General

The model FLXA™21 2-Wire Analyzer, one model of FLEXA™ series, offers single or dual sensor measurement. The modular-designed analyzer offers 4 kinds of measurements – pH/ORP (oxidation-reduction potential), contacting conductivity (SC), inductive conductivity (ISC) or dissolved oxygen (DO) – with the respective sensor module.

For dual sensor measurement, the combination of two same type sensor inputs – pH/ORP and pH/ORP (analog sensor only), SC and SC, and DO and DO – are available with two sensor modules. Dual sensor measurement offers additional functionalities; calculated data function and redundant system.

Variety of calculated data from two measuring parameters is selectable for each measurement. On the redundant system built on two measuring parameters of two sensor inputs, main output parameter is automatically switched over to the second sensor output in case of the main sensor’s failure condition.

Addition to conventional analog pH/ORP sensors, the analyzer FLXA21 can be connected to Yokogawa’s digital sensor, FU20F pH/ORP SENCOM™ Sensor.

In the FLXA21 Human Machine Interface (HMI), 2-wire type analyzer FLXA21 offers easy touch screen operation and simple menu structure in 12 languages. Menus of display, execution and setting are displayed in a selected language.

The analyzer FLXA21 automatically recognizes the installed sensor module and prepares the necessary menus for right configuration, even for dual sensor measurement.

For immediate measurement, the FLXA21 offers quick setup functionality. The quick setup screen appears when the analyzer is powered. Only a few setups – date/time, language, basic sensor configurations and output – will start the measurement.

The FLXA21 offers the best accuracy in measurement with temperature compensation functionality and calibration functionality. Sensor diagnostics and sensor wellness indication make measurement reliable. Logbook of events and diagnostic data is a useful information source for maintenance.

For hazardous location, the FLXA21 has approvals of ATEX, IECEx, FM, CSA, NEPSI and KOSHA.

Features

- 4 kinds of measurements; pH/ORP, SC, ISC and DO
- Dual sensor measurement on 2-wire type analyzer; pH/ORP and pH/ORP, SC and SC, and DO and DO
- Calculated data from dual sensor measurement
- Redundant system on dual sensor measurement
- Connection of digital FU20F pH/ORP SENCOM Sensor
- Easy touch screen operation on 2-wire type analyzer
- Simple HMI menu structure in 12 languages
- Quick setup menu for immediate measurement
- Indication of sensor wellness
- Hazardous location approvals – ATEX, IECEx, FM, CSA, NEPSI and KOSHA
General Specifications

1. Basic

- **Measurement Object/Sensor Type**
  - pH/Oxidation-reduction Potential (pH/ORP) (analog sensor)
  - Conductivity (SC)
  - Inductive Conductivity (ISC)
  - Dissolved Oxygen (DO)
  - pH/Oxidation-reduction Potential (pH/ORP) (digital sensor)

Note: The available measurement object depends on a sensor module installed on the analyzer.

- **Analyzer Structure**
  - Module structure
  - Composition of Analyzer:
    - One (1) Housing assembly
    - One (1) or two (2) Sensor modules
  - Combination of Sensor Module when two modules are installed:
    - Combinations of two same sensor modules are available:
      - pH/ORP and pH/ORP (analog sensor)
      - SC and SC
      - DO and DO

2. Measurement

2-1. **pH/Oxidation-reduction Potential (pH/ORP) with analog sensors**

- **Input Specification**
  - Dual high impedance input (≥10¹² Ω)
- **Input Range**
  - pH: -2 to 16 pH
  - ORP: -1500 to 1500 mV
  - rH: 0 to 100 rH
  - Temperature: Pt1000: -30 to 140 ºC
    - Pt100: -30 to 140 ºC
    - 6.8k: -30 to 140 ºC
    - PTC10k: -30 to 140 ºC
    - NTC 8k55: -10 to 120 ºC
    - 3k Balco: -30 to 140 ºC
    - PTC500: -30 to 140 ºC
- **Output Range**
  - pH: min. span 1 pH
  - ORP: max. span 20 pH
  - rH: min. span 2 rH
  - Temperature: min. span 25 ºC
- **Performance (Accuracy)**
  - pH Linearity: ±0.01 pH
  - Repeatability: ±0.01 pH
  - Accuracy: ±0.01 pH
  - ORP Linearity: ±1 mV
  - Repeatability: ±1 mV
  - Accuracy: ±1 mV

2-2. **Conductivity (SC)**

- **Input Specification**
  - Two or four electrodes measurement with square wave excitation, using max 60m (200ft) cable (WU40/ WF10) and cell constants from 0.005 to 50.0 cm⁻¹
- **Input Range**
  - Conductivity:
    - min.: 0 µS/cm
    - max.: 200 mS x (Cell constant) (over range 2000 mS/cm)
  - Resistivity:
    - min.: 0.005 kΩ / (Cell constant)
    - max.: 1000 MΩ x cm
  - Temperature:
    - Pt1000: -20 to 250 ºC
    - Pt100: -20 to 200 ºC
    - Ni100: -20 to 200 ºC
    - NTC 8k55: -10 to 120 ºC
    - Pb36(JIS NTC 6k): -20 to 120 ºC
- **Output Range**
  - Conductivity: min. 0.01 µS/cm
  - max. 2000 mS/cm (max 90% zero suppression)
  - Resistivity: min. 0.001 kΩ x cm
  - max. 1000 MΩ x cm (max 90% zero suppression)
  - Temperature: min. span 25 ºC
- **Performance (Accuracy)**
  - Conductivity: 2 µS x K cm⁻¹ to 200 mS x K cm⁻¹
    - Accuracy: ±0.5%F.S.
    - 1 µS x K cm⁻¹ to 2 µS x K cm⁻¹
    - Accuracy: ±1%F.S.
  - Resistivity: 0.005kΩ / K cm⁻¹ to 0.5MΩ / K cm⁻¹
    - Accuracy: ±0.5%F.S.
    - 0.5MΩ / K cm⁻¹ to 1MΩ / K cm⁻¹
    - Accuracy: ±1%F.S.
  - Temperature: with Pt1000, Pb36, Ni100
    - Accuracy: ±0.3 ºC
    - with Pt100, NTC 8k55
    - Accuracy: ±0.4 ºC
  - Temperature compensation:
    - NaCl table: ±1 %
  - Matrix: ±3 %

Note: “F.S.” means maximum setting value of analyzer output. “K” means cell constant.

