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# GTD-1000Tx

## Instruction Manual


Read in detail for correct use.

# Gas & Flame Detection System

GASTRON


When abnormalities occur after purchasing the product, please contact the following address.

· Address : 23 Gunpo Advanced Industry 1-ro, Gunpo-si, Gyeonggi-do
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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. ( * In reference to KOSHA GUIDE: P-135/6-2018 / 7.2 In-house inspection, section 2 )
- 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-135/6-2018
Calibration must be performed at a frequency requested by the manufacturer and shall be performed quarterly when the calibration period is not specified.

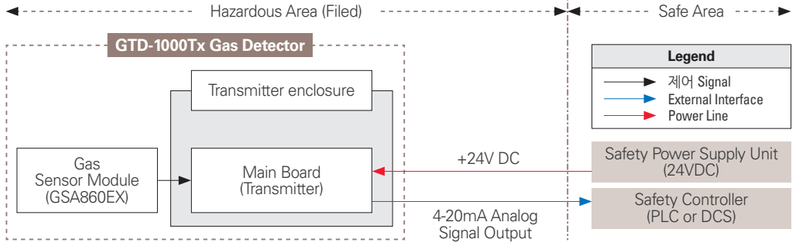
# Contents

Contents

GTD-1000Tx toxic gas detector has been developed to detect gas leaked from industrial sites and various toxic gases generated from factories, gas storages, and manufacturing processes that produce or use toxic gases and to prevent accidents in advance.
GTD-1000Tx toxic gas detector is installed in areas with gas leak hazards and continuously monitors gas leak. It converts and transmits data in DC 4~20 mA standard output signal. Also, for DC 4~20 mA standard output, output signal transmission length between detector and receiver can be connected up to 2,000 m. (When Cable CVVS or CVVSB 1.5sq and higher is used.)

## 2. Configuration

Body of GTD-1000Tx 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 areas with potential combustible gas leak and explosion hazards and internal structure consists of 1 PCB board with display part for measurements and terminal part that outputs measurements (DC 4 - 20 mA) externally. External configuration consists of detector part that monitors gas leak and cable inlets.




[Figure 1. GTD-1000Tx Overview]

### 3.1. Basic Specifications

| ITEMS | SPECIFICATION | |
|---|---|---|
| Measuring Type | Diffusion | |
| Measuring Method | - Electro-Chemical Cell<br>- Heated-semiconductor Cell | |
| Detectible Gas | Toxic Gas (Note1) | |
| Measuring Range | Capable to display 000.0 ~ 9999 (Note 1) | |
| Accuracy | ≤ ±3% / Full Range | |
| Zero Drift | ≤ 2% / Full Range | |
| Response Time | Depends on Sensor Module.<br>Refer to Sensor Specification or Contact in case for Special Gas. | |
| Approvals Classification | KCs: Ex d IIC T6 | |
| Basic Interface | Analog 4-20mA current interface | |
| Option | Rain Cover | |
| Warranty | Transmitter | 2Year |
| | Sensor | 1Year |

※ Note1. Refer to the measured gas list for measured gases and their ranges. Contact us for special gas.

### 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) |

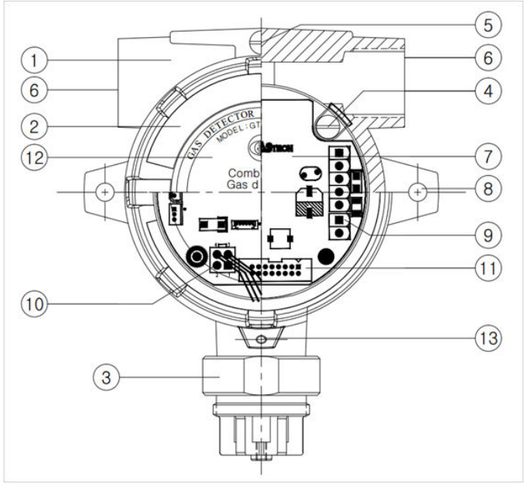
## 3.3. Electrical Specifications (Standard Type)

