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Next-generation multi-gas detector for semiconductor factories

MODEL : GD-84D-EX

CE

CE marking certification

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【Contents】

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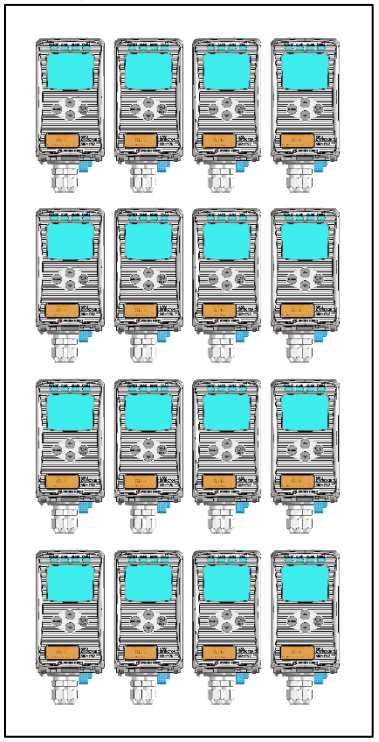
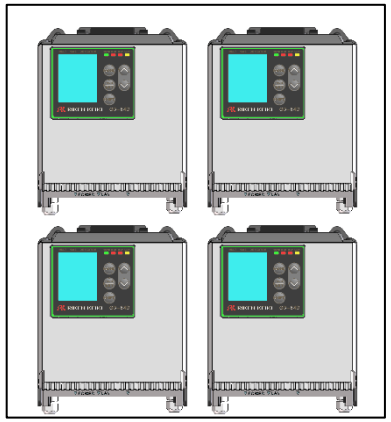
1． Product development concept

As a semiconductor plant uses an enormous number of gas detectors,
the cost of gas detectors can be prohibitive. We have developed a gas detector that combines the functions of four gas detectors into a single gas detector, offering a total cost reduction solution.
The gas detector is equipped with the sensors with enhanced self-diagnostic functions, which not only reduce costs but also make the product more reliable.



Previous gas detectors

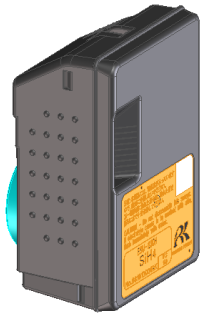
Aggregate images



New gas detectors
GD-84D-EX Series

2． Product overview

Ultra-compact 4 sensors, integrated into a single unit, reducing the size of the detector to about 2 units in comparison to a previous detector



