS (Option)	
Option	RS-485 Board	
	GTL-100 Warning Light	
	Rain Cover	
Warranty	Transmitter	2Year
	Sensor	1Year

3.2. Mechanical Specifications

ITEMS	SPECIFICATION	
Explosion Proof type	Explosion-proof enclosure)	
Dimension	136(W) × 166(H) × 95 (D) mm	
Weight including Sensor	App. 1.5kg	
Mounting type	Wall mount	
Mounting Holes	Ø 7 ±0.1	
Cable inlet	3/4" PF ( 1/2" or 3/4" NPT )	
Body material	Transmitter)	aluminum alloy
	Sensor	Stainless Steel (STS316)

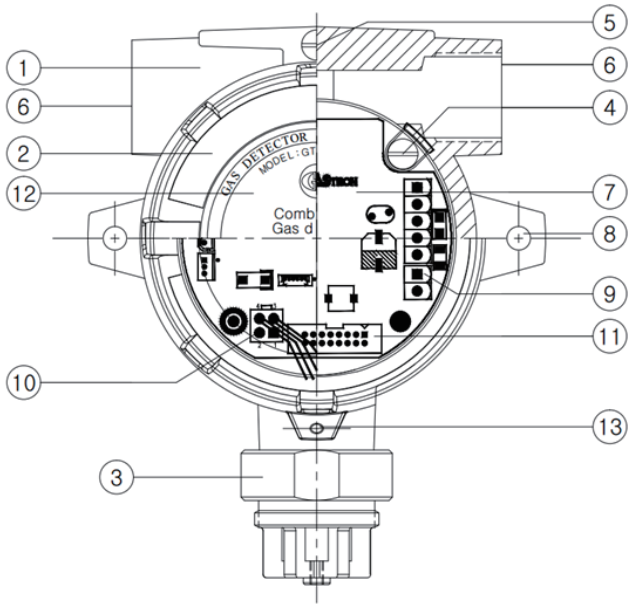
3.3. Electrical Specifications (Standard Type)

ITEMS	SPECIFICATION	
Input Voltage(Standard) ※ Customer supplied PSU must meet requirements IEC1010-1 and CE Marking requirements.	Absolute min:	18V
	Nominal:	24V
Wattage	Absolute max:	31V
	Ripple maximum allowed:	1V pk-pk
Analog output Current	Max. wattage:	4.8W @+24 VDC
	Max. current:	200mA @+24 VDC
	0-20mA(500 ohms max load) All readings ± 0.2mA Measured-value signal: 4mA(Zero) to 20mA(Full Scale)	
	Fault: 0-100% LEL: 100-109%LEL: Over 110% LEL: Maintenance:	0mA 4mA - 20mA 20mA - 21.4 mA 22mA 3mA
Analog output current ripple & noise max	±20uA	
Wiring requirement	Power	CVVS or CVVSB with shield
	Analog	CVVS or CVVSB with shield
Cable Connection Length	Analog	2500m
	RS-485	1000m
EMC Protection:	Complies with EN50270	

3.4. Environmental Specifications

ITEMS	SPECIFICATION	
Operation Temperature	Transmitter	-20 to 50 °C
	Sensor	Refer to Sensor Specification
Storage Temperature	Transmitter	-20 to 50 °C
	Sensor	Refer to Sensor Specification
Operation Humidity	Transmitter	5 to 99% RH (Non-condensing)
	Sensor	Refer to Sensor Specification
Pressure Range	90 to 110KPa	
Max. air velocity	6m/s	

4.1. Components



[Figure 2. GTD-1000Ex(M) Components]

NO	NAME	DESCRIPTIONS
1	Housing Body	Protects PCB Board built in Sensor and Housing from external environmental change and shock.
2	Housing Cover	It is assembled with detector housing body and protects PCB Board built in Sensor and Housing from external environmental change and shock
3	Sensor	It is a site that detects actual gas leak. It converts the amount of gas leak into electrical signal and transmits to the Main PCB.
4	Internal Ground	- It must be grounded to inside of detector for protection from external noise or strong electric field. - Use a conductor that is 4 mm or longer when coupling ground line.
5	External Earth Ground	- It must be grounded to outside of detector for protection from external noise or strong electric field. - Use a conductor that is 4 mm or longer when coupling ground line.
6	Conduit Connection	It is supplied for inlet of power supply and measurement output signal for the detector during installation. For cable inlet, PF or NPT 3/4" , 1/2" are prepared.
7	Main PCB	Amplifies fine outputs generated from Sensor Element to transmit a converted output in 4~20 mA DC standard. It sends data to display part.
8	Mount Hole	Hole to fix the gas detector on external wall or other installation sites.

