

General Specifications

Model PH202G, PH202S, PH202SJ
2-Wire Type pH/ORP (Redox) Transmitter

EXA PH

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 measurement. The electrodes must be properly cleaned and regularly calibrated. Yokogawa on-line 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. Flow-through submersion, suspension and float types of holders are available.

HART COMMUNICATION

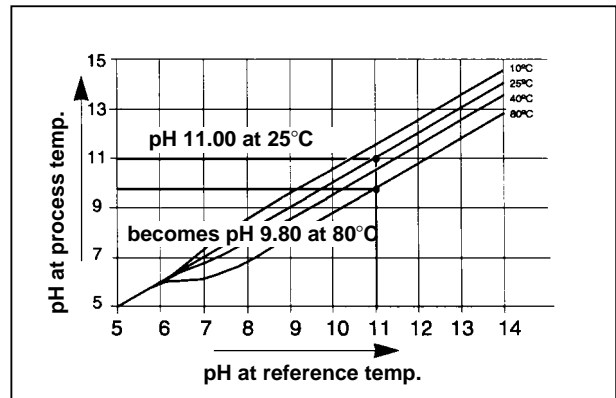
One of the features of smart field devices is their ability to detect faults, either in the device electronics or in an associated sensor. Using a fieldbus system, such faults are reported in the device status byte in every message (assuming that communication is still possible!). For HART, it is still 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

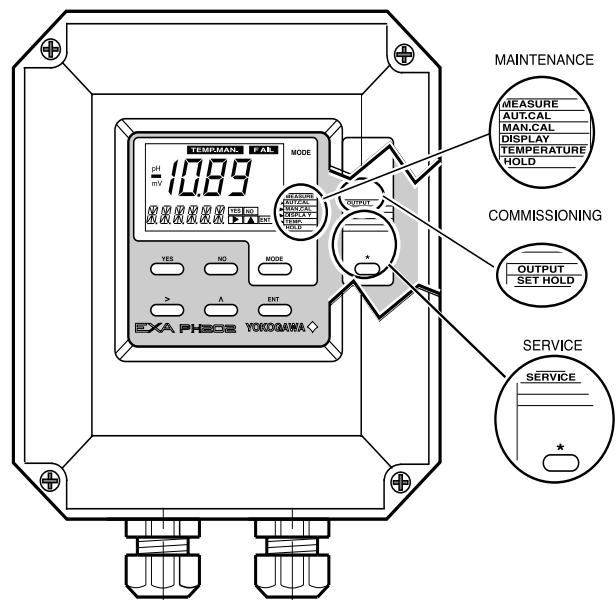
The figure below shows the strong change in pH with temperature, caused by the dissociation constant of water changing. This effectively shifts the neutral point from pH7. In order to reliably control the pH of solutions it is necessary to compensate for the changes. The PH202 transmitter has a simple-to-operate 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.



F2.EPS

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 straight-forward 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.

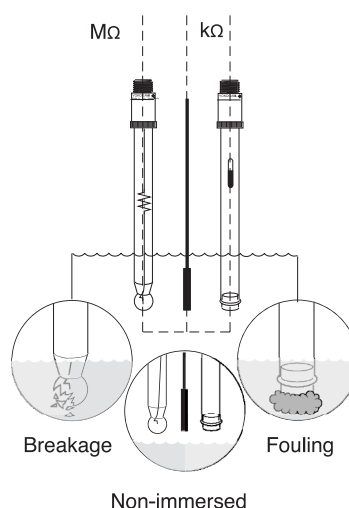
2. Faults

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 $10^{12} \Omega$) 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
 - rH : 0 to 55 rH
 - Temperature : -30 to 140°C (-20 to 300°F)
 - 8.55k Ω NTC sensor : -10 to 120 °C (10 to 250°F)
 - for 10k Ω PTC sensor : -20 to 140 °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 8.55k Ω 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 Nernst 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.

Manual, using standard sample, by correcting reading to value of standard.

Calibration by slope and asymmetry potential setting. (IEC746-2)

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.

PH202S: 17 to 31.5 V, see Fig. 2.

Maximum load resistance:

For the PH202G, see Fig. 1.

200Ω or less with the PH201G

50Ω or less with the SDBT

For the PH202S, see Fig. 2.

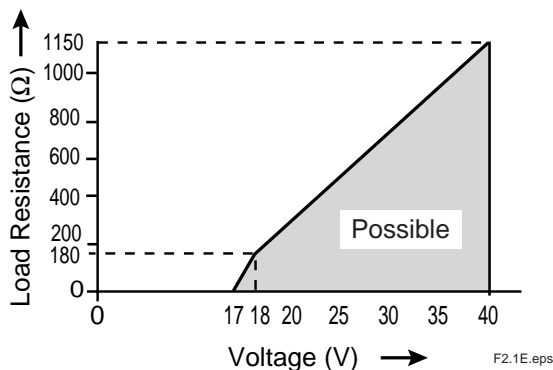


Fig.1 Supply voltage/ load diagram for the PH202G

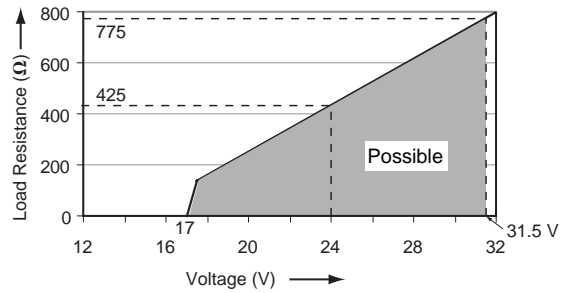


Fig.2 Supply voltage/ load diagram for the PH202S

For the PH202SJ

175Ω or less with the PH201G

25Ω or less with the SDBT

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 depending on distributor used should be as follows.