Previous gas detectors and sensors

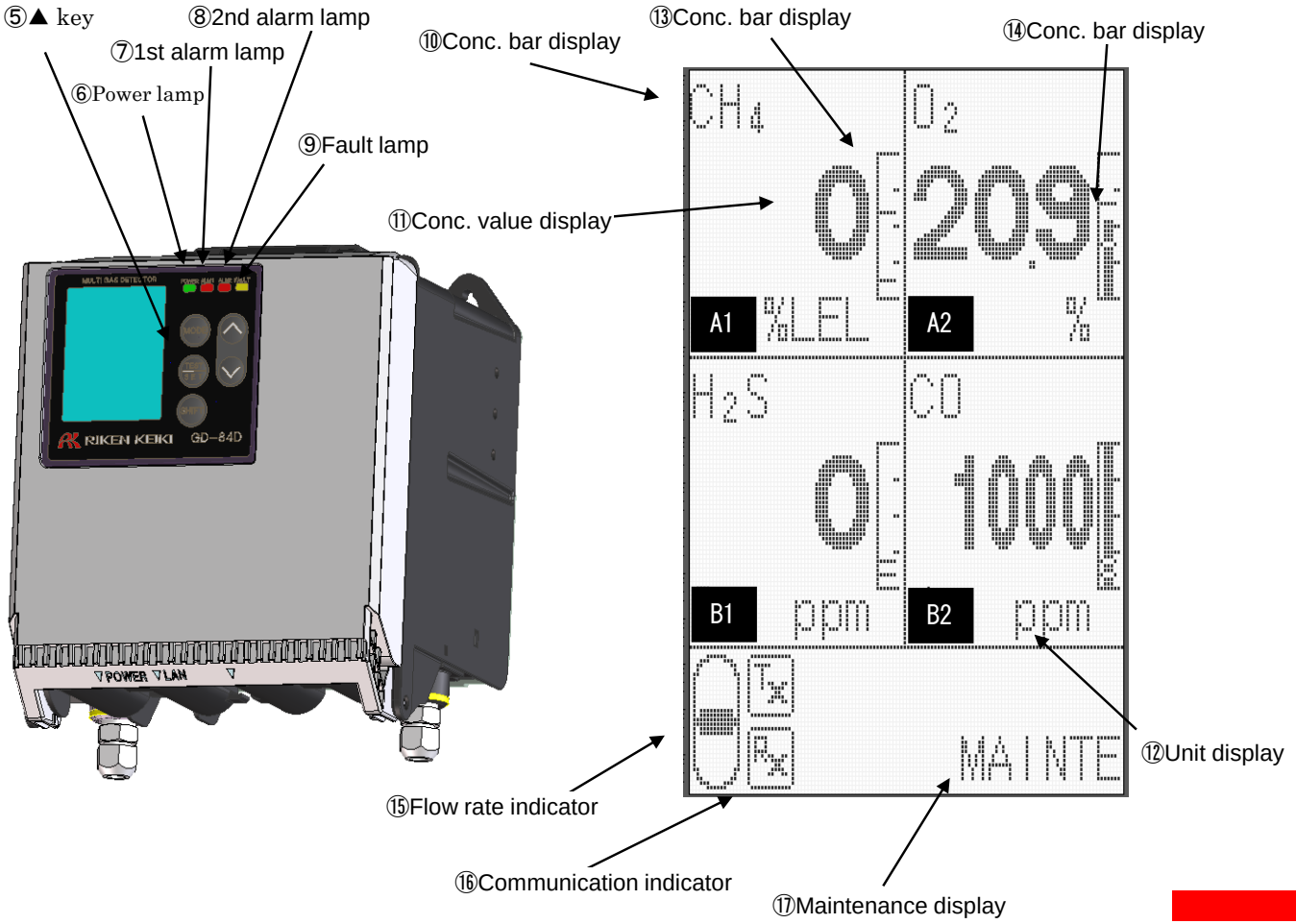
New gas detectors and sensors

The volume ratio of the sensor is about 10% per unit*
compared to the conventional sensor.

2． Product overview

Simultaneous display of 4 gas components on a full-dot LCD

①MODE key
②TEST/SET key
③SHIFT key
④▲ key
⑤▲ key



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2． Product overview

List of product models

Model	Sensor	Output	Power supply
GD-84D-EX-ET-EC	EC only	Ethernet only	PoE only
GD-84D-EX-ET	Other than EC is also available.	Ethernet only	PoE only
GD-84D-EX-EA-EC	EC only	Ethernet 4-20mA	PoE or DC24V
GD-84D-EX-EA	Other than EC is also available.	Ethernet 4-20mA	PoE or DC24V
GD-84D-EX-EC	EC only	4-20mA only	DC24V only
GD-84D	Other than EC is also available.	4-20mA only	DC24V only

※EC:Electrochemical sensors
※※ PoE:Power over Ethernet

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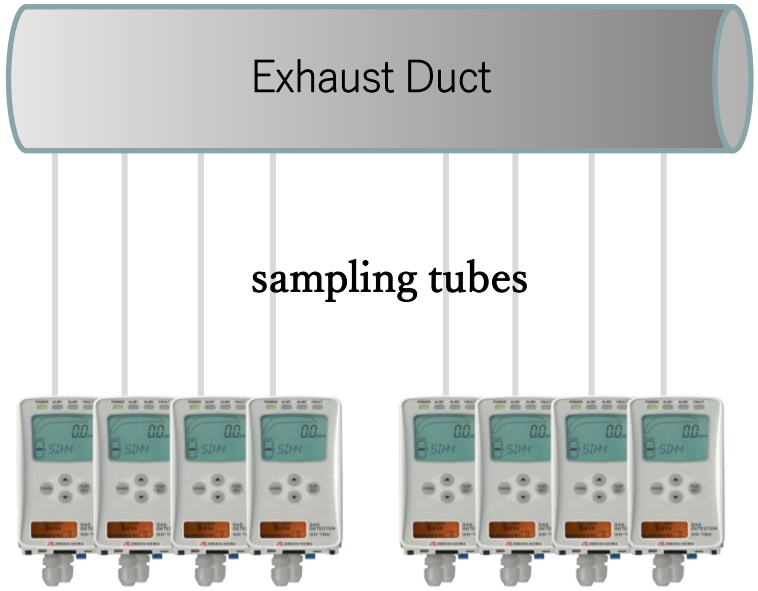
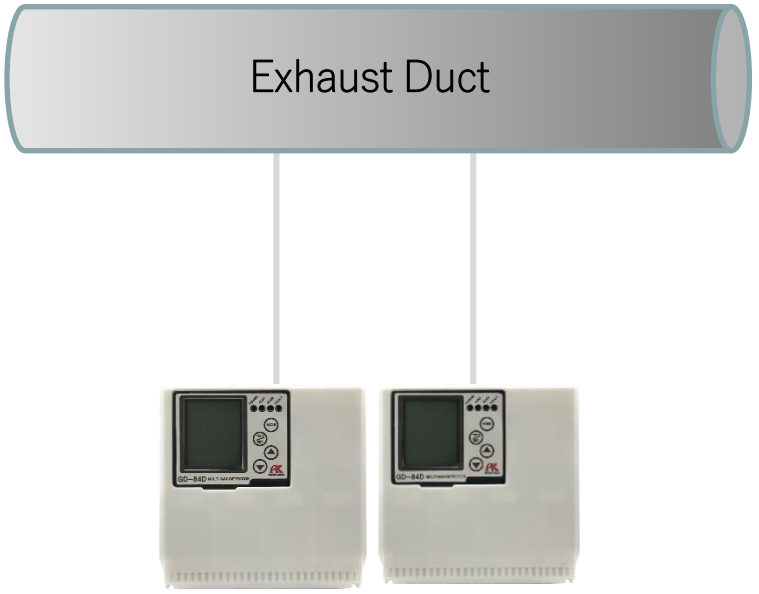
3． Cost reduction proposal

① Reduction of piping construction costs





Conventionally, the number of pipes required for gas suction and exhaust is equal to the number of gas detectors, but with the GD-84D-EX, the number of pipes is reduced to a quarter of that required, which reduces installation costs to a quarter.

