User's Manual

EXA OR

Model OR10RP
KCl Replenish-free ORP Sensor

vigilantplant.

YOKOGAWA ◆

Yokogawa Electric Corporation

◆ Introduction

This instruction manual covers the OR10RP KCl Replenish-free OR sensor for the OR100. 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
PH10RP	KCl Replenish-free pH Sensor	IM 12 B11C02-01E
OR10FP	KCl Refillable ORP Sensor	IM 12 C11C01-01E
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

T000.eps

◆ 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 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.

⚠ DANGER

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.

✋ WARNING

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.
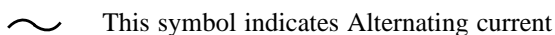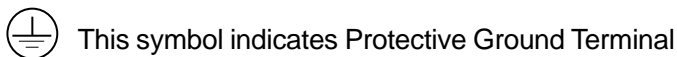
⚠ CAUTION

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

△ **Tip**

This symbol gives information that complements the current topic.

✍ **SEE ALSO**

This symbol identifies a source to be referred to.

⏚ This symbol indicates Protective Ground Terminal

⏛ This symbol indicates Function Ground Terminal (Do not use this terminal as the protective ground terminal.)

∿ This symbol indicates Alternating current

⚠ WARNING : Glass Breakage

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

◆ 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.

Table of Contents

1. Specification

The OR10RP is a KCl Replenish-free ORP 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 OR10RP, Option code : /ADP).

1.1   Standard Specifications

Measurement:	Oxidation - Reduction Potential of a solution
Measurement principle:	ORP measurement by Platinum electrode
Sensor type:	KCl Non-Refillable type
Measuring range:	-1500 to 1500 mV
Installation:	Mounting in PH10HLD Immersion Holder
	Mounting in PH10HG Guid-pipe Holder
	Connection with OR10RP/ADP piping adapter
Sample temperature range :	0 to 60° C
Sample pressure :	3 m water pressure (max.) under Atomospheric pressure
Sample flow rate :	2 m/s max.

Wetted part materials:
   Polyethylene, polypropylene, polyvinyle chloride, silicon rubber, glass, Platinum (for electrode) ceramics, chlorinated polyethylene rubber (cable insulation®), Viton fluoroelastomer (O-ring for piping adapter)
Piping adapter Material (option coode : /ADP) :
   Polyvinyle chloride
Cble: Specialty 4-conductor cable
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), silicon rubber (gasket), ethylene propylene rubber (cover)
   PH10HG Guide-pipe Holder:
        Wetted part materials: Polyvinyle chloride

1.2 Model and Suffix code

Model	Suffix code			Option code	Description
OR10RP					KCl Replenish-free ORP sensor for OR100
Cable length	-03				3m
	-05				5m
	-10				10 m
————		-AA			Always -AA
Combination holder	Adapter		-ADP *2		For piping adapter *1
	Immersion type		-HSS		For Immersion type holder *3
	Guide-pipe type		-GDH		For Guide-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.
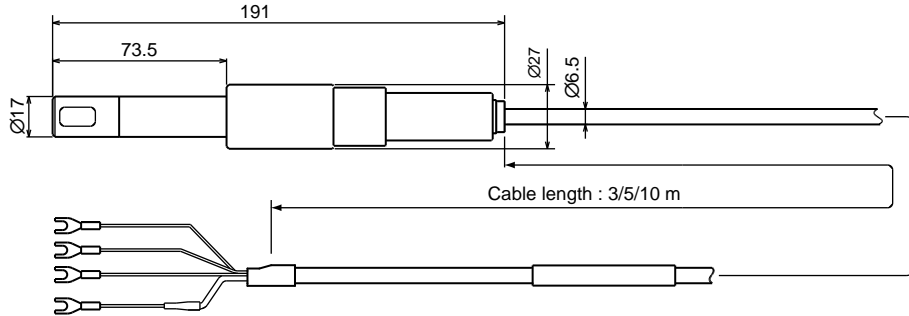   *2: Configuration is suited for Guide-pipe type holder, PH10HG.
             *3: PH10HLD Immersion holder should be ordered separately.
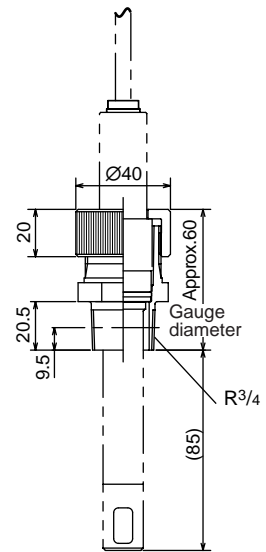
T04.EPS