YOKOGAWA provides conductivity sensors of which cell constants are 0.1 to 10 cm⁻¹.
2-3.  Inductive Conductivity (ISC)

■ Input Specification
Compatible with the Yokogawa inductive conductivity
ISC40 series with integrated temperature sensor:
NTC30k or Pt1000.

■ Input Range
Conductivity: 0 to 2000 mS/cm at 25 °C reference
temperature.
Temperature: -20 to 140 °C
Cable length: max. 60 meters total length of fixed sensor
cable + WF10(J) extension cable.
Influence of cable can be adjusted
by doing an AIR CAL with the cable
connected to a dry cell.

■ Output Range
Conductivity: min. span: 100 µS/cm
max. span: 2000 mS/cm (max 90% zero
suppression)
Temperature: min. span 25 °C
max. span 160 °C

■ Performance (Accuracy)
(The specifications are expressed with simulated
inputs.)
Performance in ppm mode:
Linearity: ±0.05 ppm or ±0.8% F.S., whichever is
greater
Repeatability: ±0.05 ppm or ±0.8% F.S., whichever
is greater
Accuracy: ±0.05 ppm or ±0.8% F.S., whichever is
greater
Performance in ppb mode:
Linearity: ±1 ppb or ±0.8% F.S., whichever is
greater
Repeatability: ±1 ppb or ±0.8% F.S., whichever is
greater
Accuracy: ±1 ppb or ±0.8% F.S., whichever is
greater
Temperature
Linearity: ±0.3 ºC
Repeatability: ±0.1 ºC
Accuracy: ±0.3 ºC
Note: "F.S." means maximum setting value of analyzer
output.

2-4.  Dissolved Oxygen (DO)

■ Input Specification
The FLXA21 accepts output from membrane covered
Dissolved Oxygen sensors. These sensors can be
Galvanic type, where the sensor generates its
own driving voltage or Polarographic type, where
the sensor uses external driving voltage from the
converter.
The input range is 0 to 50 µA for Galvanic sensors
and 0 to 1 µA for Polarographic sensors.
For temperature compensation, the FLXA21 accepts
Pt1000 (DO30 sensor) and NTC22k elements
(OXYFERM and OXYGOLD sensors).

■ Input Range
Dissolved Oxygen: 0 to 50 mg/l (ppm)
Temperature: -20 to 150 °C
DO30G sensor:
Measurement range: 0 to 20 mg/l (ppm)
Temperature: 0 to 40 ºC
Hamilton sensors:
Oxyferm:
Measurement range: 10 ppb to 40 ppm
Temperature range: 0 to 130 ºC
Oxygold G:
Measurement range: 2 ppb to 40 ppm
Temperature range: 0 to 130 ºC
Oxygold B:
Measurement range: 8 ppb to 40 ppm
Temperature range: 0 to 100 ºC

■ Output Range
DO concentration:
mg/l (ppm):
min.: 1 mg/l (ppm)
max.: 50 mg/l (ppm)
ppb:
min.: 1 ppb
max.: 9999 ppb
% saturation:
min.: 10 %
max.: 600 %
Temperature:
min. span 25 ºC
max. span 170 ºC

■ Performance (Accuracy)
(The specifications are expressed with simulated
inputs.)
Performance in ppm mode:
Linearity: ±0.05 ppm or ±0.8% F.S., whichever is
greater
Repeatability: ±0.05 ppm or ±0.8% F.S., whichever
is greater
Accuracy: ±0.05 ppm or ±0.8% F.S., whichever is
greater
Performance in ppb mode:
Linearity: ±1 ppb or ±0.8% F.S., whichever is
greater
Repeatability: ±1 ppb or ±0.8% F.S., whichever is
greater
Accuracy: ±1 ppb or ±0.8% F.S., whichever is
greater
Temperature
Linearity: ±0.3 ºC
Repeatability: ±0.1 ºC
Accuracy: ±0.3 ºC
Note: "F.S." means maximum setting value of analyzer
output.

2-5.  pH/Oxidation-reduction Potential (pH/ORP)
with digital sensor, FU20F pH/ORP SENCOM
Sensor

■ Input Specification
Bi-directional digital communication (RS-485)
between FU20F and FLXA21

■ Input Range (depending on FU20F)
pH: 0 to 14 pH
ORP: -1500 to 1500 mV
rH: 0 to 100 rH
Temperature: -10 to 105 ºC

■ Output Range
pH: min. span 1 pH
max. span 20 pH
ORP: min. span 100 mV
max. span 3000 mV
rH: min. span 2 rH
max. span 100 rH
Temperature: min. span 25 ºC
max. span 170 ºC
3. Electrical

■ Output Signal

General: One output of 4-20 mA DC
Note: Tolerance: ±0.02 mA
Bi-directional HART digital communication, superimposed on mA (4-20mA) signal
Output function:
  Linear or Non-linear (21-step table)
Burn out function: (NAMUR 43 except ISC)
Without HART/PH201G:
  Down: 3.6 mA (signal: 3.8 to 20.5 mA for pH/ORP, SC and DO)
  (signal: 3.9 to 20.5 mA for ISC)
  Up: 22mA
With HART/PH201G:
  Down: 3.6 mA for pH/ORP, SC and DO
  Down: 3.9 mA for ISC
  (signal: 3.8 to 20.5 mA for pH/ORP, SC and DO)
  (signal: 3.9 to 20.5 mA for ISC)
  Up: 22mA

■ Power Supply

Nominal 24 V DC loop powered system
One (1) Sensor module (1 input):
  16 to 40V DC (for pH/ORP (analog sensor), SC and DO)
  17 to 40V DC (for ISC)
  21 to 40V DC (for pH/ORP SENCOM sensor)
Two (2) Sensor modules (2 inputs):
  22.8 to 40V DC (for pH/ORP (analog sensor), SC and DO)
  22.8 to 40V DC (for pH/ORP (analog sensor), SC and DO)
Note: When the FLXA21 is used in the multi-drop mode of HART communication, the output signal is changed from 12.5 mA DC to 4 mA DC just after the power is turned on. Enough power supply for the instruments is to be provided.

