**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, 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.

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
- 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)
  - Conductivity (SC)
  - Inductive Conductivity (ISC)
  - Dissolved Oxygen (DO)
  
  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
  - SC and SC
  - DO and DO

2. Measurement

2-1. pH/Oxidation-reduction Potential (pH/ORP)

- Input Specification
  - Dual high impedance input (≥10\(^12\) 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
  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

- Performance (Accuracy)
  (The specifications are expressed with simulated inputs.)
  
  pH
  - Linearity: ±0.01 pH
  - Repeatability: ±0.01 pH
  - Accuracy: ±0.01 pH
  
  ORP
  - Linearity: ±1 mV
  - Repeatability: ±1 mV
  - Accuracy: ±1 mV

- Temperature
  with Pt1000, 6.8k, PTC10k, NTC 8k55, 3k Balco, PTC500
  - Linearity: ±0.3 ºC
  - Repeatability: ±0.1 ºC
  - Accuracy: ±0.3 ºC

  with Pt100
  - Linearity: ±0.4 ºC
  - Repeatability: ±0.1 ºC
  - Accuracy: ±0.4 ºC

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
  max. span 270 ºC

- Performance (Accuracy)
  (The specifications are expressed with simulated inputs.)
  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: ±0.5 ºC
  
  with Pt100, NTC 8k55
  - Accuracy: ±0.4 ºC

  Temperature compensation
  NaCl table:
  - ±1 %
  
  Matrix:
  - ±3 %

  Step response:
  90 % (< 2 decades) in 7 seconds

  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 ºC reference temperature.
  Temperature: -20 to 140 ºC
  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 ºC
  max. span 160 ºC

- **Performance (Accuracy)**
  (The specifications are expressed with simulated inputs.)
  (Output span is 0-100 µS/cm or more)
  Conductivity:
  - Linearity: ±(0.4 % F.S. + 0.3 µS/cm)
  - Repeatability: ±(0.4 % F.S. + 0.3 µS/cm)
  Temperature: ±0.3 ºC
  Step response: 90 % (< 2 decades) in 8 seconds
  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 ºC
  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.

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
    - Up: 22mA
  With HART/PH201G:
    - Down: 3.6 mA for pH/ORP, SC and DO
      - signal: 3.8 to 20.5 mA for ISC
    - Up: 22mA
Power Supply
Nominal 24 V DC loop powered system
One (1) Sensor modules (1 input):
16 to 40V DC (for pH/ORP, SC and DO)
17 to 40V DC (for ISC)
Two (2) Sensor modules (2 inputs):
22.8 to 40V DC (for pH/ORP, 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
Refer to the Figure 1.

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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

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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.

Hood (option):
• Stainless steel
• Stainless steel with urethane coating
• Stainless steel with epoxy coating

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)

