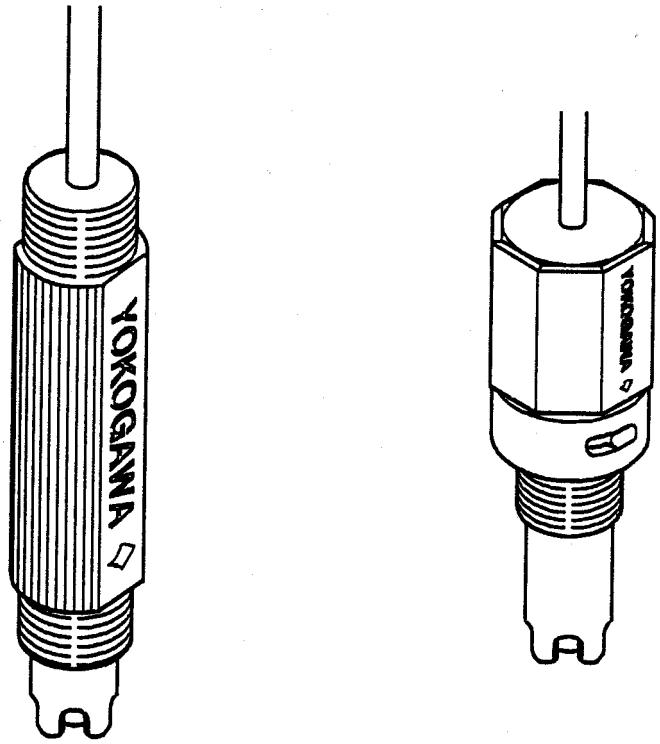
User's
Manual

Model FU20 and FU25
pH, Redox and Temperature sensors

IM 12B07K02-01E

vigilantplant.®



YOKOGAWA
Yokogawa Electric Corporation

IM 12B07K02-01E
1st Edition

Contents

1st Edition: Nov. 2000 (YK)

1. Introduction

1-1. Description

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With one wide body sensor pH, redox and temperature can be measured.

The sensor is directly fitted to the process by the industry standard threaded connection. In addition to that, the FU25 has a twist-lock quick fix and release construction without the need for special equipment.

The especially designed fixed cable has integrated for the pH sensor, reference sensor, temperature sensor, shielding and liquid earth. The cable is prefinished to make connection to any industrial pH instrument as simple as possible.

1-2. Warranty

Yokogawa Electric Co. warrants that the goods delivered are made from new materials to the best workmanship available. Malfunction of any of the delivered goods or parts of it, can only lead to replacement of the damaged parts. No claims can be made to damages or accidents resulting from the use of the goods.

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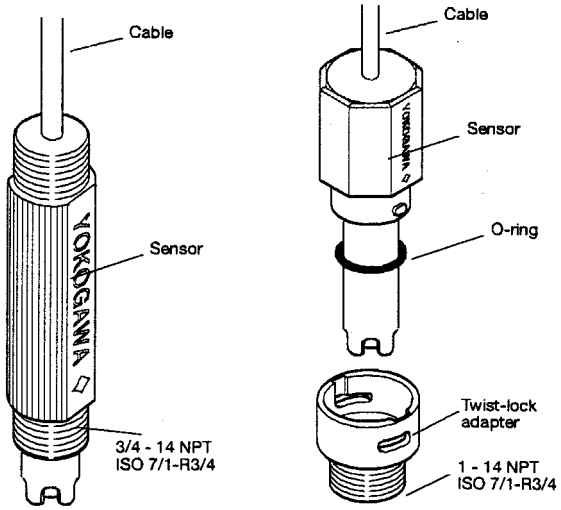


2. Specifications

2-1. Model- and suffix codes FU20

Model	Suffix code	Option code	Description
FU20	- - - - - - - - - - -	- - - - - - -	Wide body sensor
Cable length	-05	- - - - - - -	5 meter
	-10	- - - - - - -	10 meter
Temp. sensor	-T1	- - - - - - -	Pt1000
Process connection	-NPT	- - - - - - -	3/4"NPT-male
Options		/ANG	Adapter for use with guide pipe