| ITEMS | SPECIFICATION | |
|---|---|---|
| Input Voltage(Standard)<br>※ Customer supplied PSU must meet requirements IEC1010-1 and CE Marking requirements. | Absolute min:<br>Nominal:<br>Absolute max:<br>Ripple maximum allowed: | 18V<br>24V<br>31V<br>1V pk-pk |
| Wattage | Max. wattage:<br>Max. current: | 3.6W @+24 VDC<br>150mA @+24 VDC |
| Analog output Current | 0-20mA(500 ohms max load)<br>All readings ± 0.2mA<br>Measured-value signal:<br>4mA(Zero) to 20mA(Full Scale) | |
| | Fault:<br>0-100% LEL:<br>100-109%LEL:<br>Over 110% LEL:<br>Maintenance: | 0mA<br>4mA - 20mA<br>21.6mA<br>20mA - 21.4mA<br>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 |
| EMC Protection: | Complies with EN50270 | |

## 3.4. Environmental Specifications

| ITEMS | SPECIFICATION | |
|---|---|---|
| Operation Temperature | Transmitter | -20 to 50 ℃ |
| | Sensor | Refer to Sensor Specification |
| Storage Temperature | Transmitter | -20 to 50 ℃ |
| | 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-1000Tx Components]

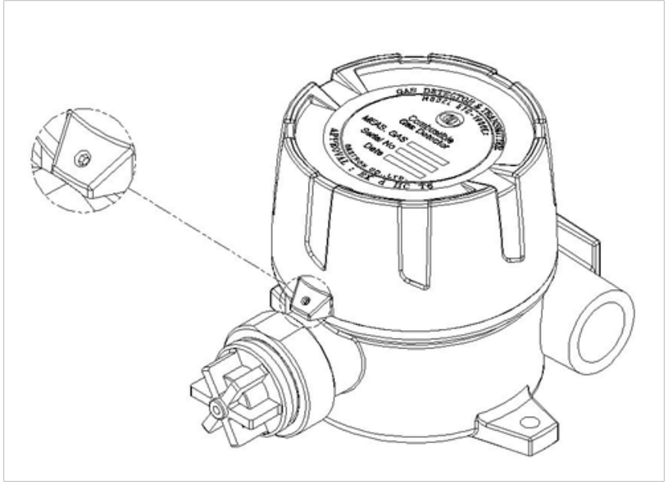
| NO | NAME | DESCRIPTIONS |
|---|---|---|
| 1 | Detector housing body | Protects PCB Board built in Sensor and Housing from external environmental change and shock. |
| 2 | Detector housing cover | It is assembled with detector housing body and protects PCB Board built in Sensor and Housing from external environmental change and shock |
| 3 | Sensor head | It is a site that detects actual gas leak. It converts the amount of gas leak into electrical signal and transmits to the Amp PCB. |
| 4 | Internal grand (2sq↑ cable) | It must be grounded to inside of detector for protection from external noise or strong electric field |
| 5 | External ground (2sq↑ cable) | It must be grounded to outside of detector for protection from external noise or strong electric field. |
| 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 1/2", 3/4" are prepared. (Default specification is PF 3/4".) |
| 7 | Mount holes(2-Ø7) | Hole to fix the gas detector on external wall or other installation sites. |
| 8 | Sensor terminal | CN1 is Sensor Connection Terminal. |
| 9 | Model name plate | Model name, measuring gas, serial number, etc. are labeled. |

[Table 1. GTD-1000Tx 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 sensor 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 turns counter clockwise (ccw) using a hex wrench (M2) then turn the cover of gas leak detector ccw to detach the cover.



[Figure 3. Slotted Set Screw]

## 5.2. Main PCB Configuration

■ After detaching the cover, the Main PCB terminal layout appears as shown in the figure below.