(PH201G) + (BARD-800): 175 Ω

(SDBT) + (BARD-800): 25 Ω

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"

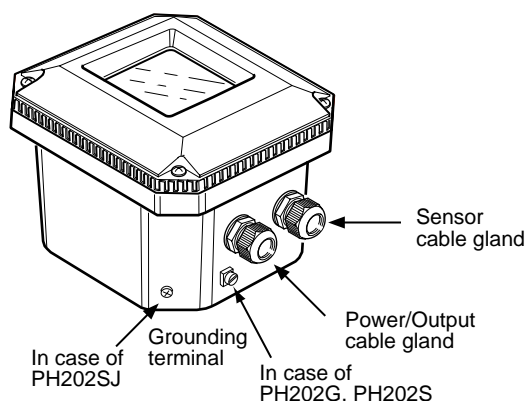
Ambient operating temperature: -10 to + 55 °C

Storage temperature: -30 to +70 °C

Humidity : 10 to 90% RH (Non-condensing)

Housing :

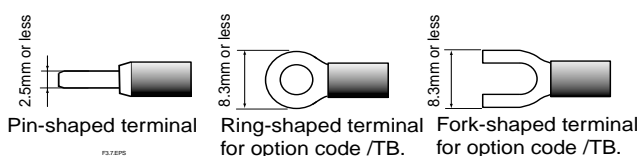
- Case: Cast aluminum case with chemically resistant coating
- Cover: Polycarbonate window.
- Case color: Off-white (Equivalent to Munsell 2.5Y8.4/1.2)
- Cover color: Deep sea Moss green (Equivalent to Munsell 0.6GY3.1/2.0)



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

	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. T3.2E.eps

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 out put of pH.

EMC Conformity standards (PH202G, S) ,

EN 61326-1 Class A, Table 2 (For use in industrial locations)

EN 61326-2-3

EN 61326-2-5 (pending)

PH202S Intrinsically safe type

Item	Description	Code
Factory Mutual (FM)	FM Intrinsically safe Approval Applicable standard: FM3600, FM3610, FM3810 Intrinsically Safe for Class I, Division 1, Groups ABCD Class I, Zone 0, AEx ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Intrinsically Safe Apparatus Parameters Vmax=31.5 V, Imax=100 mA, Pmax=1.2 W, Ci=22 nF, Li=35 µH	-U
IECEx	IECEx Intrinsically safe (see Note)	
CENELEC ATEX	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020, EN60079-26 Certificate: KEMA 06ATEX0218 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ii=100 mA, Pi=1.2 W, Ci=22 nF, Li=35 µH	-E
IECEx	IECEx Intrinsically safe (see Note)	
Canadian Standards Association (CSA)	CSA Intrinsically safe Approval Applicable standard: C22.2, No.0-M1991, C22.2, No.04-M2004, C22.2, No.157-M1992, C22.2, No.61010-1 Ex ia Class I, Division 1, Groups ABCD, Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui(Vmax)=31.5 V, Ii(Imax)=100 mA, Pi(Pmax)=1.2 W, Ci=22 nF, Li=35 µH	-C
IECEx	IECEx Intrinsically safe (see Note)	
(Note) IECEx Scheme	IECEx Intrinsically safe Applicable standard: IEC60079-0, IEC60079-11, IEC60079-26 Certificate: IECEx KEM 06.0052X Zone 0 Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ii=100 mA, Pi=1.2 W, Ci=22 nF, Li=35 µH	T1E.EPS

Type of protection "n" or Non-incendive of PH202S

Item	Description	Code
Factory Mutual (FM)	FM Non-incendive safe Approval Applicable standard: FM3600, FM3611, FM3810 Non-incendive for Class I, Division 2, Groups ABCD, Zone 2 Temp. Class: T4, Amb. Temp.: -10 to 55°C Non-incendive Safe Apparatus Parameters Vmax=31.5 V, Ci=22 nF, Li=35 µH	-N
CENELEC ATEX	CENELEC ATEX (KEMA) Type of protection "n" Applicable standard: EN60079-0:2006, EN60079-15:2003 Certificate: KEMA 06ATEX0219 EEx nA [nL] IIC, Group: II, Category: 3G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ci=22 nF, Li=35 µH	
Canadian Standards Association (CSA)	CSA Non-incendive safe Approval or type of protection "n" Applicable standard: C22.2, No.0-M1991, C22.2, No.04-M2004, C22.2, No.157-M1992, C22.2, No.213-M1987, C22.2, No.61010-1 Class I, Division 2, Groups ABCD Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui(Vmax)=31.5 V, Ci=22 nF, Li=35 µH	
IECEX Scheme	IECEX Type of protection "n" Applicable standard: IEC 60079-15:2001, IEC 60079-0:2004 Certificate: IECEX KEM 06.0052X Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ci=22 nF, Li=35 µH	

T2.EPS

Item	Description	Code
Factory Mutual (FM)	FM Intrinsically safe Approval Applicable standard: FM3600, FM3610, FM3810 Intrinsically Safe for Class I, Division 1, Groups ABCD Class I, Zone 0, AEx ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Intrinsically Safe Apparatus Parameters Entity { Vmax=24 V, Imax=250 mA, Pmax=1.2 W, Ci=220 pF, Li=0 µH	-P or -F
	FISCO { Vmax=17.5 V, Imax=380 mA, Pmax=5.32 W, Ci=220pF, Li=0 µH	-F
	FM Non-incendive safe Approval Applicable standard: FM3600, FM3611, FM3810 Non-incendive Safe for Class I, Division 2, Groups ABCD, Zone 2 Temp. Class: T4, Amb. Temp.: -10 to 55°C Non-incendive Safe Apparatus Parameters Entity { Vmax=32 V, Pmax=1.2 W, Ci=220 pF, Li=0 µH	-B or -D
FNICO { Vmax=32 V, Pmax=5.32 W, Ci=220 pF, Li=0 µH	-D	

