**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 flameproof enclosure, 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)

<table>
<thead>
<tr>
<th>MG8</th>
<th>Applicable Range</th>
<th>Installation Site</th>
<th>Measurement Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hazardous Area</td>
<td>Mixed gases of less than 4% hydrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-hazardous Area</td>
<td>Mixed gases of 4 to 100% hydrogen</td>
</tr>
<tr>
<td>MG8E used as TIIS approved flameproof (Ex d IIB T4X*4)</td>
<td>0-1 to 25% O2 (Not applicable for 21-25% O2)</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>MG8G used as non-flameproof</td>
<td>0-1 to 25% O2</td>
<td>NA</td>
<td>OK</td>
</tr>
<tr>
<td>MG8G used as non-flameproof</td>
<td>0-5 to 25% O2</td>
<td>NA</td>
<td>OK</td>
</tr>
</tbody>
</table>

*1: Refer to the Users Guide to Installing Explosion-proof 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 Explosion-proof 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: Ex d IIB T4X

(a) Structure: Flameproof enclosure
(b) Scope of area: Industrial sites and hazardous areas in office buildings. May not be used in hazardous locations in mines.
(c) Scope of measurement 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 and flammable gas or vapor.
**FEATURES**

- **Detection Unit**
  - **Long-life Sensor Regardless of Measurement Gas Types**
    A clean auxiliary gas (N₂), 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 H₂) 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.

- **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**

- **Analog output**
  - (4 to 20 mA DC)
- **Contact output**
  - (abnormal)
  - (maintenance)
  - (range selection answerback)
  - (Hi / Lo alarm)
- **Gas flow**
  - 300 to 800 ml/min
- **Analyzer inlet pressure**
  - Approx. 7kPa
- **Gas pressure regulator**
- **Auxiliary gas N₂**
- **Zero gas N₂**
- **Span gas O₂+N₂**
- **Pre-treatment unit**
  - **Feed**
  - **Drain**
  - **Steam inlet**
  - **Steam outlet**
  - **Power supply**

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.
FUNCTION

(1) Digital Display
Display Content: vol%O₂
Cell output (mV DC) and Measurement unit temperature (°C) are displayed on demand.
Set Value Display:
Calibration-gas concentration (vol%O₂)
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 UUUU 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%O₂
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 calibration 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 de energized (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 mmH₂O) 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. However, this is an exception if it is ascertained that the gas explosion characteristics are safer than the equivalent gas.

Auxiliary Gas:
Type; N₂ gas (not containing O₂ 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 measurement gas contains hydrogen of 3 % or greater, flow rate is approx. 55 ml/min)
Calibration Gas:
Zero gas; N₂ gas
Span gas; Dry air (instrument air O₂: 20.95 vol%) or standard gas containing O₂ 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:
Indoors
Ambient temperature; -5 to 50°C
Humidity; 10-95 %RH (No condensing)

Power Supply:
Power supply Voltage 100 to 115 V AC;
Rated voltage range; 100 to 115 V AC
Allowable voltage range; 90 to 127 V AC
Rated frequency; 50 or 60 Hz
Allowable frequency range; 48 to 63 Hz

Power Consumption:
170 VA maximum, approx. 25 VA normally

KC Marking:
Korea Electromagnetic Conformity Standard

GB: GB30439 Part 1
Installation altitude: 2000 m or less
Pollution degree: 2
Note: Installation category, called overvoltage category, specifies impulse withstand voltage. Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength.

Materials in Contact with Gas:
JIS SUS316 stainless steel, Fluorocarbon rubber, Hard glass

Structure: Flameproof enclosure
Ex d IIB T4X (TIIS¹ approved model)
Ex d IIB T4 (KOSHA² approved model)
¹ TIIS: Technology Institution of Industrial Safety
² KOSHA: Korea Occupational Safety and Health Agency

Dimensions: 440(W) X 370(H) X 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 % response within 3 sec; measured by analog output signal change after gas is fed through the analyzer inlet.

Drift and Influence in Ambient Temperature:

<table>
<thead>
<tr>
<th>Range</th>
<th>Item</th>
<th>Drift (zero, span)</th>
<th>Influence in Ambient Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 1% O₂</td>
<td>±2%</td>
<td>Variation of ±2% or less of span / 10°C</td>
<td></td>
</tr>
<tr>
<td>0 – 2% O₂</td>
<td>±1.5%</td>
<td>Variation of ±1.5% or less of span / 10°C</td>
<td></td>
</tr>
<tr>
<td>0 – 5% O₂</td>
<td>±1%</td>
<td>Variation of ±1% or less of span / 10°C</td>
<td></td>
</tr>
</tbody>
</table>

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 Codes:

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG8E</td>
<td>-</td>
<td>-</td>
<td>Paramagnetic oxygen analyzer</td>
</tr>
<tr>
<td>Measurement range</td>
<td>-1</td>
<td>-2</td>
<td>-5</td>
</tr>
<tr>
<td>Cell material</td>
<td>A</td>
<td>B</td>
<td>-</td>
</tr>
<tr>
<td>Auxiliary gas</td>
<td>W</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flow rate of auxiliary gas</td>
<td>N</td>
<td>H</td>
<td>-</td>
</tr>
<tr>
<td>Language</td>
<td>J</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-E</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Option</td>
<td>/B1</td>
<td>/EG</td>
<td>-</td>
</tr>
</tbody>
</table>

(Note 1) For wiring to the MG8E paramagnetic oxygen analyzer, always use the specified external cable lead-in cable glands 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 glands possible for mounting is as follows:
• Cable grounding: Up to 6 pieces
(Note 4) Material of measurement gas seal is Daielperflon (tetrafluoroethylene/perfluoro methyl vinyl ether rubber) when cell material is organic solvent resistant.
(Note 5) Consult Yokogawa for balance gas other than option “/B1.”
(Note 6) TIIS approval is not applicable when option “/EG” is selected.
(Note 7) Korean user’s manual is attached to MG8E when option “/EG” is selected.
(Note 8) Option “/EG” shall be selected with Language “-E”.

External Cable Lead-in Cable Glands:

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G9601AE</td>
<td>Cable glands</td>
<td>Cable of 10 to 13.5 mm O.D.</td>
</tr>
<tr>
<td>K9356AG</td>
<td>Cable glands</td>
<td>Cable of 8.5 to 11 mm O.D.</td>
</tr>
</tbody>
</table>
**EXTERNAL DIMENSIONS**

- Model MG8E Paramagnetic Oxygen Analyzer

![Diagram of MG8E Paramagnetic Oxygen Analyzer with dimensions and mounting holes]

- **Unit:** mm

- **Mounting holes:** M8, 4 holes; depth 12

- **<1> Cable inlet port:** G3/4
- **<2> Cable grand:** (Cable O.D.: Ф10-13.5)
- **<3> Cable grand:** (Cable O.D.: Ф10-13.5)
- **<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

**WIRING CONNECTION**

![Diagram of wiring connection with pins and descriptions]

- **Ground**
- **Output signal**
- **Automatic calibration contact input**
- **Remote range contact input**

- **1 2 3 4 5 6 7 8 9**
- **FG**
- **4-20mA DC ANALOG OUTPUT**
- **CAL START**
- **R3 R2 COM RANGE CHANGE**

- **High/low limit alarm contact output or range contact output**
- **Maintenance mode contact output**
- **FAIL contact output**
- **Auxiliary gas pressure lowering contact output**

- **10 11 12 13 14 15 16 17 18**
- **R3/Hi R2/Lo COM RANGE-OUT/HL ALM**
- **FAIL**
- **LO AUX GAS**

- **Ground Automatic calibration solenoid valve drive signal Power supply (AC)**

- **19 20 21 22 23 24 25 26 27**
- **FG ZERO SPAN SMPL COM SV POWER OUTPUT AUTO CAL**
- **L N G FG**
- **F04.ai**
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
Customer : ___________________________
Tag No. : ___________________________
Plant name : ___________________________
Sampling point : ___________________________
Final specifications sheet : ☐ Japanese ☐ English

2. Utilities and Installation Conditions
Power supply :............. 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

<table>
<thead>
<tr>
<th>Process Gas Component</th>
<th>Concentration (vol%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nor.</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>7</td>
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<td>8</td>
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<tr>
<td>9</td>
<td></td>
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<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Process pressure (kPa)</td>
<td></td>
</tr>
<tr>
<td>Process temperature (°C)</td>
<td></td>
</tr>
<tr>
<td>Dust (g/Nm3)</td>
<td></td>
</tr>
<tr>
<td>Water content ☐ vol%, ☐ °C, ☐ °F Saturated</td>
<td></td>
</tr>
<tr>
<td>Corrosiveness</td>
<td>☐ No</td>
</tr>
</tbody>
</table>

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

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 ☐ Other_________

5. Scope of Estimate
☐ Model MG8E Paramagnetic Oxygen Analyzer ___________/ set
☐ Auxiliary gas pressure meter ___________/ set
☐ Auxiliary gas cylinder ☐ 10 l ☐ 40 l ___________/ set
☐ Auxiliary gas pressure reducing valve ___________/ set
☐ Zero gas cylinder ☐ 10 l ☐ 40 l ___________/ set
☐ Zero gas pressure reducing valve ___________/ set
☐ Span gas cylinder ☐ 10 l ☐ 40 l
Range of .......... to .......... vol%O2 ___________/ set
☐ Span gas pressure reducing valve ___________/ set
☐ Spare parts for ______ year(s) ___________/ set
☐ Sampling probe (*) ___________/ set
☐ Sampling system (*) ___________/ set

* : Arrangements will be made separately.