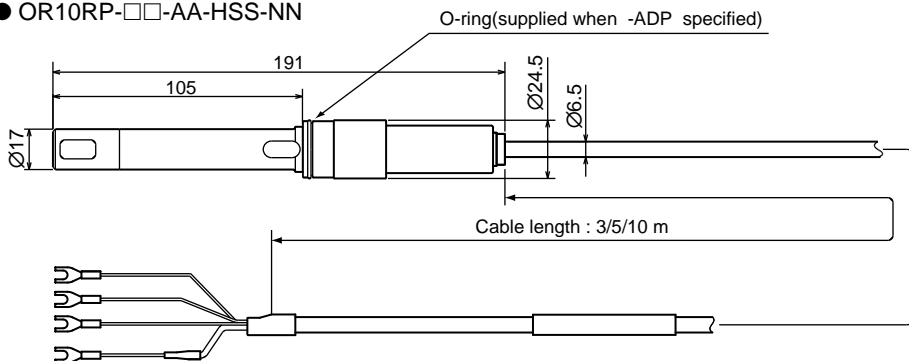# 1.3 External Dimensions

Unit : mm

● OR10RP-□□-AA-GDH-NN

191
73.5
Ø17
Ø27
Ø6.5
Cable length : 3/5/10 m

● OR10RP-□□-AA-ADP-NN/ADP

Ø40
20
Approx.60
20.5
9.5
Gauge diameter
R3/4
(85)

● OR10RP-□□-AA-ADP-NN

● OR10RP-□□-AA-HSS-NN

O-ring(supplied when -ADP specified)
191
105
Ø17
Ø24.5
Ø6.5
Cable length : 3/5/10 m

<Optional Adapter>
● /ADP
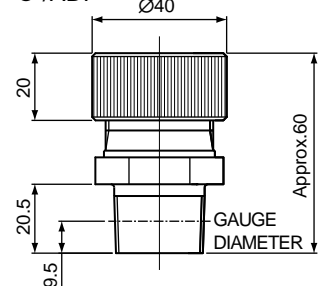Ø40
20
Approx.60
20.5
9.5
GAUGE DIAMETER

Fig. 1.1

2. Installation

2.1 Preparation for Installation

2.1.1 Checking for Damage

The OR10RP KCl Replenish-free ORP 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 OR10RP ORP sensor is used with a special pipng adapter; the PH10HLD immersion holder, 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 Installation of Associated Equipment

Check that associated equipments such as the WTB100 terminal box and the OR100 ORP converter are installed.

2.2 Requirements for mounting the ORP sensor

2.2.1 In case of installing the PH10HG guide-pipe holder

(1) Connect the ORP sensor cable to related equipments (refer to 2.3 for procedure)

(2) Take the cap, which prevents the ORP sensor from drying out, off the tip of the sensor.

(3) Install the PH10HG Guide-pipe holder as shown in figure.2.1.

The mounting hardware (/MS1 or /MS2) or holder fixing hardware for calibration (/CALK) is recommended for the first installation.

⚠ CAUTION

Refer to the other related document (No. IM 12B11D02-01E) for the details of PH10HG Guide-pipe holder installation method.

Fix by mounting hardware
(/MS1 or /MS2)

