## General Specifications

**Model PH202G**  
2-Wire Type pH/ORP (Redox) Transmitter

**GS 12B07D02-E**

### GENERAL

Flexibility, low maintenance and low installation costs are among the benefits of the EXA PH202 pH/ORP transmitter. Designed to meet the exacting requirements of measuring pH and ORP in the modern industrial environment, it contains many features to ensure peak precision whatever the application.

This 2-wire (loop powered) transmitter is housed in a robust IP65 field mountable case. HART® communication is also available. The need for expensive cabling is minimized. The famous EXA sensor diagnostics are enhanced by an improved impedance check, and the addition of a logbook feature. Calibration history is available in the display, and is used to store important configuration, calibration and diagnostic data. Prediction of sensor failure is possible by reference to the logbook.

Microprocessor-aided calibration uses internal buffer tables and stability checking to ensure maximum accuracy with minimum effort. Process temperature compensation enhances accuracy in applications where the influence of temperature is seen in process pH changes. pH and ORP or rH measurements can be made simultaneously when an appropriate sensor combination is used.

### FEATURES

- Universal pH/ORP
- Possible to input high impedance reference electrode
- On-line sensor checking
- Process temperature compensation
- Differential input amplifier with equipotential screening
- Freely configurable ITP, slope and asymmetry
- Easy to use EXA control panel
- Password protection for all levels of software
- HART®, PROFIBUS-PA, FOUNDATION Fieldbus H1 communications

### ACCURATE pH MEASUREMENT

1. **Electrode selection**  
   In order to make precise pH/ORP measurements, there are a number of pre-requisites. Special attention should be paid to the choice of the sensors to ensure compatibility with the chemical composition of the process fluid. The speed of response required, the solids content and the flow rate of the fluid are also contributory factors. The GS12B07B02-E general specifications cover the choice of sensors.

2. **Signal processing (pH/ORP)**  
   With the correct sensor configuration, the PH202 can measure pH and ORP.

3. **High performance transmitter**  
   The PH202 provides excellent noise rejection, minimizing the stray signals that can affect industrial pH measurements. Earth loop currents in damp and damaged cabling are eliminated by the equipotential screening. It offers a simple and effective process temperature compensation in addition to the usual compensation to the Nernst equation.

4. **Maintenance**  
   It is important that the system be well maintained to make precise pH/ORP measurements. The electrodes must be properly cleaned and regularly calibrated. Yokogawa online cleaning systems may be used where there is significant fouling of the sensors. Other influences from the electrode holders can be less obvious, but important none the less. Well designed fittings make it easy to provide the routine maintenance needed for best accuracy. Flowthrough submersion, suspension and float types of holders are available.

### HART COMMUNICATION

One of the features of smart field devices is their ability to detect faults, either in the device electronics or in an associated sensor. Using a fieldbus system, such faults are reported in the device status byte in every message (assuming that communication is still possible!). For HART, it is still useful to follow the convention of indicating fault conditions by setting the analogue output current to a value which is recognizably beyond the normal operating range (including the small amount of linear over-range commonly allowed). If it is still alive, the current output value is set to an appropriate value with the intention that a host system should be able to set alarm thresholds just outside the normal 4 to 20 mA range, to indicate measurement out-of-range, and to set further alarm thresholds to indicate a fault condition.
DD specification and other support files
The PH202 Device Description (DD) files are available enabling communications compatible HOST devices (and HHT for HART). Other files to support AMS, PRM and PDM are available as well.

**PROCESS TEMPERATURE COMPENSATION**
The figure below shows the strong change in pH with temperature, caused by the dissociation constant of water changing. This effectively shifts the neutral point from pH7. In order to reliably control the pH of solutions it is necessary to compensate for the changes. The PH202 transmitter has a simple-to-operate system of process temperature compensation to provide optimum accuracy and best control. An application where this is particularly important is in the measurement of alkalized boiler feed water.

![Graph showing the change in pH with temperature](image)

**3-LEVEL OPERATION**
The PH202 transmitter uses a 3-level operating system to take full advantage of the microprocessor while retaining the traditional simplicity of a 2-wire transmitter. Advanced functions are separated from conventional operation to avoid confusion. They can be activated as required for each individual application.

**MAINTENANCE level**
The normal maintenance functions are accessible through the flexible window by pushing the keys underneath.