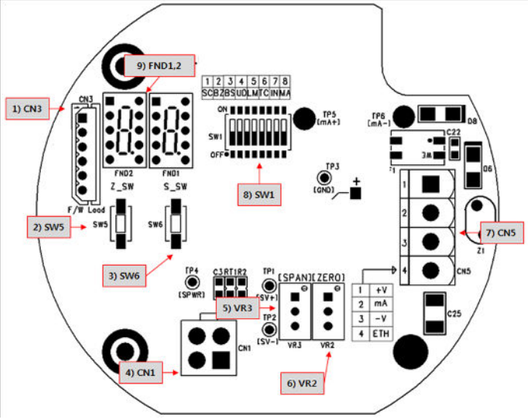


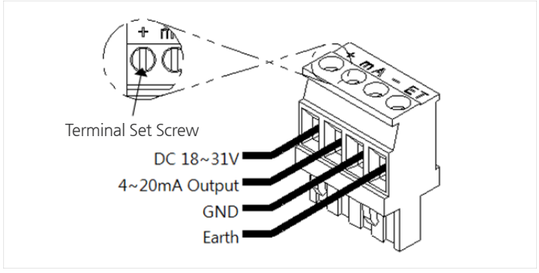

Figure 4. Main PCB Key Layout

| No | NAME | DESCRIPTION |
|---|---|---|
| 1 | CN3 | Program download Connector |
| 2 | SW5 | Zero Calibration Switch |
| 3 | SW6 | Span Calibration Switch |
| 4 | SW1 | Sensor Configuration Switch1(Factory Setting) |
| 5 | VR1 | Potentiometer for ZERO Output Adjustment |
| 6 | VR2 | Potentiometer for SPAN Output Adjustment |
| 7 | SW4 | Sensor Configuration Switch2(Factory Setting) |
| 8 | SW3 | Mode Control DIP Switch |
| 9 | CN5 | Power & Output Signal Terminal |
| 10 | FND1,2 | FND for Internal Status Display |

[Table 2. Main PCB Key Part Description]

## 5.3. Power and Signal Terminal Configuration

- After disassembling display parts, there is a terminal block in the Main PCB as shown in the figure below. Holding it with hands and pulling towards ceiling detaches it from the Main PCB.
- Loosen 5 terminal fixing screws located at top part of detached terminal block CN8 (VIS, +, mA, -, ETH) Connector by turning counter-clock wise using a Θ 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. CN1 Terminal Configuration]

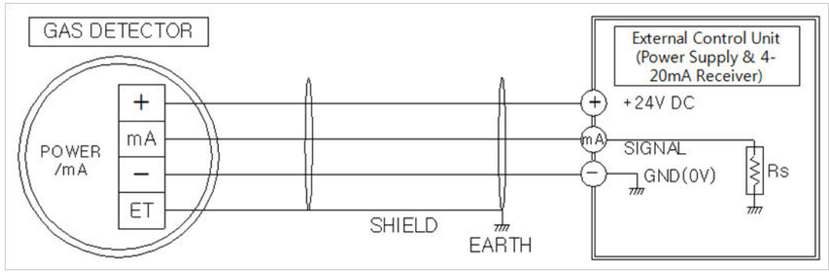
| NO | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | + | +24V / POWER (+) |
| 2 | mA | 4~20mA Source Out |
| 3 | - | GND / POWER (-) |
| 4 | ET | EARTH |

[Table 3. CN1 Terminal Detailed Description]

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

## 5.4. Method to Connect to External Control Unit

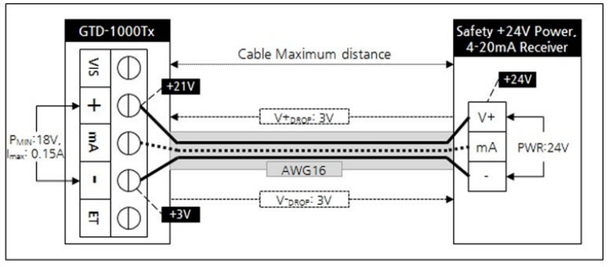
- Connect 18 V~31 V DC operation power to CN1 (+, mA, -, ET) Connection Terminal of the gas detector then connect a device that can receive 4~20 mA signals to mA.