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)
EN 61326-2-3
RCM: EN 61326-1 Class A, Table 2
Korea Electromagnetic Conformity
Standard Class A
한국 전자파적합성 기준
Russian: TR CU 020/2011
RoHS: EN 50581: 2012 (Style 3.03 or newer)
Installation altitude: 2000 m or less
Category based on IEC 61010: I (Note 1)
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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Europe (ATEX)</strong></td>
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<tr>
<td>Certificate No:</td>
<td>DEKRA 11ATEX0108X</td>
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<tr>
<td>Marking/Rating:</td>
<td>Ex II 1 G Ex ia IIC T4 Ga</td>
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<tr>
<td>Ambient Temperature:</td>
<td>-20 to 55°C</td>
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<tr>
<td>Power Supply / Signals:</td>
<td>See the control drawing.</td>
</tr>
<tr>
<td>Electrical parameters:</td>
<td>See the control drawing.</td>
</tr>
<tr>
<td>Dielectric strength:</td>
<td>500 V a.c. r.m.s. between</td>
</tr>
<tr>
<td></td>
<td>- Supply terminals and the earth terminal</td>
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<tr>
<td></td>
<td>- the terminals of Measuring Modules excluding PH, SC and ISC and the earth terminal</td>
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<td>- Supply terminals and the terminals of Measuring Modules</td>
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<td>700 V d.c. between</td>
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<td>- the terminals of PH, SC and ISC Measuring Modules and the earth terminal</td>
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<tr>
<td>Specific conditions of use:</td>
<td>Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.</td>
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<tr>
<td></td>
<td>Since the enclosure of the Model FLXA202 is made of aluminium, if it is mounted in an area where the use of EPL Ga (category 1 G) equipment is required, it shall be installed such that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.</td>
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<tr>
<td>On-site assembling:</td>
<td>See Use’s Manual IM 12A01A03-01EN.</td>
</tr>
<tr>
<td>Installation and erection:</td>
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<td>Maintenance and Repair:</td>
<td>Warning: A modification of the equipment would no longer comply with the construction described in the certificate documentation.</td>
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<td>Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.</td>
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<td>United States (FM)</td>
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<td>-20 to 55°C</td>
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<td>Ambient Humidity:</td>
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<td>- Supply terminals and the terminals of Measuring Modules</td>
</tr>
<tr>
<td></td>
<td>- the terminals of Measuring Module 1 and the terminals of Measuring Module 2</td>
</tr>
<tr>
<td></td>
<td>700 V DC between</td>
</tr>
<tr>
<td></td>
<td>- the terminals of PH, SC and ISC Measuring Modules and the earth terminal</td>
</tr>
<tr>
<td>Specific conditions of use:</td>
<td>See the control drawings.</td>
</tr>
<tr>
<td>On-site assembling:</td>
<td>See Use’s Manual IM 12A01A03-01EN.</td>
</tr>
<tr>
<td>Installation and erection:</td>
<td>See the control drawing.</td>
</tr>
<tr>
<td>Maintenance and Repair:</td>
<td>Warning: A modification of the equipment would no longer comply with the construction described in the certificate documentation.</td>
</tr>
<tr>
<td></td>
<td>Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.</td>
</tr>
<tr>
<td>Control Drawing:</td>
<td>Refer to (2)</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| United States (FM)   | [Nonincendive]  
Certificate No: 3039632  
Marking/Rating: NI CL I, DIV 2, GP ABCD ZN 2 IIC  
T4: for ambient temperature: -20 to 55°C  
Enclosure: Type 4X  
Power Supply / Signals: See the control drawing.  
Battery: No replaceable battery  
Electrical parameters: See the control drawing.  
Dielectric strength:  
- 500 V AC, r.m.s. between  
  - Supply terminals and the earth terminal  
  - the terminals of Measuring Modules excluding PH, SC and ISC and the earth terminal  
  - Supply terminals and the terminals of Measuring Modules  
  - the terminals of Measuring Module 1 and the terminals of Measuring Module 2  
- 700 V DC between  
  - the terminals of PH, SC and ISC Measuring Modules and the earth terminal  
Specific conditions of use: See the control drawings.  
On-site assembling: See Use’s Manual IM 12A01A03-01EN.  
Installation and erection: See the control drawing.  
Maintenance and Repair:  
Warning: A modification of the equipment would no longer comply with the construction described in the certificate documentation.  
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.  
Control Drawing: Refer to (3) | -DD |
| Canada (CSA)         | [Nonincendive]  
Applicable Standard: C22.2 No.0.0-10 (R2015), CAN/CSA-C22.2 No.94-M91 (R2011), C22.2 No.213-M1987 (R2013), CAN/CSA-C22.2 No.61010-1-12, CAN/CSA-C22.2 No.61010-2-030-12  
Certificate No: 2425510  
Marking/Rating: Nonincendive for Class I, Division 2, Groups A, B, C, D, T4  
Ambient Temperature: -20 to 55°C  
Ambient Humidity: 0 – 100% (No Condensation)  
Enclosure: IP66, NEMA 4X  
Power Supply / Signals: See the control drawing.  
Electrical parameters: See the control drawing.  
Dielectric strength:  
- 500 V AC, r.m.s. between  
  - Supply terminals and the earth terminal  
  - the terminals of Measuring Modules excluding PH, SC and ISC and the earth terminal  
  - Supply terminals and the terminals of Measuring Modules  
  - the terminals of Measuring Module 1 and the terminals of Measuring Module 2  
- 700 V DC between  
  - the terminals of PH, SC and ISC Measuring Modules and the earth terminal  
Specific conditions of use: See the control drawings.  
On-site assembling: See Use’s Manual IM 12A01A03-01EN.  
Installation and erection: See the control drawing.  
Maintenance and Repair:  
Warning: A modification of the equipment would no longer comply with the construction described in the certificate documentation.  
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.  
Control Drawing: Refer to (2) | |
| China (NEPSI)        | [Intrinsic safety ‘ia’]  
Applicable Standard: GB3836.1-2010, GB3836.4-2010, GB 3836.20-2010  
Certificate No: GYJ18.1051X  
Marking/Rating: Ex ia IIC T4 Ga  
Ambient Temperature: -20 to 55°C  
Control Drawing: Refer to (4) | -CH |
| Korea (KOSHA)        | [Intrinsic safety ‘ia’]  
Applicable Standard: Notice of Ministry of Labor No. 2016-54  
Certificate No: 15-AV480-0160X  
Marking/Rating: Ex ia IIC T4  
Ambient Temperature: -20 to 55°C  
Control Drawing: Refer to (4) | -EG |
Title: Control drawing (for 4–20mA type)