Stanchion(vertical)
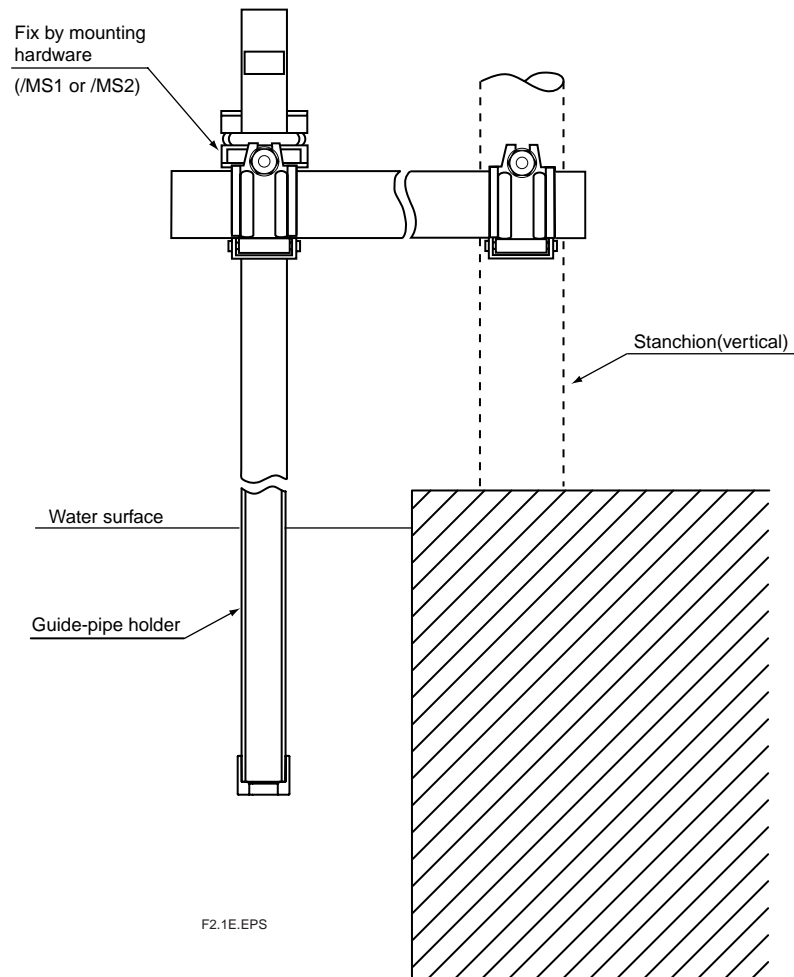
Water surface

Guide-pipe holder

F2.1E.EPS

Fig. 2.1

(4) Install the KCl Replenish-free ORP sensor in PH10HG Guide-pipe holder. Insert slowly and gently the sensor from the upper opening of the holder so that the sensor will not strongly hit the bottom of the holder; otherwise the senosor can be broken.
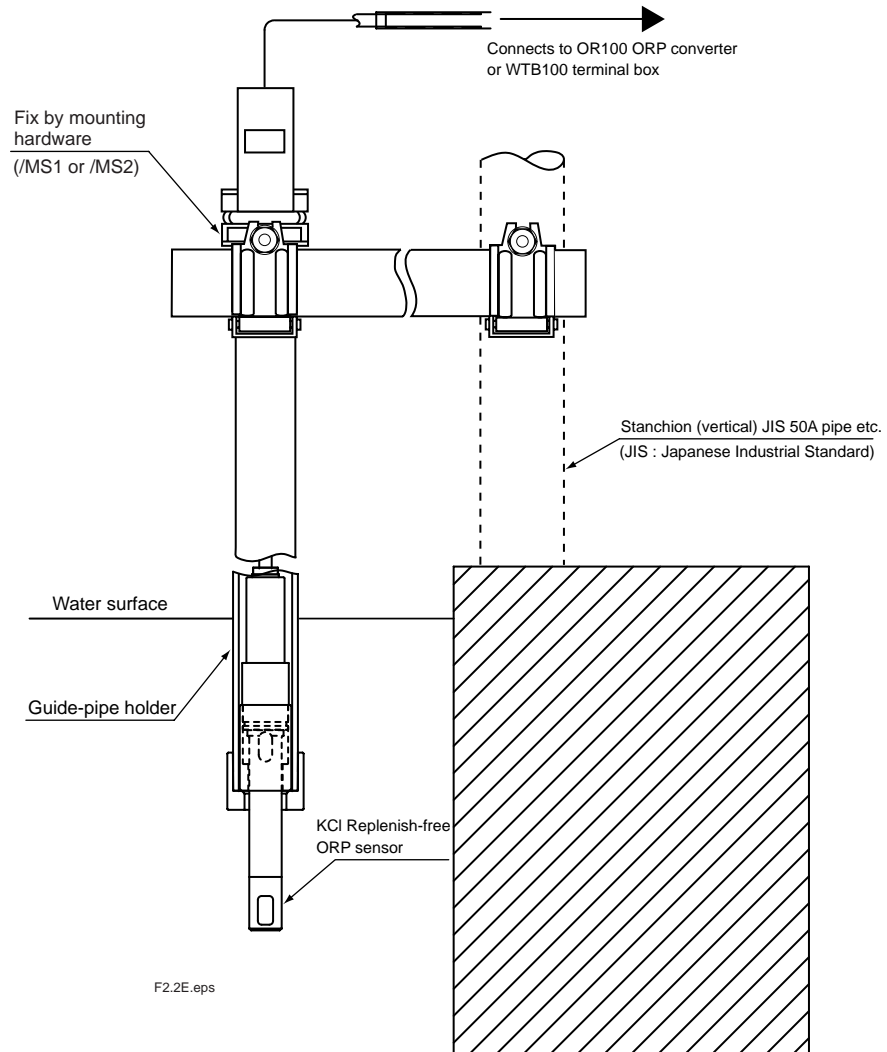
Connects to OR100 ORP converter or WTB100 terminal box

Fix by mounting hardware (/MS1 or /MS2)

