

**Model PH202SJ [Style: S2]
pH/ORP Transmitter**

IM 12B07D02-11E

vigilantplant®

PREFACE

Be sure to read this instruction manual before use, in order to get full performance on the PH202SJ two-wire pH/ORP transmitter meets TIS intrinsic safety standards which requires passing TIS tests.

This user's manual contains the information needed to install and wiring the unit mainly. Refer to the IM 12B07D02-01E for details of setting operation conditions and how to operate the PH202SJ.

The following symbols are used in this manual.

 **WARNING**

This symbol shows failure to follow these instructions is likely to result in a serious accident.

 **CAUTION**

This symbol shows failure to follow these instructions may result in injury to the user or damage to the equipment.

Feasible combinations of the PH202 pH/ORP transmitters with different styles of the PH201G distributor are listed in the table below. The distributor has the usual distributor functions (supply power to transmitter, receive current output from transmitter, and provide analog output) as well as contact output functions (maintenance, wash and fail status signals). Since the two transmitters provide different digital signals to control the distributor contact outputs, two distributor styles are provided for compatibility.

pH/ORP transmitter	Use of Distoributor PH201G		Refference
	No use of contact output	Use of contact output	
PH202SJ	Style A & Style B possible	Only Style B possible	Intrinsically safe type

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 **WARNING**

Electrostatic Discharge

The PH202 transmitter contains devices that can be damaged by electrostatic discharge. When servicing this equipment, please observe proper procedures to prevent such damage. Replacement components should be shipped in conductive packaging. Repair work should be done at grounded workstations using grounded soldering irons and wrist straps to avoid electrostatic discharge.

Do not modify the PH202 transmitters.

Before replacing parts inside a transmitter case, move it to a non-hazardous area.

Installation and wiring

The PH202 should only be used with equipment that meets the relevant IEC, American or Canadian standards. Yokogawa accepts no responsibility for the misuse of this unit.



The Instrument is packed carefully with shock absorbing materials, nevertheless, the instrument may be damaged or broken if subjected to strong shock, such as if the instrument is dropped. Handle with care. Although the instrument has a weatherproof construction, the transmitter can be harmed if it becomes submerged in water or becomes excessively wet. Do not use an abrasive or solvent in cleaning the instrument.

Contents of this manual are subject to change without notice. Yokogawa is not responsible for damage to the instrument, poor performance of the instrument or losses resulting from such, if the problems are caused by:

- Improper operation by the user.
- Use of the instrument in improper applications.
- Use of the instrument in an improper environment or improper utility program.
- Repair or modification of the related instrument by an engineer not authorized by Yokogawa.

Warranty and service

Yokogawa products and parts are guaranteed free from defects in workmanship and material under normal use and service for a period of (typically) 12 months from the date of shipment from the manufacturer.

Individual sales organizations can deviate from the typical warranty period, and the conditions of sale relating to the original purchase order should be consulted. Damage caused by wear and tear, inadequate maintenance, corrosion, or by the effects of chemical processes are excluded from this warranty coverage. In the event of warranty claim, the defective goods should be sent (freight paid) to the service department of the relevant sales organization for repair or replacement (at Yokogawa discretion). The following information must be included in the letter accompanying the returned goods:

- Part number, model code and serial number.
- Original purchase order and date.
- Length of time in service and a description of the process.
- Description of the fault, and the circumstances of failure.
- Process/environmental conditions that may be related to the installation failure of the device.
- A statement whether warranty or non-warranty service is requested.
- Complete shipping and billing instructions for return of material, plus the name and phone number of a contact person who can be reached for further information.

Returned goods that have been in contact with process fluids must be decontaminated/disinfected before shipment. Goods should carry a certificate to this effect, for the health and safety of our employees. Material safety data sheets should also be included for all components of the processes to which the equipment has been exposed.

For information about instruments related to the PH202, refer to the following User's Manual.

Manual Name	IM No.	Instruments mentioned
pH sensor & holders for general purpose	IM 12B7K1-02E IM 12B7J1-01E IM 12B7M2-01E IM 12B07M01-01E IM 12B07N01-01E IM 12B07W03-01E	PH8ERP KCI Refillable pH sensor PH8EFP KCI Filling type pH sensor PH8HG Guide-pipe PH8HS, PH8HSF Submersion type holder PH8HF, PH8HFF Flow-through type holder PH8AX Accessories
ORP sensor for general purpose	IM 12C07J01-01E IM 12C04K01-01E IM 12C04W02-01E	OR8EFG KCI filling type ORP sensor OR8ERG KCI Refillable ORP sensor OR8AX Accessories
pH sensor & holder for pure water	IM 12B7J2-01E IM 12B07P01-01E	PH8EHP pH sensor for pure water PH8HH holder for pH sensor for pure water
pH electrode & holder for fermentation use	IM 12B7Q1-11E	Y/465 pH sensor for fermentation use
	IM 12B7Q2-11E	(Y/764 holder)
	IM 12B7Q2-02E	(Y/776 holder)
Terminal box	IM 19D01B01-01E	WTB10-PH1, WTB10-PH2 Terminal Box
Ultrasonic oscillator	IM 19C1B3-01E IM 12B5U2-E	PUS400G Ultrasonic Oscillator PH8USF (Explosionproof type)
PH201G distributor (Style B)	IM 19B01E04-02E	PH201G (style B) Distributor
SDBT distributor	IM 1B04T01-02E	SDBT Distributor
SDBS distributor	IM 1B04T02-02E	SDBS Distributor
Attachment rack instrument	IM 1B4F2-01E	Instruments for rack attachment [®]
HA405 pH sensor	IM 12B07E01-01E	HA405 Solid electrolyte (Xerolyt [®])
HA406 pH sensor	IM 12B07E02-01E	HA406 Solid electrolyte (Xerolyt) with temperature element
DPAS405 pH sensor	IM 12B7G1-01E	DPAS405 pH sensor for small culture tanks
DPA405 pH sensor	IM 12B07H01-01E	DPA 405 pH sensor for chemical process
DPA406 pH sensor	IM 12B07H02-01H	DPA 406 pH sensor for chemical process with temperature element
FU20 pH sensor	IM 12B07K02-01E	FU20 pH/ORP electrode
HF405 pH sensor	IM 12B07L01-01E	HF405 Hydrofluoric Acid-resistant pH sensor
BARD Safety Barrier	IM 01B04S10-01E	Model BARD-800 Safety Barrier
PH202G, PH202S	IM 12B07D02-01E	pH/ORP Transmitter

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1. INTRODUCTION AND GENERAL DESCRIPTION

The Yokogawa's PH202 is a 2-wire pH/ORP transmitter designed for industrial process monitoring, measurement and control applications. HART communication is also available. This user's manual contains the information needed to install and wiring the unit correctly. Refer to the IM 12B07D02-01E for details of setting operation conditions and how to operate the PH202SJ.

Yokogawa can not be responsible for the performance of the PH202 if these instructions are not followed.

1-1. Instrument check

Upon delivery, unpack the instrument carefully and inspect it to ensure that it was not damaged during shipment. If damage is found, retain the original packing materials (including the outer box) and then immediately notify the carrier and the relevant Yokogawa sales office.

Make sure the model number on the textplate affixed to the side of the instrument agrees with your order. Examples of textplates are shown below.



Safety Barrier BARD-800		Safety Barrier BARD-400	
Vm≤31.5V		Vm≤31.5V	
Im≤29.2mA		Im≤35mA	
Pm≤0.92W		Pm≤1.1W	
○			
pH TRANSMITTER			
MODEL	PH202SJ		
SUFFIX			
SUPPLY	DC 24V		
OUTPUT	DC 4 to 20mA		
AMB. TEMP	-10 to 55°C		
EX SYSTEM	PH202S		
EX PROOF	i3aG4		
STYLE			
No.			
YOKOGAWA ◆			
Made in Japan			
○			

Figure 1-1. Textplate for PH202SJ Explosionproof type

Note:

The textplate will also contain the serial number and any relevant certification marks.