- **Use**: Normal operation and checking
- **How**: Simple operation by dialog through the closed front cover
- **Example**: Calibration with buffers

**COMMISSIONING level**
Functions required to commission the instrument are hidden to discourage unauthorized tampering. The front cover is removed to reveal the commissioning menu and the hidden access key (marked *).

- **Use**: For normal commissioning
- **How**: Removal of the front cover reveals the access key and second menu
- **Example**: Selecting a measuring range

**SERVICE level**
Specialized functions can be adjusted via the SERVICE menu. In this case access is by using “service codes”.

- **Use**: Only for specialist functions
- **How**: Through special coded entries
- **Example**: Process temperature compensation

With this 3-level user-friendly approach, the instrument can be operated by anyone. Commissioning is straightforward and needs no calibration equipment compared to analog instruments. Specialist functions available via access codes are invisible during normal operation. All three levels can be separately protected against unauthorized access by a password system using a three digit code.

**SENSOR CHECKING**

1. **On-line checks**
   Real-time sensor checking in the 2-wire transmitter is one of the most important features of the EXA PH202 transmitter. By special circuitry on the input board an alternating voltage is applied to the liquid earth pin and the sensors. The impedance of the measuring electrode (pH-glass or ORP-metal electrode) and reference electrode are independently measured. The measured values are compared to limiting values.

2. **Faults**
   - The pH-sensor is checked for low impedance to detect breakage of the bulb and for high impedance to detect an open circuit.
   - The Redox sensor is checked for high impedance to detect an open circuit.
   - The reference electrode is also checked for high impedance to detect fouling of the diaphragm, poisoning of the reference liquid or non immersion of the sensors.

   These faults can be transmitted to the control room or remote panel by a discrete current output of 21 mA or 3.6 mA when HART or distributor comm. is non-used, 3.9 mA when HART or distributor comm. is used over the 2-wire connection. The fault is also flagged on the display by a special marker field and an error code in the message display.
3. Off-line checks

During calibration of a pH measuring system, the response of the sensors is measured and checked. Sensitivity and drift are calculated and checked. During calibration of an ORP measuring system, the drift of the sensors is calculated and checked. If any of these are outside the limits, an error is signaled.

The comprehensive combination of on-line and off-line checking monitors all key aspects of the measurement to give an early warning, if the reading is faulty.

## GENERAL SPECIFICATIONS

### 1. Transmitter

**Input specifications:** Dual high impedance inputs (greater than $10^{12}$ Ω) with provision for liquid earth connection. Suitable for inputs from glass or enamel pH & reference sensors and ORP metal electrodes.

**Input ranges:**
- pH: $-2$ to $16$ pH
- ORP: $-1500$ to $1500$ mV
- rH: $0$ to $55$ rH
- Temperature: $-30$ to $140^\circ$C (-20 to 300°F)

8.55kΩ NTC sensor: $-10$ to $120^\circ$C (10 to 250°F)
For 10kΩ PTC sensor: $-20$ to $140^\circ$C (0 to 300°F)

(Measuring range may also be limited by the specification of the used sensor.)

**Output ranges:**
- pH: min. 1 pH max. 20 pH
- ORP: min. span 100 mV max. span 3000 mV
- rH: min. 2 rH max. 55 rH
- Temperature: min. 25 °C max. 200 °C
  (for 8.55kΩ NTC sensor max. 120 °C)

**Output signal:**
- 4-20 mA DC loop powered, isolated from input. With the possibility of 21 mA “FAIL” signal (burn up) and 3.6 mA (burn down when HART or distributor comm. is non-used).
- 3.9 mA (burn down when HART or distributor comm. is used).

**Temperature compensation:**
- Range: $-30$ °C to 140 °C (-20 to 300 °F)
  (for 8.55kΩ sensor –10 °C to 120 °C)

Sensor types: Pt100, Pt1000, 3kΩ PTC, 5.1kΩ PTC, 8.55kΩ NTC, 350Ω PTC, 6.8kΩ PTC, 10kΩ PTC

Automatic or manual compensation to Nemst equation. Process compensation by configurable coefficient. Adjustable ITP (Iso-thermal point of intersection).

**Calibration:**
- Semi-automatic, using tables in transmitter for pH 4, 7 & 9 buffer solutions, or using user-defined tables, with automatic check of measurement stability.

