Applications in Paper Manufacturing Market and Introduction to Gas Detectors and Alarms for Safety and Security
Document contents

- About Riken Keiki
- Why do we need gas detectors?
  Risks associated with toxic gases
- Applications in paper manufacturing market
- Major examples of accidents
- Product information
- International agents
About Riken Keiki
Riken Keiki was originally established to commercialize and sell detectors for preventing explosions in coal mines and on oil tankers.
Methane gas measurements in coal mine

Optical Gas Indicator Model 3 (1939)

Certification
National heritage of analytical and scientific instruments
2014

About Riken Keiki

Riken Keiki
## Company profile

<table>
<thead>
<tr>
<th>Company name</th>
<th>Riken Keiki Co., Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established</td>
<td>March 15, 1939</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Headquarters</td>
<td>2-7-6 Azusawa Itabashi-Ku, Tokyo</td>
</tr>
<tr>
<td>Development Center</td>
<td>2-3 Minamisakae-cho, Kasukabe-shi, Saitama</td>
</tr>
<tr>
<td>Factories</td>
<td>Hakodate-shi, Hokkaido; Sakurai-shi, Nara (affiliated company)</td>
</tr>
</tbody>
</table>

### Headquarters

![Headquarters Image](image1)

**To be completed in September 2018**

(conceptual drawing)

### Development Center

![Development Center Image](image2)

**To be completed in September 2018**

(conceptual drawing)
About Riken Keiki

Headquarters
(Itabashi-Ku, Tokyo)

Development Center
(Kasukabe-shi, Saitama)

Locations of sales offices
◆Domestic◆

Sales base
Production base
Maintenance base

◆Global◆

To be completed in September 2018
(conceptual drawing)
## Company profile

| Various bases | Domestic sales and branch offices: 20 locations  
Service stations: 32 locations  
Global bases: 7 locations |
|---------------|-----------------------------------------------------------------------------------|
| Major sales items | Combustible gas detectors and alarms  
Gas detectors and alarms designed to prevent oxygen deficiency accidents  
Toxic gas detectors and alarms  
Combined gas detectors and alarms  
Various measuring instruments for environmental measurements and other instruments |
| Capital | 2,565.5 million yen |
| Number of employees | 965 (non-consolidated), 1,127 (consolidated)  
* As of September 30, 2017 |

**Hakodate Factory**  
(Hakodate-shi, Hokkaido)  

**Nara Factory**  
(Sakurai-shi, Nara)
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>Riken Keiki Co., Ltd. established to produce and sell optical gas detectors, photoelasticity apparatuses, and other precision instruments invented and developed by RIKEN.</td>
</tr>
<tr>
<td>1959</td>
<td>Start production and sale of combustible gas alarms and detectors (catalytic combustion type).</td>
</tr>
<tr>
<td>1967</td>
<td>Start production and sale of oxygen measuring instruments (OX-1).</td>
</tr>
<tr>
<td>1970</td>
<td>Start production and sale of monitoring tape type measuring instruments (FP-200).</td>
</tr>
<tr>
<td>1972</td>
<td>Start production and sale of non-dispersive infrared measuring instruments (RI-550).</td>
</tr>
<tr>
<td>1975</td>
<td>Start production and sale of electrochemical type measuring instruments (EC-231).</td>
</tr>
<tr>
<td>1986</td>
<td>Start production and sale of photoemission yield spectrometers (AC-1).</td>
</tr>
<tr>
<td>2009</td>
<td>70th anniversary of founding.</td>
</tr>
<tr>
<td>2014</td>
<td>Start production and sale of portable X-ray diffractometers equipped with XRF (DF-01).</td>
</tr>
<tr>
<td>2015</td>
<td>Start production and sale of portable multi gas detectors (GX-6000), first product of its kind in Japan capable of housing photoionization detectors (PID).</td>
</tr>
</tbody>
</table>
Why Do We Need Gas Detectors?
Risks Associated with Toxic Gases
Need for gas detectors (combustible gases)

Criteria set by United Nations’ Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

According to the United Nations’ Globally Harmonized System of Classification and Labelling of Chemicals (GHS), a combustible gas (or flammable gas) is defined as follows:

A combustible or flammable gas is a gas having an explosive (flammable) range when mixed with air under atmospheric conditions of 20°C and standard pressure of 101.3 kPa.