*In the case of full mounting of 4 sensors

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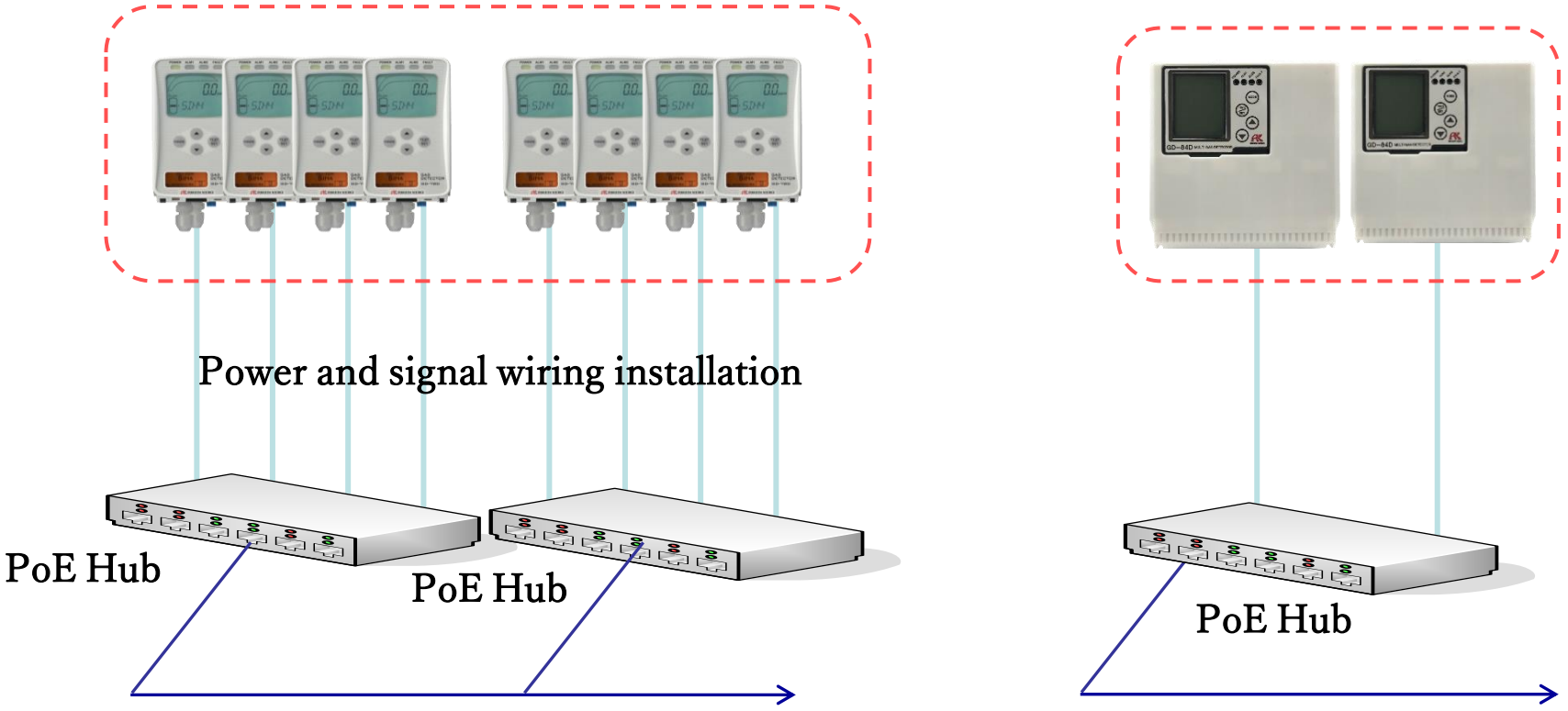
3． Cost reduction proposal

②Wiring Construction Cost Reduction

By combining the GD-84D-EX (PoE specification) with the PoE Hub, the cost of power and signal wiring and the number of hub ports can be reduced to 1/4 each. *In the case of 4 sensors fully mounted



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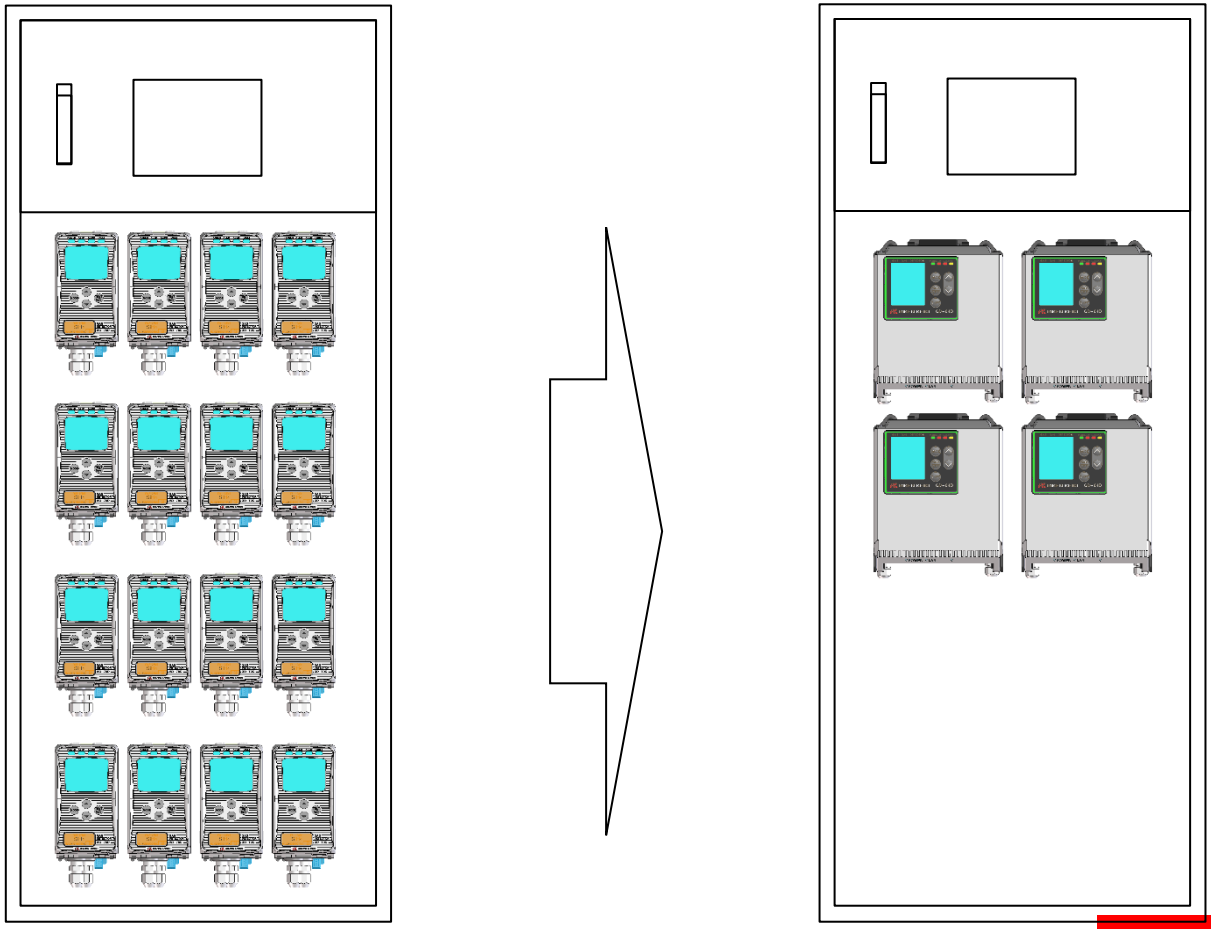
3． Cost reduction proposal