### Logbook

Software record of important events and diagnostic data. Available through HART link, with diagnostic information available in the display.

**Serial communication:**
Bi-directional digital communication superimposed on the 4-20 mA signal.

**Display:**
Custom liquid crystal display, with a main display of 3 1/2 digits 12.5 mm high. Message display of 6 alphanumeric characters, 7 mm high.
Warning flags and units (pH and mV).

**Power supply:**
Nominal 24 volt DC loop powered system.

**PH202G:** 17 to 40 V, see Fig. 1.

**Maximum load resistance:**
For the PH202G, see Fig. 1.
200Ω or less with the PH201G
50Ω or less with the SDBT

**Fig. 1 Supply voltage/ load diagram for the PH202G**

**Performance:** (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, 3kΩ PTC, 5.1kΩ PTC, 8.55kΩ NTC, 350Ω PTC, 6.8kΩ PTC, 10kΩ PTC

- Linearity: ±0.3 °C
- Repeatability: ±0.1 °C
- Accuracy: ±0.3 °C

Temperature with Pt100
- Linearity: ±0.4 °C
- Repeatability: ±0.1 °C
- Accuracy: ±0.4 °C

**Note:** The following tolerance is added to above performance.

**mA output tolerance:** ±0.02 mA of “4 - 20 mA”

**Ambient operating temperature:** -10 to +55 °C

**Storage temperature:** -30 to +70 °C

**Humidity:** 10 to 90% RH (Non-condensing)
Housing:
Case: Cast aluminum case with chemically resistant coating
Cover: Polycarbonate window.
Case color: Off-white (Equivalent to Munsell 2.5Y8.4/1.2)
Cover color: Deep sea Moss green (Equivalent to Munsell 0.6GY3.1/2.0)

Cable and terminals:
The PH202 is equipped with terminals suitable for the connection of finished cables in the size: 0.13 to 2.5 mm (26 to 14 AWG).
Cable entry: 2 cable glands 1/2NPT. The cable glands will form a tight seal on cables with an outside diameter in the range of 6 to 12 mm (0.24 to 0.47 inches).

Requirement of connecting with external instruments
<table>
<thead>
<tr>
<th>Terminal for pin cable terminal</th>
<th>Screw terminal (option /TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimp contact for cable</td>
<td>Pin-shaped crimp contact with sleeve insulator</td>
</tr>
<tr>
<td>Usable contact</td>
<td>max. 2.5 mm</td>
</tr>
<tr>
<td>Torque for fixing</td>
<td>0.5 N-m or less</td>
</tr>
<tr>
<td>Example of crimp contact*</td>
<td>Weidmuller Co., Ltd. make: H0.34/10, H0.5/12, H1/12, H1.5/12S</td>
</tr>
<tr>
<td>JST, Mfg. Co., Ltd. make: VD1.25-3 (Ring shape), VD1.25-S3A (Fork shape)</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Other crimp contact may be required, depending on core-cable diameter.

Construction: Weather resistant to IP65, NEMA 4X and Type 3S standards
Mounting: Pipe, wall or panel mounting, using optional hardware
Weight: Approx. 1.6 kg
Data protection: EEPROM for configuration and logbook, and lithium cell for clock.
Automatic safeguard: Return to measuring mode when no safe guard keystroke is made for 10 min.
Operation protection: 3-digit programmable password.

Sensor impedance checking:
Independent impedance check on measuring and reference sensor elements, with temperature compensation. Display of sensor impedance on message line of display.
FAIL flag in event of "out of limits" impedance, and the possibility of 21 mA or 3.6 mA when HART comm. is non-used (3.9 mA when HART comm. is used) error signal.

Signal processing (pH/ORP):
The PH202 can measure pH or ORP. Using the FU20 allows simultaneous measurement and display of pH and ORP. It also allows display and output of pH.

