

# Tough & Smart!

Equipped with a high-reliability optical interferometric sensor  
 SUS used for gas contact parts  
 (able to handle corrosive gases)

Enhanced self-diagnostic function  
 (compatible with MODBUS communications)  
 Easier maintenance



For Controlling and Measuring  
 Gas Concentrations

## Optical Interferometric Gas Monitor

Model FI-900

ATEX  
 IECEx  
 TIIS(Japan Ex)  
 CE Marking



理研計器株式会社

# Enhanced functionality and performance for lower customer operation and management burden!

## Tough

### Equipped with a high-reliability optical interferometric sensor

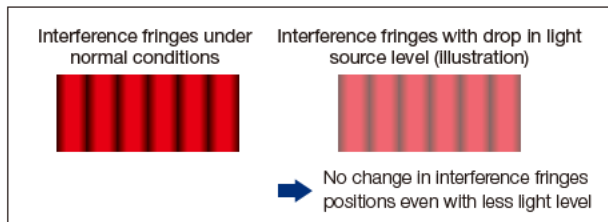
#### Measurement principle:

The gas concentration is detected from the amount of movement of interference fringes that occur due to the difference in the refractive indexes of the sample gas and reference gas.

#### Features: almost no degradation of sensor sensitivity.

Even if the light source level drops, there is no change in the positions of interference fringes.

= no change in sensor sensitivity.



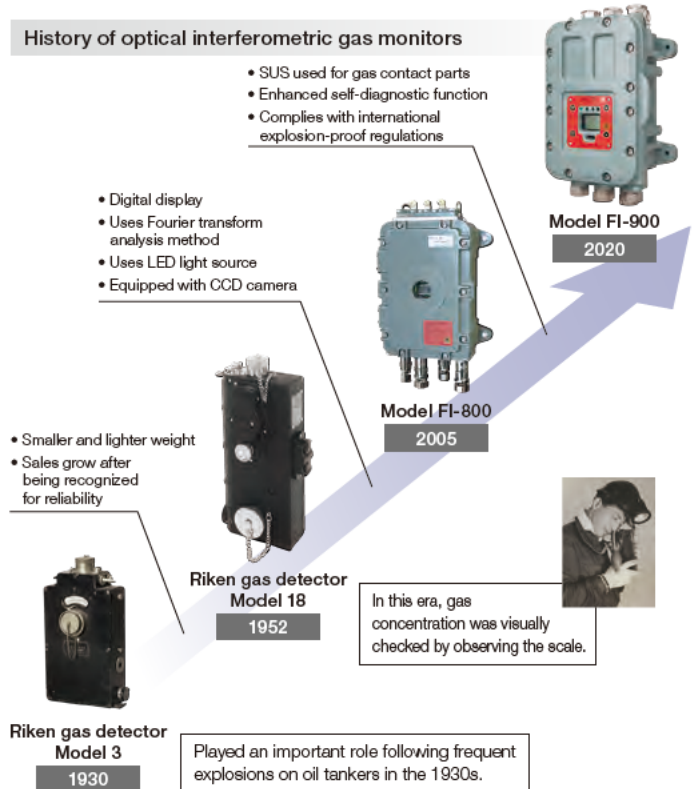
This design differs from ordinary optical sensors as it is less susceptible to decreases in light source level or a dirty chamber, and as there is no change in the sensitivity, **it is a high-reliability sensor.**

#### SUS used for gas contact parts

(able to handle corrosive gases)

SUS is used for gas contact parts, which means it can be used for explosion prevention for NH<sub>3</sub> and high-concentration hydrogen that the previous unit was not capable of. (SUS specifications for sensor part available as an option)

#### History of optical interferometric gas monitors



## Smart

### Enhanced self-diagnostic function

(compatible with MODBUS communications)

The FI-900 has enhanced self-diagnostic functions to constantly monitor self-diagnostic parameters like the 10 items shown in the table on the right, while diagnosing operating conditions of the device or its usage environment.

It is compatible with MODBUS communications to constantly monitor not only gas concentrations but also the state of the measurement device. Log data is also recorded on the measurement device, and can be checked to identify causes quickly on site if faults occur with the device.

