General Specifications

Model MG8E (Flameproof) Paramagnetic Oxygen Analyzer

GS 11P03A05-01E

■ 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 TIIS 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.

MG8E.EPS

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	NA	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.

T01.EPS

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FEATURES

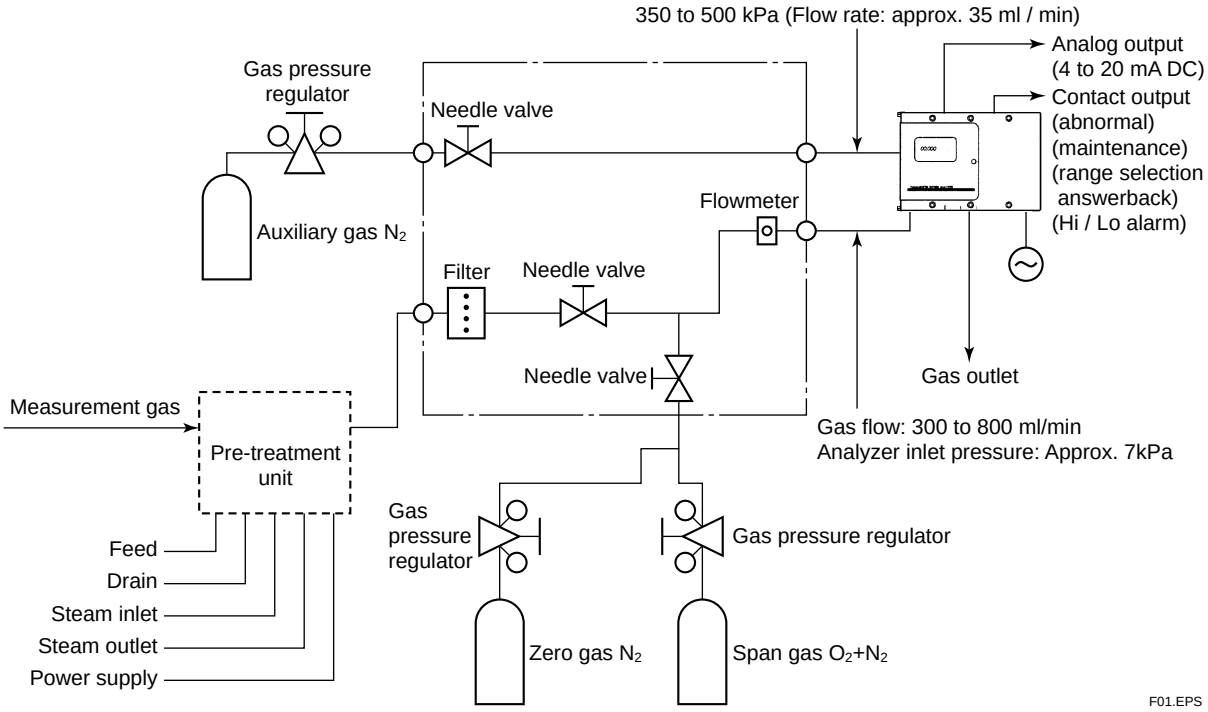
Detection Unit

- **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**
  A flammable gas (such as H_2) has a little magnetism, although their magnetism is very low 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 Operation with 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)
: Low auxiliary gas pressure

(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.
The MG8E is shipped after adjusting the cell inclination in the final adjustment stage using the magnetic characteristics and density of the measuring gas of the user. In this case, the inclination is stored using a built-in level (containing a bubble in a glass tube).

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

■ STANDARD SPECIFICATIONS

Measurement Object:

Oxygen concentration in gaseous mixture

Measurement System:

Paramagnetic system

Measurement Range:

0 – 1 to 0 –25 vol%O_2
3 ranges can be programmed arbitrarily within the above specified range.

Self-diagnostic content:

Sensor unit error, Constant temperature chamber error, Analog error, Memory error, Calibration coefficient error

Analog Output Signal:

4 to 20 mA DC (load resistance: Maximum 550 Ω)

Contact Output:

Contact rating; 3 A at 250 V AC or 30 V DC, dry contacts
Fail; 1 point, open or closed when error occurs, user configurable
Contact is activated when sensor unit error, constant temperature chamber error,analog error, memory error, or calibratio coefficient error (when automatic or semiautomatic calibration is enabled) occurs
Low auxiliary gas pressure alarm;
1 point, closed when pressure drops
Factory default low limit pressure; 300 kPa
Maintenance status;
1 point, closed during maintenance
Range answerback or high/low alarm;
2 points, normally deenergized (open)
Range answerback or high/low alarm contact output, user selectable

Output to Operate Solenoid Valve:

3points
Switching between zero and span calibration gas, and measured gas.
Maximum load : AC 1 A.

