General Specifications

Model MG8E (Flameproof) Paramagnetic Oxygen Analyzer

GS 11P3A5-E

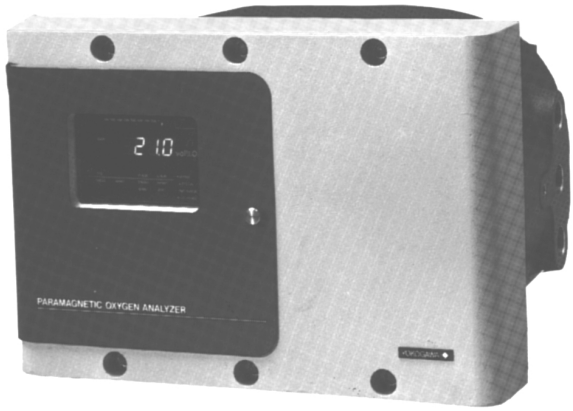
■ GENERAL

The Model MG8E Paramagnetic Oxygen Analyzer measures the concentration of oxygen based on the fact that a magnet attracts gaseous oxygen. The sensor employs a magnetic proportional flow rate system, which has been developed based on our long and field-proven experience, providing improved and advanced performance. Whereas Zirconia Oxygen Analyzers cannot measure oxygen in flammable gas mixtures, the MG8E can measure not only oxygen concentration in flammable gas mixtures but also low concentration with high precision.

The MG8E has JIS Exd II BT4X construction, for use in hazardous gas atmospheres.

The converter is microprocessor based, to provide ease of use and self-diagnostics.

It can be used together with a sampling unit to measure oxygen in high temperature, high pressure, high dusty, or high-humidity process gas mixtures.



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Model MG8 Paramagnetic Oxygen Analyzers (Installation Environment, Measured gas)

MG8	Applicable Range	Installation Site		Sample Gas					
		Hazardous Area	Non-hazardous Area*2	Class A and B hazardous gases*1 or Mixed gases of less than 4% hydrogen		Mixed gases of 4 to 100% hydrogen		Class C hazardous gas*1, excluding hydrogen*3	
				Atmosphere	Sample gas	Atmosphere	Sample gas	Atmosphere	Sample gas
MG8E used as flameproof (Exd II BT4X*4)	0-1 to 25% O_2 (Not applicable for 21-25% O_2)	OK	OK	OK	OK	NA	NA	NA	NA
MG8E used as non-flameproof	0-1 to 25% O_2	NA	OK	NA	OK	NA	OK	NA	NA
MG8G used as non-flameproof	0-5 to 25% O_2	NA	OK	NA	OK	NA	OK	NA	NA

*1: Refer to the Users Guide to Installing Explosionproof Electrical Apparatus at Plants, issued by the Technology Institution of Industrial Safety, Japan.

*2: The definition of the non-hazardous area is followed by the description in the Users Guide to Installing Explosionproof Electrical Apparatus at Plants, issued by
the Technology Institution of Industrial Safety, Japan: As a non-hazardous area is considered a place where no occurrence of explosive gas atmospheres is
guaranteed by the foreperson and confirmed by a written document.

*3: Acetylene, carbon disulfide, hydrogen, and ethyl nitrate.

*4: Exd II BT4X
(a) Structure: Flameproof
(b) Scope of area: Plants excluding hazardous areas in mining districts or hazardous areas in offices
(c) Scope of sample gas or vapor:
(c-1) Class A and B hazardous gases or vapor
(c-2) Gas or vapor with ignition temperature of 135˚C or greater
(c-3) Hydrogen concentration must be below 4%. Not applicable for gases containing acetylene, carbon disulfide and ethyl nitrate.
(d) Operating conditions
(d-1) Before opening the cover, remove power and make sure of non-hazardous atmospheres.
(d-2) Do not use for measuring oxygen concentration of gases other than those containing air or oxygen equivalent to or less than air, or those mixed with flammable gas or vapor.

