
**User's
Manual**

**Model PH8ECP
KCl Filling Type pH Sensor
(for electrolysis plant)**

IM 12B7J3-01E

vigilantplant.[®]



INTRODUCTION

This manual covers the PH8ECP KCl filling type pH sensor for electrolysis plant.

Topics and information that need your special attention in handling the product are given in the text of this manual along with cautionary notes, such as a warning or caution, depending on their importance. Strictly observe these items from the standpoint of safety and prevention of equipment damage. For a notation, such as a warning also indicated on the product, there is an alert mark in the manual.

(1) Confirming the Specifications

Upon arrival of the purchased product, carefully unpack it and make sure the product is completely free from any damage that may have occurred during transport. Also check the model code indicated on the nameplate attached to the sensor cable to make sure that you received the correct sensor. For the meaning of the model code, refer to subsection 1.2.

(2) Information Covered by This Manual

This manual covers all of the information on handling the PH8ECP, such as instructions on installation, inspection, and maintenance and service. Personnel who handle this product should read this manual thoroughly.

◆ For the safe use of this equipment

■ Safety, Protection, and Modification of the Product

- In order to protect the system controlled by the product and the product itself and ensure safe operation, observe the safety precautions described in this user's manual. We assume no liability for safety if users fail to observe these instructions when operating the product.
- If this instrument is used in a manner not specified in this user's manual, the protection provided by this instrument may be impaired.
- Be sure to use the spare parts approved by Yokogawa Electric Corporation (hereafter simply referred to as YOKOGAWA) when replacing parts or consumables.
- Modification of the product is strictly prohibited.
- The following symbols are used in the product and user's manual to indicate that there are precautions for safety:

■ Notes on Handling User's Manuals

- Please hand over the user's manuals to your end users so that they can keep the user's manuals on hand for convenient reference.
- Please read the information thoroughly before using the product.
- The purpose of these user's manuals is not to warrant that the product is well suited to any particular purpose but rather to describe the functional details of the product.
- No part of the user's manuals may be transferred or reproduced without prior written consent from YOKOGAWA.
- YOKOGAWA reserves the right to make improvements in the user's manuals and product at any time, without notice or obligation.
- If you have any questions, or you find mistakes or omissions in the user's manuals, please contact our sales representative or your local distributor.

■ Warning and Disclaimer

The product is provided on an "as is" basis. YOKOGAWA shall have neither liability nor responsibility to any person or entity with respect to any direct or indirect loss or damage arising from using the product or any defect of the product that YOKOGAWA can not predict in advance.

■ Compliance with the simple apparatus requirements

PH8ECP meet the simple apparatus requirements defined in the following standards.

Note: TIIS certified types cannot be connected.

Use the sensors under the conditions of use required by the standards.

Applicable standards:

ANSI/ISA-60079-11 (2014)

ANSI/ISA-60079-0 (2009)

CAN/CSA-C22.2 NO. 60079-11:14

CAN/CSA-C22.2 NO. 60079-0:11

방호장치 의무안전인증 고시

GB 3836.4-2010

Conditions of use:

- (1) Use in combination with an internally isolated transmitter, or use with, a transmitter in combination with isolated barrier.
The FLXA21 is internally isolated.
- (2) Upper limit of the process temperature.
The upper limit of process temperature is indicated below when the sensor is used in combination with a YOKOGAWA transmitter.

For FLXA21, model and suffix code below is available.

FLXA21-D-□-D-EA-P1-○-A-N-LA-N-NN

- can be any value.
 - must be NN or P1.
- Any option code is available.

For PH202S, model and suffix code below is available.

PH202S-○-E

- must be C or U.
- There are no PH202S models that meet the Korean explosion proof standards.
Any option code is available.

Upper limit of process temperature on the PH8ECP

Transmitter used in combination	FLXA21		PH202S	
Ambient temperature Ta	40°C	60°C	40°C	60°C
Temperature class				
T6	16	16	28	28
T5	81	31	95 (*1)	43
T4	105	66	105	78
T3	105	105	105	105
T2	105	105	105	105
T1	105	105	105	105

*1: Care about upper limit 100°C of temperature class T5 should be taken.

Other warnings are provided in the following.

 **WARNING**

Handling precautions:

- (1) Potential electrostatic charging hazard Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, e.g., rubbing with a dry cloth.
- (2) IEC60079-14 (Electrical installations in hazardous areas) requires a label indicating 'simple apparatus', stick this label to this sensor if necessary.

■ Symbol Marks

Throughout this user's manual, you will find several different types of symbols are used to identify different sections of text. This section describes these icons.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

Tip

This symbol gives information that complements the current topic.

SEE ALSO

This symbol identifies a source to be referred to.

◆ After-sales Warranty

- **Do not modify the product.**

- **During the warranty period, for repair under warranty consult the local sales representative or service office. Yokogawa will replace or repair any damaged parts. Before consulting for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem 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 pre-purchase quotation Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located 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 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.**

- **Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair for this product, please contact the nearest sales office described in this instruction manual.**

Model PH8ECP KCl Filling Type pH Sensor (for electrolysis plant)