■ Maximum Load Resistance

pH/ORP (analog sensor), SC and DO:
  Refer to the Figure 1.
ISC and pH/ORP SENCOM sensor:
  Refer to the Figure 2.

■ Display

LCD with a touch screen:
Black/White: 213 x 160 pixels
Contrast adjustment available on the touch screen
Message language:
  12 (English, Chinese, Czech, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian and Spanish)
  One analyzer has all 12 languages.
Note: Description for a selection of language and language names are written in English.
Note: Only English alphabet and numeric are available for a tag number, an additional description for each value on the display screen and passwords.
Note: Only for message language on the screen, 12 languages are provided.

4. Mechanical and others

■ Housing

Case:
  Plastic (Polycarbonate)
Case color and finish:
  Color: Silver gray (equivalent to Munsell 3.2PB7.4/1.2)
Window:
  Polycarbonate (flexible)
Protection:
  IP66 (except Canada), NEMA Type 4X (USA), CSA Type 3S/4X (Canada)

■ Plate

Main name plate: inside case cover
Regulation plate:
  on the case outside

■ Cable and Terminal

Cable size:
  Outer diameter:
    6 to 12 mm (suitable for M20 cable gland)
    3.4 to 7 mm (grounding cable for plastic case)
Terminal screw size: M4
torque of screw up: 1.2 N-m
Wire terminal:
  Pin terminal, ring terminal and spade terminal can be used for analyzer’s power supply terminals and sensor terminals.
  Pin terminal: pin diameter: max. 1.9 mm
  Ring and spade terminal: width: max. 7.8 mm
■ Cable Entry
1-Sensor measurement:
   3 holes,
   M20 cable gland x 3 pcs,
   Sleeve x 1 pc (for grounding cable line)
2-Sensor measurement:
   4 holes,
   M20 cable gland x 4 pcs,
   Sleeve x 1 pc (for grounding cable line)
Note: Cable gland and plug are delivered with an analyzer, but not assembled into the analyzer.

■ Mounting
Mounting hardware (option):
   • Universal mounting kit (Note)
   • Pipe and wall mounting hardware
   • Panel mounting hardware
Note: This kit contains the pipe and wall mounting hardware and the panel mounting hardware.

■ Stainless Steel Tag Plate
When the additional code "SCT" with a tag number is specified, the tag plate on which the tag number is inscribed is delivered with the analyzer. Tag plate is hanging type.

■ Conduit Adapter
Using optional adapter
   • G1/2 (quantity: 4)
   • 1/2NPT (quantity: 4)
   • M20 x 1.5 (quantity: 4)
These conduit adapters are delivered with an analyzer, but not assembled into the analyzer.

■ Size of Housing Case
144 (W) x 144 (H) x 151 (D) mm (without cable gland)

■ Weight
Approx. 1 kg

■ Ambient Operating Temperature
-20 to +55 ºC

■ Storage Temperature
-30 to +70 ºC

■ Humidity
10 to 90% RH at 40ºC (Non-condensing)

■ Document
Following documents are delivered with an analyzer;
   Paper copy:
   • Start-up Manual written in English
   • Safety Precautions written in English
   CD-ROM:
   • Start-up Manual written in English
   • User's Manual written in English
   • Safety Regulations Manual for European region written in 25 languages
   • General Specifications written in English
   • Technical Information for HART Communication written in English
   • User Setting Table of 5 kinds of measurement/sensor type written in English

5. Digital Communication
■ Kind of Digital Communication
   • HART (HART 5) or PH201G dedicated distributor
   Note: Only one kind of digital communication is available for one analyzer.

■ Output Value Parameter (HART)
Four value parameters (measured values) are available for one digital communication.
   • For 1-sensor measurement, these parameters are measured values.
   • For 2-sensor measurement, refer to the next item.

■ Digital Communication of 2-Sensor Measurement (HART)
Even when two sensor modules are installed, only one digital communication is available for 2-sensor measurement.
Four value parameters can be selected from the followings:
   Measured values of two sensors
   Calculated data of 2-sensor measurement
   Redundant system output

■ Specific Contact Output with dedicated distributor, model PH201G (Style B)
The distributor, model PH201G, is designed to connect with the 2-Wire Analyzer.
This distributor supplies drive power to the analyzer and receives simultaneously 4-20 mA DC signal from the analyzer.
This signal is converted to 1-5 V DC signal in the distributor.
This distributor also receives digital signals superimposed on the 4-20 mA DC signal, and provides contact outputs
Input/Output signal:
   Number of available drive/signal point: 1
   Output signal: 1-5 V DC (2 points) (Note)
   Load resistance: 2 kΩ or less (1-5 V DC output)
   Isolation system: Loop isolation type
Note: Two output signals for one analyzer’s analog output are provided. Two 1-5 V DC output signals are same.
Contact output:
   Contact rating:
   250 V AC, maximum 100 VA
   220 V DC, maximum 50 VA
   Hold contact output:
   NC contact, normally energized
   Contact closes when power is off or during Hold situation.
   Fail contact output:
   NC contact, normally energized
   Contact closes when power is off or during Fail/Warning conditions.
   Wash contact output:
   NO contact
   Contact closes during wash cycles.

Regulatory Compliance
Korea Electromagnetic Conformity Standard Class A
한국 전자파적합성 기준
### Regulatory Compliance (FLXA21)

#### Safety, EMC and RoHS Compliance

**Safety:** UL 61010-1
- UL 61010-2-030
- CAN/CSA C22.2 No.61010-1
- CAN/CSA-C22.2 No.61010-2-030
- EN 61010-1
- EN 61010-2-030

**EMC:** EN 61326-1 Class A, Table 2 (For use in industrial locations)
- RCM: EN 61326-1 Class A, Table 2
- Russia: TR CU 020/2011

**RoHS:** EN 50581: 2012 (Style 3.03 or newer)

**Installation altitude:** 2000 m or less

**Pollution degree based on IEC 61010:** 2 (Note 2)

**Note 1:** Installation category, called over-voltage category, specifies impulse withstand voltage.
- Equipment with “Category I” (ex. two wire transmitter) is used for connection to circuits in which measures are taken to limit transient over-voltages to an appropriately low level.