EMC Conformity standards (PH202G)
EN 61326-1 Class A, Table 2 (For use in industrial locations)
EN 61326-2-3
EN 61326-2-5 (Profibus communication may be influenced by strong electromagnetic field.)
Korea Electromagnetic Conformity Standard Class A

HART® communications
Input: Two-wire system, 4-20 mA DC
Power supply: PH202G: up to 40 volts
Note: The transmitter contains a switched power supply, drawing its energy from the 0-4 mA section of the signal. Consequently the 17 volt limit is applied at 4 mA. The characteristic of the unit is such that above about 7 mA on the output, the terminal voltage can drop to 14.5 volts without problem.
Transmission: Isolated output of 4 to 20 mA DC.
Signal: Maximum load 425Ω at 24 VDC
Burn to signal failure acc. NAMUR Recommendation NE43 (18.01.1994)
Operating range: 3.9 to 21mA
Communication: HART®, 1200 Baud, FSK modulated on 4 to 20 mA signal
Configuration: Local with 6 keys
Software: Firmware based on Yokogawa stack.
Hardware: Yokogawa HART Modem F9197UB
Other Control systems: Yokogawa PRM, Rosemount AMS, Siemens PDM
Hand Terminal: Rosemount HHT 275/375
Output span:
- pH: min 1 pH, max 20 pH. (max 90% zero suppression)
The instrument is user programmable for linear or nonlinear pH ranges.
Cable specification: 0.5 mm diameter or 24 AWG over maximum length of 1500 m
DD specification: The PH202 Device Description is available enabling communications with the Handheld communicator and compatible devices.

PROFIBUS-PA communications
Input signal: Digital
Supply voltage: 9 to 32 V DC
Operating current: 26.0 mA
Operating values: According to IEC 1158-2
Bus connection: Fieldbus interface based on IEC 1158-2 according to FISCO-Model
Power supply: Power supply is achieved dependant on the application by means of segment coupler
Data transfer: According to PROFIBUS-PA profile class B based on EN 50170 and DIN 19245 part 4
GSD file: The actual file can be downloaded from www.profibus.com
Configuration: Local with 6 keys
Software: Firmware based on Siemens DPC31 stack.
Hardware: PC- or PCMCIA-interfaces from Siemens
Other control: Siemens PDM systems
Electrical connection: Terminals acc. to IEC 1158-2
Fieldbus-cable-types: Twisted and shielded two wire cable according to recommendation based on IEC 1158-2
Cable diameter: 6 to 12 mm (0.24 to 0.47 inch)

FOUNDATION Fieldbus H1 communications
Input signal: Digital
Supply voltage: 9 to 32 V DC
Operating current: 26.0 mA (base current)
Operating values: According to IEC 1158-2
Bus connection: Fieldbus interface based on IEC 1158-2 according to FISCO-Model
Power supply: Power supply is achieved dependant on the application by means of segment coupler
Data transfer: FF Specification Rev. 1.4, Basic device
Function blocks: 3xAI, Transducer, Resource
Files: Actual file can be downloaded from our homepage
Configuration: Local with 6 keys
Software: National Instruments, NI-FBUS configurator
Hardware: FBUS-interfaces from National Instruments (AT-FBUS and PCMCIA FBUS)
Other control systems: Yokogawa PRM, DMT

2. Dedicated Distributor PH201G (Style B)
This distributor, designed exclusively for use with these pH transmitter, supplies drive power to the 2-wire transmitter while simultaneously receiving 4 to 20 mA DC current signal from the transmitter and converting it to 1 to 5 V DC voltage signal; it also simultaneously receives a digital signal superimposed on 4 to 20 mA DC signal, and provides contact outputs during hold, failure, and/or cleaning.
A current limiter function is built into this unit so it can continue to operate properly even with a short circuit on the transmitter side.

Contact Output
Contact rating: 250 V AC, maximum 100 VA
220 V DC, maximum 50 VA
Hold contact output: N.C. 1 contact, Normally energized
Contact closes when power is off or during maintenance.
Failure contact output: N.C. 1 contact, Normally energized
Contact closes when power is off or during failure.
Cleaning contact output: 1 contact, Close during cleaning only
Used as drive contact for solenoid valve for cleaning.

Regulatory Compliance
Korea Electromagnetic Conformity Standard Class A
한국 전자파적합성 기준
System Configuration Example

- pH or ORP Sensor
- 2-wire pH/ORP Transmitter PH202G (General purpose type)
- Dedicated Distributor PH201G
- Analog output 1 to 5 V DC
- Failure contact output
- Maintenance contact output
- General Distributor
- Power supply 20 to 130 V DC or 80 to 138 V AC, 47 to 63 Hz

Contact outputs are available on the dedicated distributor PH201G.