IM 12B7J3-01E 6th Edition

CONTENTS

- ◆ INTRODUCTION.....i
- ◆ For the safe use of this equipment.....ii
- ◆ After-sales Warrantyv
- 1. SPECIFICATIONS 1-1
 - 1.1 Standard Specifications..... 1-1
 - 1.2 Model and Suffix codes..... 1-2
 - 1.3 External Dimensions 1-3
- 2. INSTALLATION 2-1
 - 2.1 Preparation 2-1
 - 2.1.1 Unpacking and Visual Inspection..... 2-1
 - 2.1.2 Installing Flow-Through Type Holder..... 2-1
 - 2.1.3 Installing Associated Instruments 2-1
 - 2.2 pH Sensor Installation Procedures..... 2-2
 - 2.2.1 Installing pH Sensor in Flow-through Holder. 2-2
 - 2.3 Connecting Sensor cables..... 2-5
 - 2.3.1 Connecting Sensor Cable to Two-wire pH transmitter 2-5
 - 2.3.2 Connecting Sensor Cable to Four-wire pH Converter..... 2-6
- 3. USE OF pH SENSOR..... 3-1
 - 3.1 Operation and Periodical Maintenance 3-1
 - 3.1.1 Buffer Solution Calibration 3-1
 - 3.1.2 Pressurizing Reserve Tank..... 3-1
 - 3.1.3 Replenishment of KCl Solution..... 3-2
 - 3.1.4 Cleaning the Glass Electrode and Liquid Junction..... 3-3
- Customer Maintenance Parts List..... CMPL12B07J03-01E
- Revision Informationi

1. SPECIFICATIONS

The PH8ECP pH sensor, consisting of a complex glass electrode assembly, has high resistance to corrosion in solutions involving highly concentrated chlorine (Cl₂) and sodium chloride (NaCl). It can be used to measure the pH of solutions in an electrolytic plant. This KCl filling type pH sensor is incorporated in a flow-through type holder.

1.1 Standard Specifications

Measurement: Hydrogen ion concentration (pH) of a solution

Measurement principle: Glass electrode method

Measuring range: 0 to 14 pH

Weight: Approx. 0.4 kg (including 3-meter cable)

Installation: Mounted in a flow-through type holder

When a sensor is built into the submersion type holder, seal materials are required.

Contact your nearest Yokogawa service station or sales representative.

Ambient temperature limits: -10 to 50 °C.
(Do not allow KCl to condense in the reserve tank).

Wetted part materials:

Body; Glass

Earth electrode; Platinum

Liquid junction material; Ceramics

Cable specifications: Four-conductor low-noise cable, O.D. approx. 6.5 mm;
3 or 5 meter length should be selected.

Operating Conditions:

Solution temperature: -5 to 105 °C

Note: The maximum solution temperature also depends on the material of the holder.

Temperature detection element: Pt1000

Solution pressure: Atmospheric pressure

(When a flow-through type holder with a medium pressure KCl solution reserve tank is used, the maximum solution pressure is limited to 500 kPa.)

Solution flow velocity: Maximum 2 m/sec

Solution flow rate: 3 to 11 L/min (when a flow-through type holder is used)

Solution conductivity: 50 μS/cm or higher

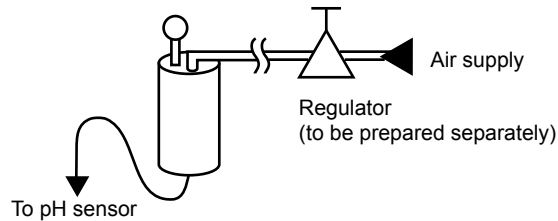
KCl solution consumption: 3 mL/day or less (pressurized with 10 kPa)

Response time: 90% response within 10 seconds to measurement or buffer solution at 20 °C

1.2 Model and Suffix codes

Model	Suffix Code	Option Code	Description
PH8ECP	.....	.....	KCl Filling type pH Sensor (*1)
Cable and KCl Tube Length	-03	.....	3 m
	-05	.....	5 m
Solution Ground Tip	-PT	.....	Platinum
KCl Reserve Tank (*2)	-TT1	.....	For general purpose with KCl reserve tank
	-TT2	.....	For medium pressure with KCl reserve tank (*3)
	-TN1	.....	For general purpose without KCl reserve tank
	-TN2	.....	For medium pressure without KCl reserve tank
Style	*A	.....	Style A
Options	/FK		Fork terminal for PH200, PH400
	/FL		M4 ring terminal for FLXA202/FLXA21 (*5)
	/E		Pin terminal for PH202, FLXA202/FLXA21 (*6)
	/G		M3 ring terminal for PH450G, PH202/TB (*4)

- *1: When used in combination with a special flow-through holder for electrolysis, use a Teflon coated O-ring for sealing (P/N: K9142YU). This O-ring is supplied with a washer.
- *2: Only a supply tube, but no KCl solution, is supplied with TN1 and TN2. KCl solution is supplied with TT1. Since a KCl solution is not supplied with TT2, arrange it from among accessories or auxiliary parts
- *3: Prepare an air pressure regulator as shown in the diagram below when the medium pressure reserve tank is used.