Check that all the parts are present, including mounting hardware, as specified in the option codes at the end of the model number. For a description of the model codes, refer to Chapter 2 of this manual under General Specifications.

Basic Parts List:Transmitter PH202

User's Manual English

Optional mounting hardware when specified (See model code)

2. SPECIFICATIONS

2-1. Transmitter Specification

Input specifications :

Dual high impedance inputs (greater than $10^{12} \Omega$) 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
- Temperature : -30 to 140°C
(For 8.55k Ω NTC sensor : -10 to 120 °C)
(Measuring range may also be limited by the specification of the used sensor.)

Output ranges :

- pH : min 1 pH max 20 pH
- ORP : min 100 mV max 3000 mV
- rH : min 2 rH max 55 rH
- Temperature : min 25 °C max 200 °C
(for 8k55 Ω NTC sensor : max 120 °C)

Output signal :

4-20 mA DC loop powered, isolated from input. maximum load resistance:

175 Ω or less with the PH201G

25 Ω or less with the SDBT

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), or pulse of 21 mA to signal failure.

Temperature compensation:

- Range : -30°C to 140°C
(for 8k55 Ω NTC sensor -10 °C to 120°C)
- Sensor types: Pt100, Pt1000, 3k Ω PTC, 5.1k Ω PTC (25 °C),
8.55k Ω NTC (25°C), 350 Ω PTC (25°C), 6.8k Ω PTC (25°C),
10k Ω PTC (25°C)

Automatic or manual compensation to Nernst equation.

Process compensation by configurable coefficient.

Adjustable ITP (ISO-thermal point of intersection).

Calibration :

Semi-automatic using reconfigured JIS (NIST) buffer tables 4, 7 & 9, or with user defined buffer tables, with automatic stability check. Manual adjustment to grab sample.

Slope and Asymmetry Potential setting.

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.

For PH202SJ allowable load resistance should be determined by the following equation.
When used with BARD-800:

$$\text{Allowable load resistance } (\Omega) = \frac{V-18.5}{0.022} - R$$

When used with BARD-400:

$$\text{Allowable load resistance } (\Omega) = \frac{V-19}{0.022} - R$$

V: Minimum output voltage of power supply (distributor)

R: Internal resistance of power supply (distributor)

Note: Maximum load resistance by distributor used should be as follows.

(SDBT) + (BARD-800): 25 Ω

(PH201G) + (BARD-800): 175 Ω

Performance :(The specifications are expressed with simulated inputs.)

- pH- Linearity : ± 0.02 pH
- Repeatability : ± 0.02 pH
- Accuracy : ± 0.02 pH
- ORP- Linearity : ± 1 mV
- Repeatability : ± 1 mV
- Accuracy : ± 1 mV

Temperature with Pt1000 Ω , 3k Ω PTC, 5.1k Ω PTC, 350 Ω PTC, 6.8k Ω PTC, 10k Ω PTC, 8.55k Ω NTC

- Linearity : ± 0.3 $^{\circ}\text{C}$
- Repeatability : ± 0.1 $^{\circ}\text{C}$
- Accuracy : ± 0.3 $^{\circ}\text{C}$

Temperature with Pt100 Ω

- Linearity : ± 0.4 $^{\circ}\text{C}$
- Repeatability : ± 0.1 $^{\circ}\text{C}$
- Accuracy : ± 0.4 $^{\circ}\text{C}$

Note: The following tolerance is added to above performance.
mA output tolerance: ± 0.02 mA of “4 - 20 mA”

Performance :(The specifications are expressed with sensor.)

- Repeatability : 0.05 pH
- Response time : 10 seconds (90% response, using pH sensor and buffer solution both equalized to 20 $^{\circ}\text{C}$, with adequate agitation.)
- Accuracy : ± 0.1 pH (using PH8EFP or PH8EHP)
 ± 0.15 pH (using other sensors)

Ambient operating temperature:

-10 to + 55 $^{\circ}\text{C}$

Storage temperature:

-30 to +70 $^{\circ}\text{C}$

Humidity :

10 to 90% RH (Non-condensing)

Housing :

Case: Cast aluminum case with polyurethane baked-finish
Cover: Polycarbonate window.
Case color: Frosty-white (Equivalent to Munsell 2.5Y8.4/1.2)
Cover color: Deepsea Moss green (Equivalent to Munsell 0.6GY3.1/2.0)

Cable entry :

Polyamide glands DIN(Pg 13.5) (cable 6 to 12mm O.D.)

Cable terminals :

Provided for max. 2.5 mm

Construction :

Weather resistant to IP65 and NEMA 4X standards

Mounting :

Pipe, wall or panel mounting, using optional hardware

Weight :

Approx. 1.6 kg

Data protection :

EEPROM for configuration and logbook, lithium cell for clock.

Automatic safeguard :

Return to measuring mode when no keystroke is made for 10 min even though HOLD is activated with HOLD function enabled.

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 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 out put of pH.

Cables and Terminals:

The glands will form a tight seal on cables with an outside diameter in the range of 6 to 12 mm.

PH202SJ Intrinsically Safe Version

Electrical:

Safety Barrier Used	Construction, Explosion /Ignition Groups	Safety Barrier Rating
BARD-800	i3aG4	V _m =DC 31.5 V I _m =DC 29.2 mA P _m =0.92 W
BARD-400	i3aG4	V _m =DC 31.5 V I _m =DC 35 mA P _m =1.1 W

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Environmental:

Altitude: 1000 m max.
 Ambient temperature: -10 to +55°C for sensor and transmitter
 Humidity: 45 to 85% RH
 Location: Zones 0, 1 and 2 hazardous locations, with safety barrier.

Wiring between PH202SJ and safety barrier:

Safety Barrier	Maximum Allowable Inductance	Maximum Allowable Capacitance
BARD-800	2.2 mH	35 nF
BARD-400	2.2 mH	35 nF

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Sample oxidation-reduction potential: Within ± 2 V

Connection is required between common terminal (3) of safety barrier and common terminal of distributor (power supply). Failure may cause errors on 4-20 mA signal due to characteristics of safety barrier. When BARD-800/400 safety barrier is used, it is needed to prevent large current from flowing into the safety barrier in order to avoid possible fuse blowing.

Yokogawa's distributors, Models PH201G and SDBT, have a current limiter function and are best suited for use with the PH202SJ.

HART communication

- Input** : Two-wire system, 4-20 mA DC
- Power supply** : PH202SJ: up to 31.5 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 21 mA
- 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 non-linear 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.

2-2. Model and suffix codes

1. 2-Wire pH/ORP Transmitter (Explosionproof type)

[Style : S2]

Model	Suffix Code	Option Code	Specification
PH202SJ	.....	.....	Intrinsically safe type transmitter (*1)
Type	-1	.....	TIIS Certification
Language	-J	.....	Japanese
	-E	.....	English
Option	Mounting Hardware	/U	Pipe, wall mounting bracket(Stainless steel)
		/PM	Panel mounting bracket(Stainless steel)
	Hood	/H	Hood for sun protection (Carbon steel)
		/H2	Hood for sun protection (Stainless steel)
	Tag Plate	/SCT	Stainless steel tag plate
	Conduit Adapter	/AFTG	G 1/2
		/ANSI	1/2 NPT
		/TB	Screw terminal
		/SPS	With screws for salt protection (*2)
		/X1	Epoxy baked finish (*3)
		/PAC	Cable gland for separate type detector (*4)

(*1) The PH202SJ can be also used as ORP transmitter. (Setting can be made in the field.)

(*2) The SUS screws with teflon coating are used at the four corners of the cover.

(*3) The housing is coated with epoxy resin.

(*4) Cable gland for separate type pH detector (pH sensor, reference sensor and temperature element are not integrated) "/PAC" contains the items on the following table.