[Figure 6. External Control Unit Connection Method]

## 5.5. Installation Cable Length

- The maximum length between GTD- 1000Tx and power supply is decided by wire specification.
- Max. Installation Length = VMAXDROP ÷ IMAX ÷ WIRER/m ÷ 2
  - ·VMAXDROP: Maximum Power Loop Voltage Drop (=Power Supply voltage - min operating voltage)
  - ·IMAX : Max. Current of GTD-1000Tx
  - ·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-1000Tx minimum operating voltage = 18 Vdc
  - ·VMAXDROP = 24 - 18 = 6V
  - ·IMAX = 0.15A( 150mA )
  - ·6 ÷ 0.15 ÷ 0.01318 ÷ 2 = 1517.451m ≒ 1517m




[Figure 7. Calculation of GTD-1000Tx Installation Cable Length]

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

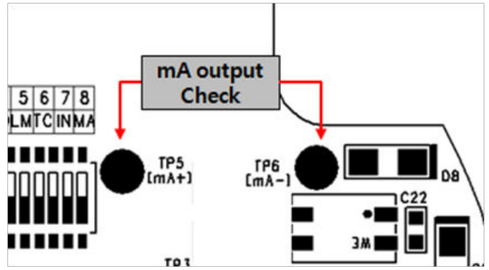
| AWG | mm2 | COPPER RESISTANCE(ohms/m) | METERS |
|---|---|---|---|
| 12 | 3.31 | 0.00521 | 3838 |
| 14 | 2.08 | 0.00828 | 2415 |
| 16 | 1.31 | 0.01318 | 1517 |
| 18 | 0.82 | 0.02095 | 954 |
| 20 | 0.518 | 0.0333 | 600 |

[Table 4. GTD- 1000Tx Power Cable Installation Length]

- Stabilization time of 30 min from the initial supply of operation power to the sensor for the stabilization of the sensor. Calibration and test must be performed approx. 30 min after when the sensor has been stabilized.

## 6.1. 4-20mA Output Diagnosis

- It supplies voltage of 18~31 V and current of 200 mA to the sensor. When the voltage is measured by connecting a multimeter to TP5 (+mA) and TP6 (-mA) of AMP PCB, current of 4~20 mA can be confirmed.



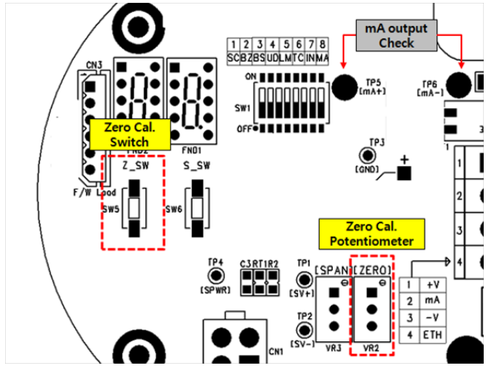

[Figure 8. 4-20mA Output Test Terminal]

## 6.2. 4mA Adjustment (ZERO Calibration)

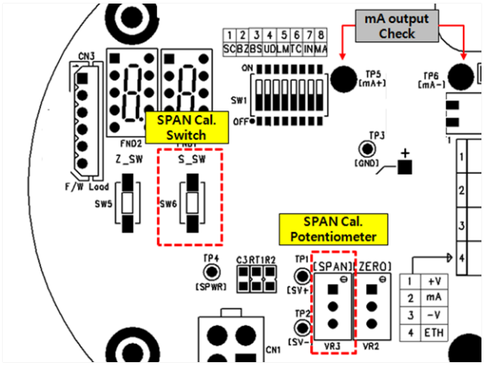
- Check voltage of 18~31 V DC at both (+24 V) and (GND) of terminal block 'CN5'.
- Check whether (mA) terminal of terminal block 'CN5' is connected to the receiver.
- Change DMM to current measuring mode, then connect (+) and (-) terminals of DMM to TP5 (+mA) and TP6(-mA) of AMP PCB, respectively.
- When zero switch (SW5) is pressed for 3 sec, a message "[ZE][RO]" flashes 3 times on FND1 and FND2 and it enters zero calibration mode.
- When clean air or 99.9% nitrogen (N2) is injected to cell part, 4 mA output is observed. If the output is not 4 mA, adjust the potentiometer 'VR2 (ZERO)' left and right to set 4mA.
- Adjust 'ZERO' potentiometer to obtain a current of 4.00 mA to be displayed on FND1 and FND2.
- When zero switch (SW5) is pressed for 3 sec after output is set to 4 mA, result from zero calibration is displayed on FND1 and FND2. "[PA][SS]" means that the calibration has performed successfully. "[FA][IL]" means that the calibration has not met the condition and failed. In this case, sensor and power must be reconfirmed then calibration shall be performed again.