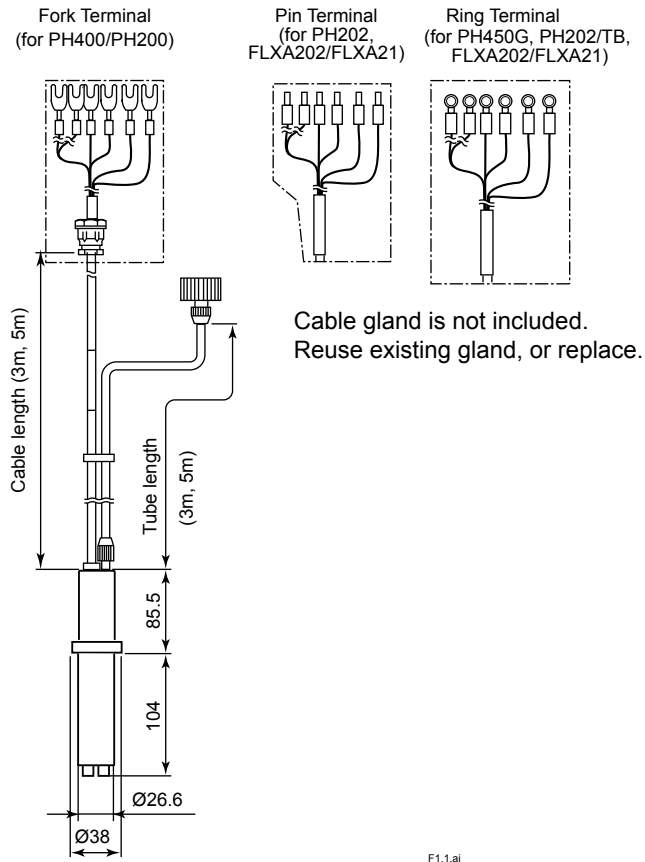


- *4: When terminal box is used, select WTB10-PH3.
- *5: When terminal box is used, select WTB10-PH5.
- *6: When terminal box is used, select WTB10-PH1.

1.3 External Dimensions

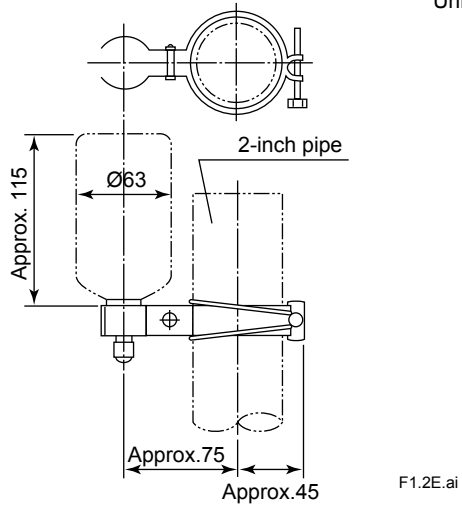
PH8ECP

Unit: mm



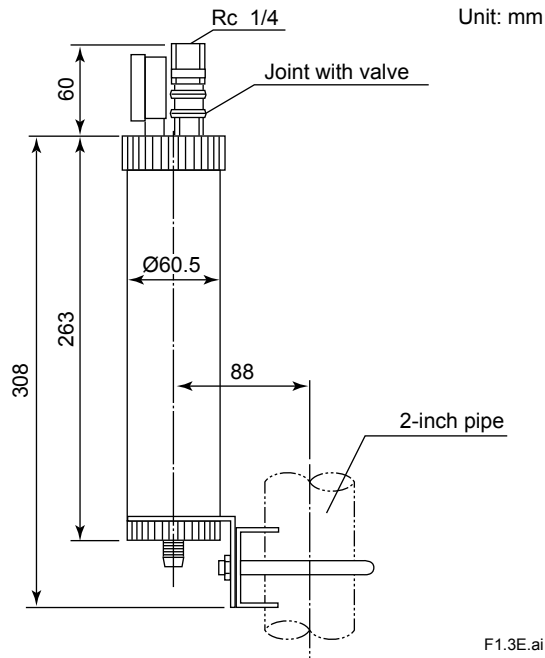
General purpose KCI Reserve Tank

Unit: mm



Medium Pressure KCI Reserve Tank

Unit: mm



2. INSTALLATION

2.1 Preparation

2.1.1 Unpacking and Visual Inspection

PH8ECP pH sensor is carefully packaged to guard against damage during shipment.

Inspect the instrument and items included as soon as they are received.

Note: To prevent the tip of the glass electrode and wetted part from drying out or being damaged, do not remove the transportation cap until the sensor is to be incorporated in a flow-through type holder.

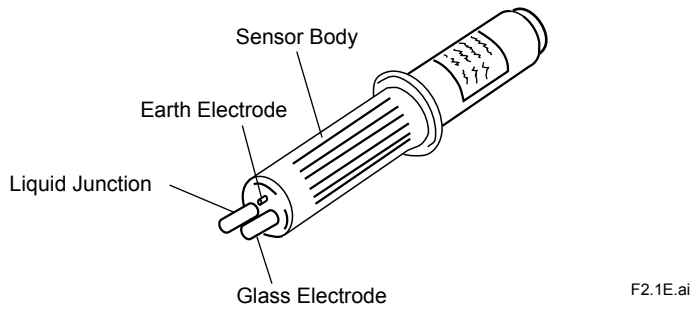


Figure 2.1 Names of PH8ECP pH Sensor Components

2.1.2 Installing Flow-Through Type Holder

Insure that the PH8ECP pH Sensor is installed in the flow-through type holder.

2.1.3 Installing Associated Instruments

Check that any or the pH converter, two-wire pH transmitter, and terminal box which is used to connect cables from the pH sensor is already installed.

2.2 pH Sensor Installation Procedures

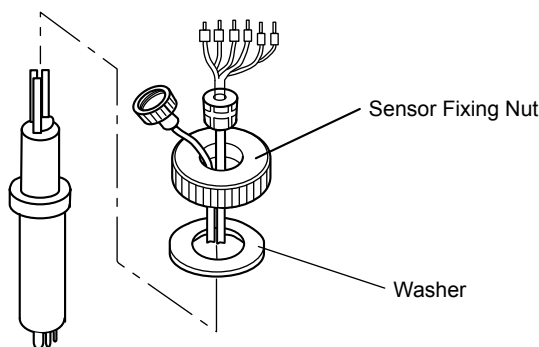
2.2.1 Installing pH Sensor in Flow-through Holder.