Item	Qty.	Description
1) Packing with 4 holes	1	Use in case of applying separate type pH detector (pH sensor, reference sensor and temperature element are not integrated.)
2) Plug (black)	2	For plugging the unused holes of Packing with 4 holes
3) Plug (Semi-transparency)	1	For plugging the unused holes of Packing with 4 holes

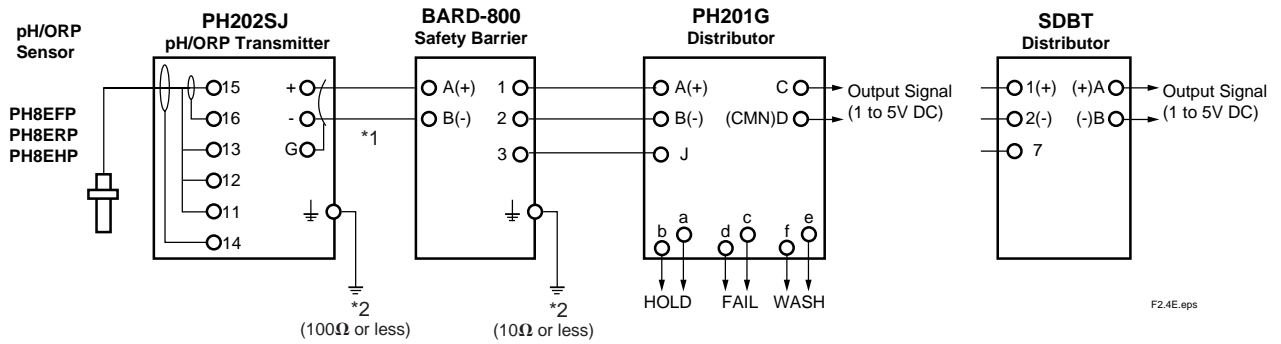
Note: The above items may also be necessary when using detectors other than YOKOGAWA made.

2. Distributor (Dedicated EXA Series)

Model	Suffix Code	Option Code	Specification
PH201G	.....	.....	Distributor
Power Supply	-A1	.....	100 V AC
	-A2	.....	220 V AC
—	*B	.....	Style B
Option		/TB	Terminal for Power connection

Note : Refer to GS12B07B02-E for detectors, terminal box and accessories.

2-3. Wiring diagram for power supply



- *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 intrinsically safe version ground resistance of PH202SJ should be 100Ω or less (Japanese Class D grounding). For safety barrier ground resistance should not exceed 10Ω (Japanese Class A grounding).

CAUTION

Grounding wire connection for PH202SJ is different from that for PH200S. When installing PH202SJ as a replacement for PH200S, grounding wire must be reconnected as above.

3. INSTALLATION AND WIRING

3-1. Installation and dimensions

3-1-1. Installation site

The PH202 transmitter is weatherproof and can be installed inside or outside. It should, however, be installed as close as possible to the sensor to avoid long cable runs between sensor and converter. In any case, the cable length should not exceed 20 meters. Select an installation site where:

- Mechanical vibrations and shocks are negligible
- No relay/power switches are in the direct vicinity
- Access to the cable glands is possible (see figure 3-1)
- The transmitter is not mounted in direct sunlight or severe weather conditions
- Maintenance procedures are possible (avoid corrosive environments)

The ambient temperature and humidity of the installation environment must be within the limits of the instrument specifications. (See chapter 2).

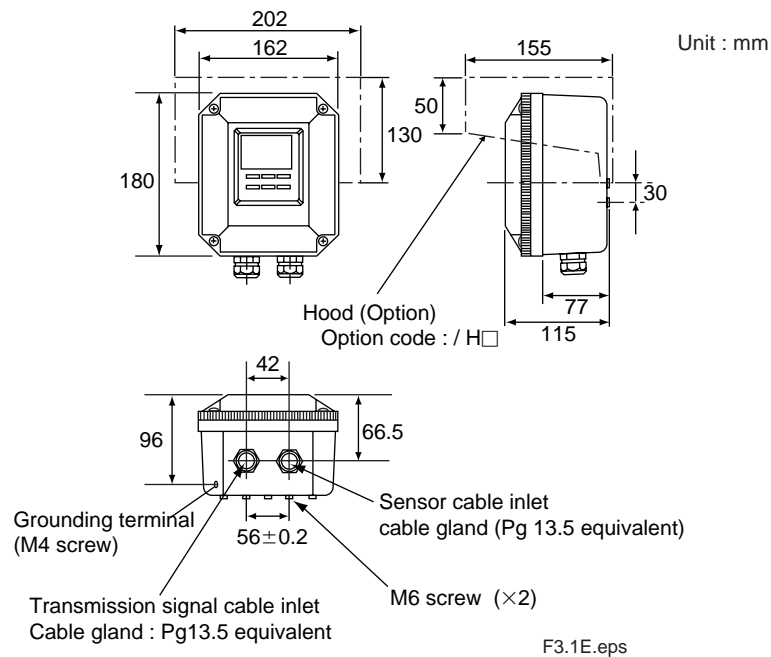


Fig. 3-1. Housing dimensions and layout of glands

3-1-2. Mounting methods

Refer to figures 3-2 and 3-5. Note that the PH202 has universal mounting capabilities:

- Panel mounting using two (2) self-tapping screws
- Surface mounting on a plate (using bolts from the back)
- Wall mounting on a bracket (for example, on a solid wall)
- Pipe mounting using a bracket on a horizontal or vertical pipe (maximum pipe diameter 60.5 mm)