Gases falling under this definition are further subdivided into the following two categories based on the severity of the associated risk:

**Category 1 (Danger: Extremely flammable gas)**

Gases capable of igniting at 20°C and standard pressure of 101.3 kPa when occurring in a mixture of 13% or less by volume with air or having an explosive (flammable) range of at least 12% when mixed with air regardless of the lower explosion (flammable) limit

**Category 2 (Warning: Flammable gas)**

Gases, other than those in Category 1, which are gaseous at 20°C and a standard pressure of 101.3 kPa and have an explosive (flammable) range when mixed with air

We need gas detectors because flammable gas leaks can lead to explosions.
Need for gas detectors (definition of permissible concentration)

- **Definition of permissible concentration**
  Even when workers are exposed to hazardous substances at work sites, no adverse health effects should emerge as long as the airborne concentration of the hazardous substance remains below the permissible concentration.

  Recommended permissible concentrations have been set by the American Conference of Governmental Industrial Hygienists (ACGIH) and the Japan Society for Occupational Health. We use the ACGIH permissible concentrations.

- **Types of permissible concentrations**
  - **TWA (Time Weighted Average)**
    Time Weighted Average refers to time-weighted average concentrations over an 8-hour workday and 40-hour workweek of routine work to which workers may be repeatedly exposed without adverse health effects.

  - **STEL (Short Term Exposure Limit)**
    Short Term Exposure Limit refers to exposure that does not lead to adverse health effects if each exposure does not exceed 15 minutes, the number of daily exposures does not exceed four, and the exposures are separated by at least one hour.

  - **C (Ceiling value)**
    Ceiling Value refers to the upper limit that can never be exceeded.

We need gas detectors because leaks exceeding permissible concentrations can lead to accidents.
How human body reacts to oxygen-deficiency

**O2 Concentration: 21%**
Symptoms: Natural air

**O2 Concentration: 18%**
Symptoms: Limit level for not causing serious health problems. Continuous ventilation is required

**O2 Concentration: 16%-12%**
Symptoms: Rapid breathing, Increase in pulse rate, Loss of concentration, Headache, Nausea, Ear ringing

**O2 Concentration: 14%-9%**
Symptoms: Stupor, Headache, Nausea, Cyanosis, Faintness on the entire body

**O2 Concentration: 10%-6%**
Symptoms: Comatose, Loss of consciousness, Muscle spasm on the entire body

**O2 Concentration: 6% or less**
Symptoms: Unconsciousness, Comatose, Cessation of breathing, Cardiac arrest, Die in 6 minutes
## Effects of hydrogen sulfide (H₂S) on human body

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>Effects and Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.025</td>
<td>Smell vaguely. (It varies according to the individual.)</td>
</tr>
<tr>
<td>0.3</td>
<td>Smell clearly.</td>
</tr>
<tr>
<td>3 - 5</td>
<td>Smell moderate degree of objectionable odor.</td>
</tr>
<tr>
<td>10</td>
<td>Lower-level to irritate eyes' mucus membranes.</td>
</tr>
<tr>
<td>20 - 40</td>
<td>A strong odor. Lower-level to irritate lungs' mucous membranes.</td>
</tr>
<tr>
<td>100</td>
<td>Sense of smell is impaired in 2 - 15 minutes. Eyes and respiratory tract are irritated in 1 hour. 8 - 48 hours continuous exposure can lead to death.</td>
</tr>
<tr>
<td>170 - 300</td>
<td>1 hour exposure is the limit for not causing serious health problems.</td>
</tr>
<tr>
<td>400 - 700</td>
<td>Life-threatening exposure in 0.5 - 1 hour.</td>
</tr>
<tr>
<td>800 - 900</td>
<td>Bring on loss of consciousness, cessation of breathing and death.</td>
</tr>
<tr>
<td>1000</td>
<td>Bring on immediate loss of consciousness and death.</td>
</tr>
<tr>
<td>Concentration (ppm)</td>
<td>Effects and Toxicity</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>100</td>
<td>No noticeable effects even after breathing for a few hours.</td>
</tr>
<tr>
<td>200</td>
<td>A mild headache in around 1.5 hours.</td>
</tr>
<tr>
<td>400 - 500</td>
<td>Headache, nausea and ear ringing in around 1 hour.</td>
</tr>
<tr>
<td>600 - 1000</td>
<td>Loss of consciousness in around 1 - 1.5 hours.</td>
</tr>
<tr>
<td>1500 - 2000</td>
<td>Headache, vertigo and disabling nausea in around 0.5 - 1 hour, and losing consciousness.</td>
</tr>
<tr>
<td>3000 - 6000</td>
<td>Headache, vertigo, disabling nausea...etc. in a few minutes. 10 - 30 minutes exposure can lead to death.</td>
</tr>
<tr>
<td>10000</td>
<td>Bring on immediate loss of consciousness and death.</td>
</tr>
</tbody>
</table>
Applications in Paper Manufacturing Market
Applications in paper manufacturing market