- (1) Connect the KCl refilling tube to the pH sensor.
- (2) Connect pH sensor cables to associated instruments. Pass the special washers (made of Tetrafluoroethylene resin) through sensor cables and KCl refilling tube. Remove the nut that holds the pH sensor in the flow-through type holder. Pass the sensor cable and KCl refilling tube through this nut.



Tip

A washer (P/N K9142YT) is supplied with a specialty flow-through holder for electrolysis (PH8HF-PV/TF1 or PH8HF-TN/TF1) containing a Teflon coated O-ring for sealing (P/N K9142YU). The washer is also supplied together when the O-ring itself is ordered. Please purchase separately the O-ring containing the washer if necessary.

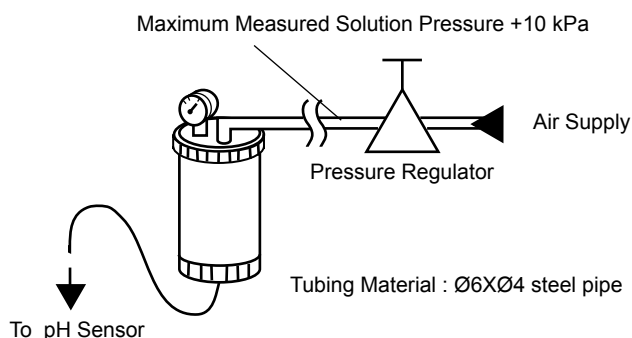


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Figure 2.2 Sensor Cable Treatment

Connect the sensor cable correctly by referring to Section 2.3.

- (3) A general purpose reserve tank filled with KCl solution 250 mL and hardware or a medium pressure reserve tank (where specified), are attached to the PH8ECP pH Sensor. Mount the general purpose reserve tank holder on a 2-inch pipe. Connect the KCl refilling tube to the general purpose reserve tank. Remove the cap from the tank and connect the tube connectors to the tank. Mount the medium pressure reserve tank on a 2-inch pipe and connect a pipe to the reserve tank (see Figure 2.3). Connect the sensor KCl refilling tube to the reserve tank.



F2.3E.ai

Figure 2.3 Connecting Pipe to Reserve Tank

- (4) Supply the sensor with KCl solution. When a general purpose reserve tank is used, mount the reserve tank in its holder with the tube connections directed downward.

Make some ventilation holes in the top side of the reserve tank using the pins supplied with the tank. Loosen the air exhaust plug in the reference electrode and allow KCl solution to flow into the sensor until the sensor is filled with KCl solution. Plug the air exhaust hole.

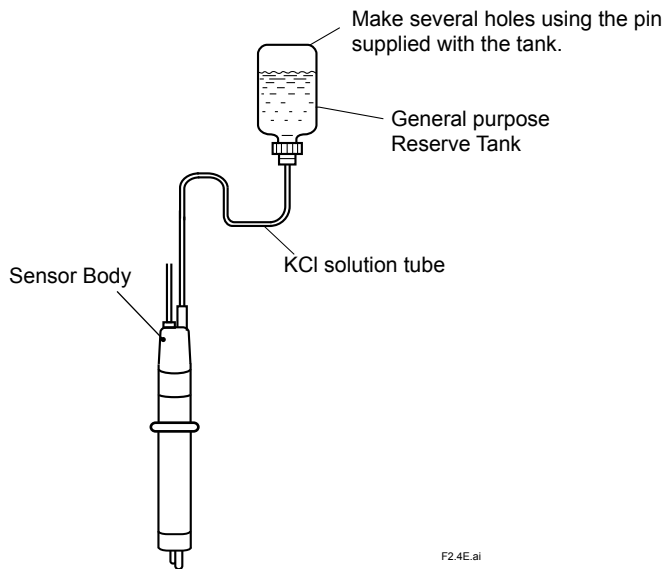


Figure 2.4 Supplying KCl Solutions in the Sensor



CAUTION

For the best measurements, swing the sensor four or five times to remove air bubbles from the electrodes before plugging the exhaust hole.

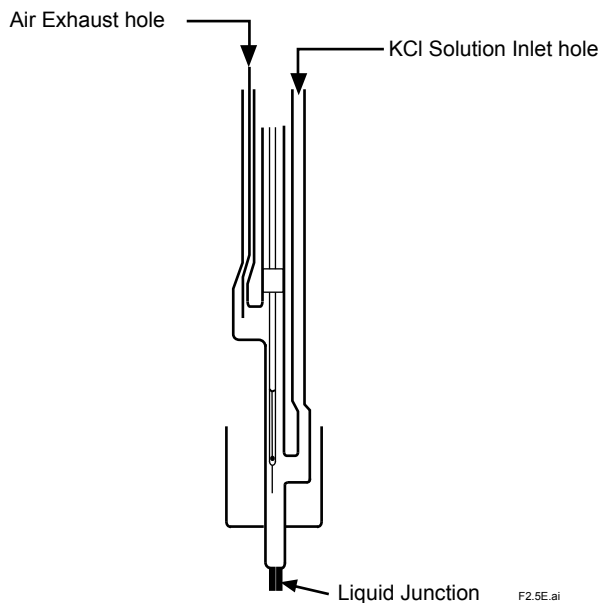


Figure 2.5 Structure of Reference Electrode in the Sensor

When a medium pressure reserve tank is used, proceed as follows to supply the reserve tank with KCl solution. Loosen the nut on the reserve tank upside and remove the cap - the pressure gauge mouted. Supply the reserve tank with about 250 mL of KCl solution. Loosen the reference electrode air exhaust plug and allow KCl solution to flow from the reserve tank into the sensor. Plug the air exhaust port if the KCl solution overflows. Install the reserve tank cover and tighten the nut. 3.3 mol/L is used as KCl solution.