FM.EPS

Item	Description	Code
CENELEC ATEX Entity	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020 EN60079-26 Certificate: KEMA 07ATEX0048 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=220 pF, Li=0 µH	-P or
CENELEC ATEX FISCO	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020 EN60079-26, EN60079-27 Certificate: KEMA 07ATEX0048 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=220 pF, Li=0 µH	-F
CENELEC ATEX	CENELEC ATEX (KEMA) Type of protection "n" Applicable standard: EN60079-0:2006, EN60079-15:2003 Certificate: KEMA 07ATEX0049 EEx nA [nL] IIC, Group: II, Category: 3G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=32 V, Ci=220 pF, Li=0 µH	-B or -D

ATEX.EPS

Item	Description	Code
IECEX Scheme Entity	IECEX Intrinsically safe Applicable standard: IEC 60079-0, IEC60079-11, IEC60079-26 Certificate: IECEX KEM 07.0026X Zone 0 Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=220 pF, Li=0 µH	-P or
IECEX Scheme FISCO	IECEX Intrinsically safe Applicable standard: IEC 60079-0, IEC60079-11, IEC60079-26, IEC60079-27 Certificate: IECEX KEM 07.0026X Zone 0 Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=220 pF, Li=0 µH	-F
IECEX Scheme	IECEX Type of protection "n" Applicable standard: IEC 60079-15:2001, IEC 60079-0:2004 Certificate: IECEX KEM 07.0026X Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=32 V, Ci=220 pF, Li=0 µH	-B or -D

IEC.EPS

Item	Description	Code
Canadian Standards Association (CSA)	CSA Intrinsically safe Approval Applicable standard: C22.2, No. 0-M1991, C22.2, No. 04-M2004, C22.2, No. 157-M1992, C22.2, No. 61010-1 Ex ia Class I, Division 1, Groups ABCD Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Entity { Ui(Vmax)=24 V, Ii(Imax)=250 mA, Pi(Pmax)=1.2 W, Ci=220 pF, Li=0 µH	-P or -F
	FISCO { Ui(Vmax)=17.5 V, Ii(Imax)=380 mA, Pi(Pmax)=5.32 W, Ci=220 pF, Li=0 µH	-F
	CSA Non-incendive safe Approval or type of protection "n" Applicable standard: C22.2, No.0-M1991, C22.2, No.04-M2004, C22.2, No.157-M1992, C22.2, No.213-M1987, C22.2, No. 61010-1 Class I, Division 2, Groups ABCD Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Entity: Ui(Vmax)=32 V, Ci=220 pF, Li=0 µH FNICO: Ui(Vmax)=32 V, Ci=220 pF, Li=0 µH	-B or -D

CSA.EPS

Item	Description	Code
NEPSI	NEPSI Intrinsically safe Approval Applicable standard: GB3836.1-2000, GB3836.4-2000 Cert No. GYJ081156X Ex ia IIC T4/T6 Temp. Class: T4, Amb. Temp.: -10 to 55°C Temp. Class: T6, Amb. Temp.: -10 to 40°C Ui(Vmax)=31.5 V, Ii(Imax)=100 mA Pi(Pmax)=1.2 W, Ci=22 nF, Li=35 µH	-K

NEPPEPS

PH202SJ TIIS Intrinsically safe type Electrical:

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

T5a.eps

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

T6e.eps

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 to connect may cause errors on 4-20 mA signal due to characteristics of safety barrier. When BARD-800/400 safety barrier is used, be sure 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® communications

- Input** : Two-wire system, 4-20 mA DC
- Power supply** : PH202G : up to 40 volts
 PH202S ,SJ: 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 Signal** : Isolated output of 4 to 20 mA DC.
 : 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 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.

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.

<Input/Output Signal Specifications>

- Number of input points (Number of transmitter units connectable): 1 point
- Output signal: 1 to 5 V DC (2 points)
- Load resistance : 2 kΩ or less (1 to 5 V DC Output)
- Isolation system : Loop isolation type

<Mounting /Form>

Mounting method : Indoor rack mounting
 Connection method :
 External signal connection : M4 screw terminal connection
 Power supply / Ground connection :
 100V : JIS C8303 ground type 2 plug connection
 220V : CEE 7VII (European electrical device standard) plug connection
 Cable length : 300 mm
 External dimensions : 180H x 48W x 300D mm
 Weight : Approx. 1.7 kg (Including rack and case)

<Standard Specifications>

Accuracy : ± 0.2 % of span
 Transmitter supply voltage : 26.5 ± 1.5 V DC
 Maximum current and power consumption
 24 V DC : Approx. 4.8 W
 100 V AC : Approx. 7 VA
 220 V AC : Approx. 11 VA
 Insulation resistance
 Between I/O terminals and ground pin : 100 M Ω / 500 V DC
 Between power supply pins and ground pin : 100 M Ω / 500 V DC

<Operating Specifications>

Ambient temperature : 0 to 50°C
 Ambient humidity : 5 to 90 % RH (Non-condensing)
 Power supply : Dual use AC/DC
 100 V : DC power 20 to 130 V, no polarity
 AC power 80 to 138 V, 47 to 63 Hz
 220 V : DC power 120 to 340 V, no polarity
 AC power 138 to 264 V, 47 to 63 Hz

<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.

3. Safety Barrier BARD-800 (for PH202SJ)

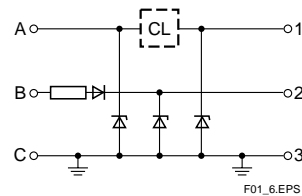
The BARD-800 intrinsic safety (IS) barrier, connected to intrinsic safety devices installed in a hazardous area, configure an IS system in such a way that electric currents and voltages delivered from a safe area into a hazardous area can be limited to prevent energy generated in the IS circuit from igniting specified explosive gases.