No. IKE039-A31 Page1 Revision0 Date 2019-10-18

Notes:
1. The associated apparatus must be a linear source.
2. "Measuring Module 2" is not always installed.
3. ISC module, SENCOM module and SSA module are not installed as "Measuring Module 2".
4. Sensor 1 and Sensor 2 may be simple apparatus or intrinsically safe apparatus.
5. In case of SSA module, Sensor 1 is SENCOM SA (SENCOM Smart Adaptor).
6. When accessing the display window or other non-metallic parts of the enclosure of FLXA202/FLXA21, take the following measures to minimize the risk of explosion from electrostatic discharges, in addition to avoiding any actions that cause the generation of electrostatic charges, such as rubbing with a dry cloth.

   - Earth the operator through a wrist-strap,
   - Operate FLXA202/FLXA21 on the conductive floors, wearing anti-static work clothes and electrostatic safety shoes,
   - Neutralize the operator and FLXA202/FLXA21 by a static elimination bar which has a metal part earthed through resistor from 100kΩ to 100MΩ.

In case that those measures cannot be taken or static electricity cannot be suppressed, bring a gas detector and make sure there is no ignition capable atmosphere around FLXA202/FLXA21 before the operation.

Supply +, Supply –
Ui: 30 V
Ii: 100 mA
Pi: 0.75 W
Ci: 13 nF
Li: 0 mH

Measuring Module 1, 2
Type of Measuring Module
pH, SC, DO ISC SENCOM, SSA
Uo 11.76 V 11.76 V 5.36 V
Io 116.5 mA 60.6 mA 106.16 mA
Po 0.3424 W 0.178 W 0.1423 W
Co 100 nF 100 nF
Lo 1.7 mH 8 mH 0.45 mH
**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**

**Measuring Module 1, 2 (Note 6):**

- **Type of Measuring Module**
  - pH, SC, DO, ISC, SENCOM, SSA

<table>
<thead>
<tr>
<th>Type</th>
<th>Uo (V)</th>
<th>Io (mA)</th>
<th>Po (W)</th>
<th>Co (nF)</th>
<th>Lo (mH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>11.76</td>
<td>116.5</td>
<td>0.3424</td>
<td>100</td>
<td>1.7</td>
</tr>
<tr>
<td>SC</td>
<td>11.76</td>
<td>60.6</td>
<td>0.178</td>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td>DO</td>
<td>5.36</td>
<td>106.16</td>
<td>0.1423</td>
<td>31</td>
<td>0.45</td>
</tr>
</tbody>
</table>

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

**Specific conditions 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-...

- **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.**
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.
   - \( U_o \) (or \( Voc \))
   - \( I_o \) (or \( Isc \))
   - \( P_o \)
   - \( C_o \) (or \( C_a \))
   - \( L_o \) (or \( L_a \))

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.

6. ISC module, SENCOM module and SSA module are not installed as "Measuring Module 2".

7. 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.

8. 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.

9. 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, IEC61010-1, or a technically equivalent standard, or
   - d) fed directly from cells or batteries.

10. 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.
FM

Intrinsic safety, Nonincendive

Model: FLEXA Series

Date: April 17, 2015

Rev. 2: Dec. 26, 2019

Doc. No.: IFM039-A71

Yokogawa Electric Corporation

Control drawing (4–20 mA type)

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):

Type of Measuring Module
pH, SC, DO, ISC, SENCOM, SSA

Uo 11.76 V 11.76 V 5.36 V

Io 116.5 mA 60.6 mA 106.16 mA

Po 0.3424 W 0.178 W 0.1423 W

Co 100 nF 100 nF

Lo 1.7 mH 8 mH 0.45 mH

Specific conditions of use:

- Precautions shall be taken to minimize the risk of non-metallic parts and painted parts of the enclosure. When the equipment is used in hazardous locations, avoid any action which generates electrostatic discharge such as rubbing with a dry cloth.