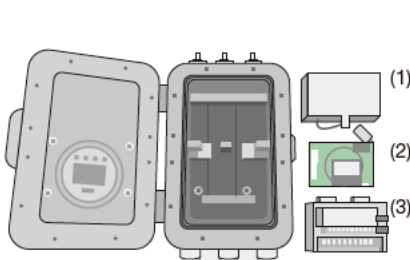
Table Self-diagnostic monitoring parameters (excerpt)

	Constant monitoring	Logging
Sensor output	○	○
Sensor temperature	○	○
GAS flow rate	○	○
REF.GAS flow rate	○	○
GAS OUT absolute pressure	○	○
Light source voltage	○	—
Interference fringes light level	○	○
Interference fringes contrast	○	—
4 to 20 mA output conditions	○	—
Power supply voltage	○	—

\* Monitors a total of 35 items including the 10 items above.

### Improved maintenance

The FI-900 comprises three simple units. If faults are identified with the self-diagnostic function, only faulty units need to be replaced, **which means the device can be quickly restored for use on the field.**



Unit part names (1) Optical sensor unit (2) Main controller (3) Power supply unit

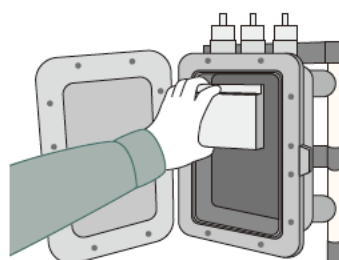
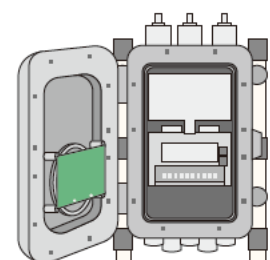


Illustration of unit replacement



Device with each unit mounted inside



## Broad range of gases measured

Measurements are conducted using gas-specific refractive indexes capable of a broad range of gas measurement, making it capable of measuring over 80 types of gases.

Measurement of additional gas types is also possible to suit requirements (gases in the list are an example).

**In addition to air and nitrogen, the sensor can also be used with various base gases such as argon and CO<sub>2</sub>.**

### [0 -100% LEL]

Measuring Gas	Measurement Range	Base Gas
Butadiene	0 -100% LEL	Air
2,3,3,3-Tetrafluoropropene	0 -100% LEL	Air
Acetone	0 -100% LEL	Air
Acetonitrile	0 -100% LEL	Air
Acrylonitrile	0 -100% LEL	Air
Benzene	0 -100% LEL	Air
Cyclohexane	0 -100% LEL	Air
Cyclopentanone	0 -100% LEL	Air
Dichloromethane	0 -100% LEL	Air
Dimethyl ether	0 -100% LEL	Air
Ethane	0 -100% LEL	Air
Ethyl alcohol	0 -100% LEL	Air
Ethyl acetate	0 -100% LEL	Air
Ethylcyclohexane	0 -100% LEL	Air
Ethylene	0 -100% LEL	Air
Hydrogen	0 -100% LEL	Air/N <sub>2</sub>
Isoprene	0 -100% LEL	Air
Isopropyl alcohol	0 -100% LEL	Air
M-Xylenhexafluoride	0 -100% LEL	Air
Methyl alcohol	0 -100% LEL	Air
Methyl ethyl ketone	0 -100% LEL	Air
Methyl isobutyl ketone	0 -100% LEL	Air
Methyl methacrylate	0 -100% LEL	Air
Methylcyclohexane	0 -100% LEL	Air
Butyl acetate	0 -100% LEL	Air
Normal heptane	0 -100% LEL	Air
Normal hexane	0 -100% LEL	Air
Normal propyl alcohol	0 -100% LEL	Air
Propane	0 -100% LEL	Air
R-454C	0 -100% LEL	Air
Styrene	0 -100% LEL	Air/N <sub>2</sub>
Toluene	0 -100% LEL	Air
Polyvinyl chloride	0 -100% LEL	Air
Xylene	0 -100% LEL	Air