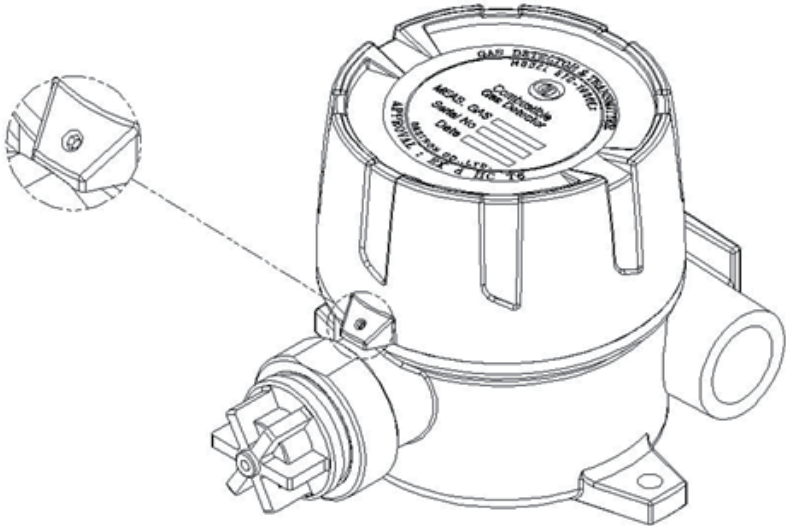
NO	NAME	DESCRIPTIONS
9	Power/Signal Terminal	CN6 consists of DC 24 V power supply and DC 4~20 mA standard output connection terminal (VISO, +24V, mA, GND, ETH). CN7 is RS-485 Modbus network terminal.
10	Sensor Terminal	CN5 is Sensor Connection Terminal.
11	Display Terminal	It is a terminal that connects to display board. Display board is attached for test and calibration.
12	Model Name Plate	Model name, measuring gas, serial number, etc. are labeled.
13	Set screw(M4-L6)	It is a set screw that prevents cover opening from the detector housing body.

[Table 1. GTD-1000Ex(M) Components Description]

- It is prohibited for an individual, other than an approved user or a technician responsible for installation and repair from the head office, to install a gas leak sensor on site or open the cover of the installed gas leak detector and manipulate it. This may cause serious loss of life and property from fire, explosion, and etc. In addition, please check whether there is any remaining explosive gas or combustible material in the surroundings. Power must be turned off before performing work.

5.1. Detachment of Housing Cover

- Turn the slotted set screw (M4 x 1ea) fixing the cover part of main body 3~4 tuns counter clockwise (ccw) using a hex wrench (M2) then turn the cover of gas leak detector ccw to detach the cover. When the cover is detached, LCD appears.

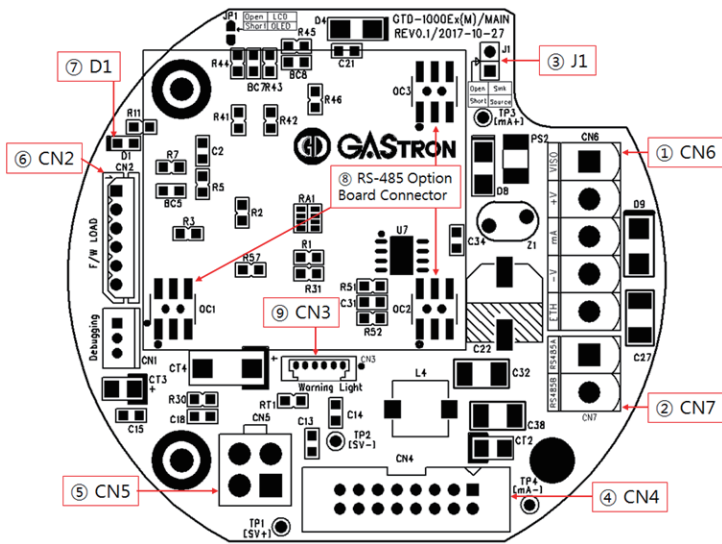


[Figure 3. Slotted Set Screw]



5.2. Main PCB Configuration

- After detaching the display parts, the Main PCB terminal layout appears as shown in the figure below.