Stanchion (vertical) JIS 50A pipe etc. (JIS : Japanese Industrial Standard)

Water surface

Guide-pipe holder

KCl Replenish-free ORP sensor

F2.2E.eps

Fig. 2.2

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

(1) Take the ORP sensor cap, which prevents the ORP 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 .
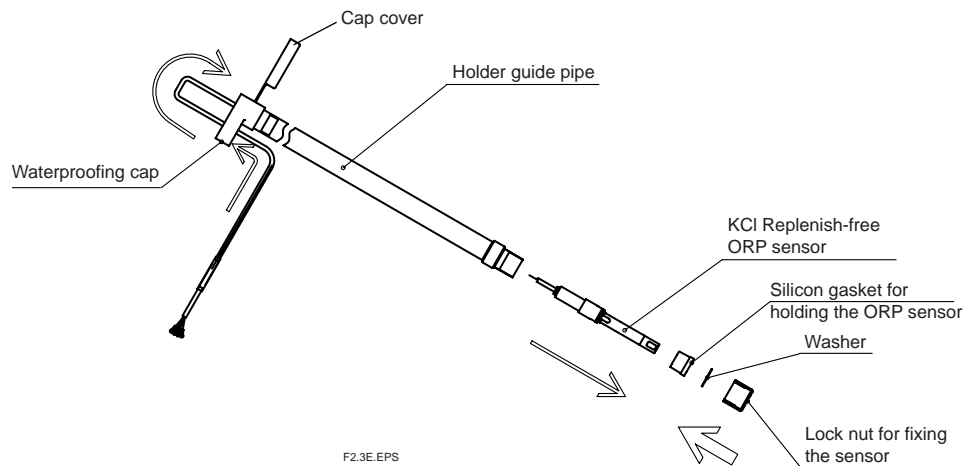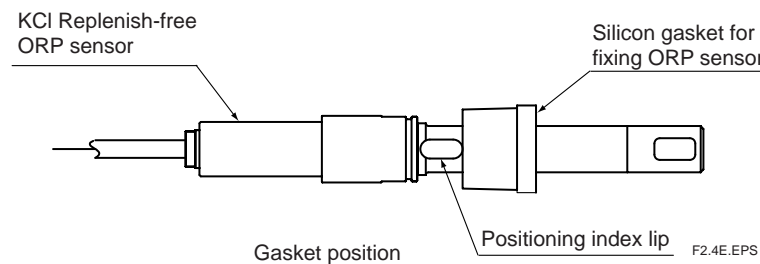

F2.3E.EPS

Fig. 2.3

F2.4E.EPS

Fig. 2.4

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

The mounting hardware (/MS1 or /MS2) or holder fixing hardware for calibration (/CALK) is recommended for the first installation.
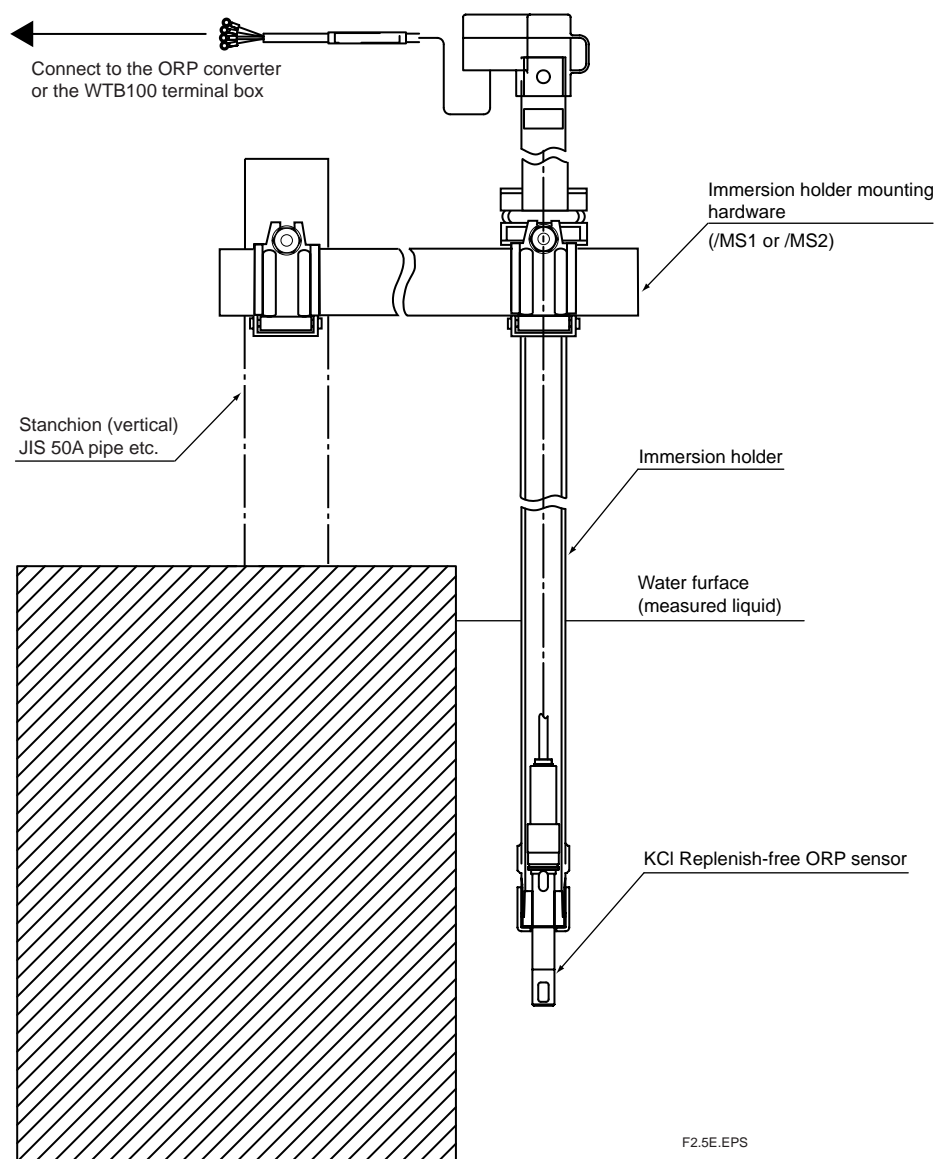