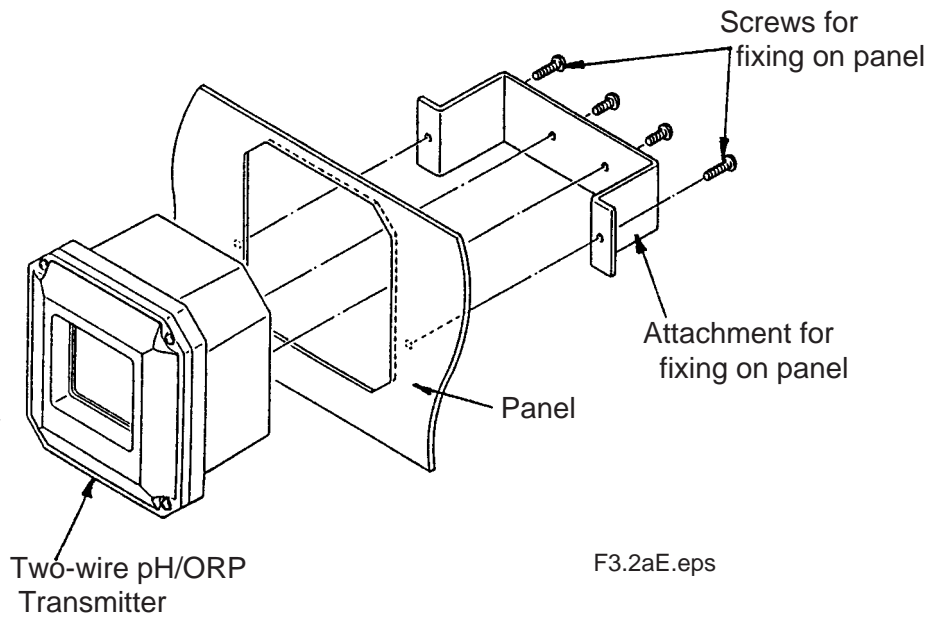


Fig. 3-2. Panel mounting hardware and overview diagram

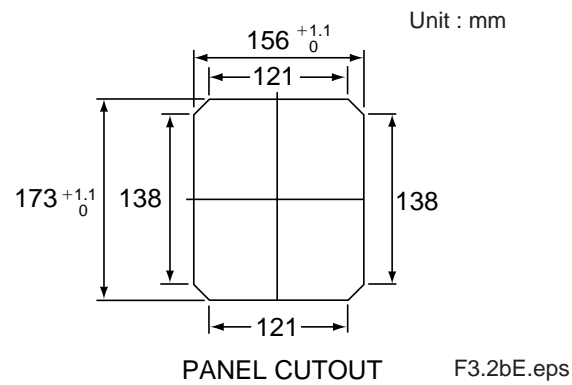


Figure 3-3. Panel cut-out dimensions

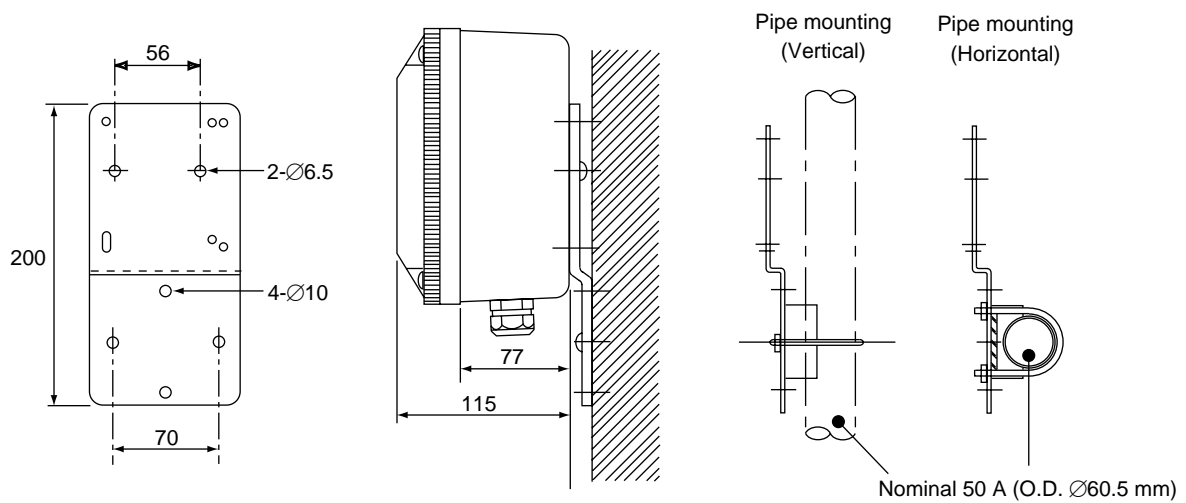


Figure 3-4. Wall and pipe mounting diagram

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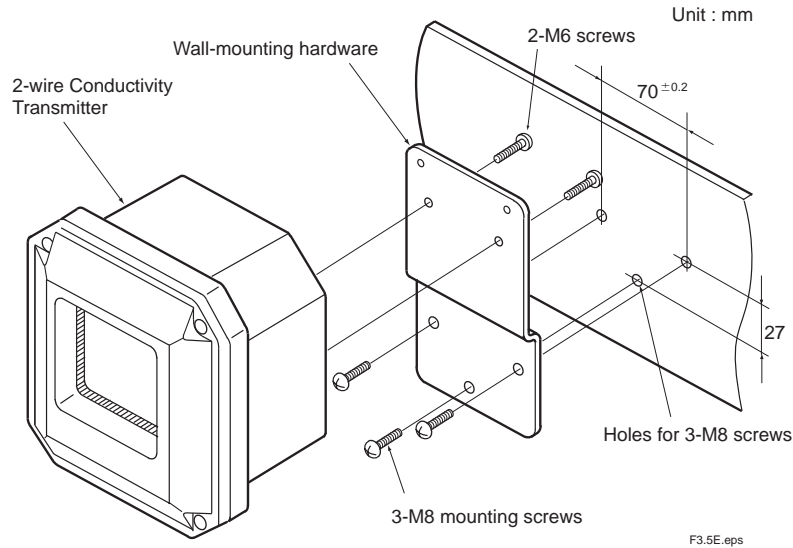


Figure 3-5. Hardware and overview diagram for wall mounting

3-2 Preparation

Refer to figure 3-6. The power/output connections and the sensor connections should be made in accordance with the diagram on Sec. 3-3. The terminals are of a plug in style for ease of mounting.

To open the PH202 for wiring:

1. Loosen the four frontplate screws and remove the cover.
2. The terminal strip is now visible.
3. Connect the power supply. Use the gland on the left for this cable.
4. Connect the sensor input, using the gland on the right (see fig. 3-7). Switch on the power. Commission the instrument as required or use the default settings.
5. Replace the cover and secure frontplate with the four screws.

(Note) : The solid line "INPUT2" (and dots in "INPUT1") of parts 1 to 4 of Figure 3-6 below indicate possible shorting-bar jumper settings. These markings are printed on the bodies of PH202 transmitters to help the user avoid wrong jumper settings. (Refer to Sec. 2-3, Sec. 3-2-1 below for a diagram and explanation of terminal connections).

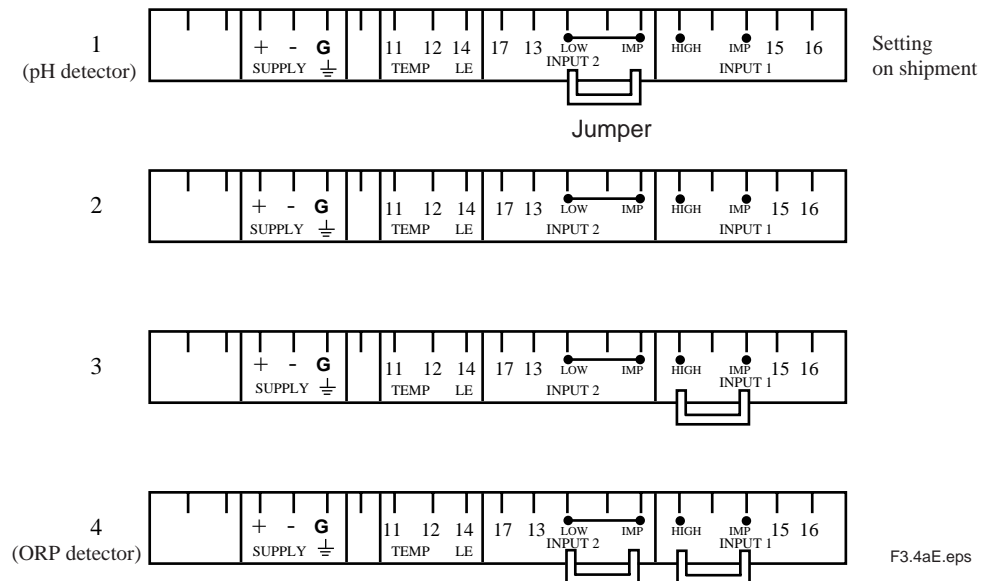


Figure 3-6. Wiring diagram of the PH202

3-2-1. Cables, terminals and glands

The PH202 is equipped with terminals suitable for the connection of finished cables in the size range: 0.13 to 2.5 mm (26 to 14 AWG). The glands will form a tight seal on cables with an outside diameter in the range of 6 to 12 mm.