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Yokogawa Electric Corporation

GS 11P3A5-E

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FEATURES

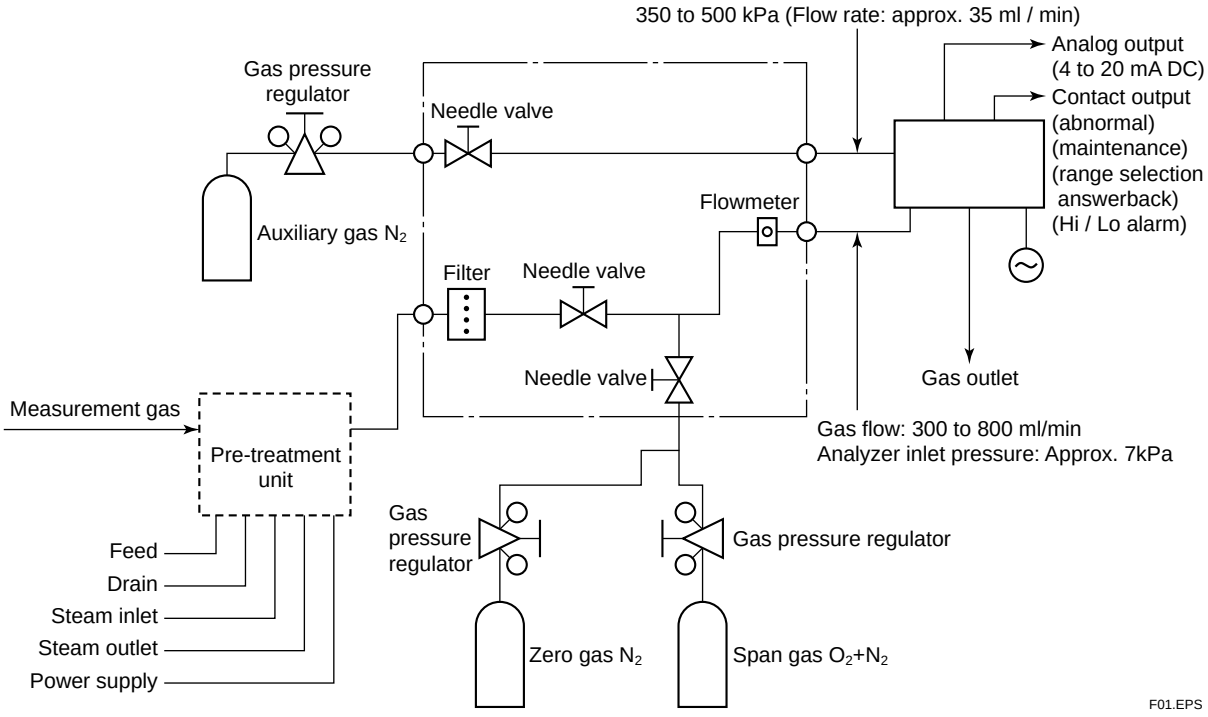
Detection Unit

- Long-life Sensor Regardless of Measurement Gas Types
  A clean auxiliary gas (N_2), not process gas, is always flowing past the detection unit sensor. Therefore, a stabilized output can be obtained for a long period uninfluenced by contamination in the process gas or by corrosive gas.
- 90% Response within 3 sec
  Since a thermistor having high sensitivity and a high speed of response directly detects variations in an auxiliary gas, a response can be derived instantaneously. Moreover, since the thermistor does not come into contact with the process gas, a long service life and stable high-speed response can be obtained.
- Structure with No Movable Parts
  Having no movable parts, the MG8E is excellent in seismic-proof property and shock resistance. Since the material along the process-gas flow path is made of JIS SUS316 stainless steel, it has excellent durability.
- Interference-gas Compensation Function
  Since a flammable gas (such as H_2) is magnetic (having a small magnetic susceptibility compared to oxygen), this causes error in a paramagnetic oxygen analyzer to result in error.
  However, the MG8E has a function to compensate for one type of interfering gas (or multicomponent gas having constant of its mixture ratio) using the differences in gas densities.
- Stable Indications of Zero Point
  Highly stable indications at around the zero point make the MG8E suitable for low concentration measurement, e.g., safety control.