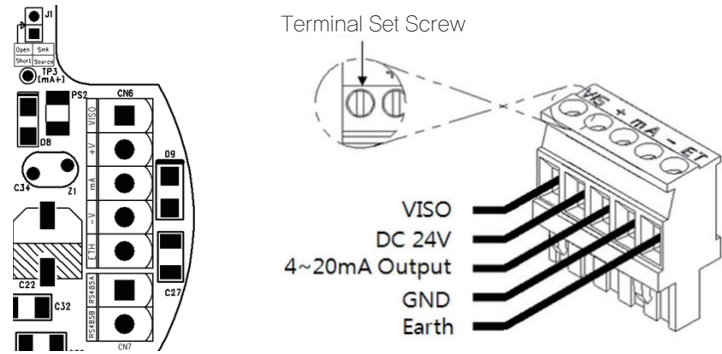
No	NAME	DESCRIPTION
1	CN6	Power & Output Signal Terminal
2	CN7	RS-485 Terminal
3	J1	4~20mA Source / Sink Selection Jumper ( ON: Source Type, OFF: Sink Type)
4	CN4	Display LCD Connector
5	CN5	Sensor Connector
6	CN2	Program download Connector
7	D1	Status LED (Flashes in 1 sec interval during normal operation)
8	OC1 , OC2, OC3	RS-485 Option Board Connector
9	CN3	Warning light (GTL-100) Interface Connector

[Table 2. Main PCB Key Part Description]

- Using OC1, OC2, and OC3 shown in the layout above, RS-485 option board can be attached and 3ØScrew holes located at top left of RS-485 option board are used for fixing.

5.3. Terminal Configuration

- ⌞Warning – Turn off power before connecting power terminal⌟
- Loosen 5 terminal fixing screws located at top part of detached terminal block CN6 (VIS, +, mA, –, ETH) Connector by turning counter-clockwise using a Ø driver. Connect DC 18~24 V power to +, and – then connect signal cable to mA. Tighten 5 terminal fixing screws clockwise so that terminal does not leave the track then insert Main PCB as the same condition before disassembly.



[Figure 5. CN6, CN7 Terminal Configuration]

NO	PCB SILK	PIN NAME	DESCRIPTION	
			4~20mA Source Drive (J1 Jumper ON)	4~20mA Sink Drive (J1 Jumper OFF)
1	VISO	VIS	N.C	4~20mA Sink In(+)
2	+24V	+	+24V / POWER (+)	
3	mA	mA	4~20mA Source Out	4~20mA Sink Out(–)
4	GND	–	GND / POWER (–)	
5	ETH	ET	EARTH	

[Table 3. CN6 Terminal Detailed Description]

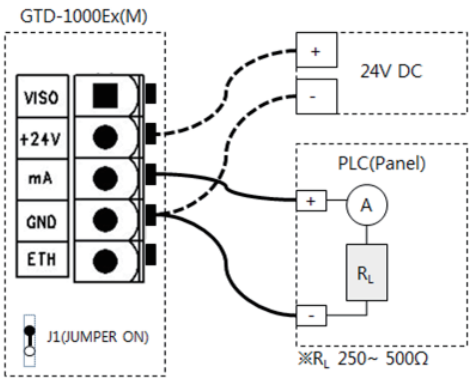
- Use CVVS or CVVSB 2.0sq ↑ Shield Cable for terminal configuration.

