Applications in Automotive 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 automotive 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
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>Location</td>
<td>Headquarters: 2-7-6 Azusawa Itabashi-Ku, Tokyo 2-3 Minamisakae-cho, Kasukabe-shi, Saitama</td>
</tr>
<tr>
<td></td>
<td>Development Center:</td>
</tr>
<tr>
<td>Factories</td>
<td>Hakodate-shi, Hokkaido; Sakurai-shi, Nara (affiliated company)</td>
</tr>
</tbody>
</table>

Headquarters

Development Center

To be completed in September 2018 (conceptual drawing)
About Riken Keiki

Headquarters
(Itabashi-Ku, Tokyo)

Development Center
(Kasukabe-shi, Saitama)

To be completed in September 2018
(conceptual drawing)

Locations of sales offices
◆Domestic◆

◆Global◆

Sales base
Production base
Maintenance base

Riken Keiki Co., Ltd. headquarters

Affiliated company
Sales agent
**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 (H\(_2\)S) 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>
</tbody>
</table>
# Effects of carbon monoxide (CO) on human body

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>Effects and Toxicity</th>
</tr>
</thead>
<tbody>
<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 Automotive Market
Applications in automotive market

1. Entire flow of processes at automobile manufacturing plant

2. Automobile manufacturing processes
   - 2-1: Pressing
   - 2-2: Coating and drying (1)
   - 2-3: Coating and drying (2)
   - 2-4: Casting
   - 2-5: Heat treatment

3. Laboratory

4. Engine laboratory and environmental testing laboratory

5. Vehicle testing laboratory

6. Test bench

7. Lithium battery production

8. Heating furnace
1. Entire flow of processes at automobile manufacturing plant

The figure below shows the risks posed by combustible and toxic gas leaks in automobile manufacturing processes and examples of gas detector and alarm installations. The following pages discuss the details of each process.
2-1: Pressing

**Description:** In the pressing process, a large press machine or similar equipment is used to press the body.

**Hazardous risks:** Fuel from the press machine may leak and cause oxygen deficiencies or explosions in the underground pit.

⇒ Detecting combustible gases to prevent explosions
⇒ Detecting oxygen concentration to prevent oxygen deficiencies

**Detector heads for oxygen deficiencies**
- Smart Transmitter/Gas Detector
  Model: **SD-1OX**
- Oxygen Gas Detector Head
  Model: **GD-F3A-A**

**Personal gas detector for workers**
- Four Gas Personal Monitor
  Model: **GX-2009**

**Underground pit** ⇒ oxygen deficiencies and explosions
2-2: Coating and drying (1)

**Description:** Paint is applied in various ways in coating and drying processes. The body is coated by electrodeposition or spray painting and dried in a drying oven.

**Hazardous risks:**
- Organic solvents used in the electrodeposition equipment and painting booth may cause explosions.
- CO poisoning may occur in the drying oven.

⇒ Detecting combustible gases to prevent explosions
Detecting CO to prevent poisoning

To monitor concentrations of VOCs and CO discharged from the drying oven

- Electrodeposition equipment
- Painting booth
- Drying oven

**Detection devices:**
- Smart Transmitter/Gas Detector Model: SD-1
- Gas Detector Model: RM-6000
- Personal Single Gas Monitor Model: GP-03
- Portable Multi Gas Detector Model: GX-6000
- Fixed PID VOC Monitor Model: RVOC
2-3: Coating and drying (2)

**Description:** Paint is applied in various ways in coating and drying processes. The body is coated by electrodeposition or spray painting and dried in a drying oven.

<table>
<thead>
<tr>
<th>Hazardous risks</th>
<th>Detecting solvents in the painting booth, drying oven, and deodorizing furnace may result in explosions or poisoning.</th>
<th>Detecting organic solvents to prevent explosions and poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detecting solvents in painting booth</td>
<td>Detecting unburnt gas in drying oven (LPG/LNG)</td>
<td>Detecting unburnt gas in drying oven (LPG/LNG)</td>
</tr>
<tr>
<td>Detecting burner leaks (LPG/LNG)</td>
<td>Detecting burner leaks (LPG/LNG)</td>
<td>Detecting burner leaks (LPG/LNG)</td>
</tr>
<tr>
<td>Model: GD-A80</td>
<td>Model: RM-5003-SD-1RI / FI-800</td>
<td>Model: RM-5003-SD-1RI / FI-800</td>
</tr>
</tbody>
</table>

