
**User's
Manual**

**Model PH10RP
KCl Replenish-free pH Sensor**

IM 12B11C02-01E

vigilantplant™

◆ Introduction

This instruction manual covers the PH10RP KCl Replenish-free pH sensor for the PH100. Other related EXA100 series items are described in the following manuals:

| Model name | Manual Name | IM No. |
|------------|------------------------------------|------------------|
| PH100 | Panel Mount pH Converter | IM 12 B11A01-01E |
| OR100 | Panel Mount ORP Converter | IM 12 C11A01-01E |
| SC100 | Panel Mount Conductivity Converter | IM 12 D11A01-01E |
| PH10FP | KCl Refillable pH Sensor | IM 12 B11C01-01E |
| OR10FP | KCl Refillable ORP Sensor | IM 12 C11C01-01E |
| OR10RP | KCl Replenish-free ORP Sensor | IM 12 C11C02-01E |
| SC10XB | Conductivity Sensor for SC100 | IM 12 D11C01-01E |
| PH10HLD | Immersion Holder for EXA100 | IM 12 B11D01-01E |
| PH10HG | Guide-pipe Holder for EXA100 | IM 12 B11D02-01E |
| WTB100 | Terminal Box for EXA100 | IM 12 B11E01-01E |
| WF100 | Extension Cable for EXA100 | IM 12 B11F01-01E |

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◆ For the safe use of this equipment

(1) About This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- The contents of this manual shall not be reproduced or copied, in part or in whole, without permission.
- This manual explains the functions contained in this product, but does not warrant that they are suitable for the particular purpose of the user.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, when you realize mistaken expressions or omissions, please contact the nearest Yokogawa Electric representative or sales office.
- This manual does not cover the special specifications. This manual may be left unchanged on any change of specification, construction or parts when the change does not affect the functions or performance of the product.
- If the product is not used in a manner specified in this manual, the safety of this product may be impaired.

(2) Safety and Modification Precautions

- Follow the safety precautions in this manual when using the product to ensure protection and safety of the human body, the product and the system containing the product.

(3) The following safety symbols are used on the product as well as in this manual.



This symbol indicates that an operator must follow the instructions laid out in this manual in order to avoid the risks, for the human body, of injury, electric shock, or fatalities. The manual describes what special care the operator must take to avoid such risks.



This symbol indicates that the operator must refer to the instructions in this manual in order to prevent the instrument (hardware) or software from being damaged, or a system failure from occurring.



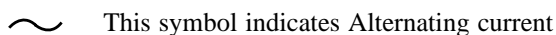
This symbol gives information essential for understanding the operations and functions.



This symbol gives information that complements the current topic.



This symbol identifies a source to be referred to.



 **WARNING : Glass Breakage**

Since the sensor contains a glass electrode, do not apply physical shock or excessive force to it. Breakage may occur.

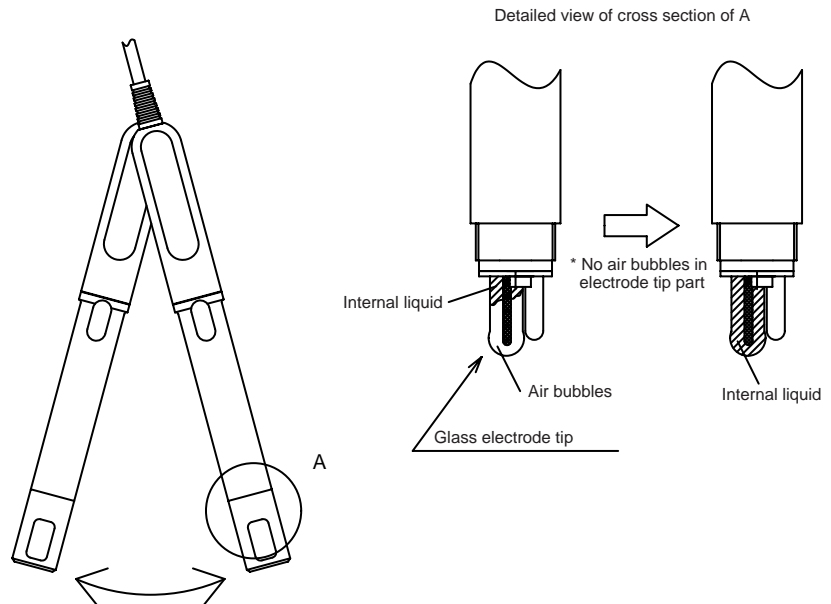
 **CAUTION : Error (E-01) Indication**

When a new sensor is installed, an E-01 error message may appear. This cause is not due to a failure but due to poor hydrophobic properties of its glass electrode. Soak the electrode in water for about 24 hours and rehydrate it before taking measurements.

 **CAUTION : Bubbles**

Before taking measurements, examine bubbles in the glass electrode. Bubbles trapped in the electrode tip may prevent proper measurement. If bubbles are present, gently swish the electrode from side to side, as shown in the following figure, to dislodge bubbles from the tip.

Cautions when using pH sensor



(Note) Swish electrode lightly in liquid before measurement, and check that there are no air bubbles at the tip of electrode.