1. Overview of processes for the paper manufacturing market (pulp manufacture)
2. Overview of processes for the paper manufacturing market (preparation and papermaking)
3. Details of individual processes for the paper manufacturing market
   3-1: Chip silo
   3-2: Digester
   3-3: Ethanol manufacture
   3-4: Recovery boiler
   3-5: Bleacher (pulp bleaching)
   3-6: Measurement of environmental parameters during pulp manufacturing process
   3-7: Dryer section, solvent recovery unit, and deodorizer
   3-8: Natural gas and LPG fueled boiler facility
1. Overview of processes for the paper manufacturing market (pulp manufacture)

Chemical pulp manufacturing process

⇒ Go to 3-1.

- Chips (raw material)
- Chip silo (chip storage)
- Chip feeder
- Chip grinder (refiner)
- Dust remover (cleaner)
- Dehydrator
- Oxygen bleacher (bleaching using oxygen)
- Bleacher (pulp bleaching)
- High-concentration chest (pulp storage)

⇒ Go to 3-2.

- Chips (raw material)
- Chip silo (chip storage)
- Chip feeder
- Chip grinder (refiner)
- Dust remover (cleaner)
- Dehydrator
- Machine pulp manufacturing process

⇒ Go to 3-3.

- Recovery boiler (digestion chemical recovery, steam generation)
- Green liquor tank
- Black liquor concentrator
- Caustification unit (reagent reuse)
- Lime kiln (lime reuse)
- White liquor tank
- Green liquor tank

⇒ Go to 3-4.

- White liquor
- Black liquor

⇒ Go to 3-5.

Machine pulp manufacturing process

- Chip silo (chip storage)
- Chip grinder (refiner)
- Dust remover (screen)
- Dehydrator
- Bleacher (pulp bleaching)
- Chest (pulp storage)
- To preparation process

Waste paper pulp manufacturing process

- Waste paper (raw material)
- Waste paper disintegrator (pulper)
- Dust remover (cleaner)
- Refining mill
- Dust remover (screen)
- Deinking unit (flotator)
- Dehydrator
- Beater (refiner)
- Chest (pulp storage)
2. Overview of processes for the paper manufacturing market (preparation and papermaking)

- **Beater (refiner)**
  - Preparation process

- **Wire section (paper layer forming)**
- **Press section (water removal)**
- **Dryer section (steam drying)**
- **Calender (glossing)**
- **Reel (winding)**
- **Cutter (finishing)**

- **Size press (sizing agent application)**

- **Finished product**

⇒ Go to 3-7.
**3-1: Chip silo**

**Description:** The wood chips that make up the raw material for the pulp are temporarily stored in the chip silo.

**Hazardous risks:** Smoldering inside the enclosed chip silo poses oxygen deficiency and fire risks. The carbon monoxide (CO) generated by the smoldering poses poisoning risk.