### [0-100 vol%]

Measuring Gas	Measurement Range	Base Gas
Ammonia <sup>1</sup>	0-100 vol%	N <sub>2</sub>
Carbon dioxide	0-100 vol%	Air/N <sub>2</sub> / Hydrogen
Deuterium	0-100 vol%	Air
Ethylene	0-100 vol%	N <sub>2</sub>
Hydrogen <sup>1</sup>	0-100 vol%	Air/N <sub>2</sub> /CO <sub>2</sub> Argon/ Methane
Methane	0-100 vol%	Air
FC218	0-100 vol%	Air
Propane	0-100 vol%	N <sub>2</sub>
Sulfur hexafluoride	0-100 vol%	Air

### [0-50 vol%]

Measuring Gas	Measurement Range	Base Gas
Butadiene	0-50 vol%	N <sub>2</sub>
Carbon dioxide	0-50 vol%	Argon
Chlorofluorocarbon 22	0-50 vol%	N <sub>2</sub>
Hydrogen	0-50 vol%	N <sub>2</sub>
Propylene	0-50 vol%	N <sub>2</sub>

### [0-20 vol%]

Measuring Gas	Measurement Range	Base Gas
Dichloromethane	0-20 vol%	Air
Ethylene	0-20 vol%	Air/N <sub>2</sub>
Hydrogen	0-20 vol%	N <sub>2</sub>
Propylene	0-20 vol%	N <sub>2</sub>

### [0-10 vol%]

Measuring Gas	Measurement Range	Base Gas
Carbon dioxide	0-10 vol%	Air
Dichloromethane	0-10 vol%	Air
Hydrogen	0-10 vol%	N <sub>2</sub>
Normal hexane	0-10 vol%	Air/N <sub>2</sub>
Propylene	0-10 vol%	N <sub>2</sub>

### [Others]

Measuring Gas	Measurement Range	Base Gas
Normal heptane	0-8 vol%	N <sub>2</sub>
Acetone	0-5 vol%	N <sub>2</sub>
Benzene	0-5 vol%	Air
Carbon dioxide	0-5 vol%	Air
Deuterium	0-5 vol%	N <sub>2</sub>
Dichloromethane	0-5 vol%	Air
Ethyl acetate	0-5 vol%	Air
Hydrogen	0-5 vol%	N <sub>2</sub>
Methane	0-5 vol%	Air
Normal hexane	0-5 vol%	N <sub>2</sub>
Propylene	0-5 vol%	N <sub>2</sub>
Butadiene	0-2 vol%	N <sub>2</sub>
Dichloromethane	0-2 vol%	Air
Ethylcyclohexane	0-1 vol%	Air
Methylcyclohexane	0-1 vol%	Air
Toluene	0-1 vol%	Air
Trichloroethylene	0-1 vol%	Air
Hydrogen	40-100 vol%	Methane

<sup>1</sup> Specify the optional SUS sensor part.

Contact us for other gas types.

## Designed to suit various customer requirements—gas concentration measurements, gas concentration control, purity measurements, explosion prevention!

Examples of industry applications

Hydrogen production



Use: hydrogen purity measurement

Painting (such as automobile painting)



Use: VOC concentration control, explosion prevention

Gravure printing



Use: VOC concentration control, explosion prevention

Petroleum refining



Use: hydrogen concentration measurement during hydrodesulfurization process

Petrochemicals (VCM plants, etc.)



Use: VCM and other process gas concentration measurement

Foodstuff (breweries, etc.)