6. Calibration and Maintenance






[Figure 9. ZERO Calibration related Parts]




[Figure 10. Span Calibration related Parts]

## 6.3. SPAN Calibration

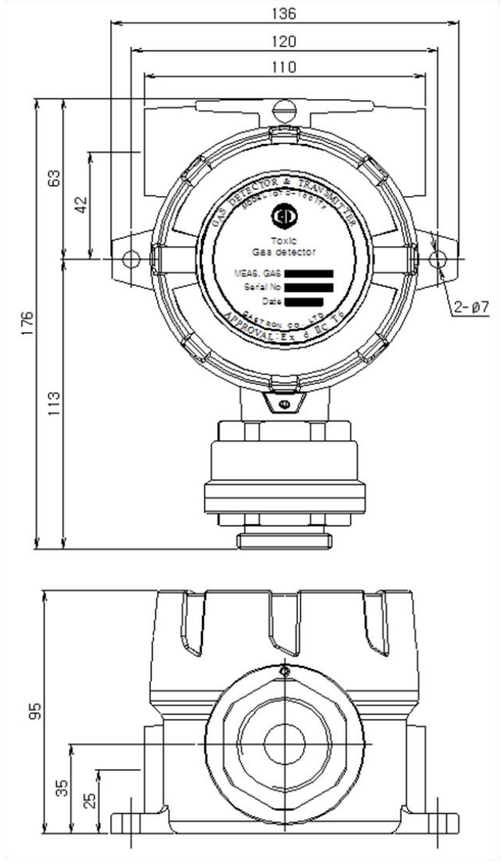
- Check voltage of 18~31 V DC at both (+24 V) and (GND) of terminal block 'CN5'.
- Check whether (mA) terminal of terminal block 'CN5' is connected to the receiver.
- Change DMM to current measuring mode, then connect (+) and (-) terminals of DMM to TP5 (+mA) and TP6(-mA) of AMP PCB, respectively.
- When span switch (SW6) is pressed for 3 sec, a message "[SP][AN]" flashes 3 times on FND1 and FND2 and it enters span calibration mode.
- When the standard calibration gas is injected into cell part, 12 mA output is observed. If the output is not 12 mA, adjust the potentiometer 'VR3 (SPAN)' left and right to set 12 mA.
- Adjust 'SPAN' potentiometer to obtain the correct current output for the standard gas to be displayed on FND1 and FND2.
- When SPAN switch (SW6) is pressed for 4 sec after it is set to a desired output, result from span calibration is displayed on FND1 and FND2. "[PA][SS]" means that the calibration has performed successfully. "[FA][IL]" means that the calibration has not met the condition and failed. In this case, sensor and power must be reconfirmed then calibration shall be performed again.

- Ex.) Output Calculation Method for NH3
  Range : 0-150ppm — Calibration gas : 100ppm $NH_3$ /$N_2$ balance
  Output signal : 4-20mA — Test point signal ( TP5, TP6 )

$$(200 - 40) \times \frac{\text{100ppm } NH_3 \text{ (Standard Gas)}}{\text{150ppm } NH_3 \text{ (Measurement Range)}} + 40 = 147 = 14.7\text{mA}$$

- Ex.) Output Calculation Method for CO
  Range : 0-150ppm — Standard Gas : 100ppm
  Output signal : 4-20mA — Test point signal (TP5, TP4)

$$(200 - 40) \times \frac{\text{100ppm CO (Standard Gas)}}{\text{150ppm CO(Measuring Range)}} + 40 = 147 = 14.7\text{mA}$$




[Figure 11. GTD-1000Tx Drawing]

## 8.1. Selecting a Place for Installation (Occupational Health & Safety Act Data)

A gas leak detector alarm shall be installed in the following places.