Converter

- Easy Opertion via Large Display
  The large display can display oxygen concentration, thermostat temperature of the detector, cell output, and so on. The analog bar graphs can indicate the analog output statuses for each range.
- Compensation for Atmospheric Pressure Error
  Equipped with an atmospheric pressure-compensation sensor as standard, atmospheric pressure error can be compensated.
- One-touch Calibration, Automatic Calibration for Labor-saving
  Calibration is enabled by only pressing the calibration button after turning on the calibration gas (zero/span gas) flow. Further, an automatic calibration mode is available if you need.
- Multiple Self-diagnosis Functions
  Since five types of errors including cell error, analog error, and temperature error are clearly displayed, appropriate actions can be immediately taken.
  When the auxiliary gas pressure falls to a preset level, a contact point will operate.

BASIC SYSTEM CONFIGURATION



■ FUNCTION

(1) Digital Display

Display Content : vol%O_2
Cell output (mV DC) and Measurement unit temperature (°C) are displayed on demand.
Set Value Display
: Calibration-gas concentration (vol%O_2)
Output range selection
Hi/Lo alarm
Automatic calibration equivalent
Autozero span selection
Calibration interval time
Wait time
Stability time
Error Display : Self-diagnostic result
Cell error
Measurement unit temperature error
Analog error
Digital error
Memory error
: Warm-up (temperature and ∪∪∪∪ mark appear alternately on display)

(2) Atmospheric Pressure Compensation

Compensation Range : 900 to 1050 hPa

(3) Interfering-gas Compensation

Using the difference of gas density, compensation for one type of interfering gas (or multicomponent gas having constant of its mixture ratio) is possible.

Note: Before opening cover, applicable criteria on previous page.

■ STANDARD SPECIFICATIONS

Measurement Object
: Oxygen concentration in gaseous mixture
Measurement System : Paramagnetic system

● Measurement Range

: 0-1 to 25 vol%O_2
3 ranges are settable in 1%O_2 units.

● Analog Output Signal

: 4 to 20 mA DC (resistance load : 550 Ω)
Input-output isolation

● Contact Output

Error Contact
: 1 point, normally energized, normally de-energized. (125 V AC 3 A, 30 V DC 3 A resistance load)
(Contact will operate if cell error, measurement unit temperature error, analog error, digital error, or memory error occurs)
Low Auxiliary Gas Pressure
: 1 point; 300 kPa (initial setting)
Normally energized (125 V AC 3 A, 30 V DC 3 A)
Maintenance
: 1 point, normally de-energized
(125 V AC 3 A, 30 V DC 3 A resistance load)
Range Selection Answerback Hi/Lo Alarm
: 2 points, normally de-energized
(125 V AC 3 A, 30 V DC 3 A resistance load)
One of which can be selected on program.

● Contact Input

Remote range switching
: Output ranges 1 to 3 can be switched by external contact signal.
Autocalibration
: External contact starts single autocalibration cycle.
Contact ON : 10 ohms or less
Contact OFF : 100 k ohms or greater

● Output to Operate Solenoid Valve

Switching between zero and span calibration gas, and measured gas.
Maximum load : 250 V AC 1 A.
Leakage current when OFF : 2 mA or less

● Gas Conditions

(a) Measurement Gas

Gas Flow : Setting range : 300 to 800 ml/min (standard 600 ml/min)
Allowable range : ±10% of a set value
Pressure : Approx. 7 kPa {approx. 700 mmH_2O} in Analyzer inlet
Temperature
: 0 to 50°C
Humidity : No moisture condensation in the flow path or the sensor
Operating Conditions
- Measurement gas must be an explosive gas which has T4 ignition temperature and must be a hazardous gas less than or equal to the gas vapor-air mixtures.
- Oxygen concentration in the measurement gas must, be less than a mixture of air with a flammable gas (Exd II BT4X).
However, this is an exception if it is ascertained that the gas explosion characteristics are safer than the equivalent gas.