<Standard Specifications>

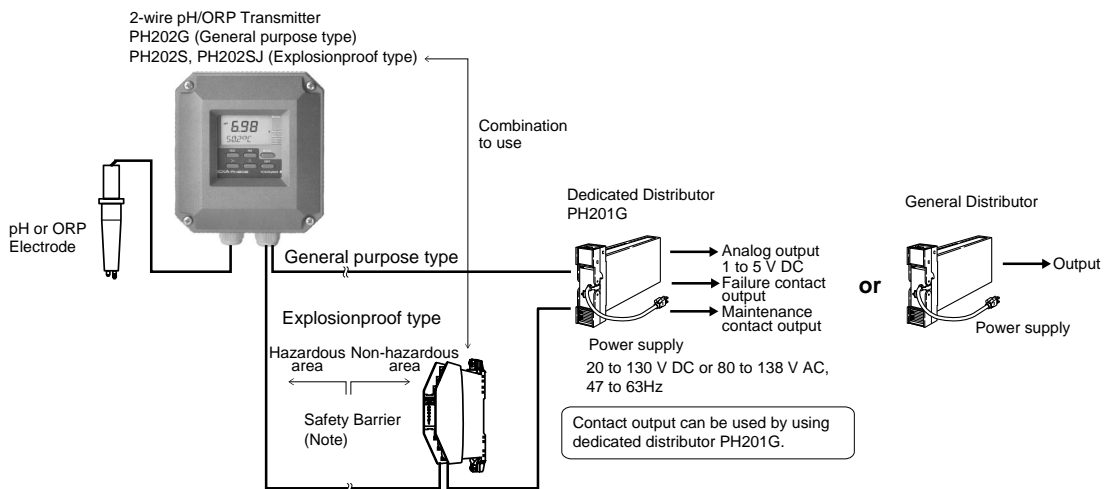
Type: Zener barrier
 Use: 4 to 20 mA DC signal
 Intrinsic safety class and certificate number:
 Construction Grade; i3aG5 (certified by TIIS, No. 55577)
 Intrinsic safety ratings:
 Vmax (Uo): 31.5 V
 Icc (Io): 29.2 mA
 Pmax (Po): 0.92 W
 Cext (Co): 42 nF
 Lext (Lo): 4.2 mH
 VM (Um): 250 V AC/DC
 Leakage current: 10 μ A at 28 V
 Internal voltage drop:
 $139\Omega \times I_o + 0.9$ V, 4.16 V at 23.6 mA

Maximum impressed voltage: 31.0 V
 Rated current of internal fuse: 50 mA
 Working temperature range: -10 to 50°C
 Storage temperature range: -40 to 90°C
 Humidity range: 5 to 95% RH (no condensation)
 Installation location: Nonhazardous area (indoors)
 Grounding: Grounding resistance of 10 Ω or less (equivalent to Japanese Industrial Standard Class A)
 Housing: Material; Polycarbonate, Color; Light green
 Weight: 160 g

Schematic Diagram



System Configuration Example



(Note) For intrinsically safe approval, use the safety barrier certified by the testing laboratories.
 Use the safety barrier designed for the communications when PH201G distributor is used.
 Use BARD-800/400 when PH202SJ is used.

MODEL AND SUFFIX CODES

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

[Style : S3]

Model	Suffix Code	Option Code	Description
PH202G	.....	.....	2-Wire pH/ORP Transmitter (*1)
Type	-E -C -U -P -F	..... ..... ..... ..... .....	mA with HART (For other regions) mA with HART (Canada type) mA with HART (North America type) Profibus FF
Language	-J -E	..... .....	Japanese English
Option	Mounting Hardware Hood Tag Plate Conduit Adapter	/U /PM /H /H2 /SCT /AFTG /ANSI /TB /X1	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) Epoxy baked finish (*3)

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

T8-1.eps

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

[Style : S3]

Model	Suffix Code	Option Code	Description
PH202S	.....	.....	2-Wire pH/ORP Transmitter (*1)
Type	-E -C -U -K -P -F -B -N -D	..... ..... ..... ..... ..... ..... ..... ..... .....	Intrinsic safe mA with HART (ATEX) Intrinsic safe mA with HART (CSA) Intrinsic safe mA with HART (FM) Intrinsic safe mA with HART (NEPSI) Intrinsic safe Profibus (ATEX, CSA, FM) Intrinsic safe FF (ATEX, CSA, FM) Non-incendive FF (ATEX, CSA, FM) (*3) Non-incendive mA with HART (ATEX, CSA, FM) (*3) Non-incendive Profibus (ATEX, CSA, FM) (*3)
Language	-J -E	..... .....	Japanese English
Option	Mounting Hardware Hood Tag Plate Conduit Adapter	/U /PM /H /H2 /SCT /AFTG /ANSI /X1	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 Epoxy baked finish (*2)

(*1) The PH202S can be also used as ORP transmitter. (Setting can be made in the field.)

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

(*3) When the instrument with Suffix Code "-B,-N,-D" is used, take measures so that the display window is not exposed to direct sunlight.

3. 2-Wire pH/ORP Transmitter (TIIS Explosionproof type) [Style : S2]

Model	Suffix Code	Option Code	Description
PH202SJ	.....	.....	Intrinsically safe type transmitter (*1)
Type	-1	.....	TIIS Certification (*5)
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	Teflon coated SUS steel screws (resistance to salt corrosion) (*2)
/X1		Epoxy baked finish (*3)	
	/PAC	Cable gland for separate type detector (*4)	

PH202SJ is available only for Japan, South Korea , Taiwan, China, and Russia.

(*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.

T8-12.eps

(*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-transparent)	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 ones.

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 holes in the packing with the black plugs.

(*5) "TIIS Certification" as a certified explosion approval from the Technology Institution of Industrial Safety.