**Note 2:** Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.

**Information of the WEEE Directive**

This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply. The WEEE Directive is only valid in the EU.

### Explosion Protected Type Compliance

**Europe (ATEX)**

- **Intrinsic safety “ia”**
- **Certificate No:** DEKRA 11ATEX0010XX
- **Ambient Temperature:** -20 to 55°C
- **Control Drawing:** Refer to (1)

**International (IECEx)**

- **Intrinsic safety “ia”**
- **Applicable Standard:** IEC 60079-0: 2011, IEC 60079-11: 2011
- **Certificate No:** IECEx DEK 11.0044X
- **Ambient Temperature:** -20 to 55°C
- **Control Drawing:** Refer to (1)

**United States (FM)**

- **Intrinsically safe / Nonincendive**
- **Certificate No:** 3039632
- **Marking/Rating:** IS CL I, DIV 1, GP ABCD CL I, ZN 0, AEx ia IIC
- **T4:** for ambient temperature: -20 to 55°C
- **Enclosure:** Type 4X
- **Control Drawing:** Refer to (3)

**Canada (CSA)**

- **Intrinsically safe / Nonincendive**
- **Certificate No:** 2425510
- **Ambient Temperature:** -20 to 55°C
- **Ambient Humidity:** 0 – 100% (No Condensation)
- **Enclosure:** IP66, NEMA 4X
- **Control Drawing:** Refer to (2)
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MANUAL

1. WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE USERS
   INSTRUCTIONS. For safe and proper operation of intrinsically safe equipment, the equip-
   ment must be earthed when exposed to the possibility of electrostatic charge. An equip-
   ment with an earth connection, such as a wrist strap or a conductive floor, should be
   used. Be sure the equipment is earthed when exposed to the possibility of electrostatic
   charge.

2. The associated apparatus must be earthed. For safe and proper operation of intrin-
   sically safe equipment, all associated equipment must be earthed. The earth connection
   is necessary to prevent electrical accidents and to protect personnel from electrocution.

Table 1: Specifications

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<th>pH 2</th>
<th>pH ISC</th>
<th>SENCOM</th>
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Notes:
1. The associated apparatus must be a linear source.
2. Measuring Module 2 is not necessarily installed. As for ISC module and SENCOM module, only
   one module is permitted to be installed at a time.
3. Sensor 1 and Sensor 2 may be simple apparatus or intrinsically safe apparatus.
4. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE USER'S
   MANUAL.
Yokogawa Electric Corporation

**Control drawing (4-20mA type)**

Installation for Zone 0, 1 / Division 1

Applicable models: FLXA21-D-x-x-CD-xx-xx-A-..., FLXA202-D-x-x-CD-xx-xx-A-...

Non-hazardous Area Hazardous Area

Class I, Zone 0, 1, Group IIC, or Class I, Division 1, Groups A, B, C, D

Temperature Class: T4

Supply +, Supply –

Housing Assembly

Measuring Module 1

Measuring Module 2

FLEXA Series Analyzer

Sensor 1 (Note 6)

Sensor 2 (Note 6)

Measuring Module 1, 2 (Note 6):

<table>
<thead>
<tr>
<th>Type of Measuring Module</th>
<th>pH, SC, DO ISC SENCOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uo</td>
<td>11.76 V</td>
</tr>
<tr>
<td>Io</td>
<td>116.5 mA</td>
</tr>
<tr>
<td>Po</td>
<td>0.3424 W</td>
</tr>
<tr>
<td>Co</td>
<td>100 nF</td>
</tr>
<tr>
<td>Lo</td>
<td>1.7 mH</td>
</tr>
</tbody>
</table>

Specific conditions of use

- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

- In the case where the enclosure of the analyzer is made of Aluminum, if it is mounted in Zone 0, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

**Control Equipment** (Note 7, 8)

Supply +, Supply – (Note 7):

<table>
<thead>
<tr>
<th>Ui</th>
<th>30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ci</td>
<td>13 nF</td>
</tr>
<tr>
<td>Li</td>
<td>0 mH</td>
</tr>
</tbody>
</table>

Specific condition of use

- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

- Specific conditions of use for FLXA202-D-x-x-DE-xx-xx-A-... when it is used as "Ex nAic" - The cable glands accompanying the equipment may not provide sufficient clamping. Additional clamping of the cable shall be provided to ensure that pulling and twisting are not transmitted to the termination. Alternatively, Ex d, Ex e, or Ex n cable glands which provide sufficient clamping shall be used instead of the accompanying cable gland.

- The gaskets of the cable glands shall be protected from light.

- Analyzer must be installed in such a way that the air vent is physically protected from any possible impact.
NOTES:

1. Installation must be in accordance with the Canadian Electric Code Part I (C22.1), ANSI/ISA-RP12.06.01 and relevant local codes.

2. The associated apparatus must be a linear source meeting the following conditions:

   - \[ U_{o} \text{ (or } V_{oc} \text{)} \leq U_{i} \text{ (or } V_{i} \text{)} \]
   - \[ I_{o} \text{ (or } I_{sc} \text{)} \leq I_{i} \text{ (or } I_{i} \text{)} \]
   - \[ P_{o} \leq P_{i} \]
   - \[ C_{o} \text{ (or } C_{a} \text{)} \geq C_{i} + C_{cable} \]
   - \[ L_{o} \text{ (or } L_{a} \text{)} \geq L_{i} + L_{cable} \]

3. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds \( U_{m} \) of the associated apparatus.

4. The control drawing of the associated apparatus must be followed when installing the equipment.

5. Measuring Module 2 is not always installed. As for ISC module and SENCOM module, only one module is permitted to be installed at a time.