2-2. Model- and suffix codes FU25

Model	Suffix code	Option code	Description
FU25	- - - - - - - - - - -	- - - - - - -	Wide body sensor "twistlock" version
Cable length	-05	- - - - - - -	5 meter
	-10	- - - - - - -	10 meter
Temp. sensor	-T1	- - - - - - -	Pt1000
Options		/NPT	Adapter for 1"NPT-male
		/FPS	Adapter for use with conductivity fitting
		/Q	Quality certificate

3. Installation

3-1. Unpacking and checking

When you receive the FU20 or FU25 sensor it is packed in a cardboard box. Open the box and check that the modelcode on the fitting is the same as on the packing list. Also check that it is supplied with the option you ordered. The conductivity fitting adapter for FU20 and the NPT/BSP twist lock adapters for FU25 are delivered as an option. If you have any problems or questions, contact the nearest Yokogawa Engineering Service or Sales organisation for assistance.

The FU20 or FU25 sensor has an identification number on the cable with the full modelcode and a serialnumber.

3-2. Installation site

The FU20 sensor is intended to be used for in-line or by-pass pH measurement. The FU25 is delivered with an optional adapter-piece, so it can be retracted from its position by simply turning the complete sensor anticlockwise by hand.

The location can be at the bottom of an immersion pipe or directly into large diameter pipe-line or vessel.

Several examples are given in the drawings on the next page.

Installation in a bend of a pipe-line is a good measurement position.

When inserting the FU20 or FU25 sensor in a perpendicular position to the process flow, the flow velocity will put a mechanical force on the probe. Take care that this force is not too large. It is recommended to have the FU20 or FU25 sensor positioned at a 45º angle into the process stream.

3-3. Installation method

It is important to have the point of measurement in a location that truly representing the process composition. Check whether the specifications of the sensor fulfil the maximum occurring process conditions.

The FU20 has a 3/4"NPT or ISO 7/1-R3/4 connection. The FU25 has a 1"NPT or ISO 7/1-R1 connection.

Check that you received the correct type. The FU20 comes complete as one part, the FU25 comes with a twist-lock adapter. Install the fitting at a convenient location accessible for maintenance and calibration.

For maintenance or calibration the probe will need a space of about 0.5 meter for retraction. The sensor can be mounted in any position to the horizon; with the tip pointing downward, sideways or even upward.

To prevent the loss of process liquid when the sensor is removed, it is advised to either drain or stop the flow in the process-line where the sensor is mounted.

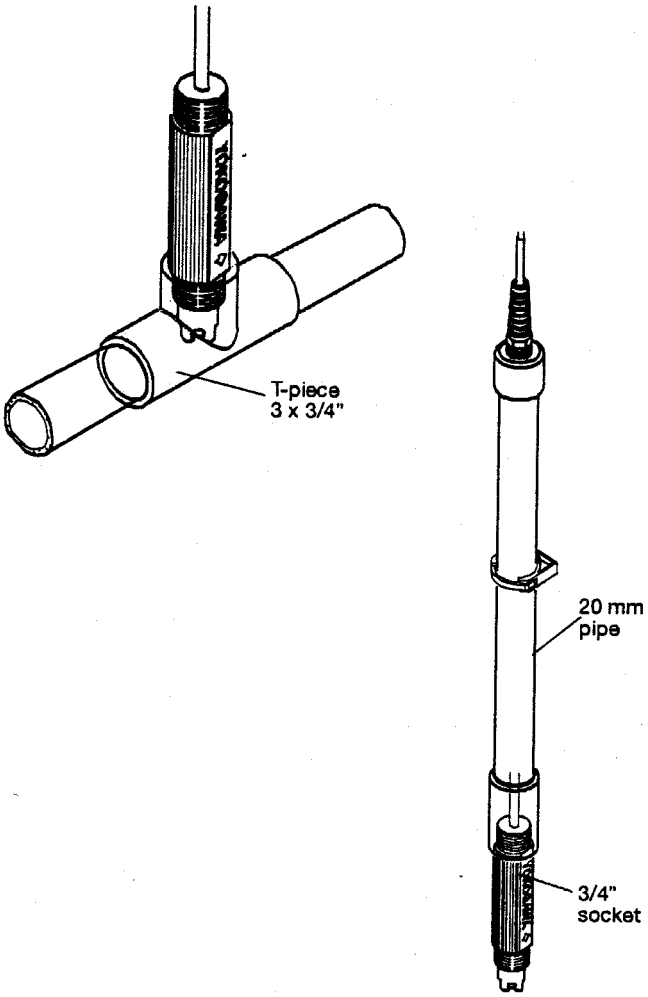
3-4. Assembly of FU25 adapter, taping the thread