- 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 4):

Ui: 30 V

Ii: 100 mA

Pi: 0.75 W

Ci: 13 nF

Li: 0 mH

(Note 7)

(Supply +, Supply –) (Note 9):

Ui: 30 V

Ci: 13 nF

Li: 0 mH

(Note 7)
13. **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.**

12. **WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND SUITABILITY FOR DIVISION 2 / ZONE 2.**

11. **WARNING - IN THE EVENT OF RARE INCIDENTS, IGNITION SOURCES DUE TO IMPACT AND FRICTION SPARKS ARE EXCLUDED.**

10. The control equipment must be an FM-approved associated nonincendive field wiring apparatus meeting the conditions below. Alternatively, it may be general-purpose equipment where mandated by the conditions below.

9. 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, or alternatively, they may be equipment suitable for Division 2 or Zone 2 respectively if a suitable wiring method other than nonincendive field wiring is employed.

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

7. Measuring Module 2 is not always installed. ISC module, SENCOM module and SSA module are not installed as “Measuring Module 2.”

6. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds the associated apparatus Um.

5. Control equipment connected to the control drawing must be an FM-approved associated linear source meeting the conditions below.

4. NEPSI and KOSHA Intrinsin safety “ia”

(Refer to (1) ATEX and IECEx Control Drawing)
## 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></td>
<td>-D</td>
<td>Always -D</td>
</tr>
<tr>
<td>Power supply</td>
<td>-D</td>
<td></td>
<td>2-Wire Analyzer</td>
</tr>
<tr>
<td>Housing</td>
<td>-P</td>
<td></td>
<td>Plastic</td>
</tr>
<tr>
<td>Display</td>
<td>-D</td>
<td></td>
<td>Anti-glare LCD</td>
</tr>
<tr>
<td>Type</td>
<td>-AB</td>
<td></td>
<td>General purpose for CE, RCM</td>
</tr>
<tr>
<td></td>
<td>-AD</td>
<td></td>
<td>General purpose for CSA</td>
</tr>
<tr>
<td></td>
<td>-AG</td>
<td></td>
<td>General purpose for KC</td>
</tr>
<tr>
<td></td>
<td>-AQ</td>
<td></td>
<td>General purpose for EAC with PA (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-AR</td>
<td></td>
<td>General purpose for EAC (Note 2)</td>
</tr>
<tr>
<td></td>
<td>-CB</td>
<td></td>
<td>IS for ATEX, IEC Ex (Note 3)</td>
</tr>
<tr>
<td></td>
<td>-CD</td>
<td></td>
<td>IS for FM, CSA (Note 4)</td>
</tr>
<tr>
<td></td>
<td>-CH</td>
<td></td>
<td>IS for NEPSI (Note 5)</td>
</tr>
<tr>
<td></td>
<td>-EG</td>
<td></td>
<td>IS for KOSHA (Note 6)</td>
</tr>
<tr>
<td></td>
<td>-EQ</td>
<td></td>
<td>IS for EACEx with PA (Note 7)</td>
</tr>
<tr>
<td></td>
<td>-ER</td>
<td></td>
<td>IS for EACEx (Note 8)</td>
</tr>
<tr>
<td></td>
<td>-DD</td>
<td></td>
<td>NI for FM, CSA (Note 9)</td>
</tr>
<tr>
<td>1st input</td>
<td>-P1</td>
<td></td>
<td>pH/ORP</td>
</tr>
<tr>
<td></td>
<td>-C1</td>
<td></td>
<td>Conductivity (SC)</td>
</tr>
<tr>
<td></td>
<td>-C5</td>
<td></td>
<td>Inductive conductivity (ISC)</td>
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<tr>
<td></td>
<td>-D1</td>
<td></td>
<td>Dissolved oxygen (DO)</td>
</tr>
<tr>
<td>2nd input (Note 10)</td>
<td>-NN</td>
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<td>Without input</td>
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<tr>
<td></td>
<td>-P1</td>
<td></td>
<td>pH/ORP</td>
</tr>
<tr>
<td></td>
<td>-C1</td>
<td></td>
<td>Conductivity (SC)</td>
</tr>
<tr>
<td></td>
<td>-C5</td>
<td></td>
<td>Inductive conductivity (ISC)</td>
</tr>
<tr>
<td></td>
<td>-D1</td>
<td></td>
<td>Dissolved oxygen (DO)</td>
</tr>
<tr>
<td>Output (Note 11)</td>
<td>-A</td>
<td></td>
<td>4-20 mA + HART</td>
</tr>
<tr>
<td></td>
<td>-N</td>
<td></td>
<td>Always -N</td>
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<tr>
<td>Language set (Note 12)</td>
<td>-LA</td>
<td></td>
<td>English and 11 languages</td>
</tr>
<tr>
<td>Country (Note 13)</td>
<td>-N</td>
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<td>Global except Japan</td>
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<td>-J</td>
<td></td>
<td>Japan</td>
</tr>
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<td></td>
<td>-NN</td>
<td></td>
<td>Always -NN</td>
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<tr>
<td>Option</td>
<td>Mounting hardware</td>
<td>/UM</td>
<td>Universal mounting kit (Note 14)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>/U</td>
<td>Pipe and wall mounting hardware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>/PM</td>
<td>Panel mounting hardware</td>
</tr>
<tr>
<td>Hood</td>
<td>/H6</td>
<td></td>
<td>Hood, stainless steel</td>
</tr>
<tr>
<td></td>
<td>/H7</td>
<td></td>
<td>Hood, stainless steel + urethane coating</td>
</tr>
<tr>
<td></td>
<td>/H8</td>
<td></td>
<td>Hood, stainless steel + epoxy coating</td>
</tr>
<tr>
<td>Tag plate</td>
<td>/SCT</td>
<td></td>
<td>Stainless steel tag plate</td>
</tr>
<tr>
<td>Conduit adapter</td>
<td>/CB4</td>
<td></td>
<td>Conduit adapter (G1/2 x 4 pcs)</td>
</tr>
<tr>
<td></td>
<td>/CD4</td>
<td></td>
<td>Conduit adapter (1/2NPT x 4 pcs)</td>
</tr>
<tr>
<td></td>
<td>/CF4</td>
<td></td>
<td>Conduit adapter (M20 x 1.5 x 4 pcs)</td>
</tr>
</tbody>
</table>