◆ After-sales Warranty

- For repair during the warranty period, carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.
- Before returning a product for repair under warranty, give us information of the model name and serial number and a description of the problem. Any diagrams or data explaining the problems would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the purchase quotation. Yokogawa shall conduct warranty service based on its standard. When the customer site is outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged for repair fee regardless of warranty period.
 - Failure of components which are out of scope of warranty stated in instruction manual.
 - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa Electric did not supply.
 - Failure due to improper or insufficient maintenance by user.
 - Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
 - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
 - Failure caused by any usage out of scope of recommended usage.
 - Any damage from fire, earthquake, storms and floods, lightning, disturbances, riots, warfare, radiation and other natural changes.
- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa Electric will not bear responsibility when the user configures the product into systems or resells the product.
- Our maintenance service and the supply of repair parts will be covered for five years after the production ends. For product repair, please contact the nearest sales office described in this instruction manual.

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1. Specification

The PH10RP is a KCl Replenish-free pH Sensor easy to be maintained : unnecessary to flow out KCl solution. The sensor can be installed in a Immersion Holder (Model Code : PH10HLD) , Guide-pipe Holder (Model Code : PH10HG) or /a piping adapter (option of PH10RP).

1.1 Standard Specifications

| | |
|---------------------------------|--|
| Measurement: | Hydrogen ion concentration (pH) of a solution |
| Measurement principle: | Glass electrode method |
| Sensor type: | KCl Non-Refillable type |
| Measuring range: | 2 to 12 pH |
| Installation: | Mounting in PH10HLD Immersion Holder Mounting in PH10HG Guid-pipe Holder Connection with PH10RP/ADP piping adapter |
| Sample temperature range : | 0 to 60 ° C |
| Sample pressure : | 3m water pressure (max.) under Atmospheric pressure |
| Sample flow rate : | 2 m/s max. |
| Sample conductivity : | 50 μ S/cm or higher |
| Temperature detection element : | Pt1000 |

Wetted part materials:

Polypropylene, polyvinyl chloride, silicone rubber, glass, ceramics, chlorinated polyethylene rubber (cable insulation[®]), Viton fluoroelastomer (O-ring for piping adapter)

Piping adapter Material (option coode : /ADP) :

polyvinyle chloride

Cable length:

3, 5, 10 m (up to 50 m , including a sensor cable length when using WTB100 terminal box)

Weight: Approx. 300g (3 m), 450g (5 m), 800g (10 m)

Other related instruments:

WTB100 Terminal Box and WF100 Extension Cable:

Up to 50 m , including a sensor cable length

PH10HLD Immersion Holder

Wetted part materials:

Polypropylene (holder), polyethylene (spacer), silicone rubber (gasket), ethylene propylene rubber (cover)

PH10HG Guide-pipe Holder:

Wetted part materials; Polyvinyl chloride

1.2 Model and Suffix code

| Model | Suffix code | Option code | Description |
|--------------------|-----------------|-------------|--|
| PH10RP | | | KCl Replenish-free pH sensor for PH100 |
| Cable length | -03 | | 3m |
| | -05 | | 5m |
| | -10 | | 10m |
| | -AA | | Always -AA |
| Combination holder | Adapter | -ADP | For piping adapter * ¹ |
| | Immersion type | -HSS | For immersion type holder * ³ |
| | Guide-pipe type | -GDH | For giude-pipe type holder * ² |
| | | -NN | Always -NN |
| Option | Piping adapter | /ADP | Piping adapter for replenish-free type sensor R3/4 |

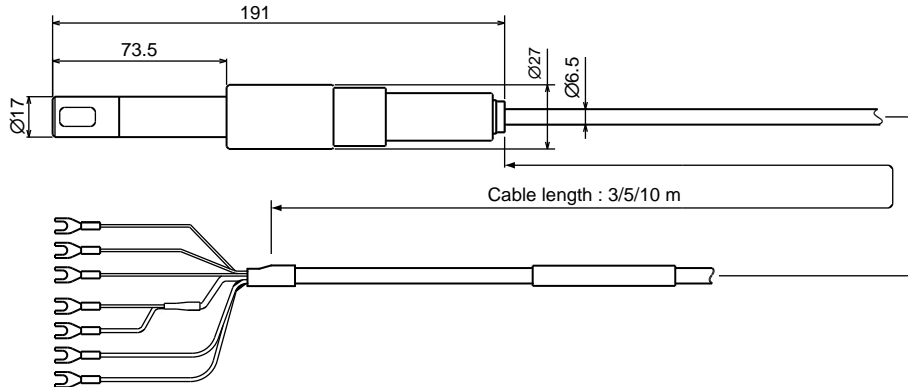
- Notes
- *1 : O-ring for piping adapter (/ADP) is included. Must be selected when optional piping adapter is specified.
 - *2 : Its Configuration is the same as PH10HG guide-pipe holder configuration.
 - *3 : The PH10HLD Immersion holder is not included. It should be ordered separately.