When the adapter is ordered with the FU25, it should be mounted to the measuring position first. When the adapter is in place, the sensor can be put into the adapter by turning the twist-lock coupling clockwise (see drawings on this sheet).

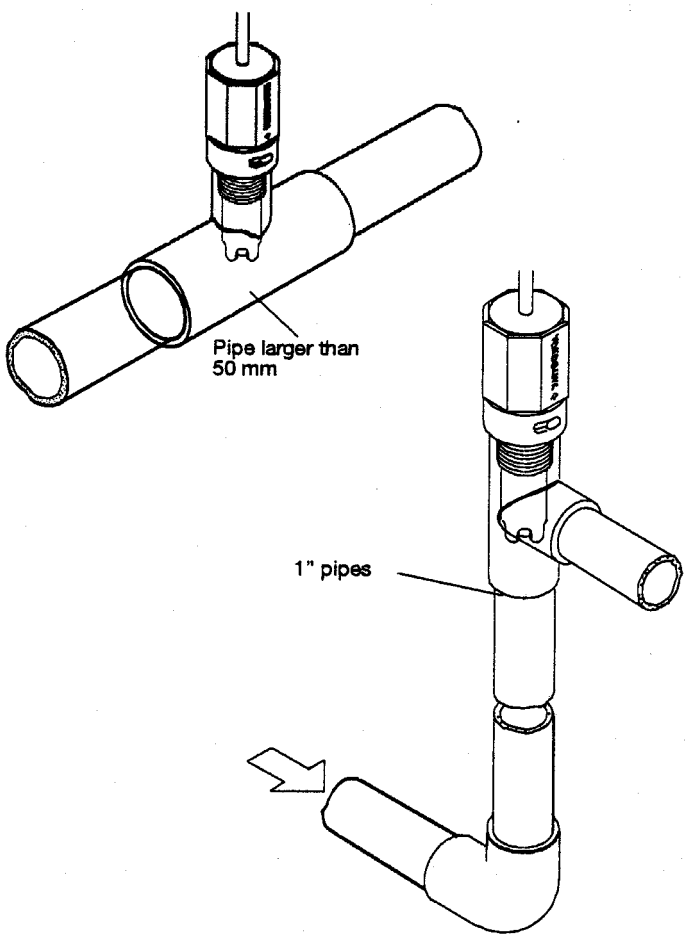
The FU20 and FU25 are equipped with a threaded connection. A gas or watertight sealing can only be achieved by taping the male threaded part with PTFE tape. No further instruction or description is given in this manual.

3-5. Installation examples

FU20



FU25



3-6. Preparing the sensor for use

Take a new sensor from the box (model FU20 or FU25). Take it out and remove the "wet" pocket.

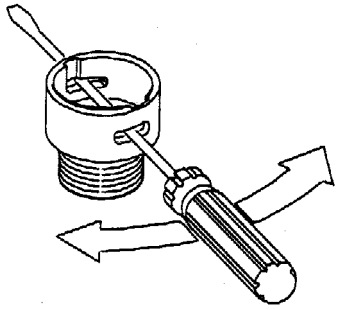
3-7. Mounting the sensor into the process

Find a suitable measuring point to connect the sensor. Prepare the male thread with PTFE-tape and mount the sensor. Mount and connect the cable to the transmitter.