6. When installed in Zone 0 or 1, or Division 1, Sensor 1 and Sensor 2 may be simple apparatus or intrinsically safe apparatus meeting the conditions below. When installed in Zone 2 or Division 2, Sensor 1 and Sensor 2 may be simple apparatus or non-incendive field wiring apparatus meeting the conditions below, or alternatively, they may be equipment suitable for Zone 2 or Division 2 respectively, if a suitable wiring method other than non-incendive field wiring is employed.

   - \[ U_{i} \text{ (or } V_{max} \text{)} \geq U_{o} \]
   - \[ I_{i} \text{ (or } I_{max} \text{)} \geq I_{o} \]
   - \[ P \geq P_{o} \]
   - \[ C_{i} \leq C_{o} - C_{cable} \]
   - \[ L_{i} \leq L_{o} - L_{cable} \]

7. The control equipment must be an associated non-incendive field wiring apparatus meeting the conditions below. Alternatively, it may be general-purpose equipment, if a suitable wiring method other than non-incendive field wiring is employed.

   - \[ U_{o} \text{ (or } V_{oc} \text{)} \leq U_{i} \text{ (or } V_{i} \text{)} \]
   - \[ C_{o} \text{ (or } C_{a} \text{)} \geq C_{i} + C_{cable} \]
   - \[ L_{o} \text{ (or } L_{a} \text{)} \geq L_{i} + L_{cable} \]

8. When FLXA202-D-x-x-DE-xx-xx-A-... is used as "Ex nA ic", it must be installed in accordance with one of the following:

   a) in a SELV or PELV system, or
   b) via a safety isolating transformer complying with the requirements of IEC 61558-2-6, or a technically equivalent standard, or
   c) directly connected to apparatus complying with IEC60950 series, IEC61010, or a technically equivalent standard, or
   d) fed directly from cells or batteries.

9. When FLXA202-D-x-x-DE-xx-xx-A-... is used as "Ex nA ic" and with the accompanying cable glands, cable with an external diameter of 6 to 12 mm must be used for field wiring. The cable glands must be secured with a tightening torque of 6 Nm so that they can be released only with the aid of a tool. Unused cable glands shall be sealed with the accompanying metal plug.

10. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD

11. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

12. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR ZONE 2 / DIVISION 2

Mar. 23, 2018-00
(3) **FM**

**Intrinsic safety, Nonincendive**

**Model:** FLEXA Series **Date:** April 17, 2015

**Rev. 1:** May 29, 2017  **Doc. No.:** IFM039-A71

**Yokogawa Electric Corporation**

**Installation for Division 1 / Zone 0, 1**

**Applicable models:** FLXA21-D-x-x-CD-xx-xx-A-..., FLXA202-D-x-x-CD-xx-xx-A-...

**Unclassified Location Hazardous (Classified Location)**

**Class I, Division 1, Groups A, B, C, D, or Class I, Zone 0, 1, Group IIC**

**Temperature Class:** T4

**Measuring Module 1, 2 (Note 8):**

<table>
<thead>
<tr>
<th>Type of Measuring Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH, SC, DO, ISC, SENCOM</td>
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<th>11.76 V</th>
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<td>116.5 mA</td>
</tr>
<tr>
<td>Po</td>
<td>0.3424 W</td>
</tr>
<tr>
<td>Co</td>
<td>100 μF</td>
</tr>
<tr>
<td>Lo</td>
<td>1.7 mH</td>
</tr>
</tbody>
</table>

**Specific conditions of use:**
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.
- In the case where the enclosure of the analyzer is made of Aluminum, if it is mounted in ZONE 0, it must be installed such that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

**Supply +, Supply – (Note 9):**

<table>
<thead>
<tr>
<th>Ui</th>
<th>30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ii</td>
<td>100 mA</td>
</tr>
<tr>
<td>Pi</td>
<td>0.75 W</td>
</tr>
<tr>
<td>Ci</td>
<td>13 nF</td>
</tr>
<tr>
<td>Li</td>
<td>0 mH</td>
</tr>
</tbody>
</table>

**Control Equipment (Note 9):**

- Contaminant sensors
- Temperature sensors
- Contaminant sensors
- Temperature sensors

**Hazardous (Classified Location)**

**Control Equipment (Note 9):**

- Contaminant sensors
- Temperature sensors
- Contaminant sensors
- Temperature sensors

**Model:** FLEXA Series **Date:** April 17, 2015

**Unclassified Location Hazardous (Classified Location)**

**Class I, Division 2, Groups A, B, C, D, or Class I, Zone 2, Group IIC**

**Temperature Class:** T4

**Measuring Module 1, 2 (Note 8):**

<table>
<thead>
<tr>
<th>Type of Measuring Module</th>
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</thead>
<tbody>
<tr>
<td>pH, SC, DO, ISC, SENCOM</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Uo</th>
<th>11.76 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Io</td>
<td>60.6 mA</td>
</tr>
<tr>
<td>Po</td>
<td>0.178 W</td>
</tr>
<tr>
<td>Co</td>
<td>100 μF</td>
</tr>
<tr>
<td>Lo</td>
<td>8 mH</td>
</tr>
</tbody>
</table>

**Specific conditions of use:**
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

**Supply +, Supply – (Note 4):**

<table>
<thead>
<tr>
<th>Ui</th>
<th>30 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ii</td>
<td>100 mA</td>
</tr>
<tr>
<td>Pi</td>
<td>0.75 W</td>
</tr>
<tr>
<td>Ci</td>
<td>13 nF</td>
</tr>
<tr>
<td>Li</td>
<td>0 mH</td>
</tr>
</tbody>
</table>

**Control Equipment (Note 9):**

- Contaminant sensors
- Temperature sensors
- Contaminant sensors
- Temperature sensors