**Safety**

- Multi-channel Gas Monitoring Systems Model: RM-5000 series
- Combustible/Toxic Gas Detector Heads Model: GD-A80 series
- Smart Transmitter/ Gas Detector Model: SD-1RI
- Optical Interferometric Gas Analyzer Model: FI-800
- Portable Multi Gas Detector Model: GX-6000
- Four Gas Personal Monitor Model: GX-2009

**Description:**

- Detecting organic solvents to prevent explosions and poisoning

- IN side measurement before waste gas combustion treatment
  - Model: RM-5003-SD-1RI / FI-800

- OUT side measurement after waste gas combustion treatment
  - Model: RM-5003-SD-1RI / FI-800 + sampling unit

- Personal gas detector for workers

- Environmental measurements before work

- The GD-A80S nameplate is blue.
2-4: Casting

**Description:** A casting machine is used to produce engines and other cast products. In a casting machine, fuel is supplied from the gas supply unit to the melting furnace to melt aluminum.

**Hazardous risks:** LPG supplied to the casting machine may cause explosions. Oxygen deficiencies may occur in the underground pit.

Detecting organic solvents to prevent explosions and poisoning

**Casting machine control panel**
- O₂, CO, and LPG indicator

**Multi-channel Gas Monitoring System**
- Model: RM-5003

**Casting machine**

**Gas supply unit**

**To burner**

**LPG**

**Personal gas detector for workers**
- Four Gas Personal Monitor
  - Model: GX-2009

**Detector head for oxygen deficiencies**
- Smart Transmitter/Gas Detector
  - Model: SD-1OX

**Detector head for CO**
- Smart Transmitter/Gas Detector
  - Model: SD-1EC

**Detector head for LPG**
- Smart Transmitter/Gas Detector
  - Model: SD-1
2-5: Heat treatment

**Description:** Automotive parts are heat-treated in the heat treatment process.

**Hazardous risks:** Explosions or poisoning may occur in heat treatment furnaces in which gases including LPG, LNG, and NH₃ are used. ⇒ Detecting combustible gases to prevent explosions
Detecting NH₃ to prevent poisoning

- **LPG and NH₃ indicators**
  - Multi-channel Gas Monitoring System
  - Model: GP-5001 (for LPG)
  - Model: RM-5003 (for NH₃)

- **Gas supply unit**
  - NH₃
  - LPG

- **Detector heads for NH₃**
  - Smart Transmitter/Gas Detector
  - Model: GD-70D
  - Toxic Gas Detector Head
  - Model: GD-K88Ai
  - Detector heads for heat source (LPG/LNG)
    - Combustible Gas Detector Head
    - Model: GD-A80
    - Flame-proof Suction Type Gas Detector
    - Model: GD-D58
  - Personal gas detector for workers
    - Four Gas Personal Monitor
    - Model: GX-2009

- **Heat treatment furnace control panel**
- **Heat treatment furnace control panel**

**Safety:**

Detecting combustible gases to prevent explosions
Detecting NH₃ to prevent poisoning
3. Laboratory

**Description:** In laboratories, various parts are tested in thermostatic ovens and other equipment. FC experiment systems and reformers are also tested.

**Hazardous risks:**
- H₂ and fuel leaks from the FC experiment systems and reformers during experiments may cause explosions.
- The CO in the exhaust gas may lead to poisoning.

⇒ Detecting H₂ and other combustible gases to prevent explosions
⇒ Detecting CO to prevent poisoning

**Safety:**
- Detector head for CO, detector head for H₂
- Combustible Gas Detector Head Model: GD-A80
- Detector heads for detecting CO leaks
- Smart Transmitter/Gas Detector Model: GD-70D
- Detector head for detecting H₂ leaks
- Four Gas Personal Monitor Model: GX-2009
- Personal gas detector for workers
- Methanol/CNG/LPG
- Smart Transmitter/Gas Detector Model: SD-1EC
- Toxic Gas Detector Head Model: GD-K88Ai
- Optical Interferometric Gas Analyzer Model: FI-800
- Reformer
- FC experiment system
4. Engine laboratory and environmental testing laboratory

**Description:** Various tests are performed in engine and environmental testing labs, including engine experiments using actual vehicles and environmental tests.