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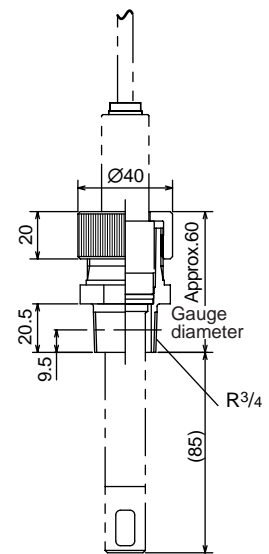
1.3 External Dimensions

Unit : mm

● PH10RP-□□-AA-GDH-NN

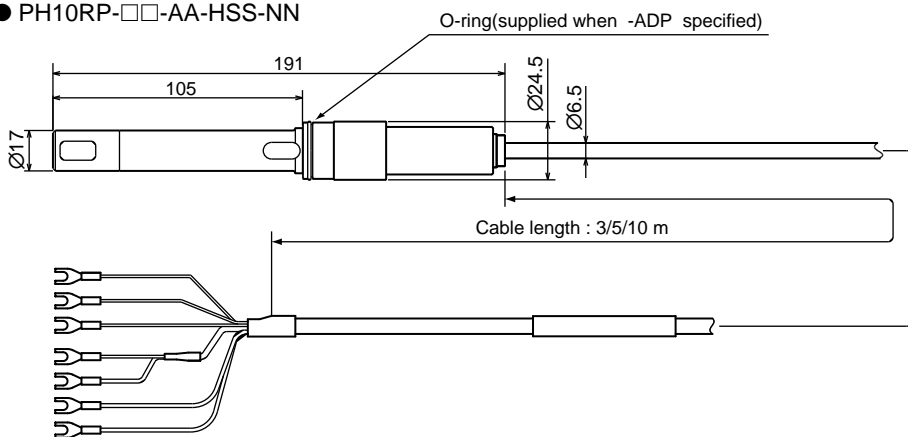


● PH10RP-□□-AA-ADP-NN/ADP



● PH10RP-□□-AA-ADP-NN

● PH10RP-□□-AA-HSS-NN



<Optional Adapter>

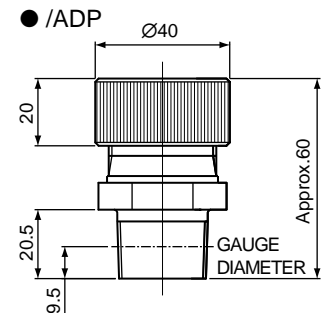


Fig. 1.1

2. Installation

2.1 Preparation for Installation

2.1.1 Checking for Damage

The PH10RP KCl Replenish-free pH sensor is carefully packed to avoid damage during Transportation. However, when you receive it, carefully unpack and check it by your eyes.

2.1.2 Mounting in a Holder

The PH10RP pH sensor is used with the PH10HLD immersion holder or the PH10HG guide-pipe holder or the piping adaptor (option /ADP). Before installing the sensor, select a place where the holder or adapter is suitable to be installed.

2.1.3 Installing Associated Equipment

Check that associated equipments such as the WTB100 terminal box and PH100 pH converter are installed and connected.

2.2 Requirements for mounting the pH sensor

2.2.1 In case of installing the PH10HG guide-pipe holder

- (1) Connect the pH detector cable to related equipments (refer to 2.3 for procedure)
- (2) Take the cap, which prevents the pH sensor from drying out, off the tip of the sensor.
- (3) Install the PH10HG Guide-pipe holder as shown in figure.2.1.

 **CAUTION**

Refer to IM 12B11D02-01E for the details for PH10HG Guide-pipe holder installation method.

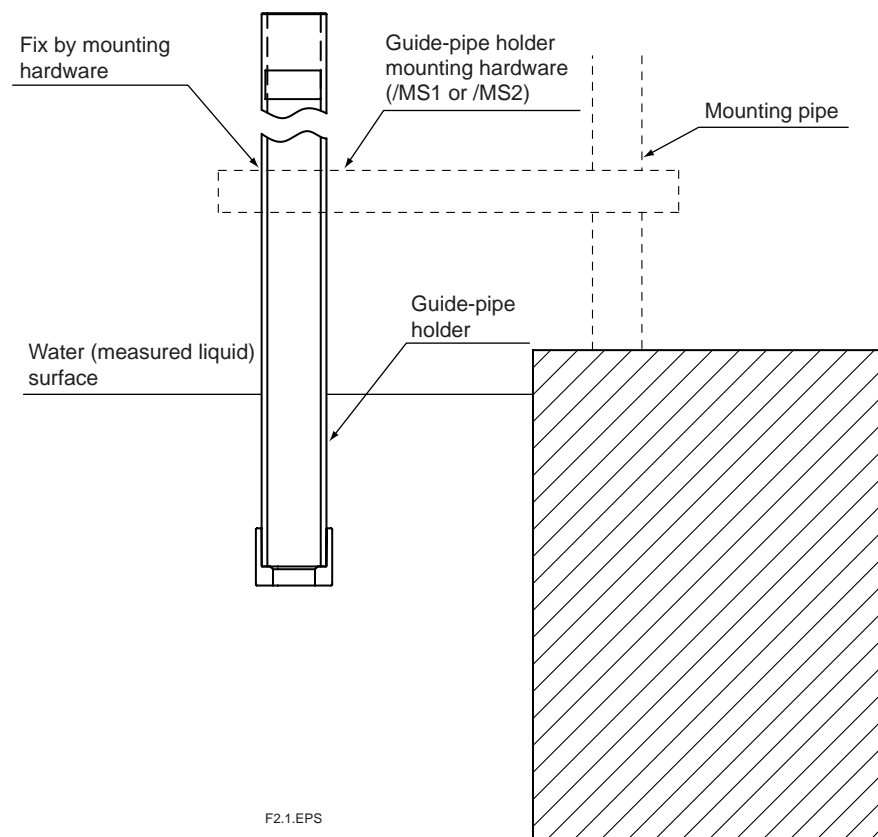
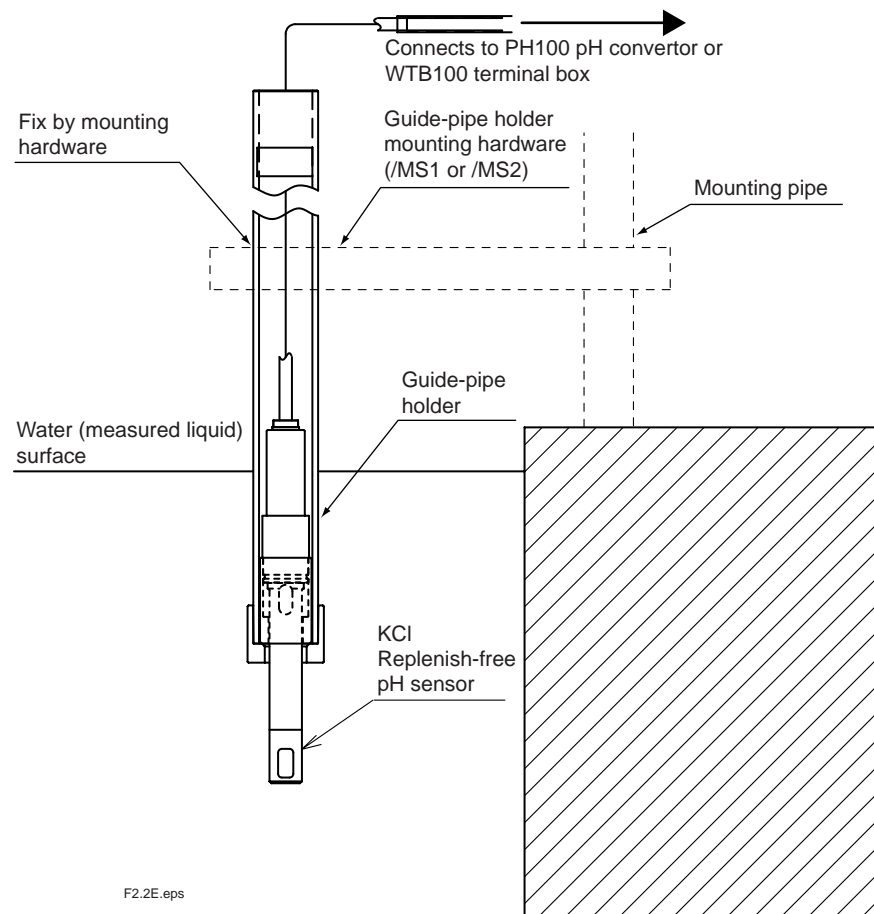