③Installation space reduction

By reducing the size of the gas detector, installation space is reduced to less than half that of a rack or other equipment.*In the case of full mounting of 4 sensors



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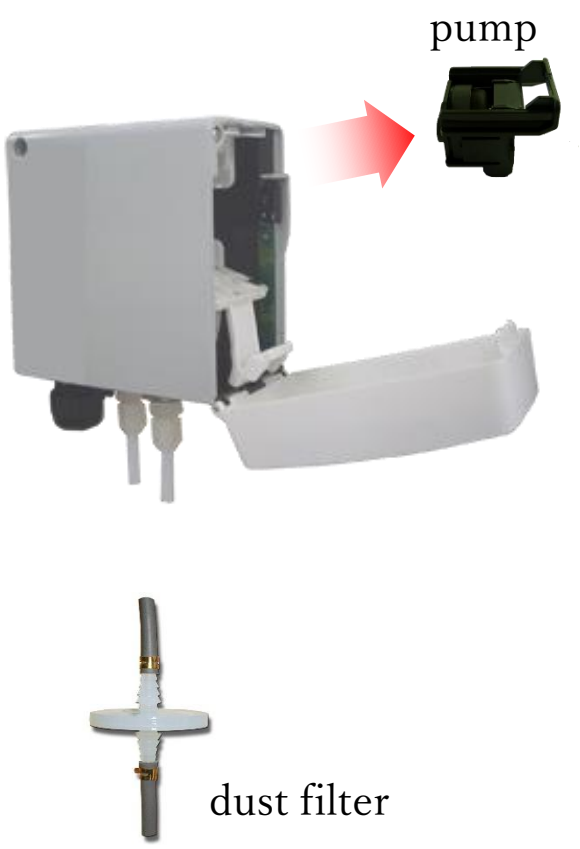
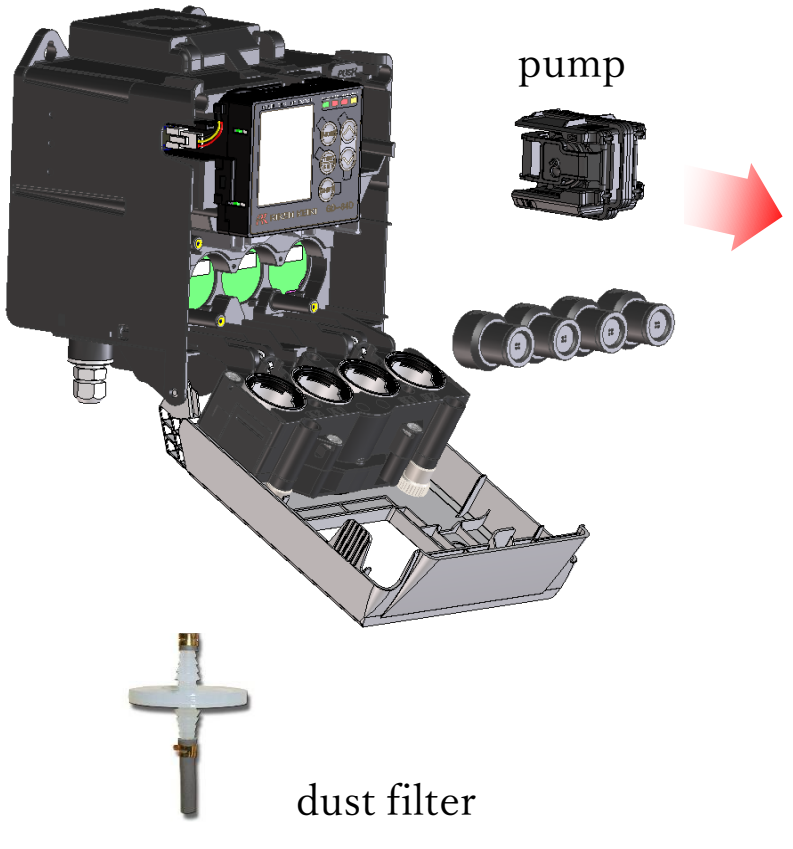
3． Cost reduction proposal