(b) Auxiliary Gas

Type : N_2 gas (not containing O_2 gas equal to or greater than 0.1 % of the maximum concentration of the measurement range)
Pressure : 350 to 500 kPa (average flow rate of approx. 35 ml/min. When sample gas contains hydrogen of 3% or greater, flow rate is approx. 55 ml/min)

(c) Calibration Gas

Zero Gas : N_2 gas (not containing O_2 gas equal to or greater than 0.1% of the maximum concentration of the measurement range)
Span Gas : Dry air (instrument air O_2: 20.95 vol%) or standard gas (residual N_2) with O_2 concentration ranging from 80 to 100% of span point

● Calibration

- Auto-zero, Auto-zero/span (calibrated automatically by setting interval)
- Auto-zero/span by external calibration request
- Manual (one-touch calibration after calibration gas entry)

Warm-up Time : Approx. 2.5 hours
Installation Conditions
: Ambient temperature ; -5 to 50°C
Vibration ; no vibration
Power Supply : 100, 110, 115 V AC ±10%, 50 or 60 Hz
Power Consumption
: 170 W maximum, approx. 20W normally
Materials in Contact with Gas
: JIS SUS316 stainless steel, Fluorocarbon rubber, Hard glass
Structure : flameproof (Exd II BT4X)
Dimensions : 440(W)×370(H)×325(D) mm
Weight : Approx. 38 kg

● Characteristics

Repeatability : ±1% of span
Linearity : ±1% of span
Response Time : 90% responce within 3 sec; measured by analog output signal change after gas is fed through the analyzer inlet.

Drift and Influence in Ambient Temperature:

Item / Range	Drift (zero, span)	Influence in Ambient Temperature
0 – 1% O_2	±2% of span / week	Variation of ±2% of span / 10˚C
0 – 2 to 4% O_2	±1.5% of span / week	Variation of ±1.5% of span / 10˚C
0 – 5 to 25% O_2	±1% of span / week	Variation of ±1% of span / 10˚C

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Influence in Measurement Gas Flow
: ±1% of span/ ±10% of set value
Influence in Atmospheric Pressure
: ±1% of span/ 10 hPa

● Model MG8E Paramagnetic Oxygen Analyzer (Flameproof) (Product code: J040)

Model	Suffix Code	Option Code	Specification
MG8E	·····	·····	Paramagnetic oxygen analyzer
Measurement range	**-1**	·····	0 — 1 to 25 vol% O_2
	-2	·····	0 — 2 to 25 vol% O_2
	-5	·····	0 — 5 to 25 vol% O_2
Cell material	**A**	·····	Standard
	B	·····	Organic solvent resistant
Auxiliary gas	**W**	·····	N_2 gas
Flow rate of auxiliary gas	**N**	·····	35 ml/min
	H	·····	55ml/min, when sample gas contains H_2 gas of 3% or greater and O_2 in He
Power supply	**5**	·····	100 V AC, 50 / 60 Hz
	7	·····	110 V AC, 50 / 60 Hz
	8	·····	115 V AC, 50 / 60 Hz
Language	**-J**	·····	Japanese
	-E	·····	English
Option		**/B1**	Balance gas: CO_2 (20%)+N_2 / N_2

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(Note 1) For wiring to the MG8E paramagnetic oxygen analyzer, always use the specified external cable lead-in cable grands shown in the table below.

(Note 2) Two pressure packing adapters (part number : G9601AE) are mounted on the MG8E cable inlet ports for power supply and output signal. (Blind plugs are mounted on the remaining four cable inlet ports.)

(Note 3) If wiring to other than the power supply and output signal is necessary, prepare the following additional items as required.
The number of external cable lead-in cable grands possible for mounting is as follows:
• Cable grounding : Up to 6 pieces

(Note 4) Material of measurement gas seal is Daielperfrow (tetrafluoroethylene/perfluoro methyl vinyl ether rubber) when cell material is organic solvent resistant.

(Note 5) Consult Yokogawa for balance gas other than option code "/B1."

● External Cable Lead-in Cable Grands

Part No.	Part Name	Specification
G9601AE	Cable grands	Cable of 10 to 13.5 mm O. D.
K9356AG	Cable grands	Cable of 8.5 to 11 mm O. D.