**Hazardous risks:** Fuel leaks from vehicles during tests in engine and environmental testing labs may cause explosions. CO in exhaust gas may lead to poisoning.

$\Rightarrow$ Detecting combustible gases to prevent explosions. Detecting CO to prevent poisoning.

- **Multi-channel Gas Monitoring System**
  - Model: RM-5000

- **Oxygen Gas Detector Head**
  - Model: GD-F3A-A
  - Detection of oxygen deficiencies

- **Toxic Gas Detector Head**
  - Model: GD-K88Aj
  - Detection of NOx

- **Flame-proof Suction Type Gas Detector**
  - Model: GD-D58
  - Detection of gasoline

- **Portable Combustible Gas Detector**
  - Model: GP-1000
  - To detect residual gases before entering laboratory

- **Portable Multi Gas Detector**
  - Model: GX-6000
  - To detect gasoline
5. Vehicle testing laboratory

**Description:** Driving tests are performed in the vehicle testing lab using actual vehicles.

**Hazardous risks:** Fuel leaks from the vehicle during tests in the vehicle testing laboratory may cause explosions. CO in the exhaust gas may lead to poisoning.

- Detecting combustible gases to prevent explosions
- Detecting CO to prevent poisoning

### Detector heads for CO
- Smart Transmitter/Gas Detector Head Model: GD-K88Ai
- Combustible Gas Detector Head Model: GD-A80

### Detector heads for HC
- Smart Transmitter/Gas Detector Head Model: SD-1

### Detector head for H₂
- Flame-proof Suction Type Gas Detector Model: GD-D58

### Personal gas detector for workers
- Four Gas Personal Monitor Model: GX-2009

### Monitoring panel
- Multi-channel Gas Monitoring System Model: RM-5000
6. Test bench

**Description:** Performance and durability tests of a tuning engine are performed in the test bench lab.

**Hazardous risks:**
- Engine fuel leaks can generate combustible gases and may cause explosions.
- CO in the exhaust gas from engine combustion may lead to poisoning.
- Oxygen deficiencies may occur during work in a closed space (for example, underground pits).

- Detecting combustible gases to prevent explosions
- Detecting CO to prevent poisoning
- Detecting oxygen concentration to prevent oxygen deficiencies

**Detectors:**
- Detector head for CO: Smart Transmitter/Gas Detector Model: SD-1EC
- Detector head for oxygen deficiencies: Smart Transmitter/Gas Detector Model: SD-1OX
- Detector heads for gasoline: Smart Transmitter/Gas Detector Model: SD-1
- Combustible Gas Detector Head Model: GD-A80

**Monitoring System:**
- Multi-channel Gas Monitoring System Model: RM-5000
- Four Gas Personal Monitor Model: GX-2009

**Test bench laboratory**

**Test bench control panel**
### 7. Lithium battery production

**Description:** Lithium battery production processes involve electrode coating and electrolyte injection.

**Hazardous risks:**
- Electrode coating processes can generate explosive NMP (N-methylpyrrolidone).
- Electrolyte injection processes can generate explosive DMC (dimethyl carbonate).

⇒ NMP and DMC detectors to prevent explosions

- Measuring oxygen concentration to prevent oxygen deficiencies

#### Personal gas detector for workers
- **Four Gas Personal Monitor**
  - Model: GX-2009

#### Environmental measurements before work
- **Portable Multi Gas Detector**
  - Model: GX-6000

#### Detector heads for DMC
- **Flame-proof Suction Type Gas Detector**
  - Model: SD-D58
- **Smart Transmitter/Gas Detector**
  - Model: SD-1GH
  - Model: SD-1RI

#### Detector head for O₂
- **Smart Transmitter/Gas Detector**
  - Model: SD-1OX

---

**Exhaust gas**

**Electrode coating**

**Electrolyte injection**
8. Heating furnace

**Description:** Heating furnaces are used to heat steel materials in automobile manufacturing.

**Hazardous risks:** Since fluctuations in the calorific value of the supplied fuel affect burner performance significantly, the calorific value must be controlled. Fuel (LNG) leaks and CO generation near the heating furnace may lead to explosions or poisoning.