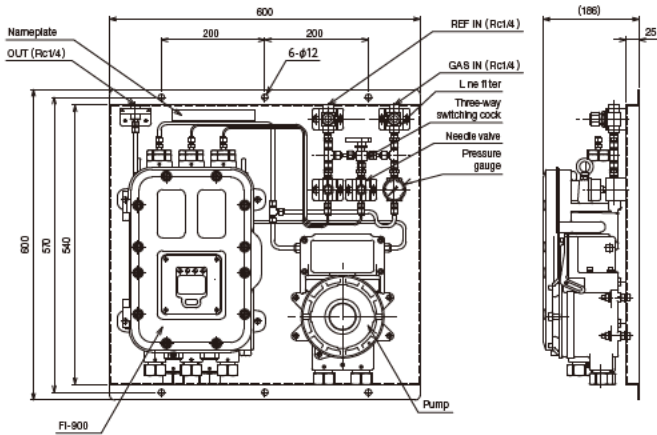


Use: CO<sub>2</sub> concentration measurement

## Specifications

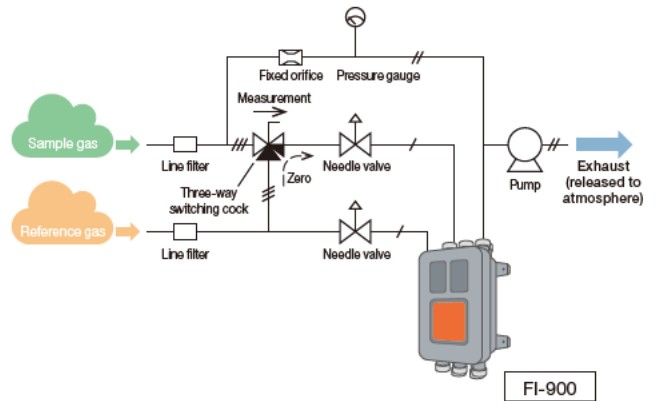
Model	FI-900
Measuring principle	Optical interferometric method
Measuring gas	Combustible gases, solvent vapors, inert gases
Measuring range	Depending on gas specifications
Alarm setpoint	Depending on gas specifications
Measuring accuracy	F.S. within $\pm 3\%$ (under same conditions, refer to separate "Specifications for measuring gas.")
Response time	T90: within 30 seconds (refer to separate "Specifications for measuring gas.")
Measuring method	Specified flow gas feed from external sampling unit
Display function	Full-dot LCD (with backlight)
External output	4 to 20 mA DC (insulated, current throw type), permitted resistive load $300 \Omega$ or less, minimum resolution 0.01 mA or less
Communications output	RS-485 (MODBUS) communication function
Alarm relay contact 1	Non-voltage contact, contact capacity 1 A 30 V DC (resistive load)
Alarm relay contact 2	Non-voltage contact, contact capacity 1 A 30 V DC (resistive load)
Fault alarm contact	Non-voltage contact, contact capacity 1 A 30 V DC (resistive load)
Power supply	24 V DC $\pm 10\%$ / 100 V to 240 V AC $\pm 10\%$ 50/60Hz *The ATEX/IECEX specifications apply to DC power source only
Power consumption	Max. 6 W (24 V DC $\pm 10\%$ ) / Max. 20 VA (100 V to 240 V AC $\pm 10\%$ 50/60 Hz) *The ATEX/IECEX specifications apply to DC power source only
Protection class	IP66/67 or equivalent
Operating temperature range	-20 to +60°C (ATEX/IECEX specifications) / -20 to +57°C (Japan Ex specifications) (no sudden changes)
Operating humidity range	95% RH or less (no condensation/use of condensible gases within unit) (no condensation)
Usage pressure range	Atmospheric pressure or equivalent (no pulses)
Outer dimensions	Approx. 286 (W)x 453 (H) x 150 (D) mm (excluding protrusions)
Weight	Approx. 23 kg
Explosion-proof structure	Flameproof enclosures
Explosion-proof class	II 2G Ex db II B+H <sub>2</sub> T4 Gb (ATEX) Ex db II B+H <sub>2</sub> T4 Gb (IECEX) Ex d II B+H <sub>2</sub> T4 (Japan Ex)
Self-diagnostic function	Status monitoring in 4 separate categories •FAILURE •FUNCTION CHECK •MAINTENANCE REQUIRED •OUT OF SPECIFICATION
Accessories	Control key, Allen key (size 2, size 6), cable ground, plug, fuse (250 V 1A)

### Outer diagram (including sample unit, suction pump, etc.)



\* This detector must be used in combination with a sampling unit. Contact us if you require a sampling unit.

### Illustration of piping for pump suction type



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