⇒ Detecting CO to prevent fire and poisoning
Measuring oxygen concentrations to prevent oxygen deficiencies

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**Safety**

- Chip silo
- O₂
- CO
- Suction-type CO detector heads
  - Smart Transmitter/Gas Detector Head Model: SD-1DEC
  - Flame-proof Pump Model: RP-D58
- Prework gas detectors
  - Portable Multi Gas Monitor Model: GX-8000
  - Portable Multi Gas Detector Model: GX-6000
- Personal gas detectors for workers
  - Personal Single Gas Monitors Model: 03 series
  - Four Gas Personal Monitor Model: GX-2009
3-2: Digester

**Description:** Wood chips are supplied with the reagent to the digester and cooked at high temperature and pressure to extract the fibers (pulp). The main components of the reagents are caustic soda and sodium sulfide (Na$_2$S).

**Hazardous risks:** The Na$_2$S used to break down the wood chips poses poisoning risk due to the hydrogen sulfide (H$_2$S) generated by hydrolysis.

⇒ Detecting H$_2$S to prevent poisoning

- **H$_2$S detector head**
  - Smart Transmitter/Gas Detector Model: SD-1EC

- **Prework gas detectors**
  - Portable Multi Gas Detector Model: GX-6000

- **H$_2$S detectors for workers**
  - Personal Single Gas Monitor Model: HS-03
  - Four Gas Personal Monitor Model: GX-2009
3-3: Ethanol manufacture

Description: The fibers (pulp) are washed in the washer, where the waste liquid, known as black liquor, is removed. This black liquor contains dissolved lignin (constituent bonding the wood fibers together) and other components. The biofuel ethanol is manufactured from black liquor.

Hazardous risks: Ethanol (C₂H₅OH) leaks from ethanol manufacture pose explosion and poisoning risks. ⇒ Detecting C₂H₅OH to prevent explosions and poisoning.
3-4: Recovery boiler

**Description:** The black liquor produced after washing the fibers is concentrated in the concentrator, and the combustion in the recovery boiler generates steam of high temperature and high pressure.

**Hazardous risks:** Incomplete combustion inside the recovery boiler poses poisoning risk due to carbon monoxide (CO).  

⇒ Detecting CO to prevent poisoning

**CO detector heads**
- Smart Transmitter/Gas Detector Model: SD-1EC
- Indoor Carbon Monoxide Monitor Model: EC-600

**CO gas detectors for workers**
- Personal Single Gas Monitor Model: CO-03
- Four Gas Personal Monitor Model: GX-2009
3-5: Bleacher (pulp bleaching)

**Description:** Foreign matter such as sand and metal fragments are removed from the wood fiber by the dust removers (screen and cleaner) before additional bleaching in the bleacher. Bleaching involves chemicals such as chlorine dioxide (ClO₂), ozone (O₃), and chlorine (Cl₂).

**Hazardous risks:** Leaks of O₃ or Cl₂ used as bleaching agents pose poisoning risk.

⇒ Detecting O₃ and Cl₂ to prevent poisoning risk.

**Safety Equipment:**
- **Portable Multi Gas Detector**
  - Model: GX-6000
- **Portable Toxic Gas Monitor**
  - Model: SC-8000
- **Intelligent Gas Detector**
  - Model: GD-70D
- **Toxic Gas Detector Head**
  - Model: GD-K88Di
- **O₃/Cl₂ detector heads**

Bleacher
3-6: Measurement of environmental parameters during pulp manufacturing process

**Description:** The pulp manufacturing process generates four differed odorous sulfur compounds: hydrogen sulfide (H$_2$S), methyl mercaptan (CH$_3$SH), methyl sulfide (C$_2$H$_6$S), and methyl disulfide (C$_2$H$_6$S$_2$).

**Hazardous risks:** The four sulfur compounds generated during pulp manufacture pose poisoning risk.

Detecting four sulfur compounds to detect odor sources and prevent poisoning.
3-7: Dryer section, solvent recovery unit, and deodorizer

**Description:** In the dryer section (paper-drying process), the paper is brought into contact with steel cylinders heated by steam and dried to achieve the desired water content. This process also involves equipment used to recover solvents generated during the paper manufacturing process and a deodorizer.

**Hazardous risks:** The volatile organic compound (VOC) solvent gas generated when drying coated paper poses poisoning and explosion risks. Waste gas from the solvent recovery unit and deodorizer poses poisoning and explosion risks.