④Reduced running costs for consumable parts

Reduces replacement of consumable parts such as pumps and dust filters to a quarter of the cost





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3． Cost reduction proposal

Summary

No.	Contents	Cost down
①	Piping construction costs	1/4(75%down)
②	Wiring Construction costs Number of Hub ports	1/4(75%down)
③	Installation space	1/2(50%down)
④	Replacement cost of consumable parts (Dust filter and Pump)	1/4(75%down)

*In the case of full mounting of 4 sensors

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4． Reliability improvement

① Next Generation High Performance Sensor "F-Sensor Series

●Enhanced sensor self-diagnosis function
- use-by date warning
- Deterioration diagnosis and warning (sensor output error) (dead liquid detection)
- Life Span Diagnosis
- Vitality warnings (span capacity diagnosis), etc.

● Extensive sensor lineup
85 types of sensors for toxic and flammable gases

●Reduced interference effect
(equal or greater than conventional products)

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●Enhanced sensor self-diagnosis function

Sensor self-diagnosis name	Sensor	Contents	Detail	Sensitivity
Expiry date warning	All	Warning after 3 years of use	Warnings 1,095 days after the default set	Sensitive
Deterioration diagnosis and warning (Sensor output error)	NCF SHF SGF	Alert when drift value from initial sensor output (in air) exceeds threshold value.	Checking hourly sensor output and tallying it up every 24 hours, and issuing a warning when the average value for 7 days exceeds the threshold value.	Almost nothing
Deterioration diagnosis and warning (Detection of liquid depletion)	ESF	Warning when the liquid resistance between the electrodes exceeds the threshold value.	Measure the liquid resistance between CK and CE electrodes (every Monday at 9:00 a.m.) and check for dryness.	Almost nothing
Life Span Diagnostic Warning	All	Predicts span capacity from calibration history and warns when it reaches zero.	Calculate the current span capacity from the slope of the span output at two points (the manufacturing span and the most recent calibration value).	Limited sensitivity that can be calibrated
Vitality (spanning power)	All	Indicates the remaining power of the sensor when a known concentration of gas is flowing as a value between 0 and 100.	Calculate the sensor's power reserve from the gas concentration (span output) and the indicated value.	Zero means it cannot be calibrated.

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●Extensive sensor lineup

Gas Sensor Lineup(ESF: Electrochemical sensors, 18 types)

NO.	principle	Sensor type	Gas name	Display name	Range
1	Electrochemical type	ESF-A24A	Nitrogen Dioxide	NO_2	0 – 15 ppm
2	Electrochemical type	ESF-A24E	Hydrogen Chloride	HCL	0 – 6 ppm
3	Electrochemical type	ESF-B242	Ammonia	NH_3	0 – 75 ppm
4	Electrochemical type	ESF-B24A	Chlorine	CL_2	0 – 0.3 ppm
5	Electrochemical type	ESF-X24P	Oxygen	O_2	0 – 25 %
6	Electrochemical type	ESF-A24D	Phosphine	PH_3	0 – 1 ppm
7	Electrochemical type	ESF-A24D	Silane	SiH_4	0 – 15 ppm
8	Electrochemical type	ESF-A24D	Disilane	Si_2H_6	0 – 15 ppm
9	Electrochemical type	ESF-A24D	Sulfur dioxide	SO_2	0 – 6 ppm
10	Electrochemical type	ESF-A24D2	Nitrogen Monoxide	NO	0 – 100 ppm
11	Electrochemical type	ESF-A24E	Hydrogen Bromide	HBr	0 – 6 ppm
12	Electrochemical type	ESF-B241	Diethylamine	DEA	0 – 15 ppm
13	Electrochemical type	ESF-B241	Dimethylamine	DMA	0 – 15 ppm
14	Electrochemical type	ESF-B241	Ethylmethylamine	EMA	0 – 15 ppm
15	Electrochemical type	ESF-B2452	Fluorine	F_2	0 – 3 ppm
16	Electrochemical type	ESF-B248	Hydrogen fluoride	HF	0 – 1.5 ppm
17	Electrochemical type	ESF-B249	Ozone	O_3	0 – 0.6 ppm
18	Electrochemical type	ESF-B24A	Chlorine Trifluoride	CLF_3	0 – 0.3 ppm

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●Extensive sensor lineup

Gas Sensor Lineup(SHF:Hot-wire semiconductor sensor, 19 types)