Fig. 2.1

- (3) Install the KCl Replenish-free pH sensor in PH10HG Guide-pipe holder. When the sensor is installed in the holder, insert slowly and gently it from the upper opening of the holder so that the sensor does not strongly hit the bottom of the holder. Or the sensor can be broken.



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Fig. 2.2

2.2.2 In case of mounting the pH sensor in the immersion holder:

- (1) Take the pH sensor cap, which prevents the pH sensor from drying out, off the tip of the sensor.
- (2) Mount the sensor in the immersion holder as the following procedures (See Fig.2.3 for details).
 - Loosen the Lock nut on the tip of the immersion holder
 - Remove the nut, a washer and a gasket.
 - Pass the sensor through the holder as the direction of the narrow white arrow in Fig. 2.3.
 - Push out the sensor until it sticks out the other pipe side as shown in Fig. 2.3.
 - Insert the sensor into the removed gasket until it comes in contact with the index lip (See Fig 2.4).
 - Attach the sensor equipped with the gasket to the guide pipe.
 - Putting the removed washer between the gasket and the nut, tighten the nut so strongly so as to hold them in place. In Fig. 2.3, the wide white arrow indicates the insert direction of the gasket, washer, and nut.
 - Set the cap cover of the holder guide pipe to the waterproofing cap .

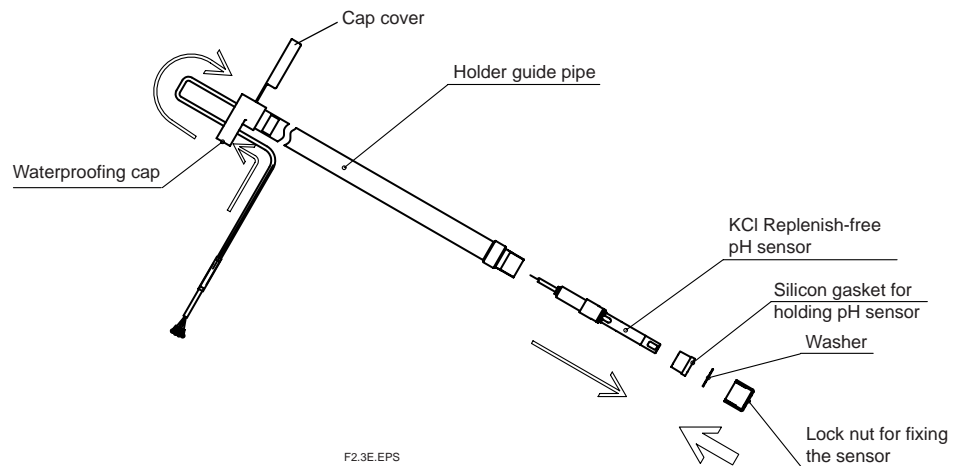


Fig. 2.3

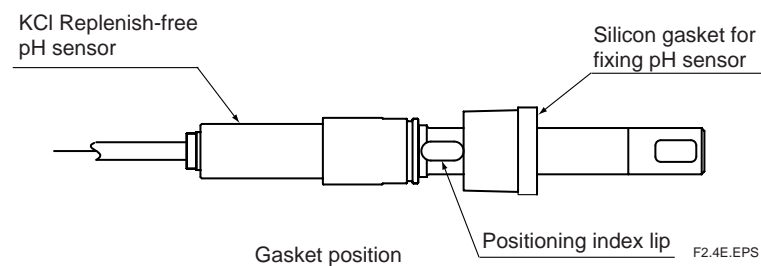


Fig. 2.4

(3) Install a PH10HLD immersing holder. Refer to IM 12B11D01-01E for the details about the installation method.