- Controlling calorific value with a calorimeter
- Detecting CO to prevent poisoning
- Detecting combustible gases to prevent explosions

**[Background of adoption]**
Particularly in countries other than Japan, LNG is purchased from multiple suppliers. Use of shale gas and other fuels is expected to increase in the future. Since fluctuations in calorific value affect burner performance significantly, OHC is also installed in the heating furnace to control calorific value.
Major Examples of Accidents

Case of acute organic solvent poisoning during cleaning of degreasing tank with trichloroethylene

[Location of accident]
Trichloroethylene cleaning tank in a factory polishing automotive parts and providing metal surface treatment

[Cause of accident]
A worker who entered the trichloroethylene tank to remove deposits from the inner wall with waste cloth soaked with trichloroethylene was found to have collapsed in a crouching position on the stand in the trichloroethylene tank.

[Damage/injuries]
The worker was rescued immediately and transferred to the hospital. However, he died the next day without regaining consciousness.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.
Case of organic solvent poisoning during cleaning of paint film removal/cleaning tank for painting jigs for automotive parts

[Location of accident]
Removal/cleaning tank for painting jigs in an automotive parts manufacturing plant

[Cause of accident]
The victim entered the removal/cleaning tank at around 3:30 pm on the day of the accident to remove paint film sludge. He entered the bottom of the tank and gathered and discharged sediment from the tank. He was poisoned around 4:10 pm after discharging sediment three times.

[Damage/injuries]
When the victim was found, he was found crouching and unconscious in the bottom of the washing tank. He was taken to the hospital by ambulance, treated, and regained consciousness approximately 2 hours and 10 minutes after the incident.

Wearing gas detectors on a routine basis enables early detection of toxic gas leaks and improves work safety.
Product Information
Personal Single Gas Monitors

Model: 03 series

Features

• Models for use with rechargeable batteries have been added to the product line.

• Standard protective covers protect the main unit from scratches, dirt, and shock.

• 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)
Four Gas Personal Monitor

Model: GX-2009

Features

• Suitable for use as an explosion-proof product, even in a hydrogen/acetylene atmosphere

• IP 67 equivalent protection for safe use in outdoor work

• Three alarm lamps and two alarm buzzers oriented in different directions to alert both the operator and those in surrounding areas

• 95+ dB buzzer audible even in the noisiest surroundings

• Simultaneous display of gas concentrations of four components on large LCD screen

• Also equipped with clock display and data logger functions
Portable Multi Gas Detector

Model: GX-6000

Features

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

• The PID sensor enables measurements of more than 200 types of chemical substances subject to regulation.

• 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
Features

• A single unit with a gas type switching function can detect 25 types of combustible gases.

• The intrinsically safe explosion-proof enclosure (explosion-proof rating: Exia II CT4) enables measurement in Zone 0 Hazardous Areas at continuous risk of explosions.

• Protection rating equivalent to IP 67 ensures secure outdoor work.

• Once a cartridge-type filter (available separately) is attached to the standard probe, the probe can be customized for hydrogen sulfide removal or silicon removal based on the measurement environment.

Portable Combustible Gas Detector

Model: GP-1000
Features

- Explosion-proof rating Exd II CT4 allows use in hydrogen and acetylene atmospheres.
- Suction type and aspirator suction type operations are supported. (* A pump unit and a power supply [available separately] are required.)
- The GD-A80-70 is also provided as a combustible gas detector head for use in high-temperature environments up to 70°C (normally 53°C).

Model:
GD-A80 series

Combustible/Toxic Gas Detector Heads

GD-A80 (For combustible gases)
GD-A80V
GD-A80S* (For combustible or toxic gases)
* The GD-A80S nameplate is blue.
Model: **SD-1 series**

**Features**

- Suitable for use as an explosion-proof product, even in a hydrogen/acetylene atmosphere
- 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 connection.
  * 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.
**Features**

- Detects high-boiling point solvent, N-methyl-2-pyrrolidone (NMP), evaporated in a dry facility.
- Direct insertion into the furnace allows accurate measurements of concentrations at the center of the exhaust duct.
- The furnace insertion section can be used in temperatures ranging from 0°C to +160°C.
- The SD-2500 features an integrated structure combining the main unit and display unit, eliminating the need for a dedicated indicator unit.
- Easy, straightforward operation by applying the control key.