NO.	principle	Sensor type	Gas name	Display name	Range
1	Hot-wire semiconductor type	SHF-8601	Methane	CH_4	0 - 5000 ppm
2	Hot-wire semiconductor type	SHF-8601	Isobutane	$i\text{-}C_4H_{10}$	0 - 2000 ppm
3	Hot-wire semiconductor type	SHF-8601	Ethylene	C_2H_4	0 - 2000 ppm
4	Hot-wire semiconductor type	SHF-8601	Acetylene	C_2H_2	0 - 2000 ppm
5	Hot-wire semiconductor type	SHF-8601	Propylene	C_3H_6	0 - 2000 ppm
6	Hot-wire semiconductor type	SHF-8601	n-Hexane	$n\text{-}C_6H_{14}$	0 - 200 ppm
7	Hot-wire semiconductor type	SHF-8601	n-Octane	C_8H_{18}	0 - 2000 ppm
8	Hot-wire semiconductor type	SHF-8601	Monofluoromethane(CH_3F)	R-41	0 - 2000 ppm
9	Hot-wire semiconductor type	SHF-8601	Difluoromethane(CH_2F_2)	R-32	0 - 2000 ppm
10	Hot-wire semiconductor type	SHF-8601	Difluoromethane(CH_2F_2)	R-32	0 - 5000 ppm
11	Hot-wire semiconductor type	SHF-8601	Isopropyl Alcohol	IPA	0 - 2000 ppm
12	Hot-wire semiconductor type	SHF-8601	Hexafluoro-1,3-butadiene	C_4F_6	0 - 2000 ppm
13	Hot-wire semiconductor type	SHF-8601	Dichloroethylene	$C_2H_2CL_2$	0 - 600 ppm
14	Hot-wire semiconductor type	SHF-8601	Carbon Monoxide	CO	0 - 1000ppm
15	Hot-wire semiconductor type	SHF-8602	Isobutane	$i\text{-}C_4H_{10}$	0 - 2000 ppm
16	Hot-wire semiconductor type	SHF-8603	Hydrogen	H_2	0 - 500 ppm
17	Hot-wire semiconductor type	SHF-8603	Hydrogen	H_2	0 - 1000 ppm
18	Hot-wire semiconductor type	SHF-8603	Deuterium	D_2	0 - 2000 ppm
19	Hot-wire semiconductor type	SHF-8603	Hydrogen	H_2	0 - 2000 ppm

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●Extensive sensor lineup

Lineup of gas sensors(SGF: Semiconductor sensor,7 types)

NO.	principle	Sensor type	Gas name	Display name	Range
1	Semiconductor type	SGF-8581	Methane	CH_4	0 - 2000 ppm
2	Semiconductor type	SGF-8581	Difluoromethane(CH_2F_2)	R-32	0 - 2000 ppm
3	Semiconductor type	SGF-8581	Methane	CH_4	0 - 5000 ppm
4	Semiconductor type	SGF-8562	Carbonyl sulfide	COS	0 - 2000 ppm
5	Semiconductor type	SGF-8562	Carbon disulfide	CS_2	0 - 200ppm
6	Semiconductor type	SGF-8563	Ethylene oxide	EO	0 - 100ppm
7	Semiconductor type	SGF-8562	Hydrogen Sulfide	H_2S	0 - 100ppm

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●Extensive sensor lineup

Gas Sensor Lineup(NCF:New Ceramic type sensor ,41 types)

NO.	principle	Sensor type	Gas name	Display name	Range	Note
1	New ceramic type	NCF-6318	Isobutane	i-C_4H_{10}	0 – 100 %LEL	For simultaneous measurement with methane
2	New ceramic type	NCF-6318	Hydrogen	H_2	0 – 2 vol%	For simultaneous measurement with methane
3	New ceramic type	NCF-6318	Hydrogen	H_2	0 – 100 %LEL	For simultaneous measurement with methane
4	New ceramic type	NCF-6318	n-Hexane	n-C_6H_{14}	0 – 2000 ppm	For simultaneous measurement with methane
5	New ceramic type	NCF-6318	Hydrogen	H_2	0 – 1 vol%	For simultaneous measurement with methane
6	New ceramic type	NCF-6318	Isopropyl Alcohol	IPA	0 – 100 %LEL	For simultaneous measurement with methane
7	New ceramic type	NCF-6318	Ethane	C_2H_6	0 – 100 %LEL	For simultaneous measurement with methane
8	New ceramic type	NCF-6318	Toluene	C_7H_8	0 – 100 %LEL	For simultaneous measurement with methane
9	New ceramic type	NCF-6318	Acetone	C_3H_6O	0 – 100 %LEL	For simultaneous measurement with methane
10	New ceramic type	NCF-6318	Hydrogen	H_2	0 – 4 vol%	For simultaneous measurement with methane
11	New ceramic type	NCF-6318	N,N-Dimethylacetamide	DMAC	0 – 4000ppm	For simultaneous measurement with methane
12	New ceramic type	NCF-6318	Acetylene	C_2H_2	0 – 100 %LEL	For simultaneous measurement with methane
13	New ceramic type	NCF-6318	Ethylene	C_2H_4	0 – 100 %LEL	For simultaneous measurement with methane
14	New ceramic type	NCF-6318	Propane	C_3H_8	0 – 100 %LEL	For simultaneous measurement with methane
15	New ceramic type	NCF-6318	n-Octane	C_8H_{18}	0 – 100 %LEL	For simultaneous measurement with methane
16	New ceramic type	NCF-6318	Ethanol	C_2H_5OH	0 – 100 %LEL	For simultaneous measurement with methane
17	New ceramic type	NCF-6318	Methanol	CH_3OH	0 – 100 %LEL	For simultaneous measurement with methane
18	New ceramic type	NCF-6318	Propylene	C_3H_6	0 – 100 %LEL	For simultaneous measurement with methane
19	New ceramic type	NCF-6318	Methane	CH_4	0 – 100 %LEL	For simultaneous measurement with methane
20	New ceramic type	NCF-6318	Methane	CH_4	0 – 2 vol%	For simultaneous measurement with methane
21	New ceramic type	NCF-6318	Methane	CH_4	0 – 20000 ppm	For simultaneous measurement with methane
22	New ceramic type	NCF-6320	Hydrogen	H_2	0 – 100 %LEL	Hydrogen selective sensor
23	New ceramic type	NCF-6320	Hydrogen	H_2	2 vol%	Hydrogen selective sensor
24	New ceramic type	NCF-6320	Hydrogen	H_2	0 – 2000 ppm	Hydrogen selective sensor
25	New ceramic type	NCF-6319	Isobutane	i-C_4H_{10}	0 – 100%LEL	chloride-resistant corrosion
26	New ceramic type	NCF-6319	Hydrogen	H_2	0 – 2vol%	chloride-resistant corrosion
27	New ceramic type	NCF-6319	Hydrogen	H_2	0 – 100%LEL	chloride-resistant corrosion
28	New ceramic type	NCF-6319	n-Hexane	n-C_6H_{14}	0 – 2000ppm	chloride-resistant corrosion
29	New ceramic type	NCF-6319	Hydrogen	H_2	0 – 1vol%	chloride-resistant corrosion
30	New ceramic type	NCF-6319	Isopropyl Alcohol	IPA	0 – 100%LEL	chloride-resistant corrosion
31	New ceramic type	NCF-6319	Toluene	C_7H_8	0 – 100%LEL	chloride-resistant corrosion
32	New ceramic type	NCF-6319	Acetone	C_3H_6O	0 – 100%LEL	chloride-resistant corrosion
33	New ceramic type	NCF-6319	Hydrogen	H_2	0 – 4vol%	chloride-resistant corrosion
34	New ceramic type	NCF-6319	N,N-Dimethylacetamide	DMAC	0 – 4000ppm	chloride-resistant corrosion
35	New ceramic type	NCF-6319	Acetylene	C_2H_2	0 – 100%LEL	chloride-resistant corrosion
36	New ceramic type	NCF-6319	Ethylene	C_2H_4	0 – 100%LEL	chloride-resistant corrosion
37	New ceramic type	NCF-6319	n-Octane	C_8H_{18}	0 – 100%LEL	chloride-resistant corrosion
38	New ceramic type	NCF-6319	Ethanol	C_2H_5OH	0 – 100%LEL	chloride-resistant corrosion
39	New ceramic type	NCF-6319	Methanol	CH_3OH	0 – 100%LEL	chloride-resistant corrosion
40	New ceramic type	NCF-6319	Propylene	C_3H_6	0 – 100%LEL	chloride-resistant corrosion
41	New ceramic type	NCF-6319	Vinyl chloride	VCM	0 – 100%LEL	chloride-resistant corrosion