**Model:** FLEXA Series **Date:** April 17, 2015
1. This drawing replaces the former control drawing IKE039-A12.
2. No revision to this drawing without prior approval of FM.
3. Installation must be in accordance with the National Electric Code (NFPA 70), ANSI/ISA-RP12.06.01 and relevant local codes.
4. The associated apparatus must be an FM-approved linear source meeting the following conditions.
   \[ \begin{align*}
   U_o & \leq U_i \\
   I_o & \leq I_i \\
   P_o & \leq P_i \\
   C_o & \geq C_i + C_{cable} \\
   L_o & \geq L_i + L_{cable}
   \end{align*} \]
5. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds \( U_m \) of the associated apparatus.
6. The control drawing of the associated apparatus must be followed when installing the equipment.
7. Measuring Module 2 is not always installed. As for ISC module and SENCOM module, only one module is permitted to be installed at a time.
8. When installed in Division 1, Zone 0 or Zone 1, Sensor 1 and Sensor 2 may be simple apparatus or intrinsically safe apparatus meeting the conditions below.
   \[ \begin{align*}
   U_i & \geq U_o \\
   I_i & \geq I_o \\
   P_i & \geq P_o \\
   C_i & \leq C_o - C_{cable} \\
   L_i & \leq L_o - L_{cable}
   \end{align*} \]
9. The control equipment must be an FM-approved associated nonincendive field wiring apparatus meeting the conditions below. Alternatively, it may be general-purpose equipment, if a suitable wiring method other than nonincendive field wiring is employed.
   \[ \begin{align*}
   U_o & \leq U_i \\
   C_o & \geq C_i + C_{cable} \\
   L_o & \geq L_i + L_{cable}
   \end{align*} \]
10. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – WHEN THE EQUIPMENT IS USED IN HAZARDOUS LOCATIONS, AVOID ANY ACTION WHICH GENERATE ELECTROSTATIC DISCHARGE SUCH AS RUBBING WITH A DRY CLOTH.
11. WARNING – IN THE CASE WHERE THE ENCLOSURE OF THE ANALYZER IS MADE OF ALUMINUM, IF IT IS MOUNTED IN ZONE 0, IT MUST BE INSTALLED SUCH THAT, EVEN IN THE EVENT OF RARE INCIDENTS, IGNITION SOURCES DUE TO IMPACT AND FRICTION SPARKS ARE EXCLUDED.
12. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND SUITABILITY FOR DIVISION 2 / ZONE 2.
### Model & Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLXA21</td>
<td>-D</td>
<td>-D</td>
<td>2-Wire Analyzer</td>
</tr>
</tbody>
</table>

**Power supply**
- \( -D \): Always -D

**Housing**
- \( -P \): Plastic

**Display**
- \( -D \): Anti-glare LCD

**Type**
- \(-AB\): General purpose for CE, RCM
- \(-AD\): General purpose for CSA
- \(-AG\): General purpose for KC
- \(-AQ\): General purpose for EAC with PA (Note 11)
- \(-AR\): General purpose for EAC (Note 12)
- \(-CB\): IS for ATEX, IEC Ex (Note 9)
- \(-CD\): IS for FM, CSA (Note 5)
- \(-CH\): IS for NEPSI (Note 15)
- \(-EG\): IS for KOSHA (Note 10)
- \(-EQ\): IS for EACEx with PA (Note 13)
- \(-ER\): IS for EACEx (Note 14)
- \(-DD\): NI for FM, CSA (Note 16)

**1st input**
- \(-P1\): pH/ORP (Note 6)
- \(-C1\): Conductivity (SC)
- \(-C5\): Inductive conductivity (ISC)
- \(-D1\): Dissolved oxygen (DO)
- \(-S1\): pH/ORP (SENCOM sensor) (Note 7)

**2nd input (Note 1)**
- \(-NN\): Without input
- \(-P1\): pH/ORP (Note 6)
- \(-C1\): Conductivity (SC)
- \(-D1\): Dissolved oxygen (DO)

**Output (Note 8)**
- \(-A\): 4-20 mA + HART
- \(-N\): Always -N

**Language set (Note 2)**
- \(-LA\): Global except Japan

**Country (Note 3)**
- \(-N\): Japan
- \(-J\): Global except Japan

**Option**

- **Mounting hardware**
  - /UM: Universal mounting kit (Note 4)
  - /U: Pipe and wall mounting hardware
  - /PM: Panel mounting hardware
- **Hood**
  - /H6: Hood, stainless steel
  - /H7: Hood, stainless steel + urethane coating
  - /H8: Hood, stainless steel + epoxy coating
- **Tag plate**
  - /SCT: Stainless steel tag plate
- **Conduit adapter**
  - /CB4: Conduit adapter (G1/2 x 4 pcs)
  - /CD4: Conduit adapter (1/2NPT x 4 pcs)
  - /CF4: Conduit adapter (M20 x 1.5 x 4 pcs)

**Notes:**

1. When a 2nd input is selected, only the same kind of the 1st input is available. For example, when a 1st input is "-P1", the 2nd input must be the same "-P1". The combination of ISC and ISC is not available. And, the combination of SENCOM sensor and SENCOM sensor is not available, either.

2. These languages are message languages on the analyzer’s display. One analyzer has English and 11 languages. All languages are as follows; English, Chinese, Czech, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian and Spanish.

3. When an analyzer is used in Japan, it must meet the Japanese Measurement Law. Only SI units must be used on the analyzer and its documents in Japan.

4. The universal mounting kit contains the pipe and wall mounting hardware (/U) and the panel mounting hardware (/PM). Temperature classes are T4.

5. The type "-CD" is intrinsic safety of FM and CSA, and non-incendive of FM and CSA. Temperature classes are T4.

6. This input is to be come from an analog pH/ORP sensor.

7. When the analyzer is connected with the digital sensor, FU20F pH/ORP SENCOM Sensor, only the following model is available; 2nd input: Without input (-NN)

8. The FLXA21 has other output types of "FOUNDATION Fieldbus" communication (suffix code: -F) and "PROFIBUS PA" communication (suffix code: -P). Refer to GS 12A01A02-71E and GS 12A01A02-72E.

9. The type "-CB" intrinsic safety type of ATEX and IECEx can be used with SENCOM sensor. Temperature class is T4. Product registration is done by Yokogawa Taiwan Corporation as an importer in Taiwan.