### MODEL AND SUFFIX CODES

1. **2-Wire pH/ORP Transmitter (Non-explosionproof type)**

   **[Style: S3]**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH202G</td>
<td></td>
<td></td>
<td>2-Wire pH/ORP Transmitter (*1)</td>
</tr>
<tr>
<td>Type</td>
<td>-E</td>
<td></td>
<td>mA with HART (For other regions)</td>
</tr>
<tr>
<td></td>
<td>-C</td>
<td></td>
<td>mA with HART (Canada type)</td>
</tr>
<tr>
<td></td>
<td>-U</td>
<td></td>
<td>mA with HART (North America type)</td>
</tr>
<tr>
<td></td>
<td>-P</td>
<td></td>
<td>Profibus</td>
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<tr>
<td></td>
<td>-F</td>
<td></td>
<td>FF</td>
</tr>
<tr>
<td>Language</td>
<td>-J</td>
<td></td>
<td>Japanese</td>
</tr>
<tr>
<td></td>
<td>-E</td>
<td></td>
<td>English</td>
</tr>
</tbody>
</table>

   **Option Mounting Hardware**
   - **Pipe**, wall mounting bracket (Stainless steel)
   - **Panel mounting bracket** (Stainless steel)
   - **Hood for sun protection** (Carbon steel)
   - **Hood for sun protection** (Stainless steel)
   - **Stainless steel tag plate**
   - **G 1/2**
   - **1/2 NPT**
   - **Screw terminal** (*2)
   - **Epoxide baked finish** (*3)

   *1: The PH202G can be also used as ORP transmitter. (Setting can be made in the field.)

   *2: It can be specified when the suffix code “-E” or “-C” or “-U” is selected.

   *3: The housing is coated with epoxy resin.

2. **Distributor (Dedicated EXA Series)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>PH201G</td>
<td></td>
<td></td>
<td>Distributor</td>
</tr>
<tr>
<td>Power Supply</td>
<td>-A1</td>
<td></td>
<td>100 V AC</td>
</tr>
<tr>
<td></td>
<td>-A2</td>
<td></td>
<td>220 V AC</td>
</tr>
<tr>
<td>Option</td>
<td>-B</td>
<td></td>
<td>Style B</td>
</tr>
<tr>
<td></td>
<td>/TB</td>
<td></td>
<td>Terminal for power connection</td>
</tr>
</tbody>
</table>
## DIMENSIONS

### pH/ORP Transmitter

**Panel Mounting (Option code : /PM)**

*Unit: mm*

- Panel thickness: 1 to 10
- Panel mounting bracket: 38 \(\pm 0.5\), 80 \(\pm 0.5\), 3.9
- Panel mounting bracket width: 185 \(\pm 0.5\)
- Panel mounting bracket height: 205 \(\pm 0.5\)

**Panel Mounting when using two (2) self-taping screws**

*Unit: mm (inch)*

- Min. 203 (min. 8.0)
- Min. 229 (min. 8.9)
- Panel cutout spacing: 172 (6.77)
- Panel cutout: 154 (6.06)
- Panel cutout: 18.5 (0.72)
- 2x Ø4 (0.16)
- 3.5 (0.14)

**Conduit Adapter (Option)**

*Adapter for Conduit Work (optional)*

- G1/2 screw (/AFTG)
- 1/2 NPT screw (/ANSI)

*Approx. 55*

**Pipe/Wall Mounting (Option code : /U)**

*Nominal 50 A (O.D. Ø60.5 mm)*

- 2-Ø6.5
- 4-Ø10
- 200
- 6-Ø5
- 70
- 115

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GS 12B07D02-E Apr. 15, 2014-00
PH201G Dedicated Distributor (Style B)

Unit : mm

"/TB" Terminal for Power Connection

Terminal configuration

Terminal Box PH202G

pH/ORP Transmitter

PH201G

Distributor

SDBT Distributor

WIRING DIAGRAMS

Example of Non-Explosionproof System

*1: Use a 2-conductor shielded cable with an outside diameter of 6 to 12 mm. Shield must be connected to internal terminal G of transmitter and left unconnected at the other side.

*2: Transmitter must be grounded using external terminal: for general purpose version ground resistance of PH202G should not exceed 100V (Japanese Class D grounding).