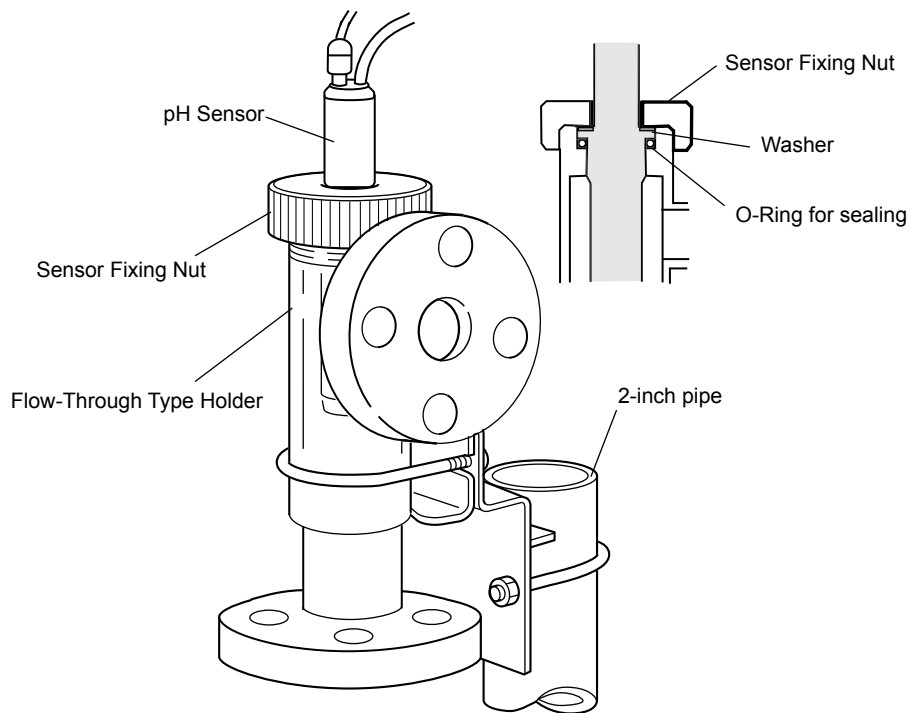
Tip

The KCl solution can be prepared from KCl powder, Yokogawa's PH8AX accessory.

Dissolve one bag of KCl powder (62 g) in deionized water and dilute to 250 mL.

(5) Set the pH sensor in the holder.

Remove the shipping materials after installing the sensor. Replace a fluoride rubber O-ring with a Tetrafluoroethylene O-ring as needed. Insert the sensor tip into the holder and tighten the nut that secures the sensor.



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Figure 2.6 Installing the Sensor Using a Flow-Through Type Holder

2.3 Connecting Sensor cables

2.3.1 Connecting Sensor Cable to Two-wire pH transmitter

The following describes how to connect a pH sensor cable directly to the two-wire pH transmitter. When the cable is to be connected to a junction terminal box, first read the separately prepared "PH8TBG Junction Terminal Box (IM12B07W01-01E)" or "WTB10 Terminal Box (IM19D01B01-01E)" instruction manual.

To connect the sensor cable to the two-wire pH transmitter, proceed as follows:

- (1) Loosen the four screws that tighten the transmitter cover. Then remove the transmitter cover.
- (2) Connect the sensor cables to the relevant terminals of the transmitter:

First, remove the nut from the cable gland. Insert the cable into the right opening for the wiring. Then pass the cable through the nut, Connect the individual cable conductors to the relevant terminals correctly by referring to the markings on the individual conductors.

For details, refer to relevant IMs.

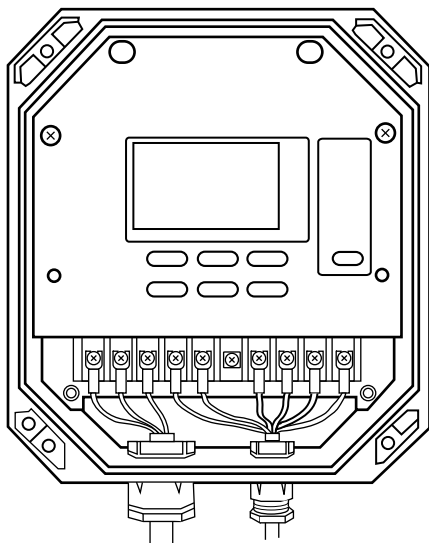


Figure 2.7 Connecting Sensor Cable Connection to Two-wire pH Transmitter

- (3) Install the cable gland in the wiring hole as follows:

Pass the tip of the cable gland into the opening and completely tighten the gland with the nut inside the case

After tightening the gland, secure the cap properly to prevent moisture from getting into the case.

Caution: Do not overly tighten the cap. Otherwise, the cable may be damaged.

- (4) After completing the cable connections, replace the transmitter cover securely, thus preventing moisture from getting into the case.

2.3.2 Connecting Sensor Cable to Four-wire pH Converter

To connect the sensor cable to a Four-wire pH converter, proceed as follows:

- (1) Loosen the four screws that tighten the converter cover. Then remove the converter cover.
- (2) Connect the sensor cables to the relevant terminals of the transmitter:

First, remove the nut from the cable gland. Insert the cable into the right opening for the wiring. Then pass the cable through the nut, Connect the individual cable conductors to the relevant terminals correctly by referring to the markings on the individual conductors.