Connect to the ORP converter or the WTB100 terminal box

Immersion holder mounting hardware (/MS1 or /MS2)

Stanchion (vertical) JIS 50A pipe etc.

Immersion holder

Water furface (measured liquid)

KCl Replenish-free ORP sensor

F2.5E.EPS

Fig. 2.5

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

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

(1) Check that a O-ring is attached to the ORP sensor.
(2) Take the cap, which prevents the ORP 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 platinum electrode can face downward.
• Set the socket so that, when attaching the ORP sensor, the electrodes can be soaked.
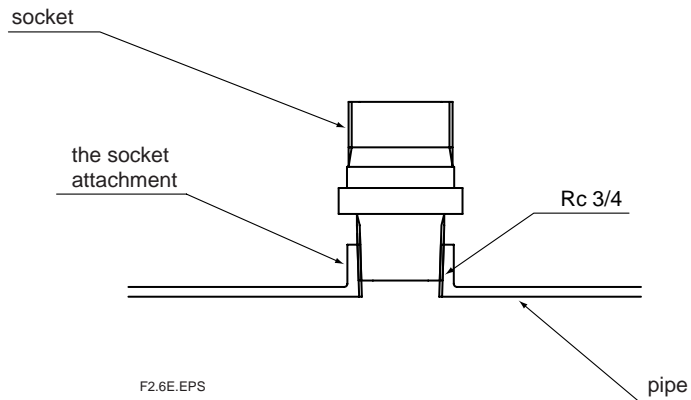
socket