⇒ Measuring VOC to prevent poisoning and explosions
⇒ Preventing poisoning and explosions due to VOC and measuring source gas concentrations to improve efficiency

**VOC**

**Dryer section**

**VOC detector heads**
- Flame-proof Suction Type Gas Detector Model: SD-D58
- Fixed PID VOC Monitor Model: RVOC
- Compact Solvent Gas Monitor Model: FI-815A
- Gas Analyzer Model: FI-800

**Prework VOC detectors**
- Optical Gas Indicator Model: FI-8000
- Portable Multi Gas Detector Model: GX-6000
3-8: Natural gas and LPG fueled boiler facility

**Description:** Paper manufacturing plants may include a boiler facility fueled by natural gas or LPG.

**Hazardous risks:**
- The carbon monoxide (CO) generated by incomplete combustion inside the boiler facility poses poisoning risk. Leaks of natural gas or LPG from fuel pipes pose explosion risk.

- Detecting CO to prevent poisoning
- Detecting LPG leaks to prevent explosions

**CO detector heads**
- Smart Transmitter/Gas Detector
  - Model: SD-1EC
- Indoor Carbon Monoxide Monitor
  - Model: EC-600

**Natural gas/LPG leak detector**
- Portable Gas Leak Checker
  - Model: SP-220 TYPE ML

**CO gas detectors for workers**
- Personal Single Gas Monitor
  - Model: CO-03
- Four Gas Personal Monitor
  - Model: GX-2009
Major Examples of Accidents
Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.

[Location of accident]
The accident occurred near a pulp liquid storage tank used in a pulp manufacturing process at a paper manufacturing plant.

[Cause of accident]
Chlorine dioxide vapors generated from wastewater draining during the bleaching process resulted in an incident as workers cleaned up pulp liquid sprayed from the top of the pulp liquid storage tank onto the floor on the first to third levels.

[Damage/injuries]
Workers reported feeling unwell and were administered oxygen after experiencing breathing difficulties. When their condition failed to improve, they were taken to the hospital. They were diagnosed with mediastinal emphysema and hospitalized.
Case of hydrogen sulfide poisoning at pulp manufacturing plant

[Location of accident]
The incident occurred near a dissolving tank at a pulp manufacturing plant.

[Cause of accident]
The alkali solution valve was closed to acid-wash the calcium carbonate buildup on the heater used to heat the alkali solution. Granulated sulfamic acid was added to warm water inside the dissolving tank to adjust the acid cleaning solution. The alkali solution valve was not fully closed during the washing procedure, allowing the sulfamic acid to react with the alkali solution and generating hydrogen sulfide. The worker and supervisor inhaled hydrogen sulfide and lost consciousness.

[Damage/injuries]
Both victims regained consciousness quickly but were taken to the hospital by ambulance. There, they were diagnosed with hydrogen sulfide poisoning.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.
Product Information
**Features**

- Explosion-proof products that can be used in hydrogen/acetylene atmospheres
- Waterproof/dustproof enclosure (IP 65 equivalent) allows deployment in severe environments.
- Supports HART Communication Protocol, allowing transmission of more information over legacy analog 4-20 mA connections.
* Excluding SD-1 (TYPE NC)
- SD-1RI, SD-1EC, and SD-1OX are SIL 2 certified in all parts of the functional safety standard, marking a first for Japanese manufacturers.
- Using the suction cap for the SD-1 series and connecting the detector to a suction pump or an aspirator unit enables suction type operation.

**Model:**

**SD-1 series**
Features

- Explosion-proof product suitable for use even in hydrogen atmospheres
- Includes automatic abnormal flow-rate detection feature.
- Features modular replacement components for ease of maintenance.
- Dustproof/waterproof construction (Protection rating: IP 67 equivalent)
- Maintenance requires a single worker.
- The RP-D58 is also available as an explosion-proof pump.