10. The type "-EG" intrinsic safety type of KOSHA for Korea. Temperature class is T4.

11. The type "-AQ" is General purpose type of EAC with Pattern Approval for Russia.

12. The type "-AR" is General purpose type of EAC for Kazakhstan and Belarus.
13: The type "EQ" intrinsic safety type of EAC with Pattern Approval for Russia. Temperature class is T4.
14: The type "ER" intrinsic safety type of EAC for Kazakhstan and Belarus. Temperature class is T4.
15: The type "CH" intrinsic safety type for NEPSI. Temperature class is T4.
16: The type "DD" nonincendive type for FM. Temperature class is T4.

### Dimensions and Mounting

![Diagram of dimensions and mounting](image)

**Conduit Adapter (Option code: □/CB4, □/CD4, □/CF4)**

- **Unit:** mm (inch)
- **Approx. 55 (2.2”)**
- **G1/2 screw (ICB4), 1/2 NPT screw (ICD4)**
- **M20x1.5 screw (ICF4)**

![Diagram of conduit adapter](image)
(Note) The universal mounting kit (/UM) contains the pipe and wall mounting hardware (/U) and the panel mounting hardware (/PM).

Panel mounting hardware (Option code: □/PM, □/UM)

Wall mounting hardware (Option code: □/U, □/UM)

Pipe mounting hardware (Option code: □/U, □/UM)

* Tighten the four screws to a torque of 2 N\(\cdot\)m.

Note: The wall on which the analyzer is mounted should be strong enough to bear the weight of more than 8 kg.
Stainless steel hood (Option code: □/H6, □/H7, □/H8)
Wiring Diagrams

**n**

*1: Use a 2-wire shielded cable with an outside diameter of 6 to 12 mm.

*2: Connect the analyzer to ground. (Class D ground: 100 ohm or less)
   Connect the grounding cable to the terminal of the power module inside.
   Use a cable with an outside diameter of 3.4 to 7 mm for the grounding line.

*3: This line is connected to a distributor or 24V DC power supply.

*4: Terminal numbers for each sensor module are shown below.

*5: Two modules of the same kind of measurement/sensor type can be installed. When measuring inductive
conductivity or pH/ORP with the SENCOM sensor, only one module can be installed.

*6: The terminal box may be necessary depending on the sensor cable length and the distance between the
analyzer and the sensor.

The SENCOM sensor is to be connected directly to the analyzer without a terminal box.

*7: Two outputs, output 1 and output2, of PH201G or SDBT are same signals.
Inquiry Specifications Sheet for FLXA21 2-Wire Analyzer

Make inquiries by placing checkmarks (✓) in the pertinent boxes and filling in the blanks.

1. General Information
   Company name: __________________________
   Contact Person; __________________________ Department; __________________________
   Plant name; ________________________________
   Measurement location; _______________________
   Purpose of use; ☐ Indication, ☐ Recording, ☐ Alarm, ☐ Control

2. Measurement Conditions
   (1) Process temperature; \[\text{to}\] Normally \[\degree C\]
   (2) Process pressure; \[\text{to}\] Normally \[kPa\]
   (3) Flow rate; \[\text{to}\] Normally \[l/min\]
   (4) Flow speed; \[\text{to}\] Normally \[m/s\]
   (5) Slurry or contaminants; ☐ No, ☐ Yes
   (6) Name of process fluid; __________________________
   (7) Components of process fluid; __________________________
   (8) Others;

3. Installation Site
   (1) Ambient temperature; \[\text{to}\] Normally \[\degree C\]
   (2) Location; ☐ Outdoors, ☐ Indoors
   (3) Others;

4. Requirements
   1st Input; ☐ pH/ORP (analog sensor) ☐ Conductivity (SC) ☐ Inductive conductivity (ISC)
              ☐ Dissolved oxygen (DO) ☐ pH/ORP (digital sensor, FU20F)
   2nd Input; ☐ With (same as 1st Input) ☐ Without

4.1 pH/ORP (analog sensor)
   ☐ 1st Input
      (1) Measuring range; ☐ pH 0 to 14 ☐ ORP __________ to __________ mV ☐ ________________
      (2) Transmission output; ☐ 4 to 20 mA DC ☐ pH ☐ ORP ☐ Temperature
      (3) System configuration selection; ☐ Electrode, ☐ Holder, ☐ pH Converter, ☐ Cleaning system, ☐ Terminal box,
                                      ☐ Accessories
      (4) Electrode cable length; ☐ 3m, ☐ 5m, ☐ 7m, ☐ 10m, ☐ 15m, ☐ 20m, ☐ __________m
      (5) Electrode operating pressure; ☐ 10 kPa or less, ☐ More than 10 kPa
      (6) Type of holder; ☐ Guide pipe, ☐ Submersion, ☐ Flow-through, ☐ Suspension, ☐ Angled floating ball,
                          ☐ Vertical floating ball
      (7) Cleaning method; ☐ No cleaning, ☐ Ultrasonic cleaning, ☐ Jet cleaning, ☐ Brush cleaning
      (8) Sample temperature; ☐ -5 to 105°C, ☐ -5 to 100°C, ☐ -5 to 80°C
      (9) Others;
   ☐ 2nd Input
      (1) Measuring range; ☐ pH 0 to 14 ☐ ORP __________ to __________ mV ☐ ________________
      (2) Transmission output; ☐ 4 to 20 mA DC ☐ pH ☐ ORP ☐ Temperature
      (3) System configuration selection; ☐ Electrode, ☐ Holder, ☐ pH Converter, ☐ Cleaning system, ☐ Terminal box,
                                      ☐ Accessories
      (4) Electrode cable length; ☐ 3m, ☐ 5m, ☐ 7m, ☐ 10m, ☐ 15m, ☐ 20m, ☐ __________m
      (5) Electrode operating pressure; ☐ 10 kPa or less, ☐ More than 10 kPa
      (6) Type of holder; ☐ Guide pipe, ☐ Submersion, ☐ Flow-through, ☐ Suspension, ☐ Angled floating ball,
                          ☐ Vertical floating ball
      (7) Cleaning method; ☐ No cleaning, ☐ Ultrasonic cleaning, ☐ Jet cleaning, ☐ Brush cleaning
      (8) Sample temperature; ☐ -5 to 105°C, ☐ -5 to 100°C, ☐ -5 to 80°C
      (9) Others;
4.2 Conductivity