NO	PCB SILK	DESCRIPTION
1	RS485A	RS485A Terminal
2	RS485B	RS485B Terminal

[Table 4. CN7 Terminal Detailed Description]

5.3.1. Wiring for 4~20mA Source Operation Type

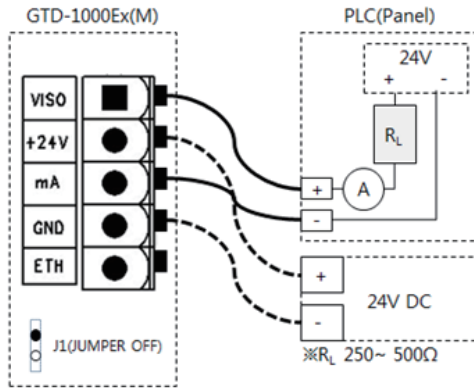
- Connect 4~20 mA signal terminal at PLC side to 'mA' of GTD-1000Ex(M). GND terminal is used in common with power. Then, turn on the J1 jumper.



[Figure 6. 4~20mA Source Configuration]

5.3.2. Wiring for 4~20mA Sink Operation Type

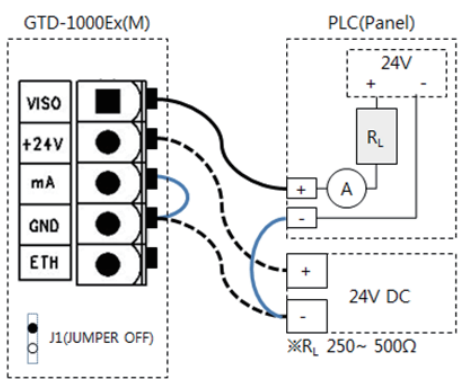
- Connect (+) and (–) terminals for 4~20 mA sink output at PLC side to VISO terminal and 'mA' terminal, respectively. Then, turn off the J1 jumper.



[Figure 7. 4~20mA Sink Configuration]

5.3.3. Wiring for 4~20mA Source Operation Type

- Connect (+) and (–) terminals for 4~20 mA sink output at PLC side to VISO terminal and power (24V DC) (–) terminal, respectively. Connect 'mA' terminal of GTD-1000Ex(M) to 'GND' terminal. Then, turn off the J1 jumper.

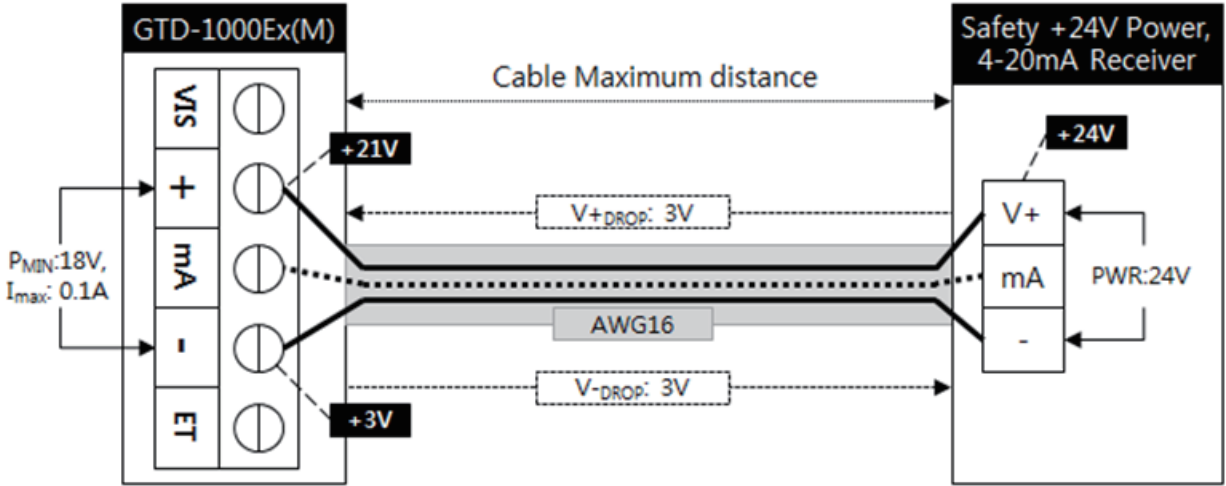


[Figure 8. 4~20mA 3Wire Sink Configuration]