**Flame-proof Suction Type Gas Detectors**

**Model: SD-D58**
(With concentration display)

**Model: GD-D58**
(Without concentration display)
Portable Multi Gas Monitor

**Model:** GX-8000

**Features**
- Compact, lightweight design for portability
- Exia II CT4X certified for hydrogen explosion-proof compatibility
- IP 67 protection rating for peace of mind, even in harsh environments
- Powerful suction capacity with high flow-rate pump
- Large easy-to-read screen with backlight
- Bright high-visibility lamps and loud, audible alarm
- Simultaneous digital readout and analog bar indicator concentration display
- Compatible with dedicated waist belt (optional) to greatly improve fit and security during use

**Type list**

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Gas types</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-component</td>
<td>TYPE A</td>
<td>HC/CH₄ (%LEL, vol%), O₂, H₂S, CO</td>
</tr>
<tr>
<td>4-component</td>
<td>TYPE B</td>
<td>HC/CH₄ (%LEL), O₂, H₂S, CO</td>
</tr>
<tr>
<td>3-component</td>
<td>TYPE C</td>
<td>HC/CH₄/C₂H₂ (%LEL), O₂, H₂S</td>
</tr>
<tr>
<td></td>
<td>TYPE D</td>
<td>HC/CH₄ (%LEL), O₂, CO</td>
</tr>
<tr>
<td></td>
<td>TYPE E</td>
<td>HC/CH₄/H₂ (%LEL, vol%), O₂</td>
</tr>
<tr>
<td>2-component</td>
<td>TYPE F</td>
<td>HC/CH₄/C₂H₂ (%LEL), O₂</td>
</tr>
<tr>
<td></td>
<td>TYPE G</td>
<td>H₂ (%LEL), O₂</td>
</tr>
</tbody>
</table>
Portable Multi Gas Detector

Model: GX-6000

Features

- A single unit can simultaneously display up to six types of gases, including VOCs. This product is the first of its kind from a Japanese manufacturer.

- The PID sensor enables measurements of more than 200 types of target chemical substances.

- Ideal for checking the risks and hazards of chemical substances as required under the Industrial Safety and Health Act.

- Support for multilingual display (Japanese, English, French, Spanish, etc.).

- Equipped with convenient new functions, including panic alarm and LED flashlight.
Personal Single Gas Monitors

Model: 03 series

Features
- Models powered by rechargeable batteries have been added to the product line.
- Standard protective cover protects the main unit from scratches, dirt, and impact.
- Compact, lightweight design doesn’t interfere with work.
- Inherently safe and explosion-proof enclosure is ideal for use in hazardous locations.

GP-03 (For combustible gases)
OX-03 (For oxygen)
HS-03 (For hydrogen sulfide)
CO-03 (For carbon monoxide)
Components Type Gas types

4-component TYPE A/H/T O₂, LEL, H₂S, CO

3-component
TYPE B/H/T O₂, LEL, H₂S
TYPE C/T O₂, LEL, CO

2-component
TYPE D/T O₂, LEL
TYPE E/H/T O₂, H₂S
TYPE F/T O₂, H₂S
TYPE I/T LEL, CO
TYPE J H₂S, SO₂

Features
• Explosion-proof product that can be used in hydrogen/acetylene atmospheres
• Protection rating equivalent to IP 67 ensures safe use for outdoor work.
• Three-direction alarm lamps and two-direction alarm buzzers to alert both the carrier and those in surrounding areas
• Buzzer volume of 95 dB or more can be clearly heard even in noisy factory environments.
• Simultaneous display of gas concentrations of up to four components on large LCD screen
• Also equipped with clock display and data logger functions

Type list

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Gas types</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-component</td>
<td>TYPE</td>
<td>O₂, LEL, H₂S, CO</td>
</tr>
<tr>
<td>3-component</td>
<td>A/H/T</td>
<td>O₂, LEL, H₂S</td>
</tr>
<tr>
<td></td>
<td>B/H/T</td>
<td>O₂, LEL, CO</td>
</tr>
<tr>
<td>2-component</td>
<td>D/T</td>
<td>O₂, LEL</td>
</tr>
<tr>
<td></td>
<td>E/H/T</td>
<td>O₂, H₂S</td>
</tr>
<tr>
<td></td>
<td>F/T</td>
<td>O₂, CO</td>
</tr>
<tr>
<td></td>
<td>I/T</td>
<td>LEL, CO</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>H₂S, SO₂</td>
</tr>
</tbody>
</table>
Fixed PID
VOC Monitor