☐ 1st Input

(1) Measuring range; 
(2) Transmission output; 4 to 20 mA DC
(3) Detector/sensor; SC4AJ ☐ Two electrode system (0.02 cm⁻¹) ☐ Two electrode system (0.1 cm⁻¹)
                           SC8SG ☐ Two electrode system (0.01 cm⁻¹) ☐ Two electrode system (10 cm⁻¹),
                           ☐ Four electrode system (10 cm⁻¹)
                           SC210G ☐ Two electrode system (0.05 cm⁻¹) ☐ Two electrode system (5 cm⁻¹)
(4) Detector/sensor mounting method;
    SC4AJ ☐ Adapter mounting, ☐ Welding socket, ☐ Welding clamp
    SC8SG ☐ Screw-in, ☐ Flow-through
    SC210G ☐ Screw-in, ☐ Flange, ☐ Flow-through, ☐ Screw-in with gate valve
(5) Electrode cable length; SC4AJ ☐ 3m, ☐ 5m, ☐ 10m, ☐ 20m
                           SC8SG ☐ 5.5m, ☐ 10m, ☐ 20m
                           SC210G ☐ 3m, ☐ 5m, ☐ 10m, ☐ 15m, ☐ 20m
(6) Others;

☐ 2nd Input

(1) Measuring range; 
(2) Transmission output; 4 to 20 mA DC
(3) Detector/sensor; SC4AJ ☐ Two electrode system (0.02 cm⁻¹) ☐ Two electrode system (0.1 cm⁻¹)
                           SC8SG ☐ Two electrode system (0.01 cm⁻¹) ☐ Two electrode system (10 cm⁻¹),
                           ☐ Four electrode system (10 cm⁻¹)
                           SC210G ☐ Two electrode system (0.05 cm⁻¹) ☐ Two electrode system (5 cm⁻¹)
(4) Detector/sensor mounting method;
    SC4AJ ☐ Adapter mounting, ☐ Welding socket, ☐ Welding clamp
    SC8SG ☐ Screw-in, ☐ Flow-through
    SC210G ☐ Screw-in, ☐ Flange, ☐ Flow-through, ☐ Screw-in with gate valve
(5) Electrode cable length; SC4AJ ☐ 3m, ☐ 5m, ☐ 10m, ☐ 20m
                           SC8SG ☐ 5.5m, ☐ 10m, ☐ 20m
                           SC210G ☐ 3m, ☐ 5m, ☐ 10m, ☐ 15m, ☐ 20m
(6) Others;

4.3 Inductive conductivity

(1) Measuring range; 
(2) Transmission output; 4 to 20 mA DC
(3) System configuration selection; ☐ ISC40GJ Sensor, ☐ Holder, ☐ Converter, ☐ BA20 Terminal box,
                             ☐ WF10J Extension cable
(4) Sensor mounting method; ☐ ISC40FDJ Immersion holder, ☐ ISC40FFJ Flow-through holder,
                             ☐ ISC40FSJ Direct insertion adapter
(5) ISC40GJ Sensor cable length; ☐ 5m, ☐ 10m, ☐ 15m, ☐ 20m
(6) WF10J Extension cable length; ☐ 5m, ☐ 10m, ☐ 20m, ☐ 30m, ☐ 40m
(7) Others;
### 4.4 Dissolved oxygen

1st Input

- **(1) Measuring range:**  □ 0 to 50 mg/L  □ ---------------
- **(2) Transmission output:** 4 to 20 mA DC
- **(3) System configuration selection:**  □ Electrode, □ Holder, □ Converter, □ Cleaning system, □ Terminal box, □ Maintenance parts set, □ Calibration set
- **(4) Electrode cable length:**  □ 3m, □ 5m, □ 10m, □ 15m, □ 20m
- **(5) Type of holder:**  □ Guide pipe, □ Submersion, □ Flow-through, □ Suspension, □ Angled floating ball, □ Vertical floating ball
- **(6) Cleaning method:**  □ No cleaning, □ Jet cleaning
- **(7) Others:**

2nd Input

- **(1) Measuring range:**  □ 0 to 50 mg/L  □ ---------------
- **(2) Transmission output:** 4 to 20 mA DC
- **(3) System configuration selection:**  □ Electrode, □ Holder, □ Converter, □ Cleaning system, □ Terminal box, □ Maintenance parts set, □ Calibration set
- **(4) Electrode cable length:**  □ 3m, □ 5m, □ 10m, □ 15m, □ 20m
- **(5) Type of holder:**  □ Guide pipe, □ Submersion, □ Flow-through, □ Suspension, □ Angled floating ball, □ Vertical floating ball
- **(6) Cleaning method:**  □ No cleaning, □ Jet cleaning
- **(7) Others:**

### 4.5 pH/ORP (digital sensor, FU20F)

- **(1) Measuring range:**  □ pH 0 to 14  □ ORP ______ to ______ mV  □ ---------------
- **(2) Transmission output:** □ 4 to 20 mA DC □ pH □ ORP □ Temperature
- **(3) System configuration selection:**  □ Electrode, □ Holder, □ pH Converter, □ Cleaning system, □ Accessories
- **(4) Electrode cable length:**  □ 3m, □ 5m, □ 10m, □ 20m, □ ______m
- **(5) Electrode operating pressure:** □ 10 kPa or less, □ More than 10 kPa
- **(6) Type of holder:**  □ Guide pipe, □ Submersion, □ Flow-through, □ Suspension, □ Angled floating ball, □ Vertical floating ball
- **(7) Cleaning method:** □ No cleaning, □ Jet cleaning
- **(8) Sample temperature:** □ -5 to 105°C, □ -5 to 100°C, □ -5 to 80°C
- **(9) Others:**