**Flame-proof Furnace Safety Monitor**

**Model:** SD-2500

**Model:** GD-A2400
**Flame-proof Suction Type Gas Detector**

**Model : SD-D58**

- With concentration indicator

**Model : GD-D58**

- Without concentration indicator

**Features**

- Suitable for use as an explosion proof product even in hydrogen atmospheres
- Equipped with automatic flow rate abnormality detection function
- Integrated assemblies of replacement parts improve maintainability.
- Dustproof/waterproof enclosure (IP 67 equivalent)
- One-person maintenance possible
Features

- Two-wire gas detector head
  Allows direct transmission to the control system.

- Equipped with pressure correction sensor
  resistant to changes in atmospheric pressure
  (GD-F88Ai, GD-F88Di)

- Built-in aspirator (optional)
  Conventional external unit replaced by built-in unit
  (GD-K88Ai, GD-K88Di)

- Corrosive gas resistant enclosure
  SUS enclosure available if requested by customer

- Intrinsically safe explosion-proof enclosure
  combined with barrier

[Diffusion type]
GD-K88Ai (for toxic gases)
GD-F88Ai (for oxygen)

[Suction type]
GD-K88Di (for toxic gases)
GD-F88Di (for oxygen)

Intrinsically safe explosion-proof enclosure
Oxygen/Toxic Gas Detector Heads

Model: GD-88 series
Features

- Compact, lightweight design allows installation anywhere.
- Drip-proof enclosure allows installation outdoors.
- The easily installed GD-F3A-SC-A is equipped with a signal converter for 4 mA to 20 mA transmission. Also allows long-distance transmission (up to 2.0 km).

Oxygen Gas Detector Head

Model: GD-F3A-A
Optical Interferometric Gas Analyzer

Model: FI-800

Features

- No warmup required
- Fast response
- Long-term stability
- Simple operation with easy-to-read digital display
- No sensitivity degradation in the presence of silicone
- Equipped with temperature and atmospheric pressure correction functions
Explosion-proof Calorimeter

Model: OHC-800

Features


• Fast response at 90% response within 5 seconds.

• High repetition accuracy within ±0.02 MJ/m³.

• Hydrogen explosion-proof enclosure (Exd IIB + H₂T4) required for calorimeters allows installation in dangerous areas.

• Excellent temperature characteristics, with temperature change of 0.10 MJ/m³ or less per day.

• Calorific value/specific gravity/Wobbe index switchable with key operation, eliminating troublesome calculations.
**Features**

- Adopts universal design independent of detection principle to allow shared use of the main unit.
- Power consumption reduced by 20% compared to past models (for constant potential electrolysis type)
- Reusable parts
- Allows recycling of constituent materials to reduce environmental impact.
- Design complies with various international regulations.
- Complies with CE requirements under RoHS Directive.

**Smart Transmitter/Gas Detector**

**Model: GD-70D**
Single-Channel Gas Monitors

Model: RM-6000 series

Features

- Easy-to-read three-color LCD display recognizable from a distance
- Single-point indicator/alarm unit
- Lock-in specification selectable (optional)
- RS-485 communication support (optional)
Combustible Gas Detector

Model: GP-147

Features

• Option to use a back-up power supply can be selected individually for each detector head.

• Capable of leak monitoring at hydrogen stations

• Capable of early detection of hydrogen leaks (ppm) and explosion prevention (% LEL)

• Improved visibility with green and red two-color LCD and bar meter display

• Gas leaks and failures indicated by voice alarms (optional)
Multi-channel Gas Monitoring Systems

Model:

RM-5000 series

Features

• Many types of gas detector heads available

• Gas concentrations are displayed in two ways: bar meter and digital display

• High-contrast three-color LCD improves visibility of detected state.

• Equipped with RS-485 communication function (optional)
Fixed PID VOC Monitor

Model: RVOC

Features

• Equipped with photoionization detector (PID) optimum for VOC detection
  Support for three measurement ranges
  (0-10/100/1,000 ppm)
  Sensor structure resists effects of humidity and keeps foreign materials away from lamp.
  Measurement cycles configurable up to 5 minutes and 50 seconds at intervals of 10 seconds (Default: 1 minute)

• Various functions with high working efficiency
  Easily installed in control system (4-20 mA output)
  Switchable type (RVOC-10s) models are available.
We are a pioneer in creating safe working environments for workers.