5.4. Installation Cable Length

- The maximum length between GTD-1000Ex(M) and power supply is decided by wire specification.
- Max. Installation Length =  $V_{MAXDROP} \div I_{MAX} \div WIRER/m \div 2$ 
  - $V_{MAXDROP}$ : Maximum Power Loop Voltage Drop (=Power Supply voltage – min operating voltage)
  - $I_{MAX}$ : Max. Current of GTD-1000Ex(M)
  - $WIRER/m$ : The resistance of the wire (ohms/meter value available in wire manufacturer's specification data sheet)
- Example of installation lengths using 24 V power supply and 16 AWG is as follows.
  - GTD-1000Ex(M) minimum operating voltage = 18 Vdc
  - $V_{MAXDROP} = 24 - 18 = 6V$
  - $I_{MAX} = 0.2A(200mA)$
  - $6 \div 0.2 \div 0.01318 \div 2 = 2276m \approx 2.000m$





[Figure 9. Calculation of GTD-1000Ex(M) Installation Cable Length]

■ Power cable installation for each cable type is as shown in the table below.

AWG	mm2	COPPER RESISTANCE(ohms/m)	METERS
12	3.31	0.00521	2879
14	2.08	0.00828	1811
16	1.31	0.01318	1138
18	0.82	0.02095	715
20	0.518	0.0333	450

[Table 5. GTD- 1000Ex(M) Power Cable Installation Length]

Display board is connected and used during maintenance and repair. For normal display operation after connecting in operation status, contact 'RESET' key.

6.1. Initial Operation Status (Power On)

- After wiring to power terminal at the top of Main PCB board then supply power, the following contents are displayed on LCD. Approx. 30min of stabilization of time is needed from the initial supply of operation power and it starts to operate normally after sufficient stabilization.

GTD-1000 [V X.XX]	– When power turns on, model name and product firm ware version are displayed on LCD.
SELF TEST [ >>>0179]	– Self test is performed for 3 min '}' symbol in the second row shows the progress.

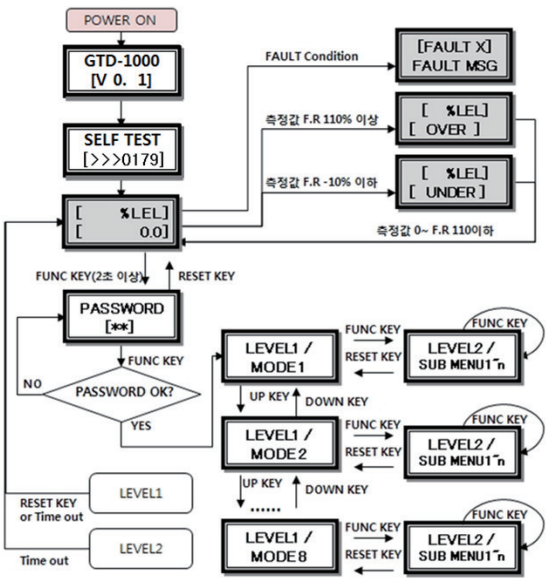
6.2. Measuring Mode

- After power on, when there is no error from "SELF TEST", it automatically enters Measuring Mode.

[ %LEL] [ 0.0]	– In normal operation mode, it runs as below. – In the first row, measured gas name and unit are displayed in 1 sec interval. In the second row, the current measurement is displayed.
[ COMB.] [ 0.0]	– In the current screen, touching the magnet-bar on 'Func' key for 2 sec or longer changes to setting mode. ※ During Modbus network, '*' is displayed on the left of the first row. ※ ENG. When the mode is on, 'L' is displayed on the left of the second row.
[ %LEL] [ 30]	– When Alarm1 or 2 occurs, it runs as below. (It only runs when alarm used setting in alarm mode is on.) – The first row runs the same as in normal status. In the second row, alarm message and gas measurement are displayed in 1 sec interval.
[ %LEL] [ ALARM1]	– When GTL100 explosion-proof warning light is installed, upon an event of alarm1, red LED and buzzer flicker and run in 1 sec interval. Upon an event of alarm2, they continuously run without flickering. – If alarm latch is on, the alarm continuously run until it is released using the reset key.
[ %LEL] [ OVER]	– When gas measurement larger than 10% of set high scale value is inputted, "OVER" displays in 1 sec interval. At this time, 4~20 mA runs as 22 mA.
[ %LEL] [ UNDER]	– When gas measurement smaller than -10%, "UNDER" displays in 1 sec interval and 4~20 mA runs below 2 mA. ※ The following function only runs when UNDER is on.
[FAULT1] SEN EMPT	– When trouble occurs in the device, it displays fault number and message. – At this time, 4~20 mA runs below 2 mA. – It is a mode that displays when Fault #1 sensor on the left is not equipped.