For details, refer to relevant IMs.

- (3) Install the cable gland in the wiring hole as follows:

Pass the tip of the cable gland into the opening and completely tighten the gland with the nut inside the case

After tightening the gland, secure the cap properly to prevent moisture from getting into the case.

Caution: Do not overly tighten the cap. Otherwise, the cable may be damaged.

- (4) After completing the cable connections, replace the converter cover securely, thus preventing moisture from getting into the case.

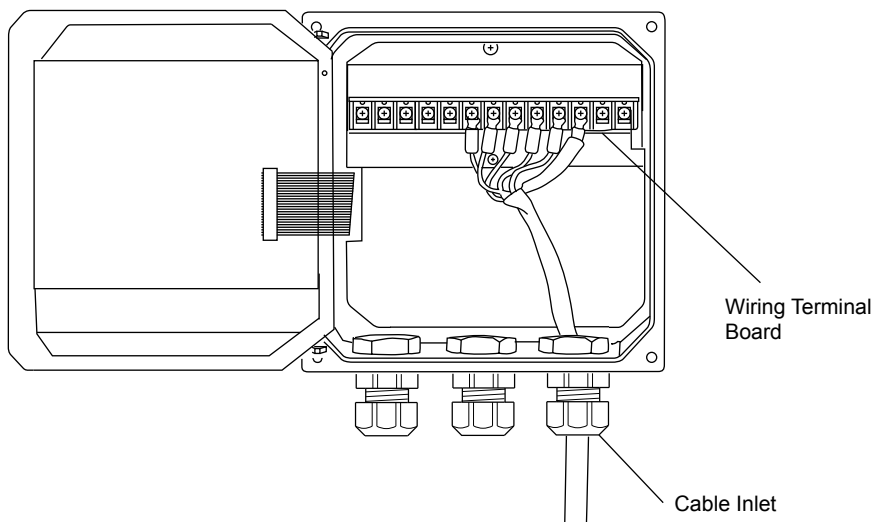


Figure 2.8 Connecting Sensor Cable to Four-wire pH Converter

3. USE OF pH SENSOR

3.1 Operation and Periodical Maintenance

3.1.1 Buffer Solution Calibration

Calibrate with buffer solution before starting normal operation because the e.m.f. of the glass electrodes differ a little from each other. The e.m.f. of the glass electrode gradually changes due to electrode staining and electrode deterioration. Therefore, the buffer solution calibration must be performed periodically within a given period to keep the measurement error within tolerance.

Refer to the Section "OPERATION" in the instruction manual of the pH converter or two-wire transmitter for instructions for buffer solution calibration.

Note: Glass electrodes which have dried out do not show stable properties until some time after immersion in solution. Submerge the electrode in water for about 30 minutes to stabilize its characteristic before carrying out buffer solution calibration.

3.1.2 Pressurizing Reserve Tank

When the pH sensor with medium pressure reserve tank is used, apply air pressure to the reserve tank before flowing the measured solution through the holder.

Set the air pressure a little higher than the maximum pressure of the measured solution during the operation.

The flow rate of the KCl solution from the liquid junction is approximately 2 mL/day when the pressure difference between air and measured solution is 10 kPa and the flow rate increases in proportion to the pressure difference.

3.1.3 Replenishment of KCl Solution

When the KCl solution in the tank seems to be nearly exhausted while using a pH sensor with general type reserve tank, replace the reserve tank with new one (provided separately as spare part). Instead of replacing the reserve tank, it can be replenished with a prepared KCl solution. Dissolve 246 g powder deionized water and dilute to one liter to make an approximately 3.3 mol/L KCl solution. Put the solution in the tank, taking care not allow the KCl solution to spout from the vent hole of the tank.

When a pH sensor with a medium pressure reserve tank is used, replenish the KCl solution when the KCl solution in the tank seems to be nearly exhausted. Carry out replenishment of KCl solution as follows:

- (1) Close the valves to shut off the flow or measured solution (see Figure 3.1), first in the inlet then the outlet valves in the flow-through type holder.

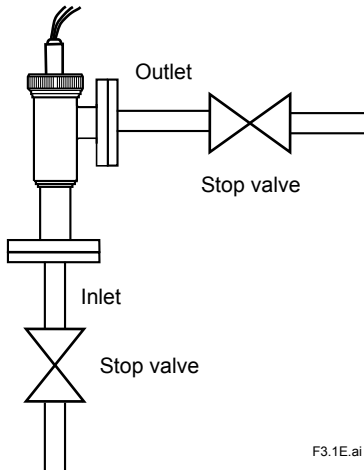


Figure 3.1 Process Piping of Flow-through Type Holder

- (2) Remove the socket type connector on the reserve tank and stop the air pressurizing the tank (see Figure 3.2).

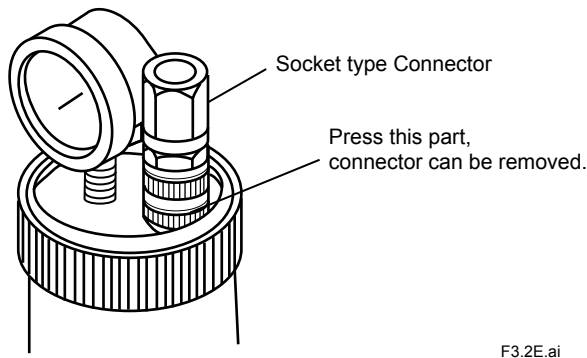
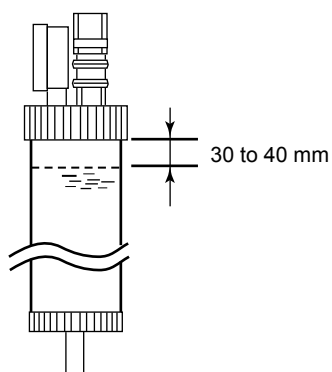


Figure 3.2 Socket type Connector

- (3) Remove the nut fixing the reserve tank cap and remove the cap.