IMPORTANT NOTICE:

Before mounting the sensor, it should be calibrated. The calibration procedure is normally described in the instruction manual of the pH transmitter, but a general guide is given in chapter 4-2.

Mount the adapter of the FU25 into the threaded pipe using a screw-driver as shown in the drawing below.



3-8. Wiring instructions

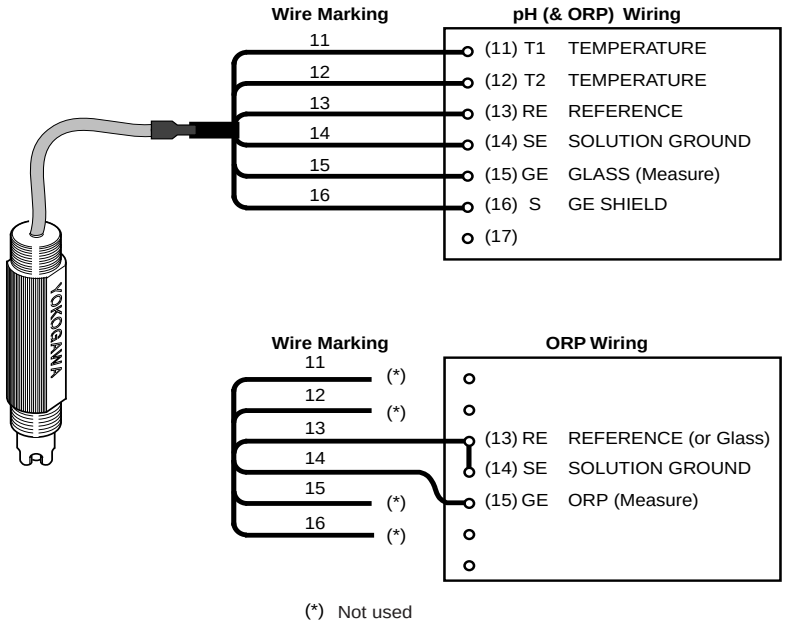
The cable used in the FU20 or FU25 sensor or prepared for easy connection to pH transmitters.

The numbering of the wires is according to the standard terminal numbering of Yokogawa pH transmitters. For redox measurement not all numbers are correct. Look at the connection diagram and short terminals 13 and 14.

Remark:

To make full use of the capibilities of the combined pH/Redox and temperature sensor, the cooperation with Yokogawa pH transmitters is preferred.