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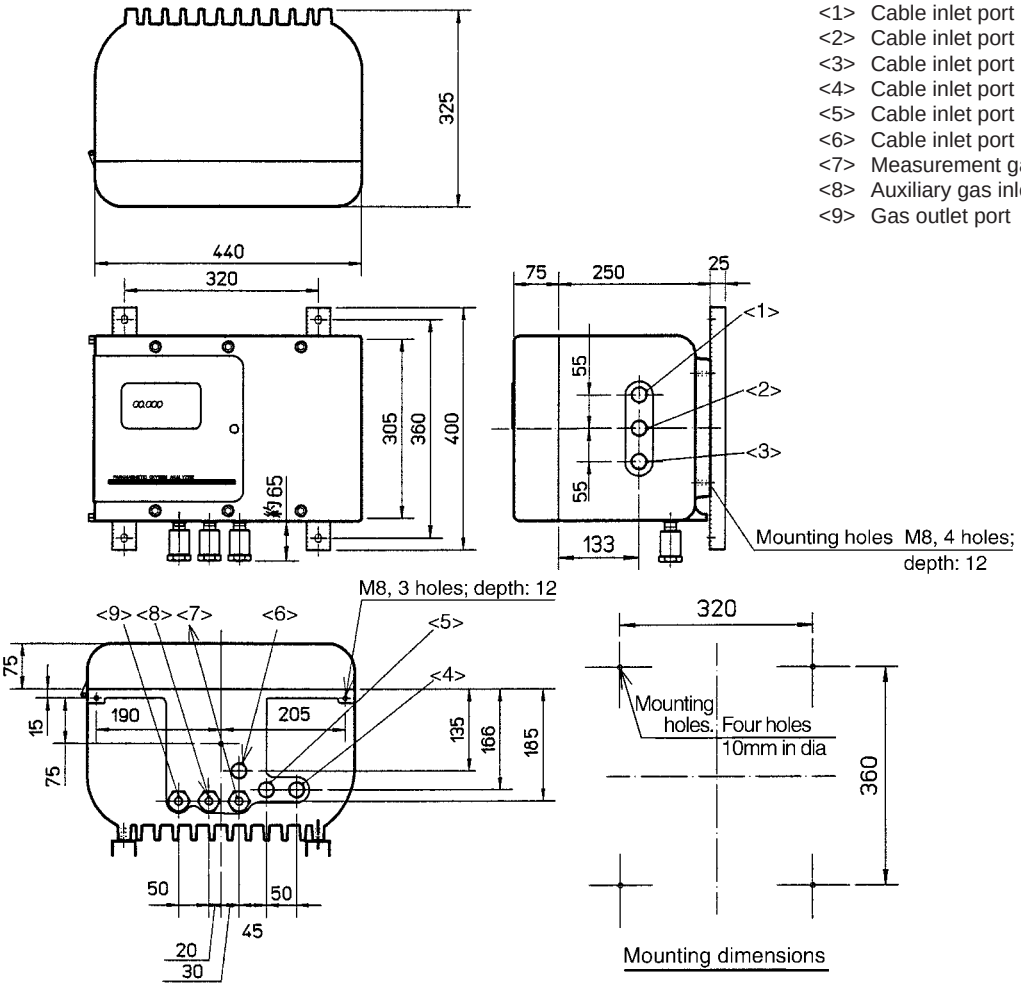
■ EXTERNAL DIMENSIONS

● Model MG8E Paramagnetic Oxygen Analyzer

Unit : mm

<1> Cable inlet port : G3/4
<2> Cable inlet port : G3/4
<3> Cable inlet port : G3/4
<4> Cable inlet port : G3/4
<5> Cable inlet port : G3/4
<6> Cable inlet port : G3/4
<7> Measurement gas inlet port : Rc1/4
<8> Auxiliary gas inlet port : Rc1/4
<9> Gas outlet port : Rc1/4