4. Distributor (Dedicated EXA Series)

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

T8-2.eps

5. Safety Barrier BARD-800 for PH202SJ only

Model	Suffix Codes	Description
BARD	.....	Safety barrier
Use	-8	For use with a 4 to 20 mA signal
Type	00	Zener barrier
Style code	*A ...	Style A

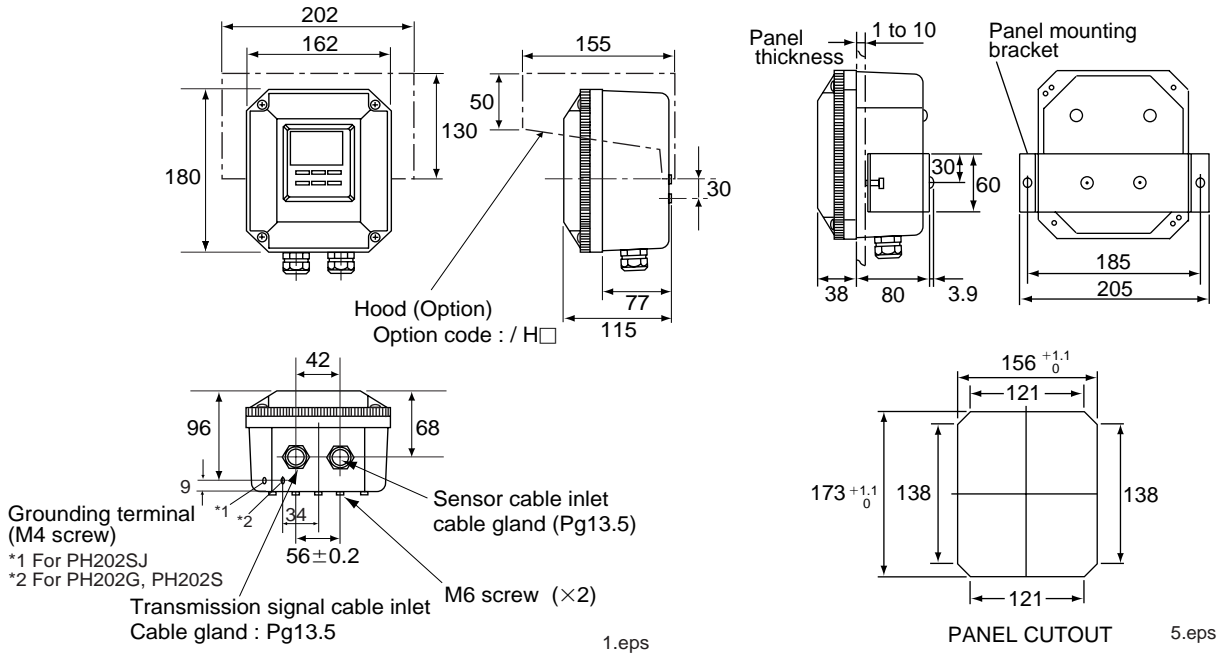
T01.EPS

DIMENSIONS

pH/ORP Transmitter

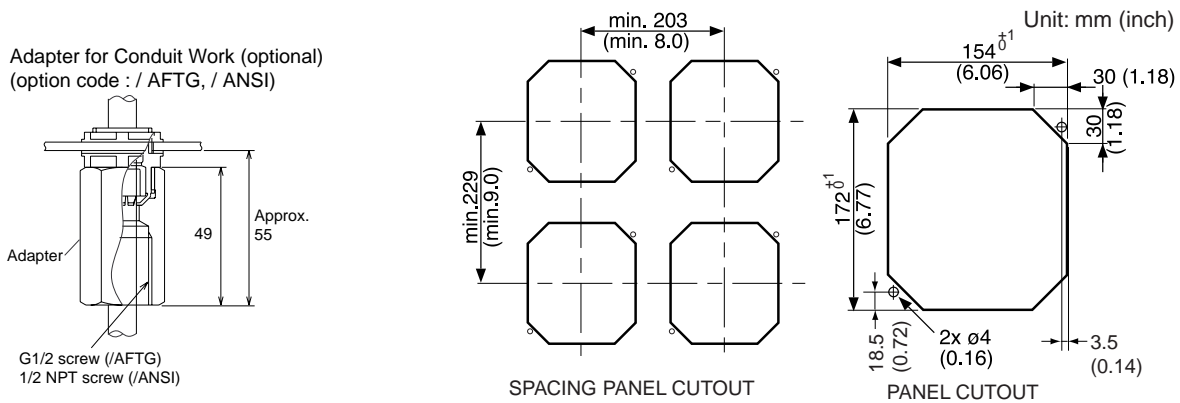
Panel Mounting (Option code : /PM)

Unit : mm

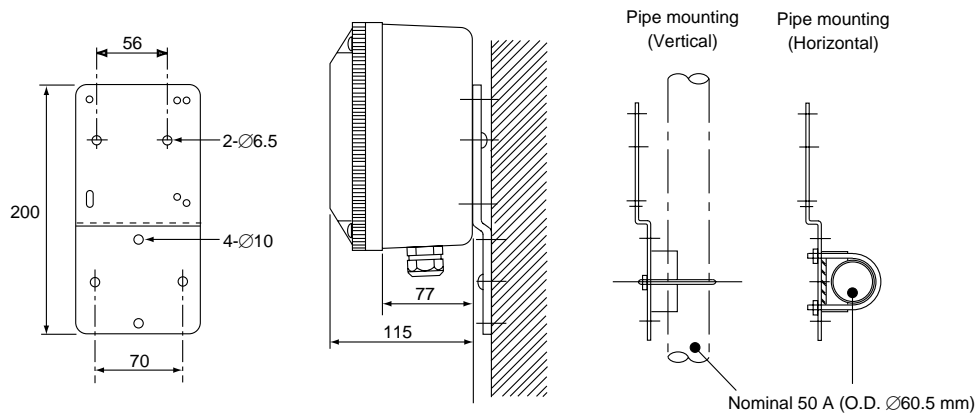


Conduit Adapter (Option)