Contact Input:

Input specification
; Contact ON ; 200 Ω or less, Contact OFF ; 100 kΩ or greater
Remote range switching
; 2 points, Output ranges 1 to 3 can be switched by external contact signal.
Calibration start
; 1 point, calibration start command by external contact signal

Measurement Gas Condition:

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.

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)

Calibration Gas:

Zero gas ; N_2 gas
Note: Zero gas should not contain O_2 gas with a concentration equal to or greater than 0.1 % of the upper range value.

Span gas ; Dry air (instrument air O_2: 20.95 vol%) or standard gas containing O_2 gas with a concentration of 80 to 100 % of the span value (balance nitrogen).

Calibration methods:

(1) Automatic calibration at set intervals by internal timer
(2) Semiautomatic calibration started by external contact input
(3) Manual calibration in the field

Warm-up Time:

Approx. 2.5 hours

Installation Conditions:

Ambient temperature ; -5 to 50°C
Humidity; 10-95 %RH (Nocondensing)
Vibration;
5 to 9 Hz : Vibration amplitude; 1.5mm or less
9 to 150 Hz: Acceleration; 2 m/s^2 or less

Power Supply:

100 to 115 V AC±10 %, 50 or 60 Hz

Power Consumption:

170 VA maximum, approx. 25 VA 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

Color:

Door: Munsell 2.0GY7.5/0.9, epoxy resin baked
Case: Munsell 2.0GY3.1/0.5, epoxy resin baked

Weight:

Approx. 38 kg

Characteristics:

Repeatability
; ±1 % or less of span
Linearity
; ±1 % or less 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% or less of span / week	Variation of ±2% or less of span / 10°C
0 – 2 to 4% O_2	±1.5% or less of span / week	Variation of ±1.5% or less of span / 10°C
0 – 5 to 25% O_2	±1% or less of span / week	Variation of ±1% or less of span / 10°C

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

■ Model and Suffix Code

MG8E Paramagnetic Oxygen Analyzer (Flameproof)

[Style:S3]

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 - 115V AC, 50 / 60 Hz
Language	-J	.....	Japanese
	-E	.....	English
Option		/B1	Balance gas: CO_2 (20%)+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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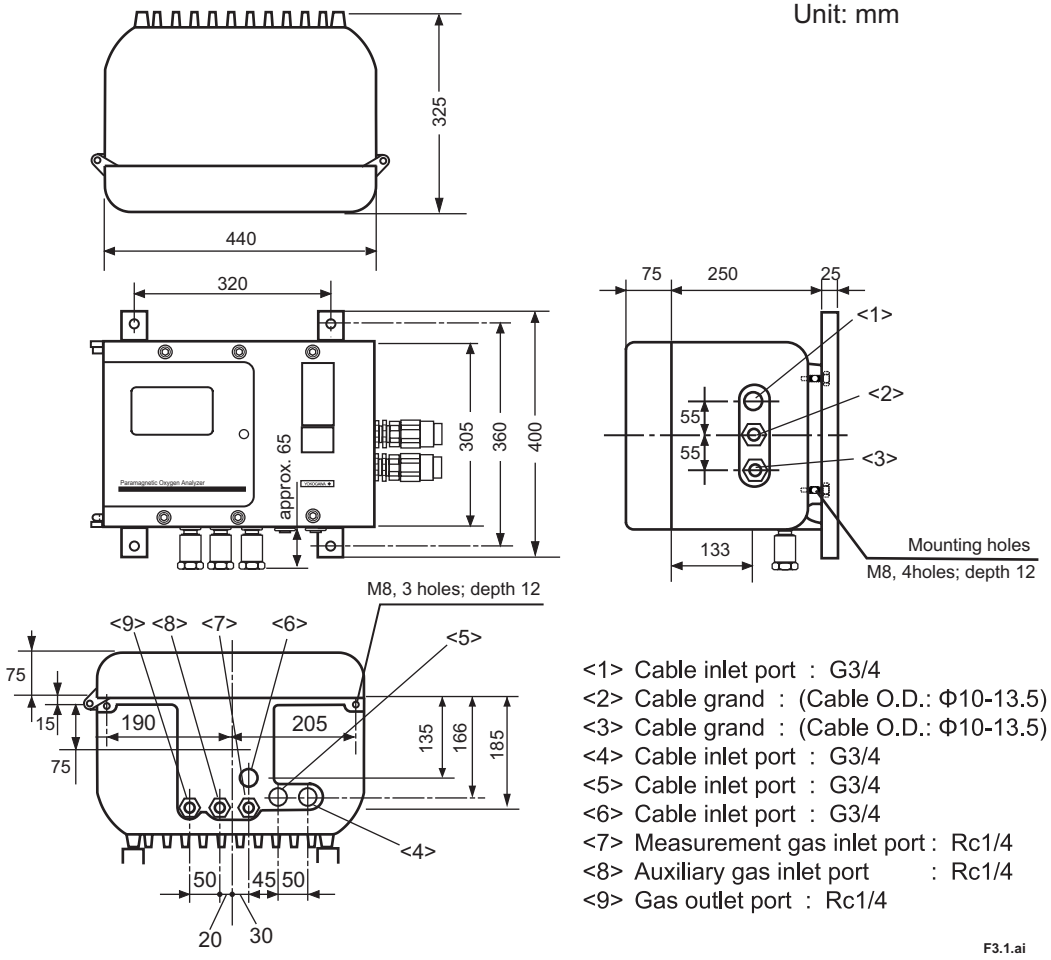
■ EXTERNAL DIMENSIONS