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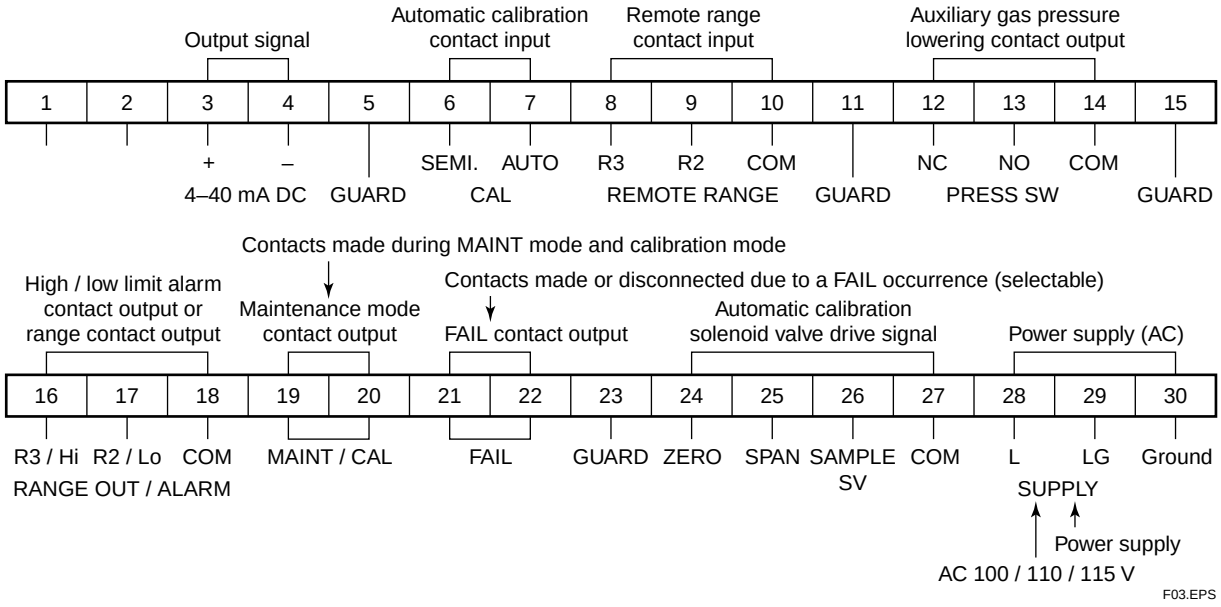
■ WIRING CONNECTION



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INQUIRY SHEET

1. General

User : _____
Tag No. : _____
Plant name : _____
Sampling point : _____
Final specifications sheet : ☐ Japanese ☐ English

2. Utilities and Installation Conditions

Power supply : ☐ V AC ± %, Hz± %
☐ V AC ± %, Hz± %
Air supply (instrument air) : pressure ..... kPa
Steam : pressure ..... kPa;
temperature ..... °C
Cooling water : temperature ..... °C
Distance between sampling point and analyzer
: ..... m ; ..... feet
Distance between analyzer and control panel
: Approx. ..... m ; ..... feet

3. Process Conditions

Process Gas Component	Concentration (vol%)		
	Nor.	Max.	Min.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
Process pressure (kPa)			
Process temperature (˚C)			
Dust (g/Nm^3)			
Water content ☐ vol%, ☐ ˚C, ☐ ˚F Saturated			
Corrosiveness	☐ No ☐ Yes		

Note: Cannot be used as a flameproof instrument when sample gas contains H_2 gas of 4% or greater.

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4. Installation Conditions

Temperature : Max. ..... °C; Min. ..... °C
Max. ..... °F; Min. ..... °F
Corrosive gases : ☐ Not present ☐ Present .....
Vibration : ☐ No ☐ Yes .....
Location where the analyzer and sampling system are installed:
☐ Indoors ☐ Outdoors ☐ Other _____

5. Scope of Estimate

☐ Model MG8E Paramagnetic Oxygen Analyzer
_____ / set
☐ Auxiliary gas pressure meter _____ / set
☐ Auxiliary gas cylinder ☐ 101 ☐ 401
_____ / set
☐ Auxiliary gas pressure reducing valve
_____ / set
☐ Zero gas cylinder ☐ 101 ☐ 401
_____ / set
☐ Zero gas pressure deducing valve _____ / set
☐ Span gas cylinder ☐ 101 ☐ 401
Range of ___ to ___ vol%O_2 _____ / set
Range of ___ to ___ vol%O_2 _____ / set
☐ Span gas pressure reducing valve _____ / set
☐ Spare parts for _____ year(s) _____ / set
☐ Sampling probe (*) _____ / set
☐ Sampling system (*) _____ / set

* : Arrangements will be made separately.