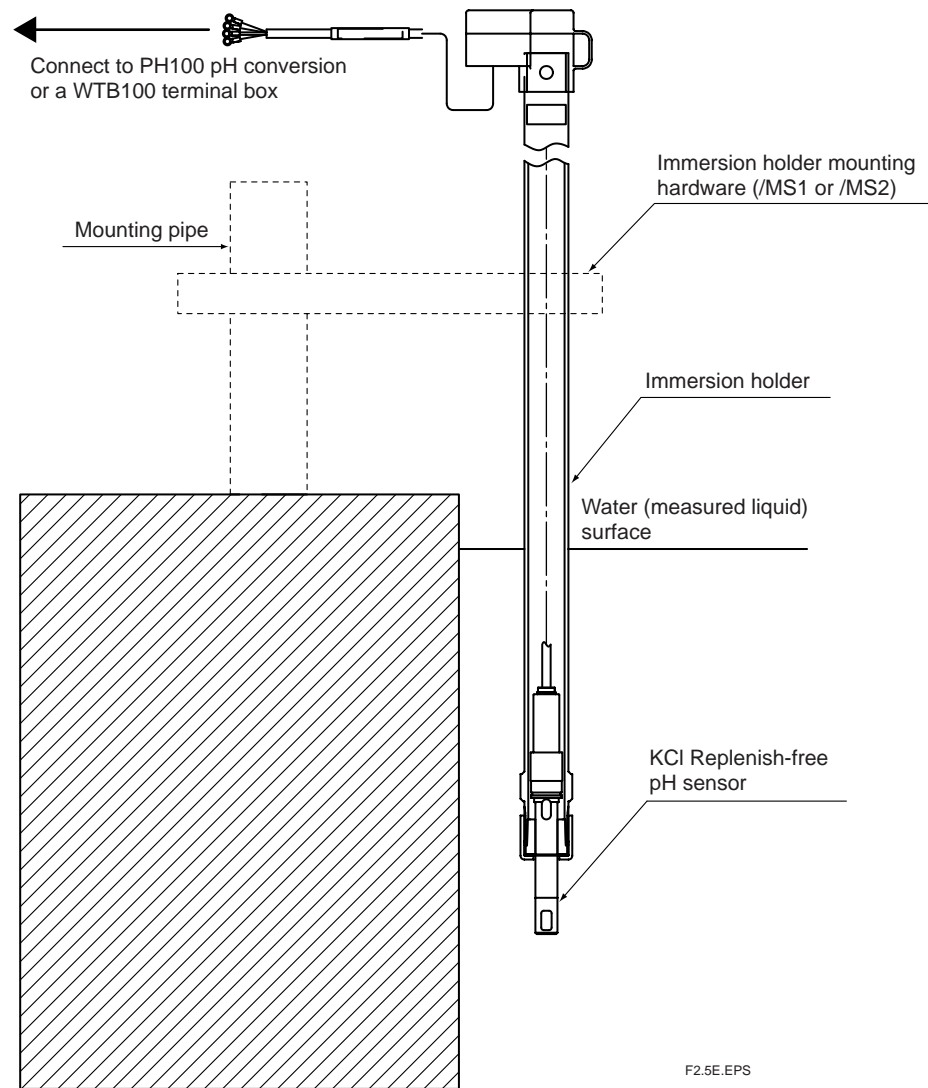


Fig. 2.5

(4) Connect pH sensor cable to pH converter or terminal box.
Refer to Sec.2.3 for details.

2.2.3 In case of attaching the pH sensor in piping adapter (an option /ADP)

- (1) Check that a O-ring is attached to the pH sensor.
- (2) Take the cap, which prevents the pH sensor from drying out, off the tip of the sensor.
- (3) Install the socket of the adapter (attached with option /ADP) in pipe.

CAUTION

- Install the socket so that the face glass electrode can face downward.
- Set the socket so that, when attaching the pH sensor, the electrodes can be soaked.

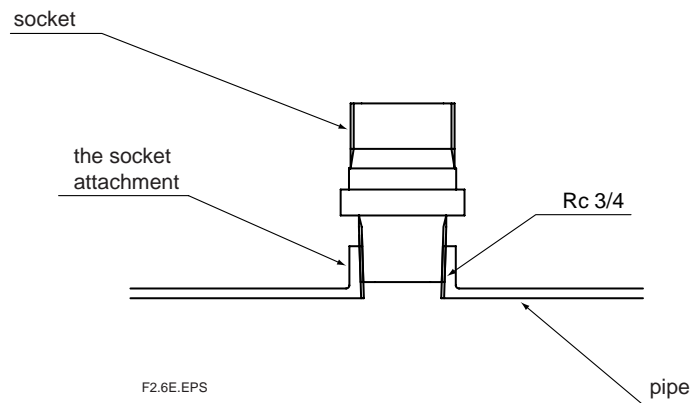


Fig. 2.6

- (4) Insert a nut of adapter from the cable terminal side of the sensor.