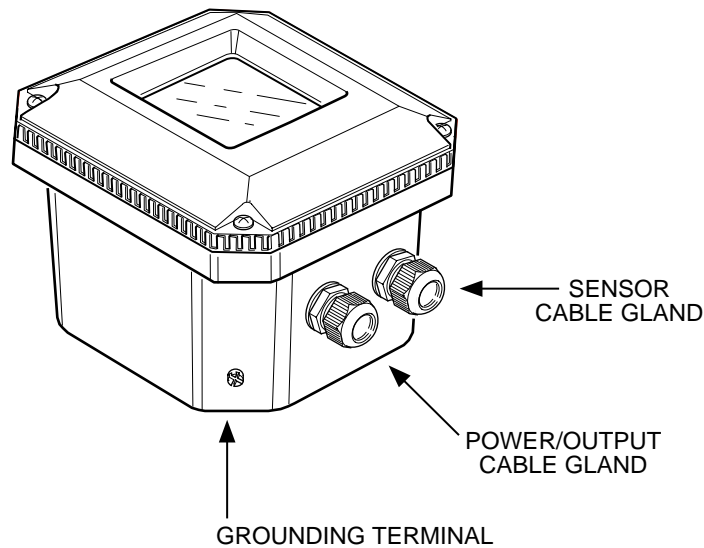


Figure 3-7. Glands to be used for cabling

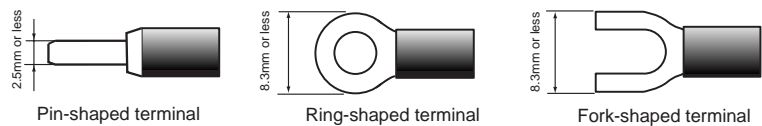
For the PH202, use cable of outside diameter 6 to 12 mm. When using individual electrodes — glass electrode, reference electrode — and separate temperature sensor, rather than an all-in-one sensor, use the circular packing with four holes. Plug the unused hole in the packing with the black plug. When using this packing, you have to be careful to ensure that it is well enough sealed to be waterproof.

Requirement of connecting with external instruments

	Terminal for pin cable terminal	Screw terminal (option /TB)
Crimp contact for cable	Pin-shaped crimp contact with sleeve insulator	Ring-shaped or fork-shaped crimp contact
Usable contact	max. 2.5 mm	Crimp contact shown as the figures see upper this table, for M3 screw
Torque for fixing	0.5 N·m or less	1.35 N·m (recommended)
Example of crimp contact*	Weidmuller Co., Ltd. make: H0.34/10, H0.5/12, H1/12, H1.5/12S	JST, Mfg. Co., Ltd. make: VD1.25-3 (Ring shape), VD1.25-S3A (Fork shape)

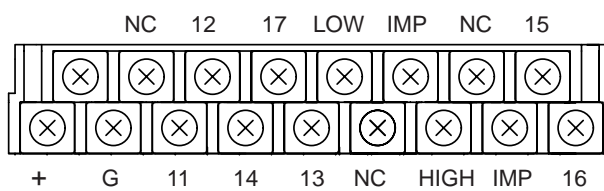
*Note: Other crimp contact may be required, depending on core-cable diameter.

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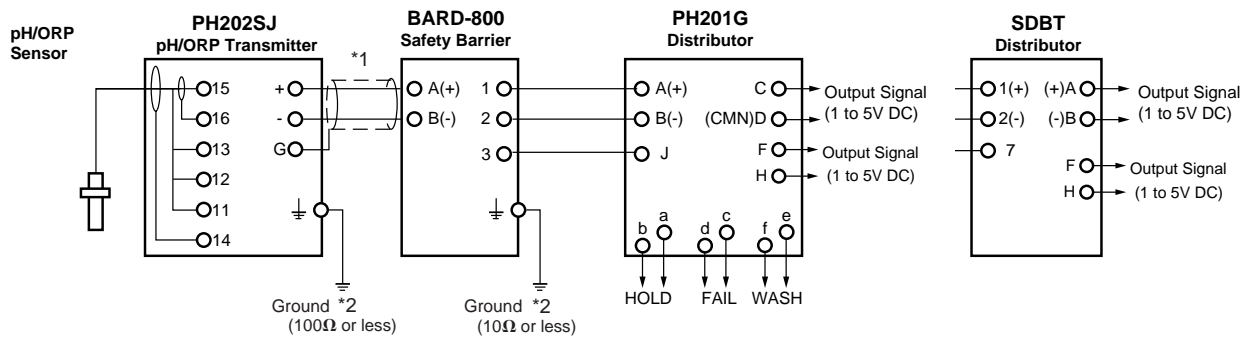
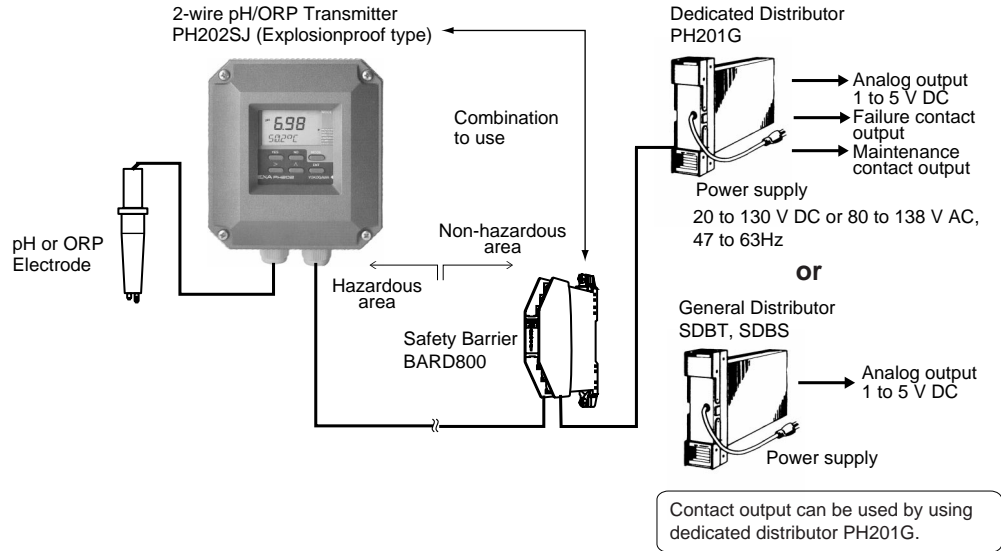
When the option of the screw terminal "/TB" is specified, the terminal block layout is as follows.



Note: Nothing is connected to NC

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When a pH sensor is used, connect both terminals LOW and IMP on the upper row with a shorting bar and nothing to both terminals HIGH and IMP on the lower row. When an ORP sensor is used, connect both terminals LOW and IMP on the upper row with a shorting bar as well both terminals HIGH and IMP on the lower row with another one.



- *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 intrinsically safe version ground resistance of PH202SJ should be 100Ω or less (Japanese Class D grounding). For safety barrier ground resistance should not exceed 10Ω (Japanese Class A grounding).

Figure 3-9. Sytem configuration and wiring example

3-2-2. Sensor cable connection

3.2.2.1 When the cable gland set attached as standard is used (when option code "/PAC" is not specified)

1. Remove the cable gland set attached on the instrument. Remove the plug on the gland, which is to seal the inside against moisture and after sensor cables have been installed, is no longer used.
2. Thread the cables through the nut and the gland.
3. Connect the cables to their designated terminals.
4. Fix the cable gland securely by tightening the nut inside the case. (Finger tight is enough.)

3.2.2.2 When the optional cable gland set is used (when option code "/PAC" is specified)

1. Remove the cable gland set attached on the instrument.
2. Remove the nut and the inner rubber seal from the optional cable gland set (option "/PAC"). The removed inner rubber seal is no longer used as it will be later replaced with the packing with 4 holes accompanying the optional cable gland. Note that the outer rubber ring seal should not be removed.
3. Thread the cables through the nut and the gland.
4. Connect the cables to their designate terminals.
5. Carefully insert the packing with 4 holes between the gland and the nut, taking care to keep the cables from getting tangled.
6. Ensure that any unused holes are filled with plugs accompanying the optional cable gland.
7. Fix the cable gland securely by tightening the nut inside the case. (Finger tight is enough.)

Item	Qty.	Description
1) Packing with 4 holes	1	Use in case of applying separate type pH detector (pH sensor, reference sensor and temperature element are not integrated.)
2) Plug (black)	2	For plugging the unused holes of Packing with 4 holes
3) Plug (Semi-transparency)	1	For plugging the unused holes of Packing with 4 holes

Note: The above items may also be necessary when using detectors other than YOKOGAWA made.

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When using this packing, be careful to ensure that it is well enough sealed to be waterproof. When separate type pH detector (pH sensor, reference sensor and temperature element are not integrated) is used, use packing with 4 holes. Plug the unused hole in the packing with the black plug.