the socket attachment

Rc 3/4

F2.6E.EPS

pipe

Fig. 2.6

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

a cable

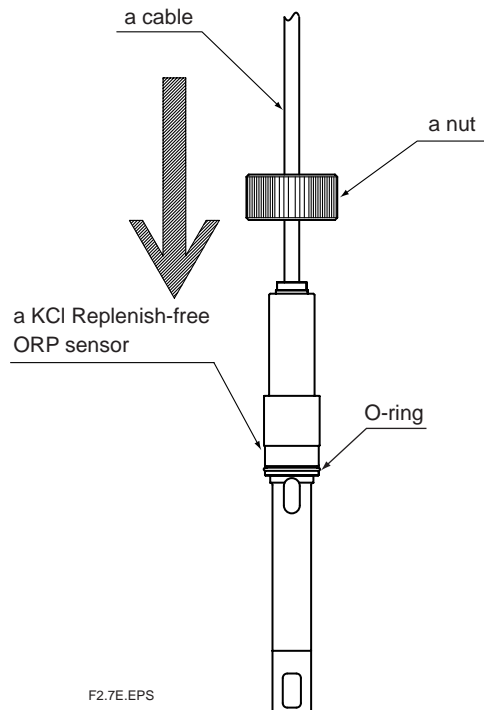a nut

a KCl Replenish-free ORP sensor

O-ring

F2.7E.EPS

Fig. 2.7

(5) Connect the ORP sensor cable to the ORP converter. (for details refer to sec.2.3.)
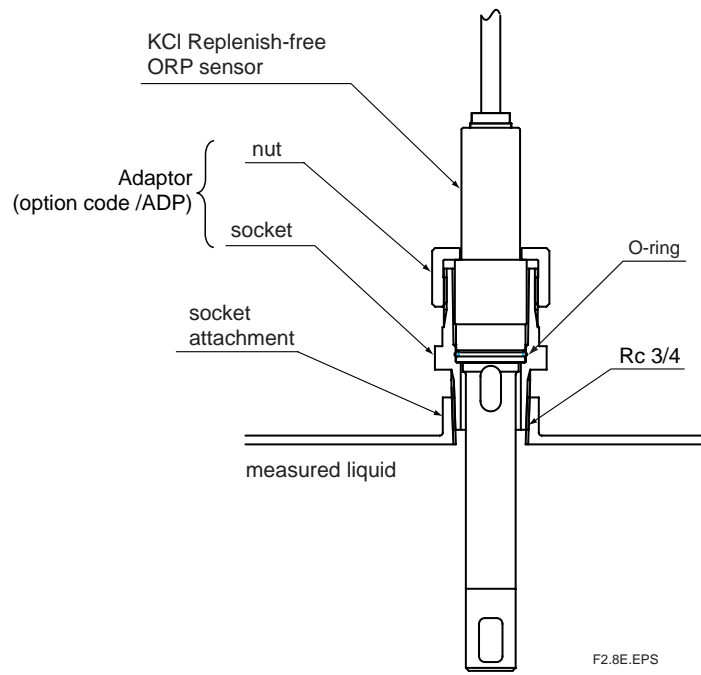(6) Insert the ORP sensor in the socket.

(7) Screw the nut.

Fig. 2.8

2.3 ORP Sensor Cable Wiring Procedure
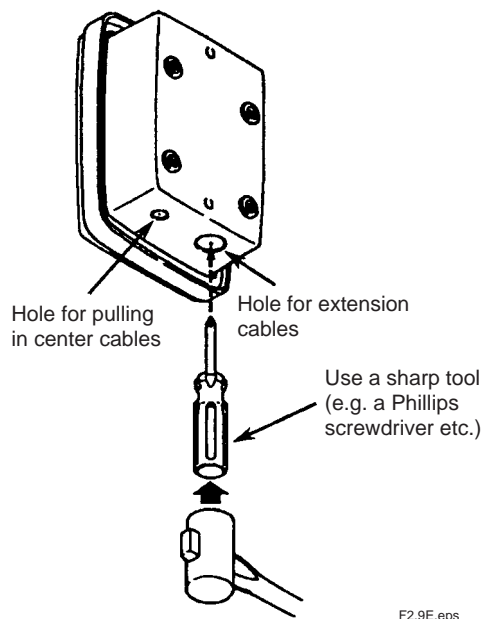
⚠ CAUTION

Place ORP sensor cable as far as possible from the power supply and ground wire.

2.3.1 Connecting to a WTB100 terminal box

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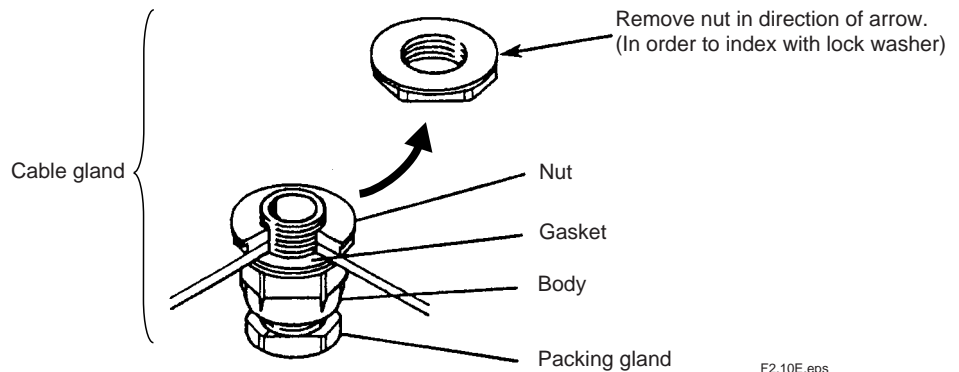
(2) Loosen two screws in the front of the terminal box, and remove the cover.

Hole for pulling in center cables

Hole for extension cables

Use a sharp tool (e.g. a Phillips screwdriver etc.)

F2.9E.eps

Fig. 2.9

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

Remove nut in direction of arrow. (In order to index with lock washer)

Cable gland

Nut

Gasket

Body

Packing gland

F2.10E.eps

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 tighten too much when screwing up these nuts.