Model: RVOC

Features

• Photoionization detector ideally suited for VOC detection
  Supports three different measurement ranges (0–10 ppm, 100 ppm, 1,000 ppm).
  Sensor design resists humidity and keeps the lamp from fouling.
  Measurement cycles can be set to up to 5 minutes and 50 seconds in 10-second intervals.
  (Default: 1 minute)

• Functions to improve work efficiency
  Easy integration with control systems (4 mA to 20 mA output)
  Also supports switchable type (RVOC-10s).
Features

- LCD screen illuminates in green, orange, or red depending on operating status for easy visibility.
- Choice of three power sources to suit operating environments: AC power, DC power, or battery
- Allows measurements at distances of up to 20 m with optional remote sensor.
Portable Toxic Gas Monitor

Model: 
SC-8000

Features
- Inherently safe explosion-proof construction
- Detects a wide range of different gases
- Dustproof and waterproof for use in all types of environments
- Adjustable alarm volume
- Easy-to-read dual display (digital/analog)
- Selectable target gas detection
**Features**

- Two-wire gas detector
  Transmits directly to control systems.

- Includes pressure correction sensor to minimize the effects of variations in atmospheric pressure.  (GD-F88Ai, GD-F88Di)

- Built-in aspirator (optional)
  Built-in type changed from previous external units  (GD-K88Ai, GD-K88Di)

- Designed to resist corrosive gases
  SUS enclosure can be specified at customer’s request.

- Inherently safe explosion-proof construction in combination with safety barrier

**Inherently Safe Explosion-proof Construction**

**Oxygen/Toxic Gas Detector Heads**

**Model: GD-88 series**

**[Diffusion type]**

- **GD-K88Ai**  (For toxic gases)
- **GD-F88Ai**  (For oxygen)

**[Suction type]**

- **GD-K88Di**  (For toxic gases)
- **GD-F88Di**  (For oxygen)
Intelligent Gas Detector

Model: GD-70D

Features

- Standardized body unit with universal design for any detection principle
- Uses reusable components.
- Made of recyclable materials to reduce environmental burdens
- Designed to comply with a wide range of international standards
- Complies with RoHS Directive and CE Marking requirements.
- Supports various communication systems.

  - Standard instrumentation signal analog transmission (4-20 mA) DC system (GD-70D)
  - DC power-line carrier system using the same wiring for power and communication (GD-70D-NT)
  - Ethernet system using PoE hub (GD-70D-EA)
Features

- High selectivity with minimal interference from other gases
- Rapidly detects even minute environmental fluctuations. (Detects at ppb levels.)
- Cassette type for easy tape replacement (Uses micro cassette)
**Features**

- A single unit can measure up to eight different gas types.
- Two selectable suction methods
  - Automatic suction using built-in pump or manual suction using hand aspirator
- Includes intermittent measurement mode (with automatic suction only).
  - Records concentrations against time to allow monitoring of gas concentration trends on the main unit.
- Large easy-to-read LCD screen
  - Clear display showing measured gas type, gas concentration, measurement units, and battery level

**Optical Gas Indicator**

**Model:**

**FI-8000**
Gas Analyzer

Model: FI-800

Features
• Zero warmup time
• Rapid response
• Long-term consistency
• Easy operation and easy-to-read digital display
• No sensitivity degradation due to silicone
• Includes temperature and atmospheric pressure correction functions.
Compact Solvent Gas Monitor

Model: FI-815A

Features

• Zero warmup time
• Rapid response
• Long-term consistency
• Easy operation and easy-to-read digital display
• No sensitivity degradation due to silicone
• Includes temperature and atmospheric pressure correction functions.
Portable Gas Leak Checker

Model: SP-220
TYPE ML

Features

• Reliably and rapidly detects minute town gas and LPG gas leaks.
• Compact and lightweight with sturdy housing
• Built-in filter for improved sensor durability
• Includes data-logging function. (Records up to 256 time/date and gas concentration readings.)
• Includes LED light for accurate measurements even in dark locations.
We are a pioneer in creating safe working environments for workers.