3-9. Wiring diagram

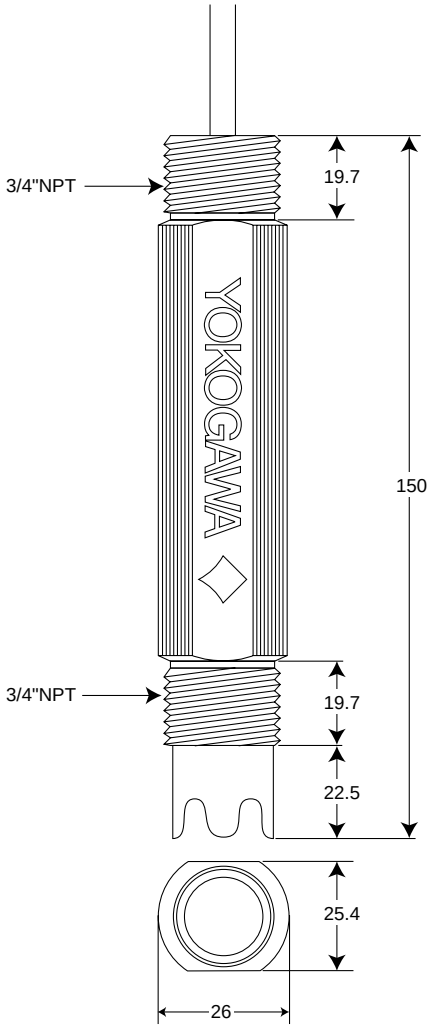


(*) Not used

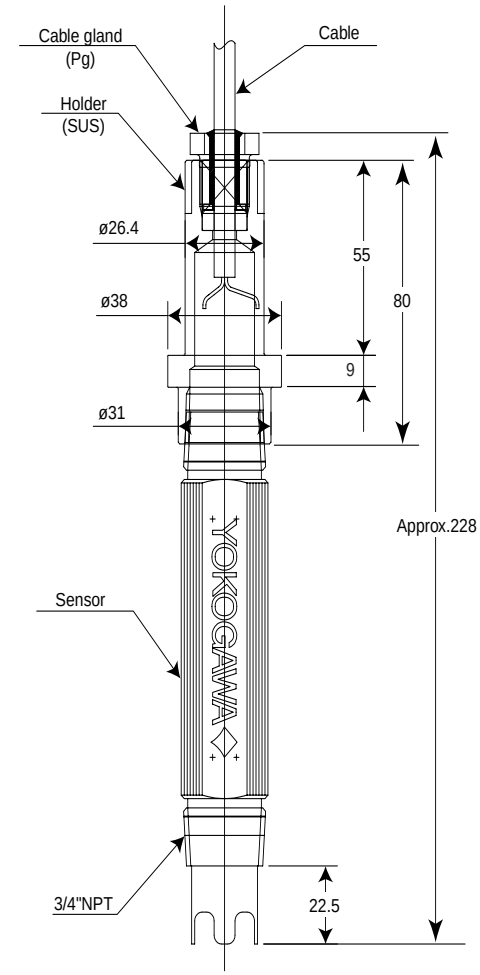
3-10. Dimensions

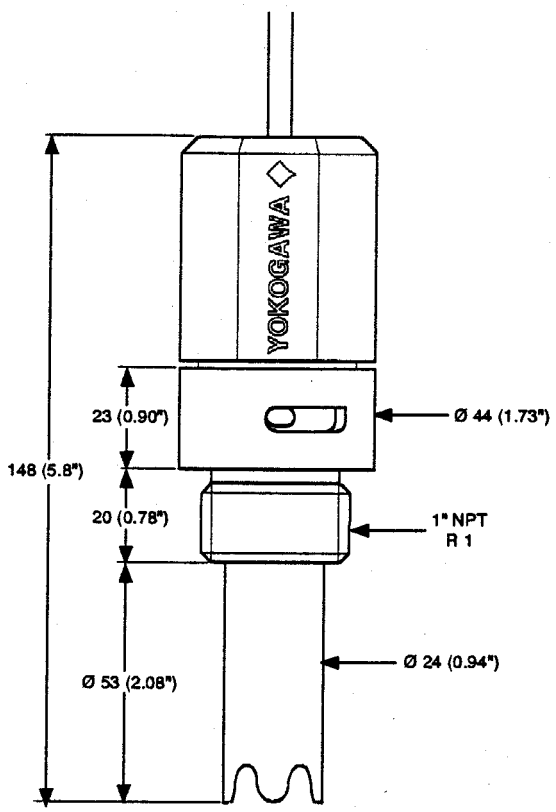
Unit: mm

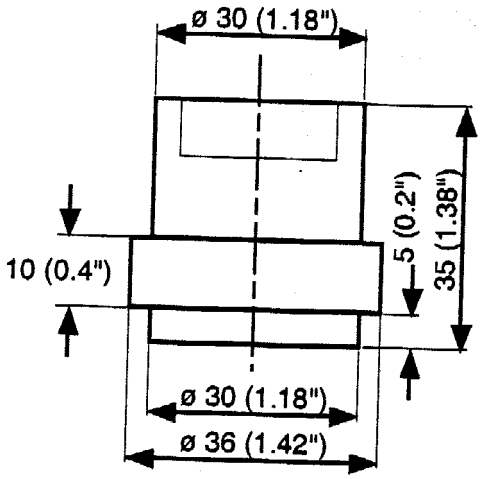
FU20-□□-T1-NPT



FU20-□□-T1-NPT/NAG




YOKOGAWA
23 (0.90")
Ø 44 (1.73")
148 (5.8")
20 (0.78")
1" NPT
R 1
Ø 24 (0.94")
Ø 53 (2.08")


ø 30 (1.18")
5 (0.2")
35 (1.38")
10 (0.4")
ø 30 (1.18")
ø 36 (1.42")

4. Maintenance

4-1. General

Before the sensor can be serviced, it should be physically separated from the process. The FU20 or FU25 sensor can be taken from its measuring position by following the procedure described below.