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

Terminal marking		Color of cable core
GE	——	red (GE)
G	——	green (G)
RE	——	brown (RE)
SE	——	black (SE)

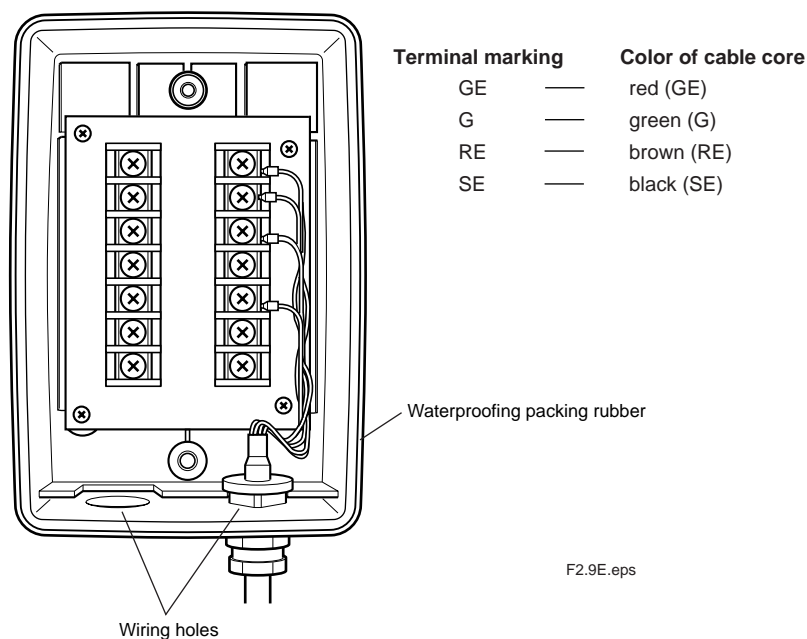Waterproofing packing rubber

Wiring holes

F2.9E.eps

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.

△ Tip

The tag as show in the below figure is attached to the sensor cable you can refer in connecting the related equipment.

(SE) black

(RE) brown

(GE) red

(G) green

GE → 赤 RED
G → 緑 GRN
RE → 茶 BRN
SE → 黒 BLK

F2.12E.EPS
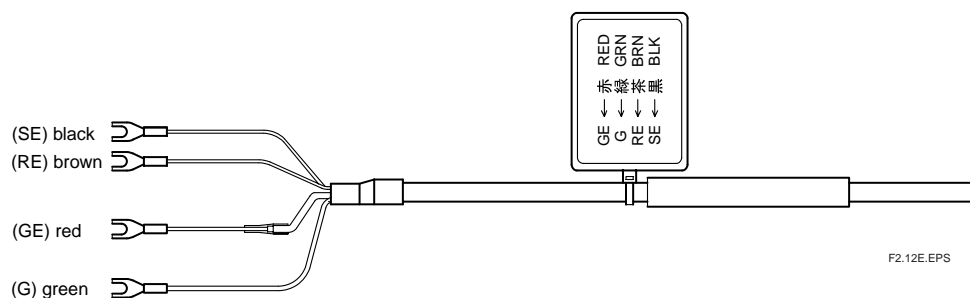
2.3.2   Connecting to the EXA OR100 ORP converter

Connect the sensor cable to the EXA OR100 ORP converter as follows:
Connect the sensor cable terminals to appropriate terminals of the converter. (See Table.2.1)
For details, see another document (No. IM 12C11A01-01E) for wiring the panel mount ORP converter.
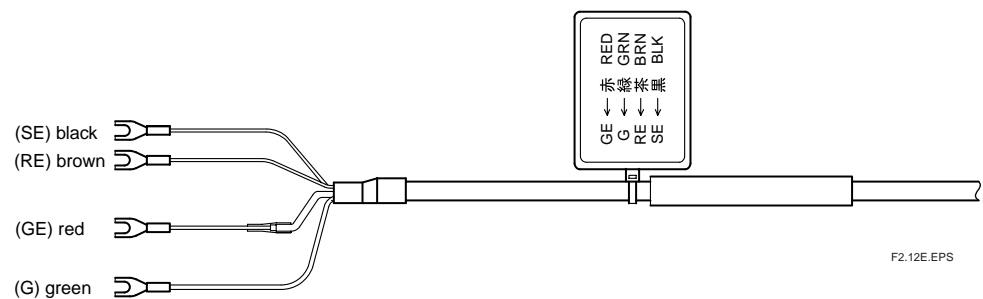
Table 2.1

pH converter terminal no.	Color of PH10FP, and PH10RP pH sensor cable core
11	(do not use)
12 (GE)	red
13 (G)	green (G)
14 (RE)	brown (RE)
15	(do not use)
16 (SE)	black (SE)
17	(do not use)
18	(do not use)

T2.1.eps

△ **Tip**

The tag as show in the below figure is attached to the sensor cable you can refer in connecting the related equipment.