- Around chemical equipment and accessories that have concerns of gas leak. This includes compressors, valves, reactors, pipe joints, etc. installed inside and outside of a building that handle combustible and toxic materials.
- Places that are easier for gases to stay such as areas around manufacturing facilities with ignition sources like heating furnace, etc,
- Areas around equipment for filling combustible and toxic materials.
- Substations, panel rooms, control rooms, and etc. located within explosive area.
- Other areas that are easier for gases to stay.

## 8.2. Selecting a Site for Installation (High-Pressure Gas Safety Control Act Data)

Gas detector of gas leak detector alarm must be installed as close to the areas with concerns of gas leakage as possible. However, for areas where direct gas leakage is not expected but are easier for leaked gas to stay, the detector must be installed at the point 1 of the following.

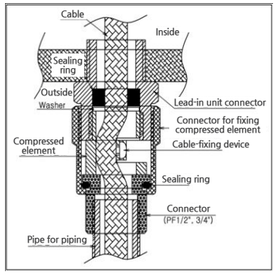
- Gas leak detector alarm installed outside a building shall be installed at points where gas is likely to stay in consideration to wind direction, wind speed, specific gravity of gas, etc.
- Gas leak detector alarm installed inside a building shall be installed near the floor when the specific gravity of gas is heavier than air and near ventilation of ceiling when it is lighter than air.
- Alarm for gas leak detector alarm must be installed at sites where the gas detector is installed and workers are present.

## 8.3. Precautions during Installation

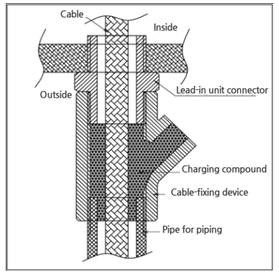
Avoid areas with electrical barriers such as rain water, etc. It is recommended to be installed in areas that are easier to work in since regular maintenance is needed. Avoid areas with vibration or shock since they can affect output values. Sensor part must be installed towards the direction of gravity.

- This equipment has explosion-proof construction for internal pressure and belongs to GROUP II for gas and vapor in general work sites and chemical plants. It can be used in ZONE 1 (ONE) and ZONE 2 (TWO) hazardous sites.
- Allowable temperature is 85 C or below, which corresponds to T6.
- Use with surrounding temperature in a range of -20 C ~ 50 °C.

- Installation Height: 1,000 M below sea level
- Relative Humidity: 5% ~ 99%
- Installation Site: Indoor and Outdoor
- Explosion Ignition Grade for the Gas or Vapor: Ex d IIC T6
- During wiring work, use explosion-proof cable gland at cable inlet or tightly seal cable conduit during metal cable wiring construction to prevent spread of flames in case of explosion or movement of gas, etc. through the cable conduit within 50 mm.
- When connecting the equipment with cable, screw thread must be tightened 5 threads or more.
- Work in conditions satisfying other [Standards for Selection, Installation, and Maintenance, etc. of Explosion- proof Electric Machine and Equipment Wiring, etc. at Work Site]
- All materials used for cable inlet such as cable gland and sealing fitting, etc. and used as sealing unused inlets must pass the verification!




[Figure 12. High-Pressure Packing Type]




[Figure 13. Y Sealing Compound]

| VERSION | CONTENTS | DATE |
|---|---|---|
| 0.0 | * Manual Initial Revision | 2013.06.09 |
| 1.0 | * Gas calibration method changed | 2014.09.19 |
| 2.0 | * mA Calibration Mode added | 2014.10.24 |
| 3.0 | * Changed Font | 2014.12.26 |
| 4.0 | * Separated Factory mode manual | 2016.09.09 |
| 5.0 | * Changed Explosion-proof Equipment Cable Entry Installation Regulation 45 cm → 50 mm | 2017.01.20 |