- (4) Refill the tank with 3.3 mol/L KCl solution (see Figure 3.3). The maximum solution level is 30 to 40 mm lower than the top.



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Figure 3.3 Maximum KCl Replenishment Level

- (5) Retighten the nut to fix the cap in position. Connect the socket type connector and apply air pressure to the tank.
- (6) Open the valve and let the measured solution flow through the holder.

3.1.4 Cleaning the Glass Electrode and Liquid Junction

Staining of the glass electrode or liquid junction can cause measurement error. Consequently, if the measured solution tends to stain the electrode, the glass electrode and liquid junction must be cleaned periodically, the period depending on the degree of staining.

Clean the glass electrode and liquid junction as per the following procedure:

- **Stains due to suspended solids, sticky material or microbes, etc.**

Using soft tissue paper, wipe the stains off the glass electrode and liquid junction.

Further, clean off the remaining stains by rinsing with water,

- **Stains due to oily material.**

Wash off the stains by submerging in a neutral detergent solution in a beaker, etc.

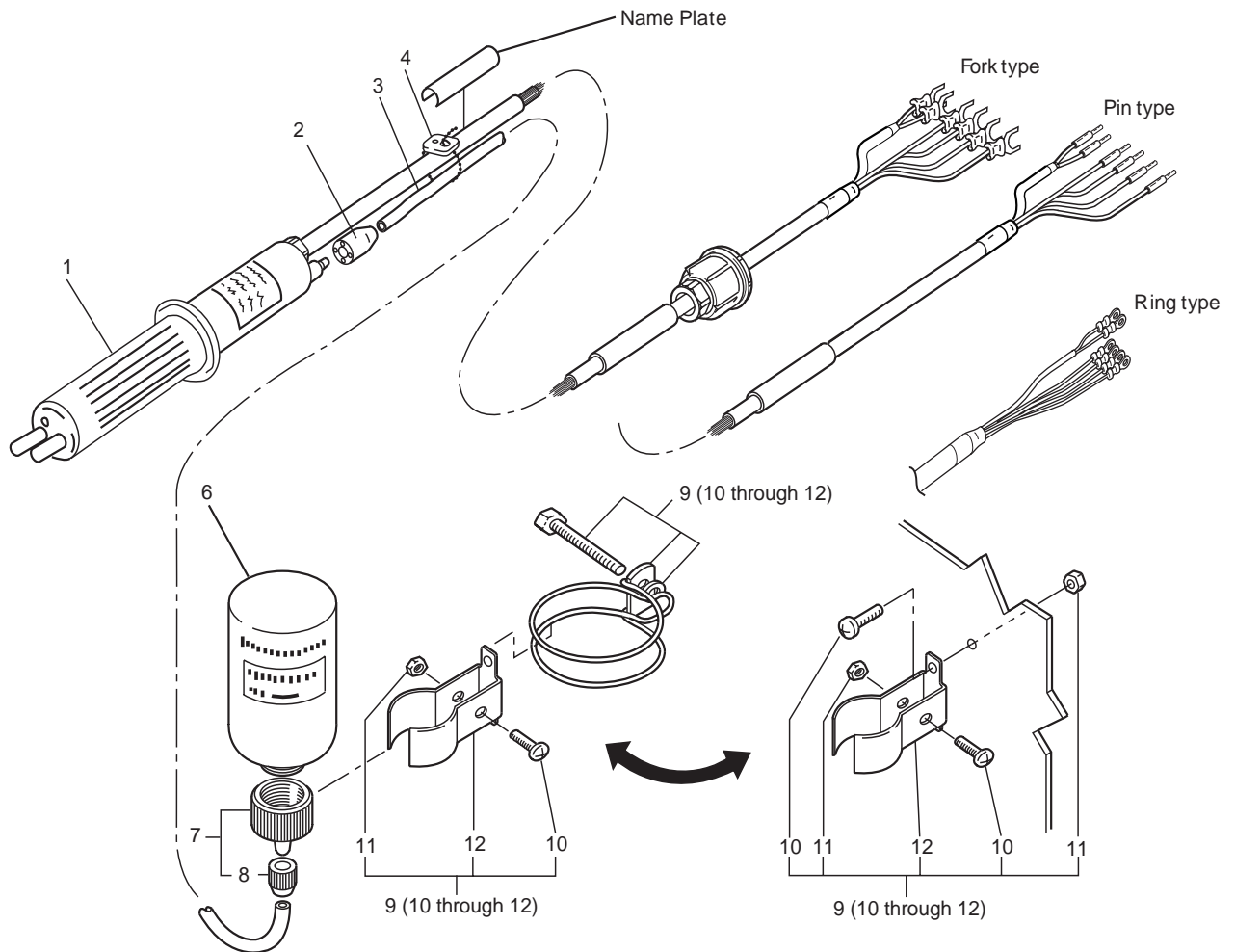
- **Chemical stains such as due to metallic adsorption.**

Submerge the "glass electrode" and the "liquid junction" in a diluted hydrochloric acid solution (1 to 2%) for several minutes (acid washing).

If the sensor characteristics are affected by chemical staining, e.g. when the sensor is used for pH measurement of a highly alkaline solution, carry out acid washing.