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



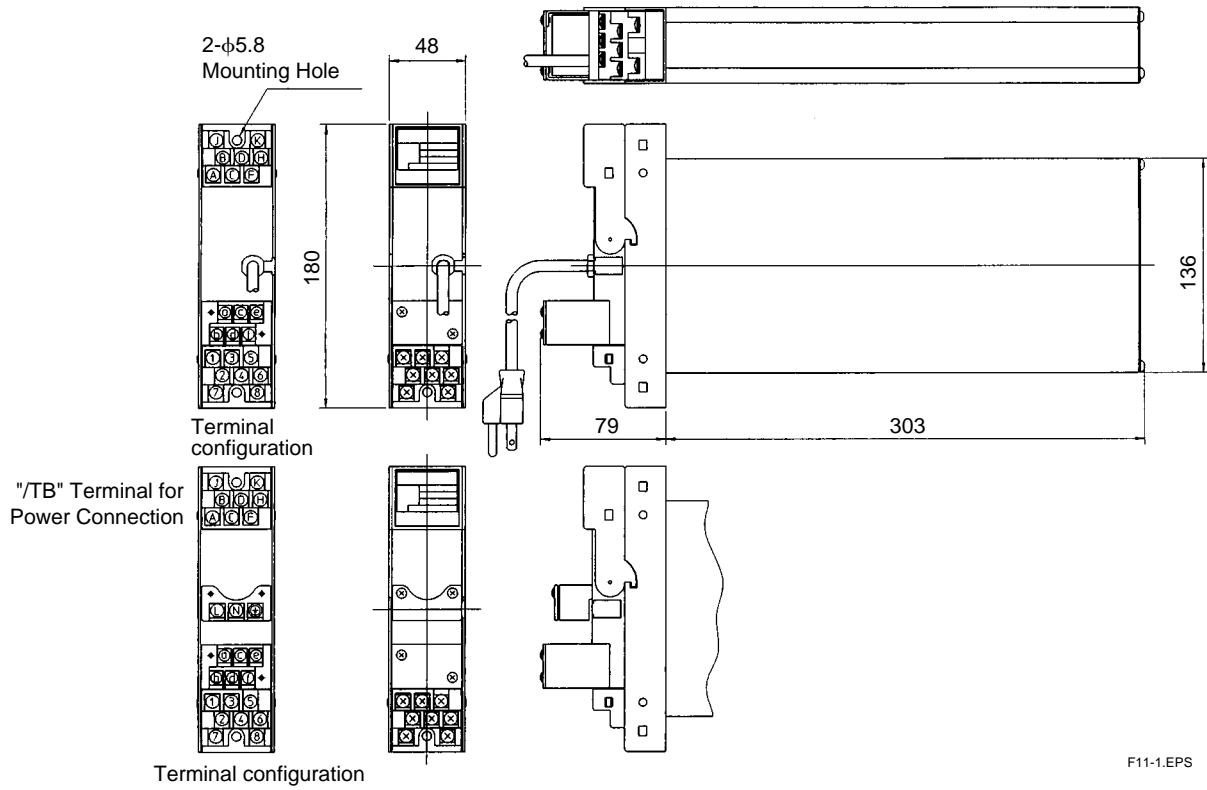
Pipe/Wall Mounting (Option code : /U)



4.eps

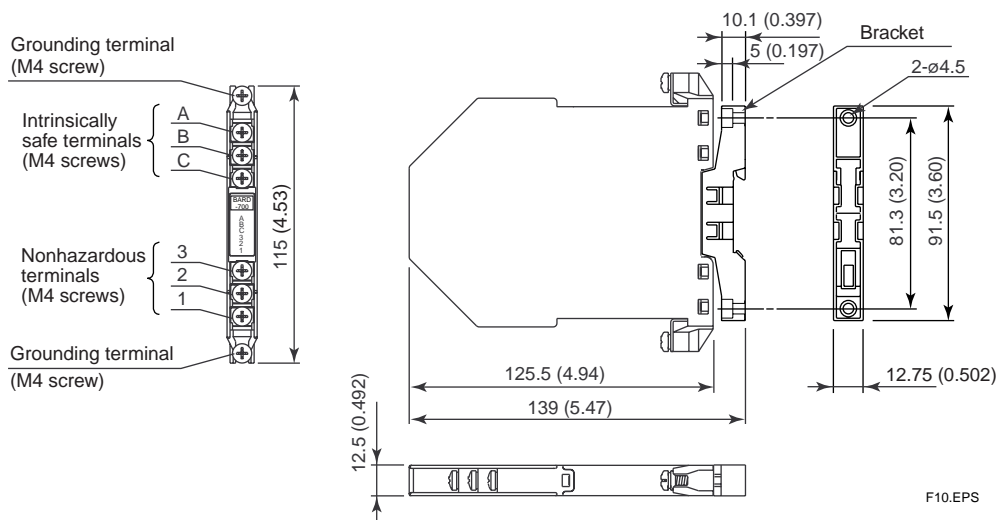
PH201G Dedicated Distributor (Style B)