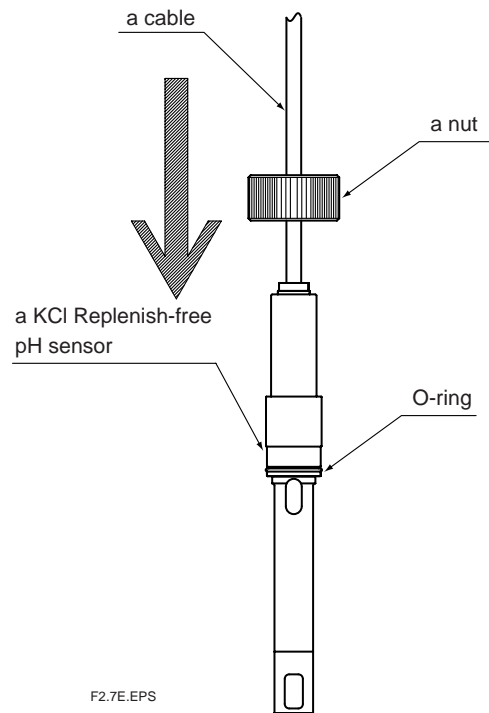


Fig. 2.7

- (5) Connect pH sensor cable to the pH converter. (for details refer to sec.2.3.)
- (6) Insert the pH sensor in the socket.
- (7) Screw the nut.

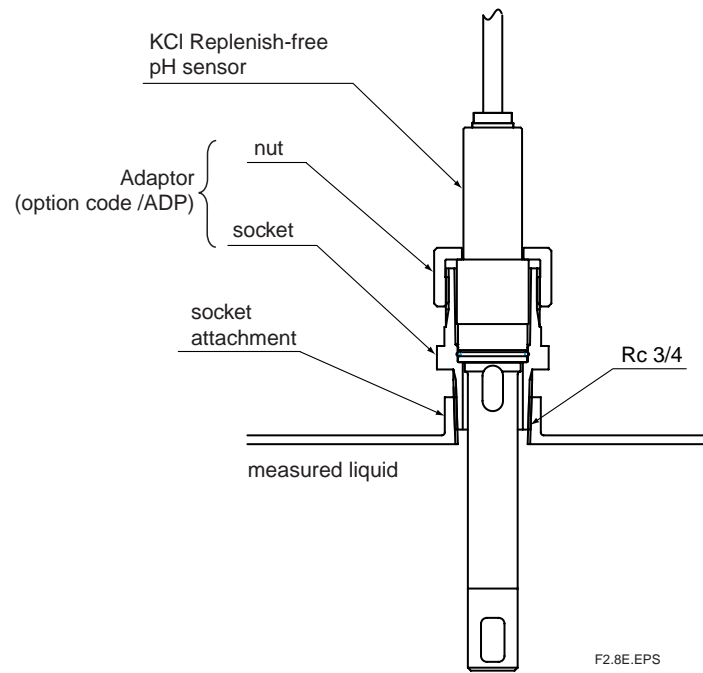


Fig. 2.8

2.3 pH Sensor Cable Wiring Procedure



CAUTION

Place pH sensor cable wiring as far as possible from power supply and ground wiring.

2.3.1 Connecting to a WTB100 terminal box

(1) Open wiring hole in terminal box.

On the bottom of the terminal box you can see circular holes for wiring (covered by a blind plate). Place the tip of a screwdriver or the like in the center of the blind hole, and hit it with a hammer or the like to punch out the blind plate.

(2) Loosen two screws in the front of the terminal box, and remove the cover.

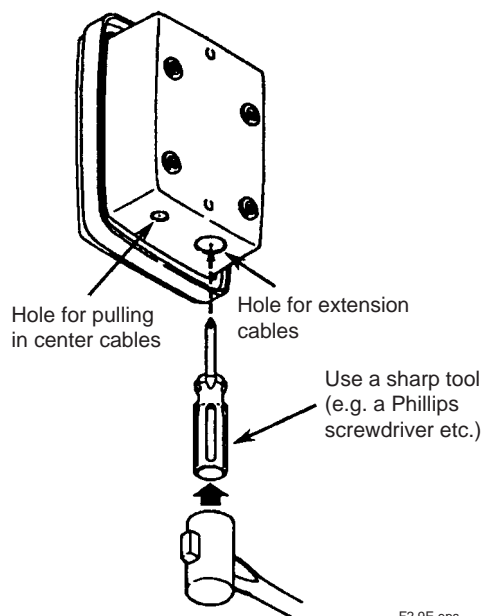


Fig 2.9

(3) Remove the nut from the dedicated cable gland (see Fig. 2.10), which is used for locking the sensor cable.