Notes:
1. The type “-AQ” is General purpose type of EAC with Pattern Approval for Russia.
2. The type “-AR” is General purpose type of EAC for Kazakhstan and Belarus.
3. The type “-CB” intrinsic safety type of ATEX and IECEx. Temperature class is T4.
4. Product registration is done by Yokogawa Taiwan Corporation as an importer in Taiwan.
5. The type “-CD” is intrinsic safety type of FM and CSA, and non-incendive of FM and CSA. Temperature classes are T4.
6. The type “-CH” intrinsic safety type for NEPSI. Temperature class is T4.
7. The type “-EG” intrinsic safety type of KOSHA for Korea. Temperature class is T4.
8. The type “-ER” intrinsic safety type of EAC for Kazakhstan and Belarus. Temperature class is T4.
9. The type “-DD” nonincendive type for FM. Temperature class is T4.
10. 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.
11. 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.
12. 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.
13. 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.
14. The universal mounting kit contains the pipe and wall mounting hardware (/U) and the panel mounting hardware (/PM).
### Dimensions and Mounting

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

- **Unit: mm (inch)**
  - Nut
  - Adapter
  - Packing
  - G1/2 screw (CB4), 1/2 NPT screw (CD4)
  - M20x1.5 screw (CF4)

**Unit: mm**

- For sensor 1 cable
- For sensor 2 cable
- For power supply
- For grounding cable

- Dimensions and Mounting
- 44.9
- 137
- 20.2
- 151
- 141
- 22.5
- 60
- 144
- 137
- 137

- 4-M6 depth 5

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

*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, 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.

*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

<table>
<thead>
<tr>
<th>Company name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Person;</td>
<td></td>
</tr>
<tr>
<td>Department;</td>
<td></td>
</tr>
<tr>
<td>Plant name;</td>
<td></td>
</tr>
<tr>
<td>Measurement location;</td>
<td></td>
</tr>
<tr>
<td>Purpose of use;</td>
<td>Indication, Recording, Alarm, Control</td>
</tr>
</tbody>
</table>

## 2. Measurement Conditions

| (1) Process temperature;  |   to   Normally   [°C] |
| (2) Process pressure;     |   to   Normally   [kPa] |
| (3) Flow rate;            |   to   Normally   [l/min] |
| (4) Flow speed;           |   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;  |   to   [°C] |
| (2) Location;             | Outdoors, Indoors |
| (3) Others;               |                     |

## 4. Requirements

### 1st Input

- pH/ORP
- Conductivity (SC)
- Inductive conductivity (ISC)
- Dissolved oxygen (DO)

### 2nd Input

- With (same as 1st Input)
- Without

#### 4.1 pH/ORP

**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)
   - 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)
   - 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**

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