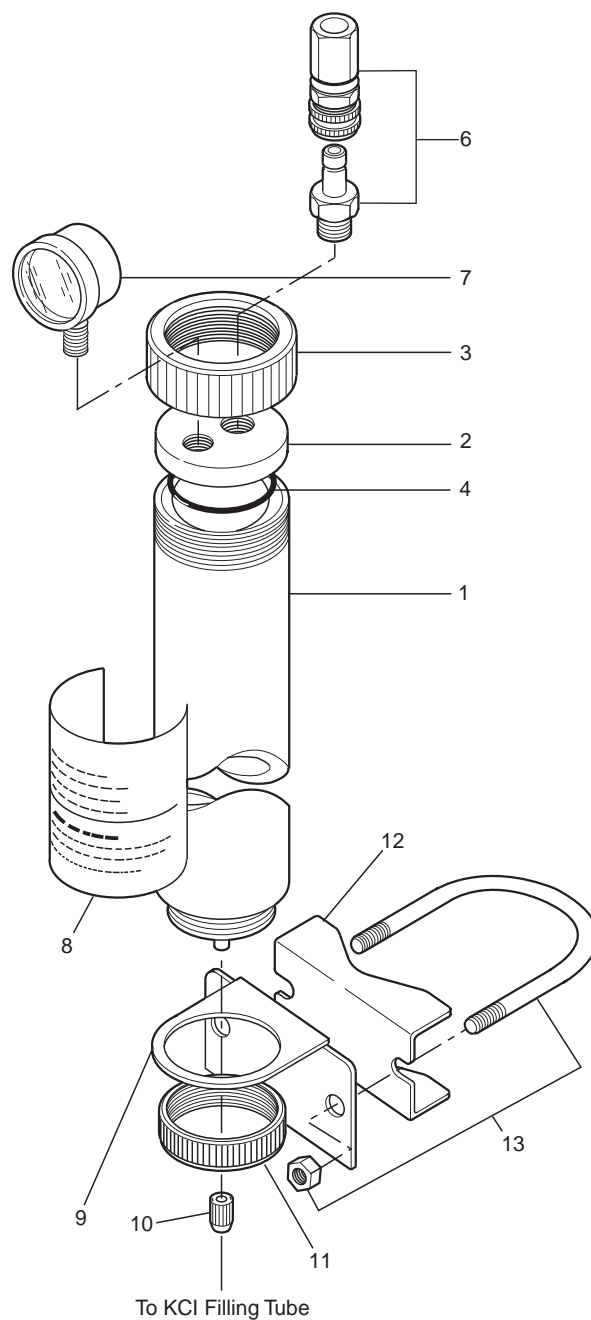
Customer Maintenance Parts List

Model PH8ECP KCl Filling Type pH Sensor for electrolysis plant



Item	Part No.	Qty	Description	Item	Part No.	Qty	Description
1	—	1	Body Assembly	10	—	3	B.H. Screw, M4×18
2	K9142 EJ	1	Cap	11	—	3	Nut
3	Below	1	KCl Filling Tube	12	—	1	Bracket
	K9142PF		Length 3 m				} For general use
	K9142PG		Length 5 m				
	K9142PJ		Length 3 m				} For Medium Pressure
	K9142PK		Length 5 m				
4	L9813UG	3 or 5	Clamp				
5	—	1	Nameplate				
6	K9084 KQ	1	Bottle for general use (250ml)				
7	K9084 KV	1	Connector Assembly (for general use)				
8	K9084 CG	1	Nut				
9	K9142VE	1	Holder Assembly				

Medium Pressure Type KCI Tank Assembly for Suffix Code : -TT2 (K9142VG)



Item	Part No.	Qty	Description
1	K9142VL	1	Tank Assembly
2	K9142VJ	1	Block
3	K9142VK	1	Block
4	G9303AE	1	O-Ring
6	L9835DD	1	Joint
7	L9867BS	1	Pressure Gauge
8	K9142RU	1	Label
9	K9142VP	1	Bracket
10	K9142EJ	1	Cap
11	K9142VQ	1	Ring
12	L9826AL	1	Bracket
13	D0117XL-A	1	U-Bolt

Revision Information

- Title : Model PH8ECP KCl Filling Type pH Sensor (for electrolysis plant)
- Manual No. : IM 12B7J3-01E

Oct. 2015/6th Edition Added FLXA202
P1-2, P1-3

Jul. 2015/5th Edition
Added a postscript about Compliance with the simple apparatus requirements.

Jul. 2011/4th Edition Page layout changed by InDesign
P 1-2, Option code of M4 ring terminals added to MS-code.
P 1-3, Some of external dimensions corrected and M4 ring terminals added.
Some of CMPL 12B7J3-01E modified.

Apr. 2008/3rd Edition
M3 ring terminals added for PH450G, CMPL12B7J3-01E revised to 3rd edition.

Aug. 2006/2nd Edition
IM Style & Format is renewed.
Revised and Corrected all over:
• Chapter of "Introduction" and its subsections added
• Conformity to SI unit expression
• Chapter 1 : Material for sealing ring is deleted. Model and suffix code table is updated
• Chapter 2 : Explanation of washer and O-ring , and notification in 2.2.1(2) is changed.
Table 2.1 is deleted. The contents of "2.3 Connecting Sensor Cable" are renewed.
• CMPL is updated.
, etc.

1987/1st Edition
Newly published.

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- If you want to have more information about Yokogawa products, you can visit Yokogawa's home page at the following web site.
Home page: <http://www.yokogawa.com/an>
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