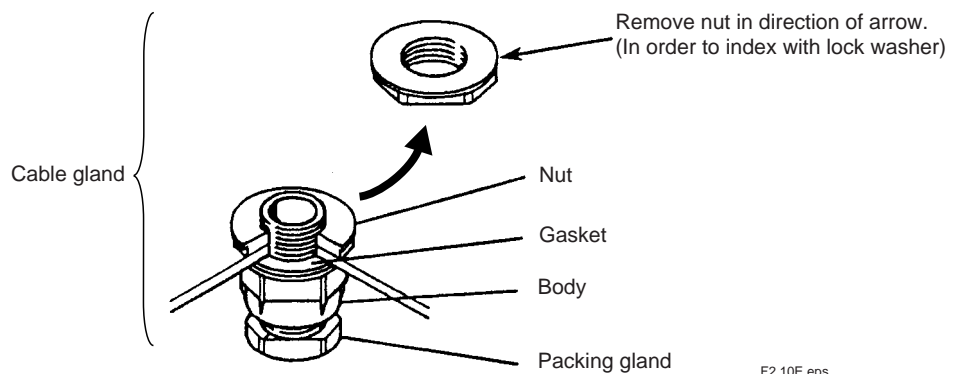


Fig 2.10

- (4) Pass the cable through the cable gland except the removed nut.
- (5) Pass the cable through the right side of the wiringhole.
- (6) Pass the cable through the removed nut.
- (7) Check each tag on the terminal of the cable, and connect each cable terminal to the corresponding terminal in the box.
- (8) Loosen the packing gland (shown in Fig.. 2.10) beforehand.
- (9) Attach the cable gland to the wiring hole by screwing up securely the body.
- (10) Screw up the packing gland so that humidity can not enter.

CAUTION

Do not too tight when screwing up these nuts.

Its very strong tightness can damage the cable as well as the cable gland itself.

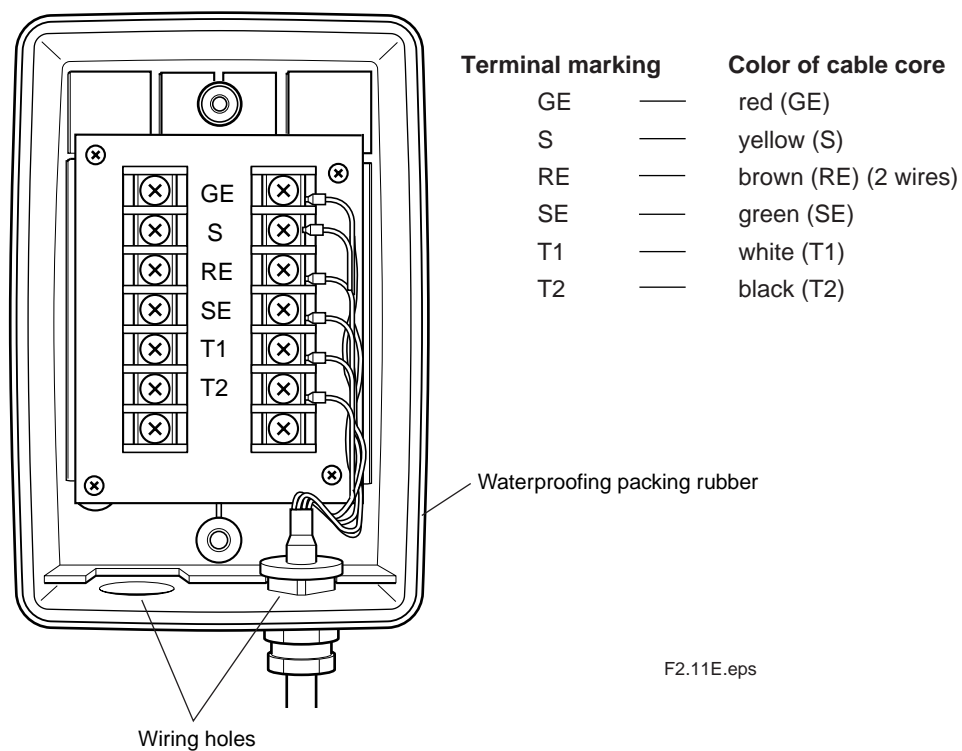


Fig 2.11 Example of wiring to a terminal box

- (11) When the wiring work is completed, attach the cover of the terminal box and tighten the screws removed. In addition, check that neither dirt nor water drops are adhering to waterproofing packing rubber of the case part.

2.3.2 Connecting to an EXA PH100 pH converter

Connect the sensor cable to the EXA PH100 pH converter as follows:

- (1) Loosen two screws, which fix the shield cover on the back of the EXA PH100.
- (2) Remove the cover.
- (3) Connect the sensor cable terminals to appropriate terminals of the converter. (See Table.2.1)

For details, see IM 12B11A01-01E for wiring of panel mount pH converter.

Table.2.1

| pH converter terminal no. | Color of PH10FP, and PH10RP pH sensor cable core |
|---------------------------|--|
| 11 | (do not use) |
| 12 (GE) | red |
| 13 (S) | yellow |
| 14 (RE) | brown:2 wires |
| 15 | (do not use) |
| 16 (SE) | green |
| 17 (T1) | white |
| 18 (T2) | black |

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- (3) Fix the sensor cable in place using a wiring clamp.
- (4) Replace the shielding cover removed in step (1).