6.3. Operation Flow

- After power on, it passes self-diagnostic process then enters Measuring Mode. Here, by operating front keys, you can go to internal System Mode.
- Timeout for Level1 and Level2 are 10 sec. It is set to 1 h for Level2 Calibration and Test Mode.
- When "RESET": key contacts at Program Mode Screen, it returns to Measuring Mode. When "RESET" key contacts at each Program Setting Screen, it returns to the parent step.



[Figure 10. GTD-1000Ex(M) Mode Configuration]

- Operation keys for detector system mode are defined as below.

ITEM	NAME	DESCRIPTION
FUNC	Function key	Detector Mode Setting Entry Function (Insert Magnetic-bar for 2 sec or longer in measuring mode) Level2 Next stage entering function and setting saving function
RESET	Reset key	Move to the previous stage from the level entered.
↑	Up key	Next level mode that is configured in LEVEL1 and Change in Level2 setting Plus
↓	Down key	Next level mode that is configured in LEVEL1 and Change in Level2 setting Minus

[Table 10. Operation Key Description]

6.4. Menu Configuration Table

LEVEL1	LEVEL2		DEFAULT
	NAME	PARAMETER	
PROGRAM MODE	GAS TYPE (Gas Type)	[DEFIN./USER]	DEFIN.
	GAS SEL (Gas Select)	Built-in gas name selection	COMB.
	UNIT SEL (Unit Select)	%/%LEL/PPM/PPB	%LEL
	D-POINT (Decimal Point)	0.100/1.00/10.0/100	100
	HIGH SCL (High Scale)	1~10000	100
	PASSWORD	00~99	00
CALIBRA. MODE (Calibration Mode)	CALIBRA. [ZERO] (Calibration Zero)	ZERO CAL [NO, YES]	[NO]
		ZERO GAS [ 0]	
		ZERO >>>> [SUCCESS / FAIL]	
		CAL. DATA [ 0/ FAIL]	
	CALIBRA. [SPAN] (Calibration Span)	SPAN CAL [NO, YES]	[NO]
		SPAN GAS [ 0]	
		SPAN SET [ 50/ FAIL]	50
		SPAN >>>> [SUCCESS / FAIL]	
		CAL. DATA [ 0]	
ALARM MODE	ALM USED (Alarm Used)	[OFF / ON]	OFF
	AL LATCH (Alarm Latch)	[OFF / ON]	OFF
	A1 LEVEL (Alarm-1 Level)	[1 ~ 10000]	20
	A1 TYPE (Alarm-1 Type)	[INC / DEC]	INC
	A1 DBAND (Alarm-1 Dead Band)	[0.0 ~ 10.0%F.S]	0
	A1 TIME (Alarm-1 Time)	[0~ 60]SEC	1
	A2 LEVEL (Alarm-2 Level)	[1 ~ 10000]	40
	A2 TYPE (Alarm-2 Type)	[INC / DEC]	INC
	A2 DBAND (Alarm-2 Dead Band)	[0.0 ~ 10.0%F.S]	0
	A2 TIME (Alarm-2 Time)	[0~ 60]SEC	1
DEVICE MODE	485 B/D	[CHECK / EMPTY]	-
	ADDRESS	[0 ~ 64]	[1]
SENSOR MODE	Factory Setting		
MAINTEN. MODE	Factory Setting		
VERSION MODE	Factory Setting		
TEST MODE	Factory Setting		