4-2. Cleaning

Separate the sensor from the process according to the following procedure.

- Turn the sensor anti-clockwise
- Take out the sensor
- Spray with water or detergent
- Use a soft brush to remove dirt
- Check the sensor visually for damages
- Calibrate the sensor (See chapter 4-2)
- Mount the sensor again

Remarks:

- Use new PTFE tape on the threaded parts.
- Take care to avoid torsion of the cable by first turning it anticlockwise before tightening the process connection.
- When the sensitivity of the sensor has decreased or the response has slowed down, the electrode needs cleaning.
- If cleaning with hot water is not sufficient, more aggressive water based agents should be used.

Examples:

1. Deposits of items, hydroxides or carbonates can be removed by immersing the electrode in a solution containing diluted hydrochloric acid. Afterwards rinse with water.
2. Deposits of oil and fat can be removed with hot water in conjunction with a detergent. When the results are unsatisfactory a mild (carbonate based) abrasive can be used.
3. Protein (alduminous) deposits should removed with a protein enzymatic solution. For instance a solution containing 8.5 ml concentrated hydrochloric acid and 10 gram pepsin in 1 litre water will do.

Note:
Avoid using non-polar solvents like tri-chloro ethylene, toluene or hexane.

Cleaning with iso-propanol or methanol is acceptable. The non-polar solvents will break up the gel-layer on the glass bulb and afterwards the electrode needs to remain soaked in water for at least 12 hours before functioning normally again.

The PTFE diaphragm of the sensor can sometimes be regenerated by putting it in hot (60 to 80 ºC) 3 molar Potassium Nitrate (KNO_3) solution and letting it cool to room temperature.

After cleaning the probe is re-inserted into the process by following the reverse procedure.

4-3. Calibration

It is recommended to start calibration with a clean electrode. Always calibrate a new electrode.

With the electrode connected to the transmitter a calibration can take place.

Check the appropriate chapters in the manual of the pH transmitter for details.

- Turn the sensor anti-clockwise
- Pull out the sensor

4-3-1 General calibration procedure

To calibrate a pH measurement two buffer solutions with known pH values are needed. It is recommended that one buffer solution has a value as near to pH 7 as possible (e.g. buffer pH 6.98). Depending on the value to be measured the second buffer solution should either be in the acidic or caustic area.

Normally the IEC buffers pH 4.01 or 9.22 are used.

Very generally a calibration procedure goes like this:

1. Clean the electrode,
2. Rinse it with water,
3. Immerse it in the first buffer (near pH 7),
4. Adjust the transmitter reading to the known volume with the asymmetry setting,
5. Rinse the electrode with water,
6. Immerse it in the second buffer (near pH 4 or 9),
7. Adjust the transmitter reading to the known value with the slope setting,
8. Rinse with water again.

During calibration the temperature compensation should be active. It is advised to calibrate with buffers at a temperature near the process temperature.

After calibration the probe is replaced by following the reverse procedure or the mounting instruction.

4-4. Replacing the electrode

Start with removing the electrode by following the procedure described below:

- Turn the sensor anti-clockwise
- Pull out the sensor

Now the electrode can be exchanged for a new one. Go to chapter 3-2 for preparation of the new electrode.

Remark:
The drawing shows to position of the sealing o-ring on the outside. Exchange it when renewing the electrode.

User's Manual

MODEL FU20 and FU25
pH, Redox and Temperature sensors

Manual Changes

Thank you for selecting MODEL FU20 and FU25 pH, Redox and Temperature sensors.
The User's Manual IM 12B07K02-01E 1st edition supplied with this product has been amended as follows, please make a note in your copy.