F2.12E.EPS

3. Maintenance on operation

3.1 Calibration and Periodic Maintenance

⚠ CAUTION

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

3.1.1 Check or calibration

The ORP measuring system is usually used for measuring not absolute ORP values but change of the value.
It is natural that the value between the instrument indication and a real solution can become different.
The ORP system is usable without any maintenance in case of the small difference of them. However, if you think the difference is beyond the accuracy necessary to operate process, please check or try to calibrate the ORP sensor. Furthermore, a periodical cleaning is recommended to prevent dirt from adhering to the platinum electrode and liquid junction.
For check or calibration details, refer to the OR100 ORP converter: Document No. IM12C11A01-01E.

(1) Outline of Checking the OR10RP sensor
 • Check the ORP sensor for the following cases:
   In using a new sensor, After cleaning the sensor, In restarting after stopping operation for a long time
 • Method of checking
   Check the indication is within tolerance error by measuring a solution with a definite ORP value
   Quinhydrone solution or iron (II, III) compound solution is useful for checking.

(2) Outline of Calibrating the OR10RP
 • Calibrate the ORP sensor for the following case:
   In confirming the tolerance error is beyond the property value of the real solution by checking
   In adjusting indication of the ORP converter to a certain value such as a manual measurement value or the indication of another converter.
 • Method of the calibration
   Use a solution with a definite ORP value for calibration, or a solution to be measured for adjusting other measurement value. Quinhydrone solution or iron (II, III) compound solution is useful for calibration.Dip the sensor into the solution.
   Calibrate or adjust indication in the manual calibration mode on the converter

△ Tip

YOKOGAWA can supply Quinhydrone powder (P/N: K9024EC) and iron (II, III) compound (P/N: K9024ED).
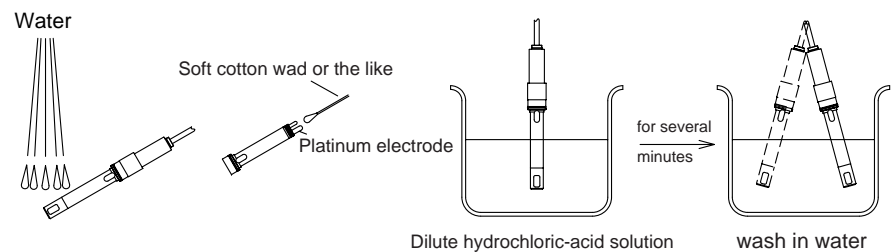Please purchase them if necessary.

3.1.2 Washing of platinum electrode and liquid junction

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

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 >

Water

Soft cotton wad or the like

Platinum electrode

for several minutes

Dilute hydrochloric-acid solution   wash in water

3.2 Replacement of consumables

● **Replacement of OR10RP KCl Replenish-free sensor**

The OR10RP sensor has a limited life. When it can no longer be calibrated with standard solution, it should be replaced.

⚠ CAUTION

- Take care not to hit the electrode and the junction to a rigid place.
- Take care not to let the electrode and the junction touch a ground.
- Dip the sensor in a solution to be measured as early as possible, because a measurement drift may occur right after immersing the senor in the solution,
- Keep in mind the OR10RP cannot apply to a chromium coating process solution because of the platinum electrode deterioration.
- Be careful not to allow the liquid junction to dry out.
  When storing the ORP sensor or keeping it in air for long time, be sure to attach the protective cap (supplied with it when it is shipped) to its tip.
  If the protective cap is lost, store the sensor with its tip immersed in tap water to keep the liquid junction wet.

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

For the OR10RP- □ □ -AA-ADP-NN, an O-ring is neccesary 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 ORP sensor – but if you find that you need to replace the O-ring alone, contact Yokogawa to get a new one.

● **Replacing the gasket in the PH10HLD Immersion holder**

For the PH10HLD immersion holder, the sealing characteristics of the silicon gasket do not usually deteriorate if it is unused for a short time, so replacement of the silicon gasket alone is not usually required. If, however, deterioration of the silicon gasket is noticeable, replace it. Use only silicon gaskets supplied by Yokogawa.

Revision Record

Manual Title : Model OR10RP KCl Replenish-free ORP sensor

Manual Number : IM 12C11C02-01E

Edition	Date	Remark (s)
1st	May. 2003	Newly published
2nd	May 2004	OR100 shield cover changed