3-2-3. Sensor cable connections using terminal box

If you can't install a sensor close to the PH202 transmitter, you may need to connect to an intermediate terminal box and use an extension cable. You should order these from Yokogawa, as these Yokogawa parts are specially designed so that system specifications will be met. The total cable length (for 5 m electrode cable plus 15 m extension cable) may be up to 20 m.

Refer to Figure 3-10 for the wiring.

3-3. Wiring of sensors

3-3-1. General precautions

Generally, transmission of signals from pH sensors is at a very low voltage and high impedance level. Thus a lot of care must be taken to avoid interference. Before connecting sensor cables to the transmitter make sure that next conditions are met:

- the sensor cables are not mounted in tracks together with high voltage and or power switching cables
- only standard coaxial electrode cables or extension cable are used
- the transmitter is mounted within the distance of the sensor cables (max. 20 m)
- the setup is kept flexible for easy insertion and retraction of the sensors in the fitting.

Excess Sensor Cable Handling for PH202SJ:

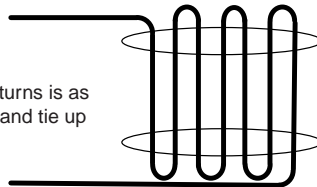
Since the allowable inductance of the sensor cable must be considered when the PH202SJ 2-wire type transmitter (intrinsically safe version) is used, observe the following instructions.

- Do not loop excess length of sensor cable.
- Fold it so length of turns is as long as possible, and tie up in a bundle.

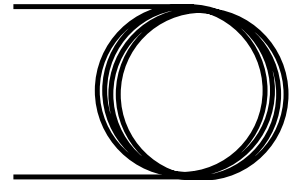
Good Example



Fold so length of turns is as long as possible, and tie up in a bundle.



Bad Example



3-3-2. Sensor wiring

Refer to figure 3-10 and 3-11, which includes drawings that outline sensor wiring.

The PH202 can be used with a wide range of commercially available sensor types, both from Yokogawa and other manufacturers. The sensor systems from Yokogawa fall into two categories; the ones that use a fixed cable and the ones with separate cables.

To connect sensors with fixed cables, simply match the terminal numbers in the instrument with the identification numbers in the instrument on the cable ends.

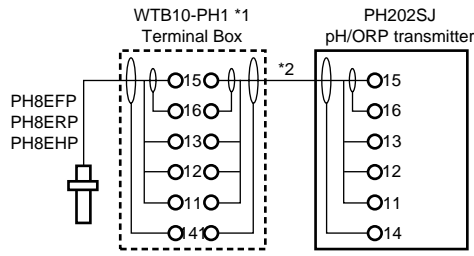
The recommended procedure is to color-code each end of the cables to match the sensors with the color strips provided with each cable. This provides a quick way to identify the ends of the cables belonging to a particular sensor when they are installed. (The procedure for fixing the identification labels is described in detail in the instruction sheet provided with the cable.)

Connection cable

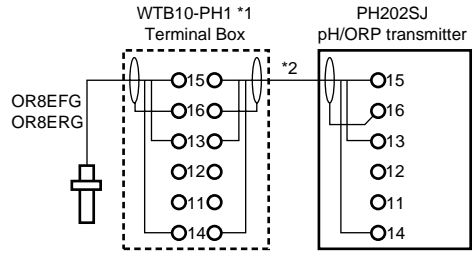
To connect the other sensor systems, follow the general pattern of the terminal connections as listed below:

11 & 12	Temperature compensation resistor input (Pt100, Pt1000, 3kΩ PTC, 5.1kΩ PTC, 8.55kΩ NTC, 350Ω PTC, 6.8kΩ PTC, 10kΩ PTC)
13	Input no. 2 (normally the reference element)
14	Liquid earth (solution ground) connection
15	Input no. 1 (normally the measuring element)
16	Screen (shield) for input no.1
17	Screen (shield) for input no. 2

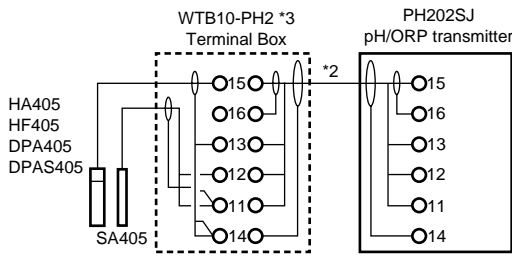
In connecting to a general purpose pH detector



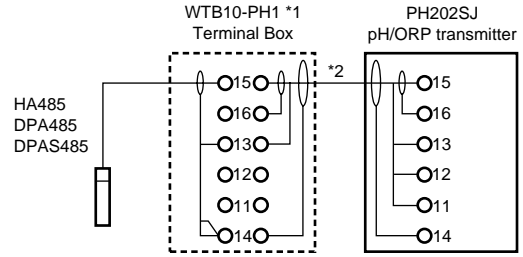
In connecting to a general purpose ORP detector



In connecting to a special purpose pH detector



In connecting to a special purpose ORP detector



*1 : Terminal Box is used only when pH/ORP transmitter is installed far from the cable length of pH/ORP detector.

*2 : The cable is specified by an option code of the terminal box.

*3 : Use the box in combining PH202 with SA405.

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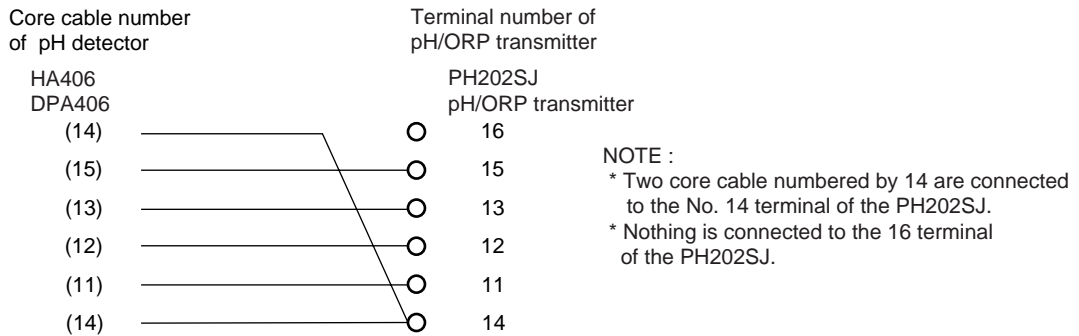
Figure 3-10 Wiring of a detector

NOTE:

When PH202.../TB option specified for using the electrode with folk terminal —for PH200/PH400, OR200/OR400 type—. Use the cable gland within the transmitter. For wiring, refer to right figure .

	pH electrode	ORP electrode
GE	15 (Red)	GE 15 (Red)
RE	13 (Brown)	RE 13 (Brown)
T1	11 (Black)	SE 14 (Black)
T2	12 (White)	G 16 (Green)
SE	14 (Green)	
S	16 (Yellow)	

In connection of the PH202G, SJ and a special purpose pH electrode having temperature element



In connection of the PH202G, SJ and FU20 pH/ORP detector

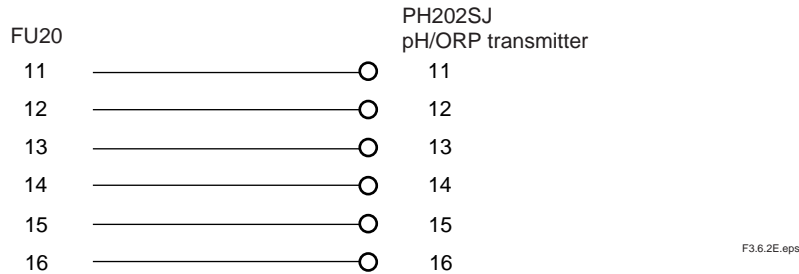


Figure 3-11 Sensor wiring

3-3-3. Liquid earth

In all circumstances, the sensor side of the measuring loop must be grounded to the measuring liquid. The PH202 uses advanced differential high impedance input circuits. This technique calls for grounding of the liquid. In addition to that the sensor checking circuits also use the liquid earth for measurement of impedance of the sensors. All Yokogawa fittings have provisions for this connection. It is usually called liquid earth in all our manuals.