-Page 1, Some revision of sensor external view.
-Page 2, Section 2-1, "Model- and suffix codes FU20", option code of "/NAG" for the FU20 deleted.
-Page 7, Section 3-9, "Wiring diagram":
The actual colors of core wires of sensor cables have been changed. Please conduct wiring according only to the marking numbers attached onto the core wires as referring to the attached revised page, and disregard the color codes of the core wires.
-Page 8, Section 3-10, "Dimensions":
The external dimensions of the FU20 have been changed in part. Please replace the drawings on page 8 with revised ones attached hereto, and use the revised drawings for installation.

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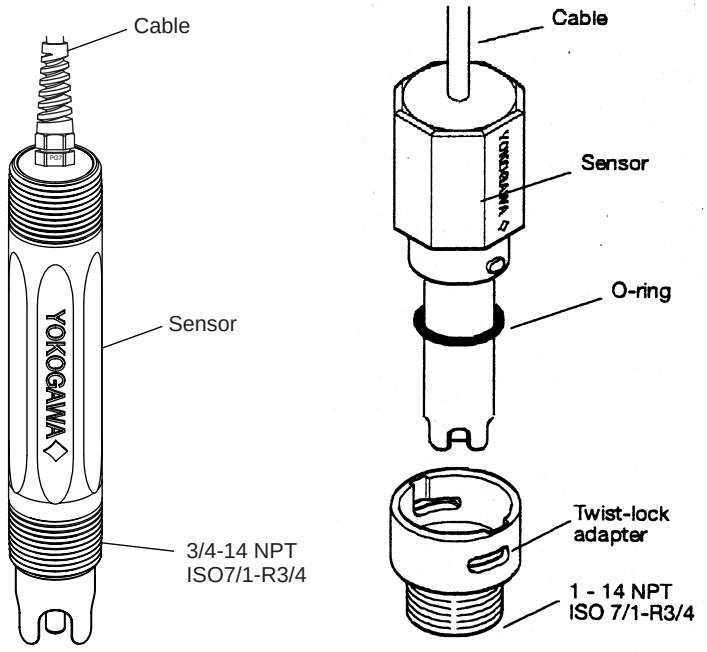

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Temp. sensor	-T1	- - - - - - -	Pt1000
Process connection	-NPT	- - - - - - -	3/4NPT-male

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	-10	- - - - - - -	10 meter
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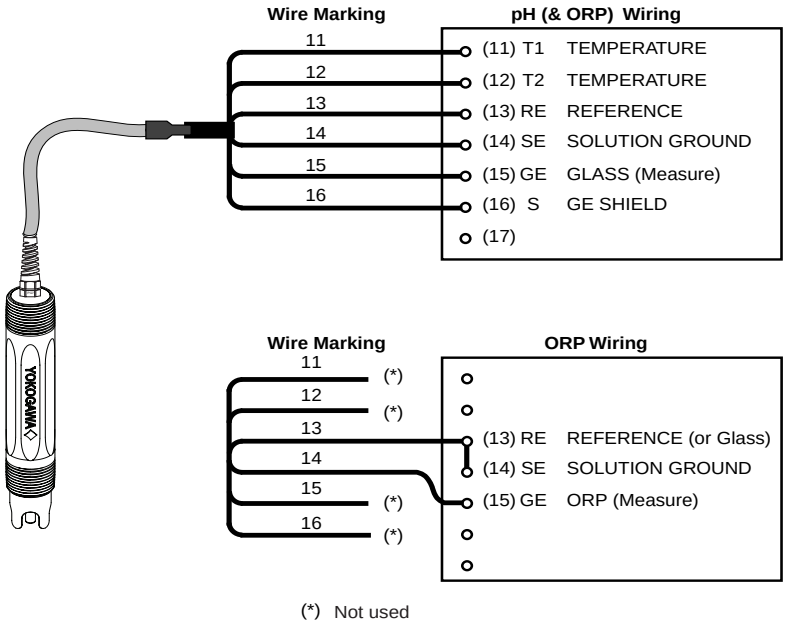

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