● Model MG8E Paramagnetic Oxygen Analyzer

Unit: mm



<1> Cable inlet port : G3/4
<2> Cable grand : (Cable O.D.: Φ10-13.5)
<3> Cable grand : (Cable O.D.: Φ10-13.5)
<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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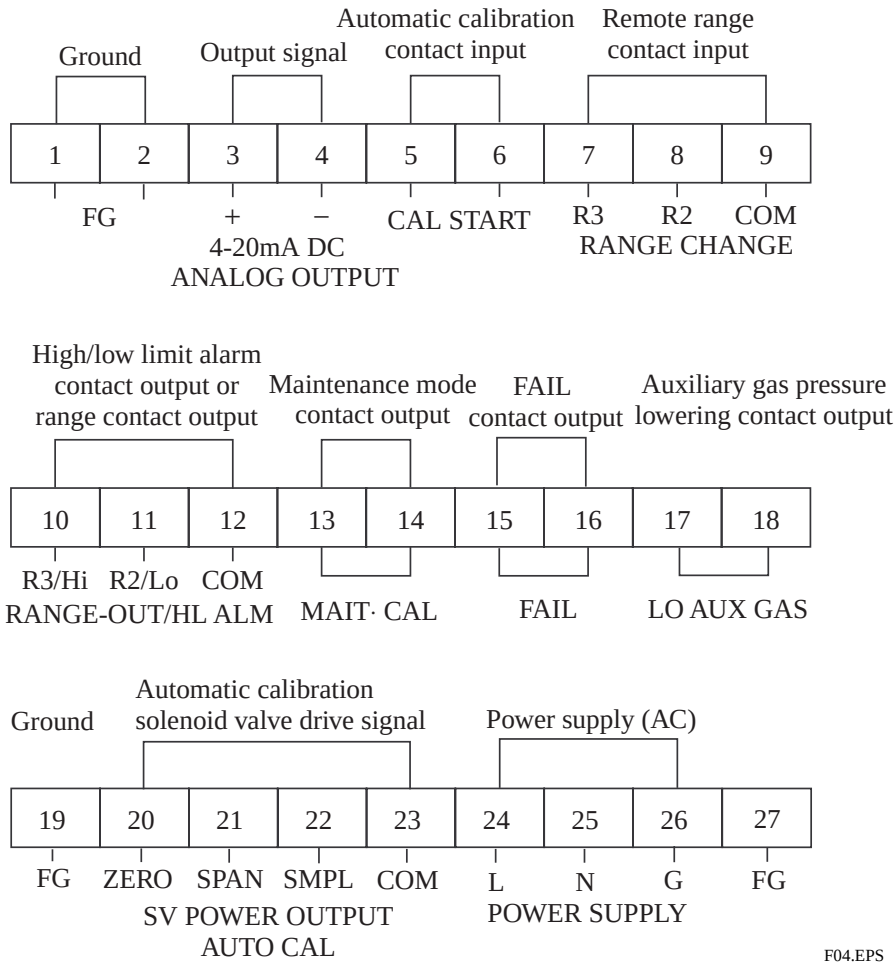
■ WIRING CONNECTION



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Inquiry Sheet for the MG8E Paramagnetic Oxygen Analyzer.

Please place checkmarks in the appropriate boxes and fill in the necessary information in the blanks.

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.