A separate connection should be made to the terminal numbered 14 in all cases to get a proper and stable measuring loop.

For sensors with a liquid earth electrode, be sure to connect the liquid earth terminal to pin 14 of the transmitter. The transmitter uses the liquid earth terminal for an impedance check (to determine if a functional sensor is connected).

Yokogawa sensors with liquid earth terminals include the PH8EFP, PH8ERP, PH8EHP, OR8ERG, OR8EFG and FU20 and so on.

Yokogawa sensors without liquid earth terminals include the HA405, HA406, DPA405, DPAS405, DPA406, HF405, HA485, DPA485 and DPAS485.

The liquid earth electrode is inside the sensor, and at the potential of the measured solution. As far as possible, you should use a sensor with liquid earth electrode and differential input, such as the new PH202 transmitter, to eliminate ground loops and so improve measurement stability. The liquid earth terminal is also used for an impedance check (to determine if a functional sensor is connected). Be sure to connect the liquid earth wire from the sensor to terminal 14 on the transmitter.

3-3-4. Access to terminal and cable entry

1. To access the terminals, first remove the four screws holding the terminal cover on the front and remove the cover.
2. Thread the wires from the sensor through to the transmitter terminals, and wire as per the wiring diagram. Make sure that all terminal wiring is firmly secured and that bare wires or terminals do not touch each other.
3. Screw the gland tight to make it moisture proof. Use a spanner of the correct size; do not use a monkey wrench.

3-4. Wiring of power supply

3-4-1. General precautions

Do not activate the power supply yet. First make sure that the DC-power supply is according to the specifications given.



Use an appropriate DC power supply (such as from the PH201G distributor) for the PH202 transmitters. Under no circumstances should you connect AC power such as 100V AC or similar AC power supply line. To measure pH or ORP in hazardous locations, use the PH202SJ with BARD-800 or BARD-400 (for replacement) intrinsic safety barriers.

The cable leading to the distributor (power supply) transports power to and output signal from the transmitter. Use a two conductor shielded cable with a size of at least 1.25 mm² and an outside diameter of 6 to 12 mm.

Grounding:

Be sure to ground the transmitter by using the ground terminal on its case.

Connect the G terminal inside the transmitter, to the shield wire of two-core shield cable which is connected between the distributor and transmitter.

3-4-2. Connection of the power supply

The terminal strip is accessed as was described in §3-2. Use the left-hand gland to insert the supply / output cable to the transmitter. Connect the supply to the terminals marked +, – and G as is indicated in figures 3-10.

3-4-3. Switching the instrument on

After all connections are made and checked, the power can be switched on from the distributor. Observe the correct activation of the instrument at the display. If for any reason the display does not indicate a value, refer to Chapter 8 of IM 12B07D02-01E, the trouble shooting section.

3-5. Choice of pH and/or ORP Detector, and Setting of Jumper

3-5-1. Impedance measurement jumper settings

Jumper for impedance measurement is set in accordance with the kind of a detector to be used, pH detector or ORP detector. Adapt the software setting condition (refer to service code 03 and 04 of IM 12B07D02-01E) for the jumper setting condition.

NOTE : It is important to decide first which application and which settings are appropriate for the installation. This decision is best made before the jumpers are installed, because the cables will rest beside the jumpers in their installed positions. No.1 condition on the Table 3-2 is set on shipment. For ORP use, change the setting to No.4.

Table 3-2 Impedance measuring jumpers

Figure no.	Jumper Settings Input #1	Jumper Settings Input #2	Application & Sensor Connections
1 (pH detector)	High Impedance	Low Impedance	For Normal pH sensors INPUT1:Glass electrode INPUT2:Reference electrode
2	High Impedance	High Impedance	Special electrodes using 2 glass sensors
3	Low Impedance	High Impedance	INPUT1:ORP (pH compensated) or rH metal sensor on Input #1 INPUT2:pH glass (as reference)
4 (ORP detector)	Low Impedance	Low Impedance	For ORP (Redox measurement) sensor INPUT1:metal electrode for ORP measure INPUT2:Normal reference electrode

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For convenience insulated jumper links are provided. Ordinary wire links can also be used, and are just as effective.

The following four jumper figure illustrations (figure 3-12) show the jumper positions related to the figure numbers in the above table.

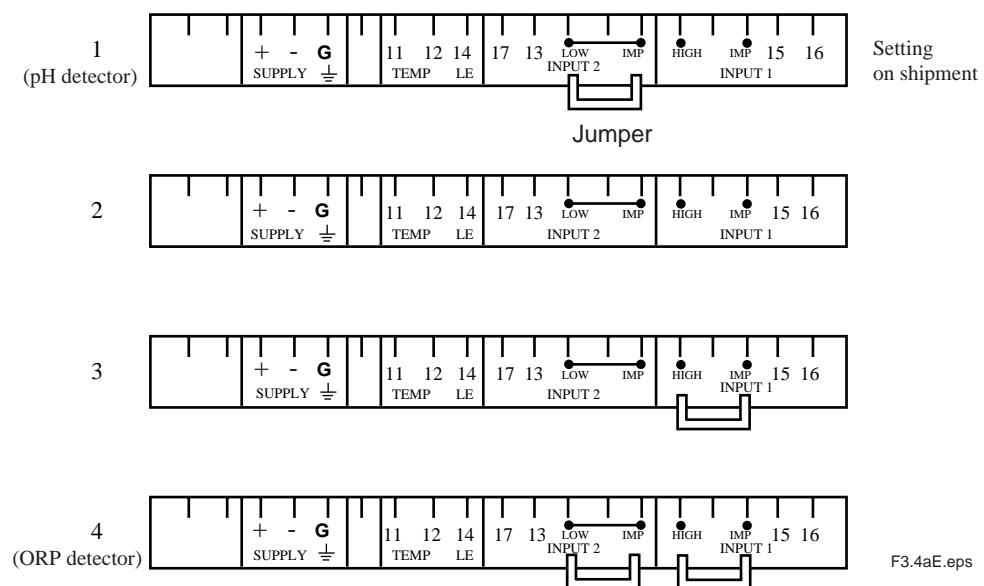


Fig. 3-12 Jumper positions

4. MAINTENANCE

4-1. Periodic maintenance for the PH202 transmitter

The PH202 transmitter requires very little periodic maintenance. The housing is sealed to IP65 (NEMA 4X) standards, and remains closed in normal operation. Users are required only to make sure the front window is kept clean in order to permit a clear view of the display and allow proper operation of the pushbuttons. If the window becomes soiled, clean it using a soft damp cloth or soft tissue. To deal with more stubborn stains, a neutral detergent may be used..

NOTE:

Never use harsh chemicals or solvents. In the event that the window becomes heavily stained or scratched, refer to Customer Maintenance Parts List for replacement part numbers..

When you must open the front cover and/or glands, make sure that the seals are clean and correctly fitted when the unit is reassembled in order to maintain the housing's weatherproof integrity against water and water vapor. The pH measurement uses high impedance sensors and may otherwise be prone to problems caused by exposure of the circuitry to condensation.

The PH202 contains a logbook feature which needs a clock to provide the timings. The PH202 instrument contains a lithium cell (battery) to support the clock function when the power is switched off. This cell needs to be replaced at 5 yearly intervals (or when discharged). Contact your nearest Yokogawa service centre for spare parts and instructions.