7.1. PROGRAM MODE

PASSWORD [**]	<div>– Contacting "FUNC" key for 2 sec or longer in Measuring Mode enters Password mode.</div> <div>– After setting Password using "↑" or "↓" key, contact "FUNC" key.</div>
PROGRAM MODE	<div>– If password is correct, it enters Program mode.</div> <div>– By contacting "↑" or "↓" key, mode changes in defined order. ( PROGRAM → CALIABRA. → ALARM → SENSOR → MAINTEN. →DEVICE →) VERSION →) TEST )</div>
GAS TYPE [ DEFIN. ]	<div>– Mode that sets gas name type and contacting "↑" or "↓" key changes gas type. (DEFIN. / USER)</div> <div>– DEFIN. Is acronym for Define and is selected when using built-in setting of gas name. USER is selected when the user directly sets a gas name.</div> <div>– When a desired gas type is displayed, contact "FUNC" key to set the gas name and enter Program Mode.</div>
GAS SEL [ COMB. ]	<div>– Mode that sets gas name and contacting "↑" or "↓" key changes gas name.</div> <div>– When gas type is set to DEFIN., built-in gas names can be selected for use. When it is set to USER, the user shall set gas name using 5 character for use. Characters allowed for use are number, capital Alphabet, space, and period. When position is moved by setting characters, a cursor in black box shape appears as shown in the figure on left.</div>
USER GAS [ ■ ]	
UNIT SEL [ %LEL ]	<div>– Mode that sets gas measuring unit and contacting "↑" or "↓" key changes gas measuring unit. ( % / %LEL / PPM / PPB ).</div> <div>– When a desired gas measuring unit is displayed, contact "FUNC" key to set the unit and enter Program Mode.</div>
D–POINT [ 100]	<div>– Mode that changes decimal place and contacting "↑" or "↓" key changes decimal place. (0.100/1.00/10.0/100)</div> <div>– When a desired decimal place is displayed, contact "FUNC" key to set the decimal place and enter the next Program Mode.</div>
HIGH SCL [ 100]	<div>– Mode that sets high scale value that should be displayed for full range. Contacting "↑" or "↓" key increases or decreases the scale value. ( 1 ~ 10000 )</div> <div>– When a desired high scale is displayed, contact "FUNC" key to set the high scale value and enter the next Program Mode.</div>
PASSWORD [00]	<div>– It is password setting mode. This password is checked when entering Program Mode.</div> <div>– Set using "↑" or "↓" key then contact "FUNC" key to set the passworkd and enter the next Program Mode.</div>

7.2. CALIBRATION MODE

- Due to characteristics of the gas detector , minimum 30 min of stabilization time is required and maintenance condition may change depending on site condition.

7.2.1. Zero Calibration

PASSWORD [**]	<div>– Contacting "FUNC" key for 2 sec or longer in Measuring Mode enters Password mode.</div> <div>– After setting Password using "↑" or "↓" key, contact "FUNC" key.</div>
CALIBRA. MODE	<div>– Contact "↑" or "↓" key to select "Calibration Mode".</div> <div>– Contact "FUNC" key when "CALIBRA. MODE" is displayed to enter Calibration Mode.</div> <div>– Contact "RESET" key to return to Measuring Mode.</div>
CALIBA. [ZERO]	<div>– When "CALIBRATION MODE" is displayed, contacting "FUNC" key selects Zero Calibration.</div> <div>– Contact "↑" or "↓" key to achieve [ZERO] then contact "FUNC" key to enter Zero Calibration.</div>
ZERO CAL [ NO]	<div>– Contact "↑" or "↓" key to achieve [YES] then contact "FUNC" key to perform Zero Calibration.</div>
ZERO GAS [ 0]	<div>– Using a calibration tool, inject clean air or 100% nitrogen into the sensor at a flow rate of 500 mL/min for 1 min. Contact "FUNC" key when measurement is stabilized to automatically perform Zero Calibration.</div>
ZERO >> [SUCESS]	<div>– When zero calibration is successful, "ZERO SUCCESS" is displayed for 2 sec on LCD display then it changes to "CALIBRATION DATA" Mode.</div> <div>– When zero calibration is not successful, "ZERO FAIL" is displayed for 2 sec and it changes to "Calibration Data Mode".</div> <div>– ZERO FAIL occurs when sensor input value exceeds 70% of total ADC input range.</div>
ZERO >> [ FAIL ]	
CAL.DATA [ 0]	<div>– It is a mode to display measurement after calibration and checks whether calibration is successful after performing auto calibration.</div> <div>– When it failed, it displays "FAIL" and the current measurement in 1 sec interval.</div> <div>– Contact "RESET" key to return to "Calibration mode".</div>