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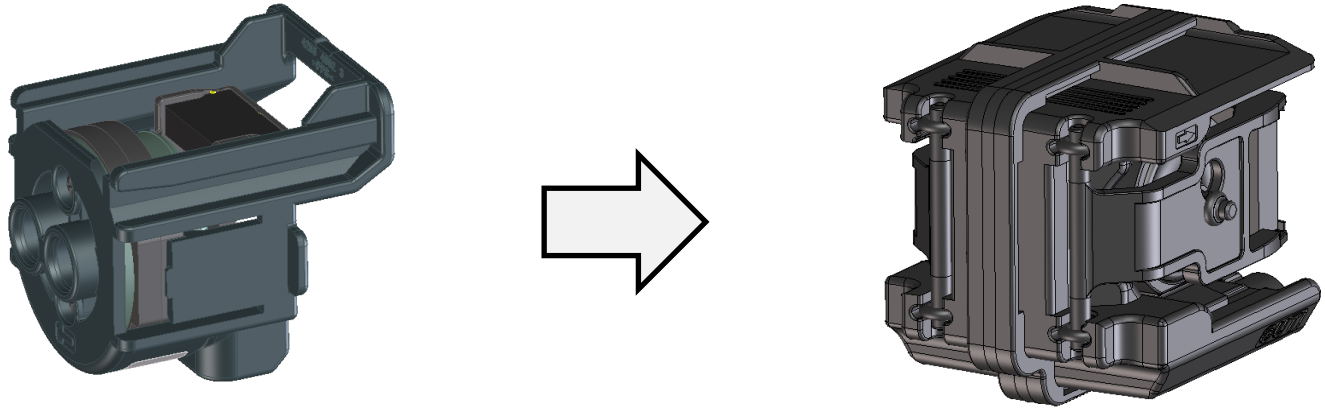
4． Reliability improvement

② High performance pump

RP-70(conventional product)　　RP-80(new product)



1. Reduction of vibration　：Two diaphragms to cancel out vibrations
2. Noise reduction　：Review of valve shape
3. Pulsation reduction　：Buffer installed in the chamber
4. Redundancy　：Twin pump -> Suction is possible even with one failure
5. Environmental Impact Reduction　：Improved recycling by eliminating adhesives and screws (nuts)

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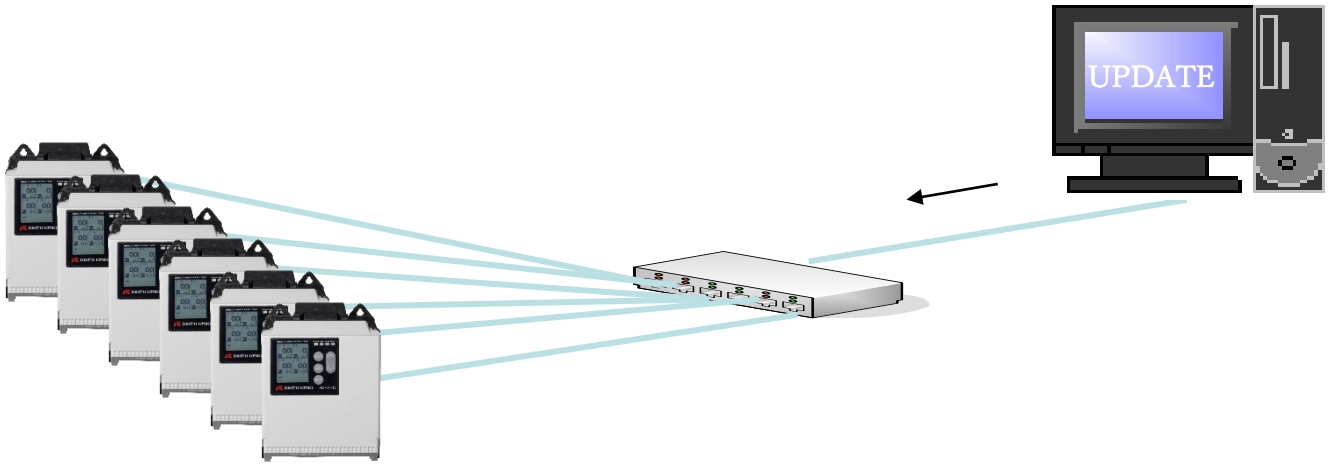
4． Reliability improvement