*3: Use a 2-conductor shielded cable with an outside diameter of 6 to 12 mm. Shield must be connected to internal terminal G of transmitter and left unconnected at the other side.

*4: Output Signal (1 to 5V DC)
## Wiring Example for Sensors

### General pH Electrode

<table>
<thead>
<tr>
<th>Terminal Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTB10-PH1 or BA10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH202 pH/ORP Transmitter</th>
</tr>
</thead>
</table>

### Separate Electrodes pH/Ref Electrode

- **PH202 pH/ORP Transmitter**

### Combined pH/Ref Electrode

- **PH202 pH/ORP Transmitter**

### Special pH Electrode

<table>
<thead>
<tr>
<th>Terminal Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTB10-PH2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PH202 pH/ORP Transmitter</th>
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</thead>
</table>

### General ORP Electrode

<table>
<thead>
<tr>
<th>Terminal Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTB10-PH1 or BA10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OR8EFG OR8ERG</th>
</tr>
</thead>
</table>

### Separate Electrodes ORP/Ref Electrode

- **PH202 pH/ORP Transmitter**

### Combined ORP/Ref Electrode

- **PH202 pH/ORP Transmitter**

### Notes

1. A temperature sensor maybe connected to 11 & 12, for temperature indication.

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*1 Terminal box is used only where pH/ORP transmitter is installed remotely from electrodes (normally not needed).

*2 This cable is specified in the option code for the terminal box (WTB10), or extension cable (WF10).
Wiring of the PH20/FU20

**pH (& ORP) WIRING DIAGRAM**

Conventional pH (& ORP) wiring
Connect the PH20 or FU20 to the EXA or EXAxt PH analyzer as shown. With this configuration, it is possible to measure ORP (or rH) at the same time.

**ORP WIRING DIAGRAM with normal reference**

Wiring for ORP measurement with normal reference
Connect the PH20 or FU20 to the EXAPH analyzer as shown.

**ORP WIRING DIAGRAM with pH sensor as reference**

Wiring for ORP measurement with pH reference
Connect the PH20 or FU20 to the EXA Glass PH analyzer as shown.

To connect the other sensor systems, follow the general pattern of the terminal connections as listed below:

- **11 & 12** Temperature compensation resistor input (= T1 and T2)
- **13** Input no. 2 (normally the reference element) = RE
- **17** Screen (shield) for input no. 2
- **14** Liquid earth (solution ground) connection = SE or LE
- **15** Input no. 1 (normally the measuring element) = GE
- **16** Screen (shield) for input no. 1 = S or G
Inquiry Specifications Sheet for 2-Wire pH/ORP (Redox) Transmitter System

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

1. **General**
   - Company name: ________________________________
   - Contact person; ____________ Section; ____________ Department; ____________
   - Plant name; ________________________________
   - Measurement location; ________________________________
   - Purpose of use; □ Indication, □ Record, □ Alarm, □ Control
   - Power supply; _______ V AC _______ Hz

2. **Measurement Conditions**
   (1) Process temperature; _______ to _______ Normally _______ [°C]
   (2) Process pressure; _______ Normally _______ [kPa]
   (3) Flow rate; _______ Normally _______ [L/min]
   (4) Flow speed; _______ Normally _______ [m/sec]
   (5) Slurry or contaminants, □ No, □ Yes
   (6) Name of process fluid; ________________________________
   (7) Composition of process fluid; ________________________________
   (8) Others; ________________________________

3. **Installation Site**
   (1) Ambient temperature; ________________________________
   (2) Installation location, □ Outdoors, □ Indoors___________________
   (3) Others; ________________________________

4. **User Requirements**
   (1) Measuring range; □ pH 0 to 14, □ ____________
   (2) Transmission output; □ 4 to 20 mA DC, □ HART®, □ PROFIBUS-PA, □ FOUNDATION Fieldbus H1
   (3) System configuration selection; □ Sensor, □ Holder, □ pH/ORP transmitter, □ Cleaning system,
      □ Terminal box, □ Accessories
   (4) Electrode cable length; □ 3m, □ 5m, □ 7m, □ 10m, □ 15m, □ 20m, □ _____m
   (5) Electrode operating pressure; □ 10 kPa or less, □ Greater 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; ________________________________