Unit : mm



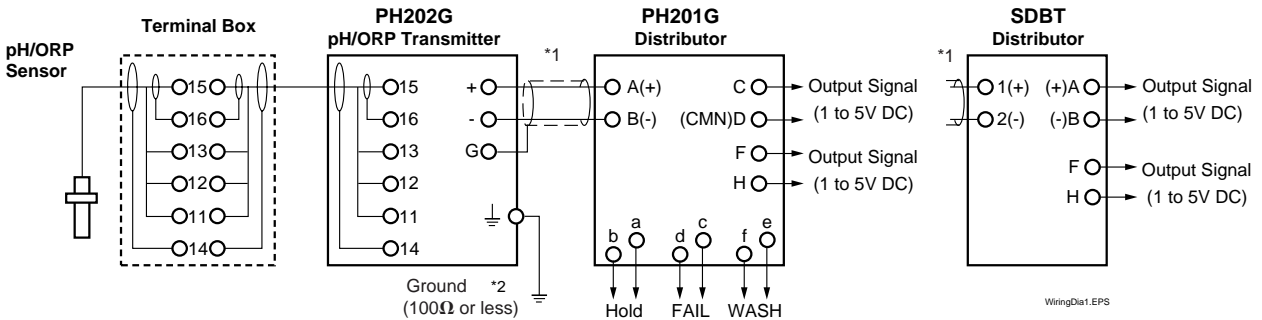
Safety Barrier BARD-800

Unit: mm (approximate inches)



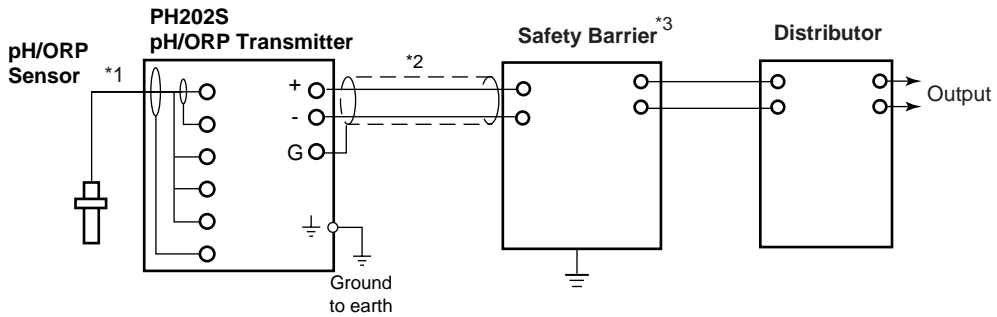
WIRING DIAGRAMS

Example of Non-Explosionproof System

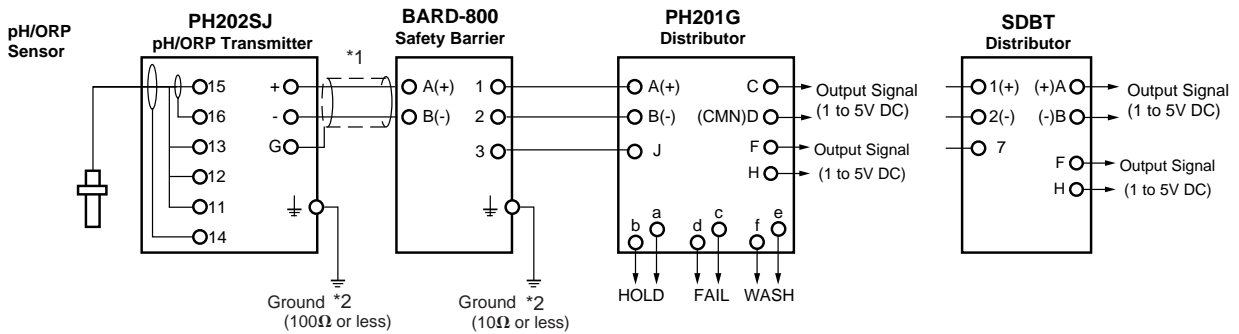


- *1: Use a 2-conductor shielded cable with an outside diameter of 6 to 12 mm. Shield must be connected to internal terminal G of transmitter and left unconnected at the other side.
- *2: Transmitter must be grounded using external terminal: for general purpose version ground resistance of PH202G should not exceed 100Ω (Japanese Class D grounding).

Example of Explosionproof System




- *1: This cable is specified by the additional code of a pH sensor, or a sensor cable.
- *2: Use two-wire cable with OD (Outside Diameter) of 6 to 12 mm.
- *3: For intrinsically safe approval, use the safety barrier certified by the testing laboratories. In case of non-incendive type (PH202S-B, -N, -D), the safety barrier is not necessary.



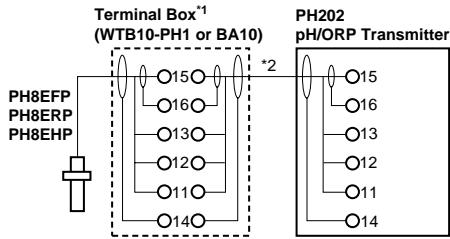
- *1: Use a 2-conductor shielded cable with an outside diameter of 6 to 12 mm. Shield must be connected to internal terminal G of transmitter and left unconnected at the other side.
- *2: Transmitter must be grounded using external terminal: for intrinsically safe version ground resistance of PH202SJ should be 100Ω or less (Japanese Class D grounding). For safety barrier ground resistance should not exceed 10Ω (Japanese Class A grounding).

CAUTION

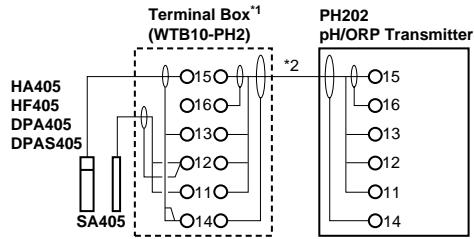
 Grounding wire connection for PH202SJ is different from that for PH200S. When installing PH202SJ as a replacement for PH200S, grounding wire must be reconnected as above.