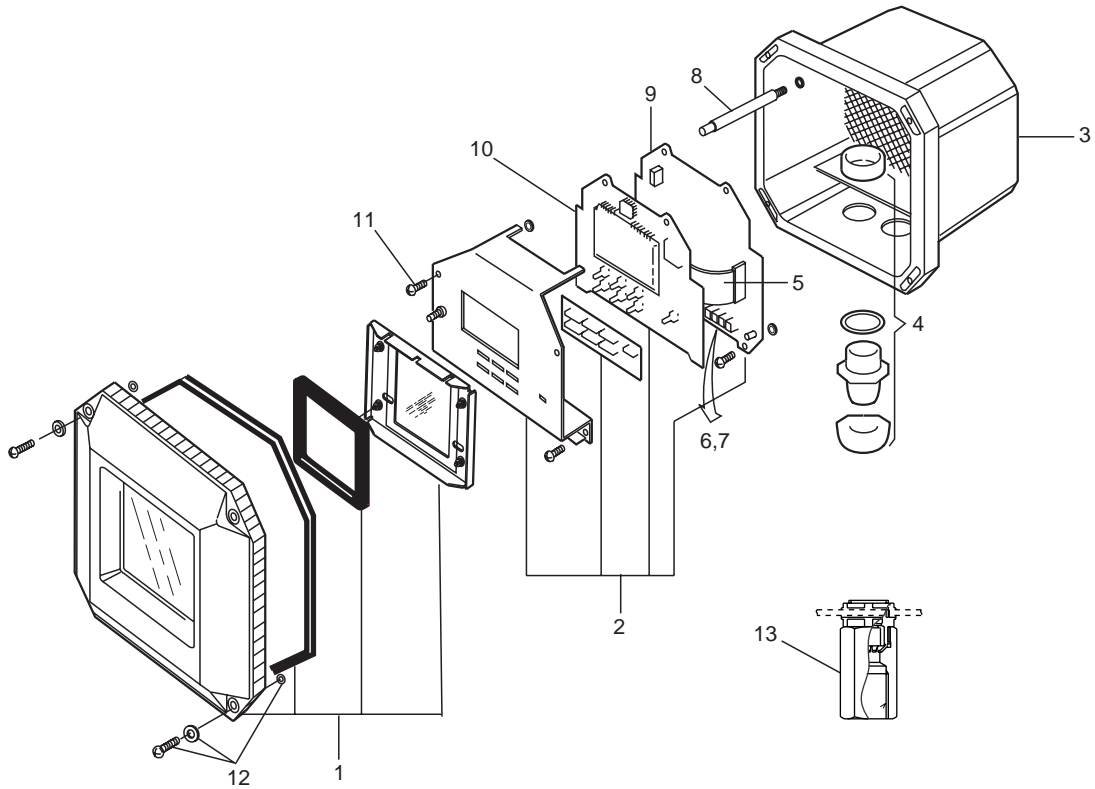


WARNING

For the PH202SJ, to prevent the risk of explosion due to electrostatic discharge in hazardous areas, do not rub the transparent plastic window of the SC202SJ transmitter's cover with a dry cloth and the like. When cleaning the window, care must be taken to avoid electrostatic charges. Normal key operation does not generate electrostatic charges.

Customer Maintenance Parts List

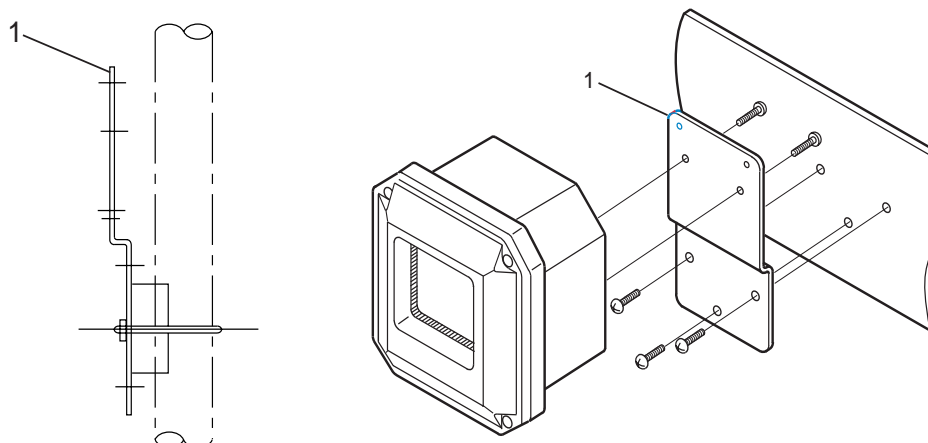
Model PH202SJ [Style: S2] 2-wire pH/ORP Transmitter



Item	Part No.	Qty	Description
1	—	—	Cover Assembly
	K9315CA	1	Polyurethane Coating
	K9315CN	1	Epoxy-polyester Coating
2	K9660YB	1	Internal Works Assembly with amplifier assembly
3	—	—	Housing Assembly
	K9315BK	1	Polyurethane Coating
	K9315BV	1	Epoxy-polyester Coating
4	K9660YU	1	Cable Gland Assembly 2 units
5	K9660BQ	1	Flat Cable
6	—	—	Pin Terminal Unit
	A1726JD	1	3 terminals type
	A1727JD	1	5 terminals type
7	K9184AA	1	Screw Terminal Unit when /TB specified
8	K9660YR	1	Stud Assembly
*9	K9660PB	1	PH202SJ Analogue Assembly
*10	K9660BV	1	Digital/Display Board
11	K9660YQ	1	Screw Assembly to fix amplifier
12	—	—	Screw Assembly to fix cover
	K9660YP	1	Stainless steel screw
	K9660YS	1	Stainless steel screw with Teflon coated when /SPS specified
13	—	—	Adapter Assembly
	K9414DH	1	For G1/2 screw when /AFTG specified
	K9414DJ	1	For 1/2NPT screw when /ANSI specified

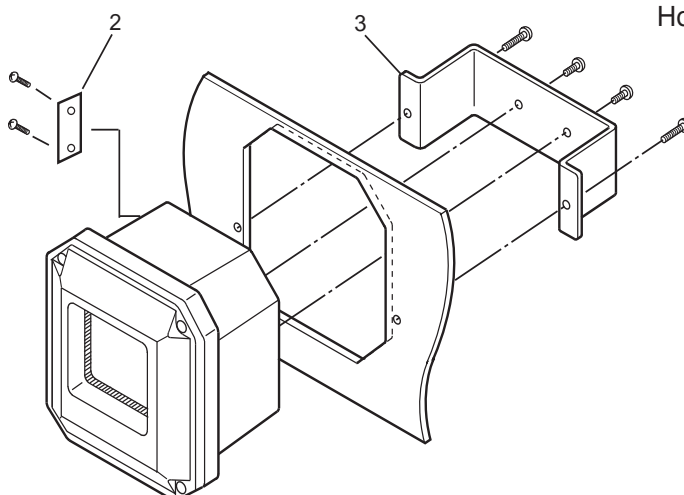
* Do not exchange these parts. Call serviceman.

Pipe/Wall Mounting Hardware (Option Code : /U)



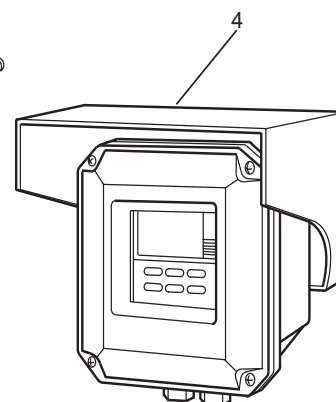
Panel Mounting Hardware

(Option Code : /SCT)



(Option Code : /PM)

Hood to sun protection (Option Code : /H /H2)



Item	Parts No.	Qty	Description
1	K9171SS	1	Universal Mount Set (/U)
2	K9311BT	1	Tag Plate (/SCT)
3	K9311KA	1	Fitting Assembly (/PM)
4	K9311KG	1	Hood Assembly (/H)
	K9660JA	1	Hood Assembly (/H2)

Revision Record

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Manual Number : IM 12B07D02-11E

Edition	Date	Remark (s)
1st	Mar. 2007	Newly published (separated from IM 12B07D02-01E, style changed to S2)