③ Firmware update function

The GD-84D-EX series is newly equipped with a firmware* update function via Ethernet.

*Software to control hardware

Whenever a new feature is added or an existing one is improved, maintenance personnel can update the gas detector without having to go to the site in person.



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GD-84D-EX Series Specifications

Model	GD-84D-EX	GD-84D-EX-EC	GD-84D-EX-EA	GD-84D-EX-EA-EC	GD-84D-EX-ET	GD-84D-EX-ET-EC
Detection principle	Electrochemical Semiconductor New ceramic Hot-wire semiconductor	Electrochemical	Electrochemical Semiconductor New ceramic Hot-wire semiconductor	Electrochemical	Electrochemical Semiconductor New ceramic Hot-wire semiconductor	Electrochemical
Gas	Toxic gas Combustible gas	Toxic gas	Toxic gas Combustible gas	Toxic gas	Toxic gas Combustible gas	Toxic gas
Display	Full dot display (gas name, flow rate, mode, communication status, gas concentration, and bar meter)					
Detection method	Pump suction method					
Suction flow	Approx.0.6 L/min					
Power indication	POWER lamp on(green)					
Alarm accuracy (under an identical condition)	Less than ±30%(against alarm preset point)					
Alarm-delay time (under an identical condition)	Less than 60sec (by providing the gas 1.6 times the alarm setpoint) (excluding delay in the tube and in the communication)					
Gas alarm type	Two-level alarm(H-HH or H-L or L-LL)					
Gas alarm indication	1st：ALM1 lamp on(red) 2nd：ALM2 lamp on(red)					
Gas alarm action	Non latching (auto-reset) or latching					
Gas alarm contact	No-voltage contact 1a or 1b (2 step independent) De-energized (energized at an alarm state) or energized (de-energized at an alarm state)				—	
Trouble alarm・Self diagnosis	System abnormalities/sensor abnormalities/flow rate/abnormalities/communication abnormalities/FAN disconnection abnormalities/temperature rise abnormalities/ /sensor life diagnosis					
Trouble alarm indication	FAULT lamp on(yellow)/detail display					
Trouble alarm action	Non latching (auto-reset) or latching					
Trouble alarm contact	No-voltage contact 1a or 1b De-energized (energized at an alarm) or energized (de-energized at an alarm)				—	
Contact capacity	24 VDC, 0.5 A (resistance load)				—	
Contact cable	Cable of CVV, etc. (1.25 mm2) - max. 6-core				—	
Output	Analog transmission: 2-wire type analog transmission (DC4-20mA)		Digital transmission: Ethernet(10BASE-T/100BASE-TX) Analog transmission: 2-wire type analog transmission (DC4-20mA)		Digital transmission: Ethernet(10BASE-T/100BASE-TX)	
Output cable	Cable of CVV, etc. (1.25 mm2) - max. 8-core		Digital transmission: Ethernet cable (category 5 or higher) Cable of CVV, etc. (1.25 mm2) - max. 8-core		Digital transmission: Ethernet cable (category 5 or higher)	
Various functions	White backlight/alarm delay/suppress/zero tracking/sensitivity compensation/flow control/calibration history/alarm trend history/event history					
Power cable	Cable of CVV, etc. (1.25mm2) - 2-core		Cable of CVV, etc. (1.25mm2) - 2-core （common with the digital transmission cable when PoE connection is used）		（common with the digital transmission cable when PoE connection is used）	
Power supply	DC24 V±10 %		DC24 V±10 % or PoE connection		PoE connection	
Power consumption	DC24 V： Approx.8 W(MAX approx.14 W)	DC24 V： Approx.2.5 W(Max Approx.7 W)	DC24 V：Approx.9 W(最大 Approx.15 W) PoE：Approx.11 W(Max approx.16 W)	DC24 V：Approx.3 W(Max approx.8 W) PoE：Approx.4.5 W(Max approx.9.5 W)	PoE： Approx.9 W(Max approx.11 W)	PoE： Approx.3.5 W(Max approx.4.5 W)
Piping port	Rc1/4(O.Dφ6-1t・with half-union <PP> for the tubing)					
Initial clear	Approx.25sec					
Operating temperature	-10 - 40℃(at a constant condition)					
Operating humidity	20 - 90 %RH(non-condensing)					
Structure	Wall mounted type					
Outer dimension	Approx.150(W)×190(H)×146(D) mm(projection portions excluded)				Approx.150(W)×183(H)×140(D) mm(projection portions excluded)	
Weight	Approx.1.9 kg				Approx. 1.4 kg	
Color	Body：gray Front door：white					