3. Maintenance on operation

3.1 Calibration and Periodic Maintenance

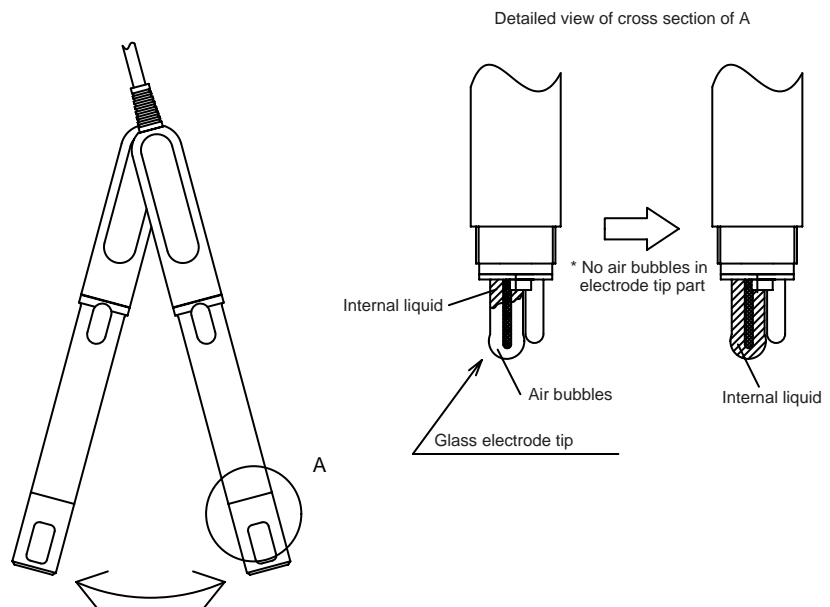
 CAUTION

Since the pH sensor contains a glass electrode, it may be broken if force or shock is applied to the sensor, or it is dropped. Please handle it carefully.

 CAUTION

There may be air bubbles inside the glass sensor; if they gather near the tip inside the glass electrode, measurement accuracy may be affected. Check before measurement that there are no air bubbles around the tip. If air bubbles are near the tip, as shown in the figure below, lightly swish the electrode to move air bubbles upwards.

Cautions when using pH sensor



(Note) Swish electrode lightly in liquid before measurement, and check that there are no air bubbles at the tip of electrode.

3.1.1 Calibration with Standard Solution

The electro motive force (emf) value of a glass electrode is different each, and varies when it gets dirty as well as old. Be sure to calibrate it with fresh standard solution before use. Calibrate it periodically to keep it measurable. Refer to the procedure for calibration with standard liquid in Section 6 of IM 12B11A01-01E. (The pH converter Instruction Manual).

Examine the optimum interval for maintenance; the interval depends on operating conditions. Preventive maintenance does not necessarily guarantee that any failure cannot happen.

3.1.2 Washing of glass electrode and liquid junction

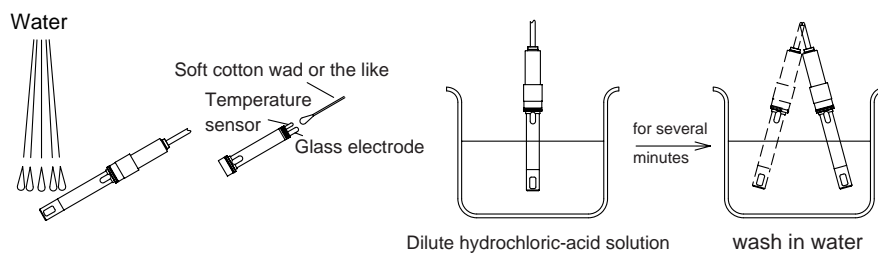
If a lot of dirt is adhering to a glass electrode or a liquid junction, measurement errors may result. Therefore, the required washing interval is necessary, depending on the speed to be dirtied.

Wash a glass electrode and a liquid junction if they are dirty as follows:

- * If the dirt is colloidal, adhesive substances, microbes, etc., wipe it off with soft tissuepaper etc. Further wash the liquid junction with water to remove remaining dirt.
- * If the dirt is oily substances, dip in neutral detergent solution in a beaker.
- * If the dirt is chemical stains, such as one caused by adsorption of metal, dip in thin (about 1-2%) hydrochloric acid solution for several minutes (Acid washing) .
- * Wash with the above acid if the sensor, which is measuring high-alkalinity solution, becomes lower in performance due to chemical dirt.

< Wash at intervals that depend on measured liquid >

< Chemical dirt, such as adsorbed metal >



3.2 Replacement of consumables

- **Replacement of PH10RP KCl Refillable sensor**

The PH10RP sensor has limited life. When it can no longer be calibrated with standard solution, it should be replaced. Refer to the Sec. 2.2 for the installation procedure.

The glass membrane needs to be soaked in water for at least 30 minutes until its characteristics is stable. After replacing the pH sensor, please be sure to calibrate it with standard solution.



CAUTION

For a new pH electrode, the error code E-01 message may be displayed on LED of a converter. This does not indicate a defective junction; the electrode may need to be soaked in water for a day before it is ready for use.

- **Replacing the O-ring in the pipe adapter**

For the PH10RP- □□-AA-ADP-NN, an O-ring is necessary for connecting it with its special adaptor. Under normal use and in most cases, this O-ring should be useful for almost the life of the pH sensor – but if you find that you need to replace the O-ring alone, contact Yokogawa to get a new one.

- **Cautions regarding storage of pH sensor**

Be careful not to allow liquid junction and glass of the pH sensor to dry out.

When storing the pH sensor, be sure to attach the protective cap (supplied with it on shipment) to its tip.

If the protective cap is lost, store the sensor so as to keep the glass and liquid junction wet; for example, dipped in water.

Revision Record

Manual Title : Model PH10RP KCl Replenish-free pH sensor

Manual Number : IM 12B11C02-01E

| Edition | Date | Remark (s) |
|----------------|-------------|-------------------|
| 1st | Apr. 2003 | Newly published |