Wiring Example for Electrode

General pH electrode

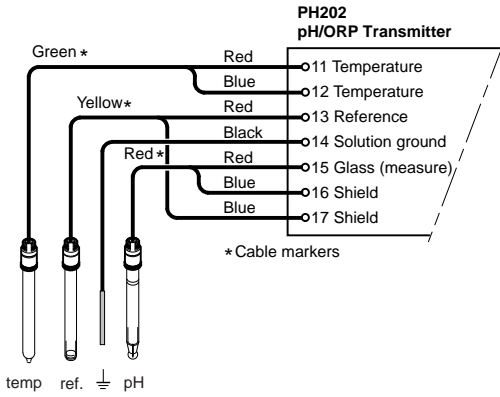


Special pH electrode

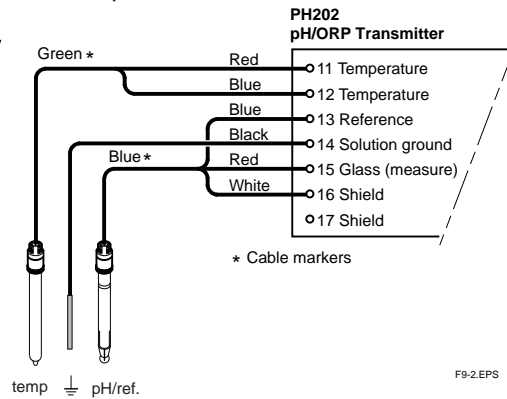


Note : Both "SE(14)" terminals of the pH detector is connected to the "SE(14)" terminal of the PH202. Nothing is connected to the "S(16)" terminal of the PH202.

Separate electrodes pH/Ref electrode

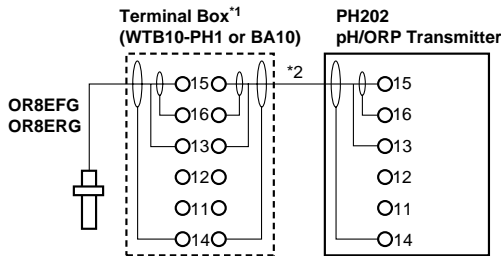


Combined pH/ref electrode

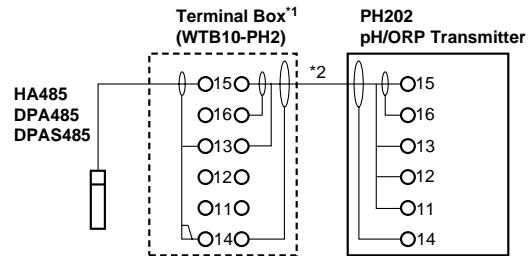


*1 Terminal box is used only where pH/ORP transmitter is installed remotely from electrodes (normally not needed).
*2 This cable is specified in the option code for the terminal box (WTB10), or extension cable (WF10).

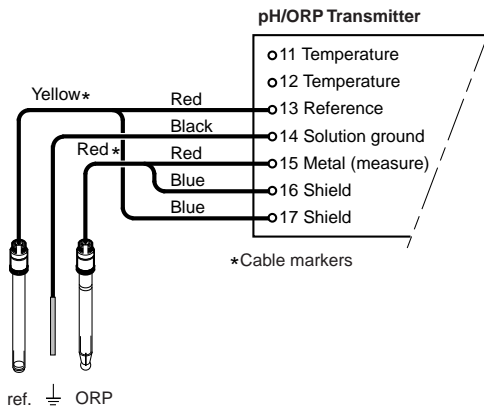
General ORP electrode



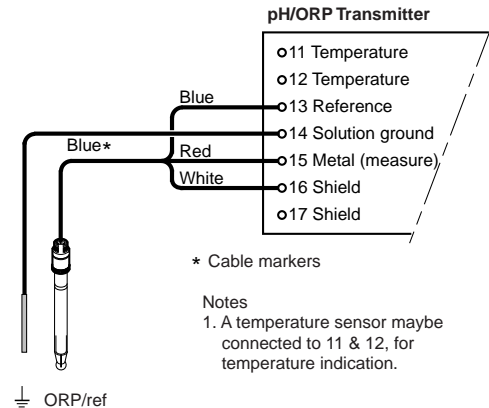
Special ORP electrode



Separate electrodes ORP/Ref electrode



Combined ORP/Ref electrode



Notes
1. A temperature sensor may be connected to 11 & 12, for temperature indication.

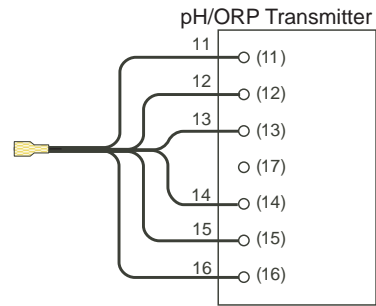
*1 Terminal box is used only where pH/ORP transmitter is installed remotely from electrodes (normally not needed).
*2 This cable is specified in the option code for the terminal box (WTB10), or extension cable (WF10).

F9-2.1.EPS

Wiring of the PH20/FU20

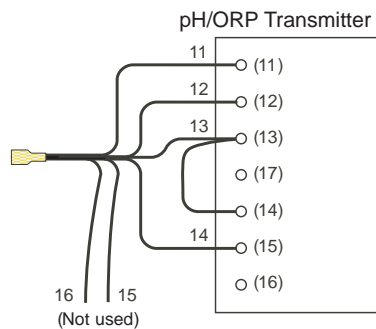
pH (& ORP) WIRING DIAGRAM

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



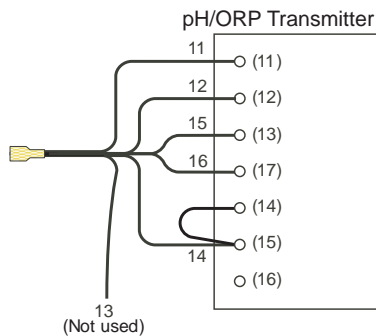
ORP WIRING DIAGRAM with normal reference

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 ; Electrode, Holder, pH/ORP Transmitter, Cleaning system,
 Terminal box, Accessories, Safety Barrier
 (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 ; _____