

Unisense In Situ Connector System



Overview

The Unisense in situ connector system is designed for easy replacement of sensors.

Unisense in situ connector system is a dedicated system for mounting microsensors:

- simple snap-on mounting
- improved protection of the sensor tip during handling and preparations
- improved shielding which makes the sensor signal very stable also in a laboratory setting

The connector system is used on all types of Unisense in situ instruments (MiniProfiler MP4, Deep Sea Lander, Field DataLogger Mini and UnderWater Meter). On the MiniProfilerMP4 and UnderWater Meter the connector system is used together with the in situ amplifiers.

Support, ordering, and contact information

To order products or if you encounter any problems and need scientific/technical assistance, please do not hesitate to contact our sales and support team. We will respond to your inquiry within one working day.

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Further documentation and support is available at www.unisense.com

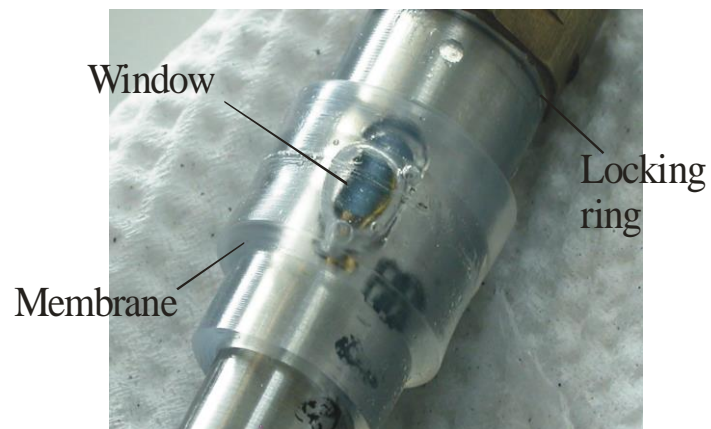
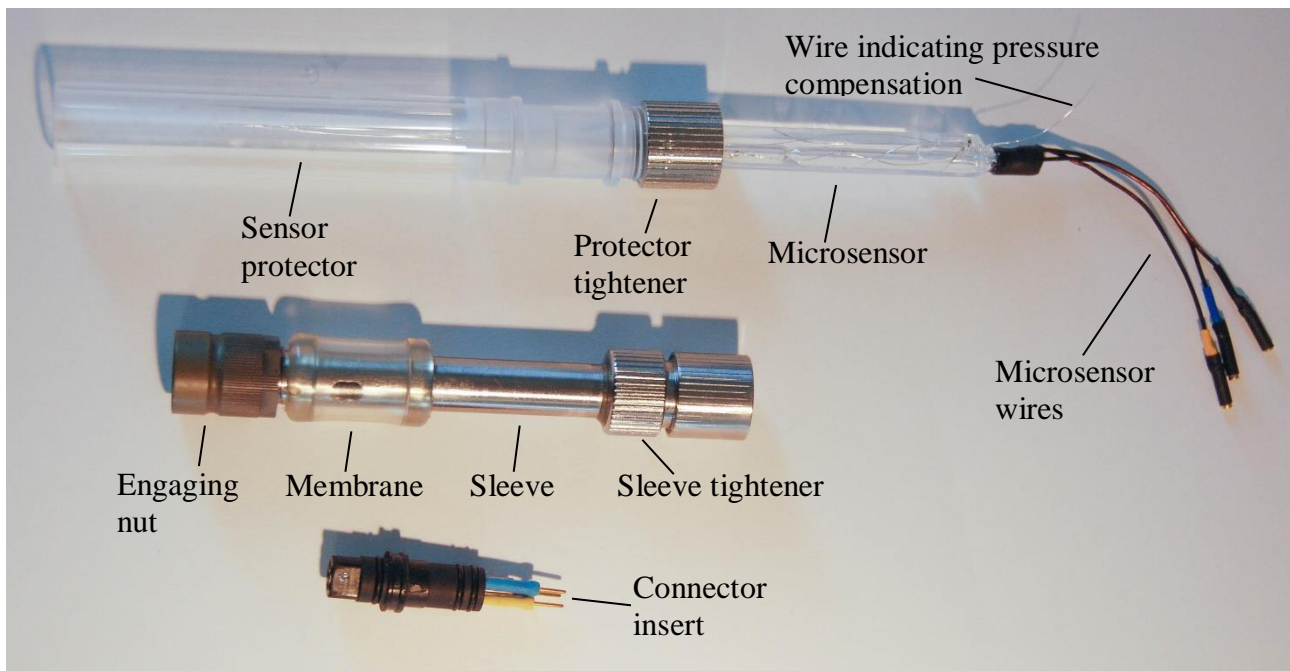
Notice to purchaser: The In Situ Connector System is for research-use only!

Manual version: 2.2

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1. Components of the *in situ* connector system



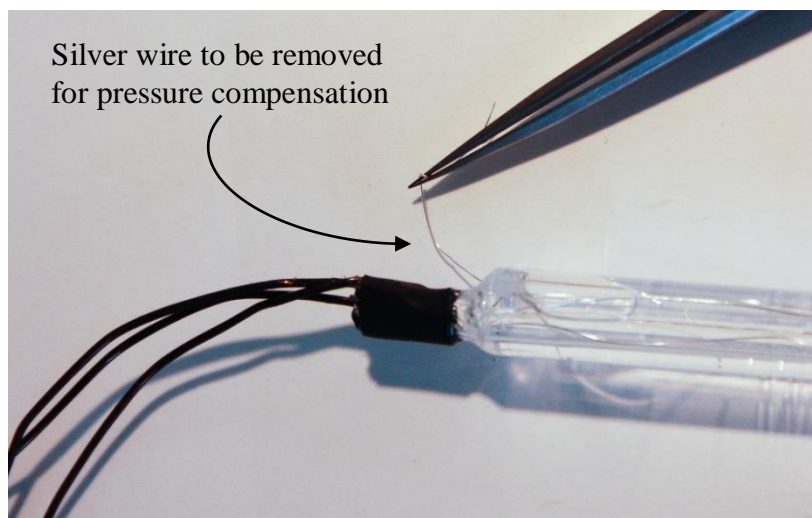
2. Prepare in situ sensors for mounting in the in situ connector

Microsensors come in two versions: With or without pressure compensation. The silver wire in the picture below is present in sensors prepared for pressure compensation. This wire must be removed before the sensor is mounted in the in situ connector. Sensors without this silver wire are not pressure compensated.

Sensors without pressure compensation may be used down to 50 m water depth. Sensors with pressure compensation can be used down to 6000 m depth. Note that in situ amplifiers in the shallow version are only rated for 300 m depth.

2.1. Testing sensors upon receipt

Make sure to test microsensors no later than two weeks after you receive them maintain the warranty. An in situ sensor may be tested by connecting the wires on the sensor to the connector insert (See picture below, left) and connecting it to the in situ amplifier or Field DataLogger Mini. This will not shield the sensor against electrical noise and the signal may be more noise than normal, but it is possible to verify that the sensor is working correctly.

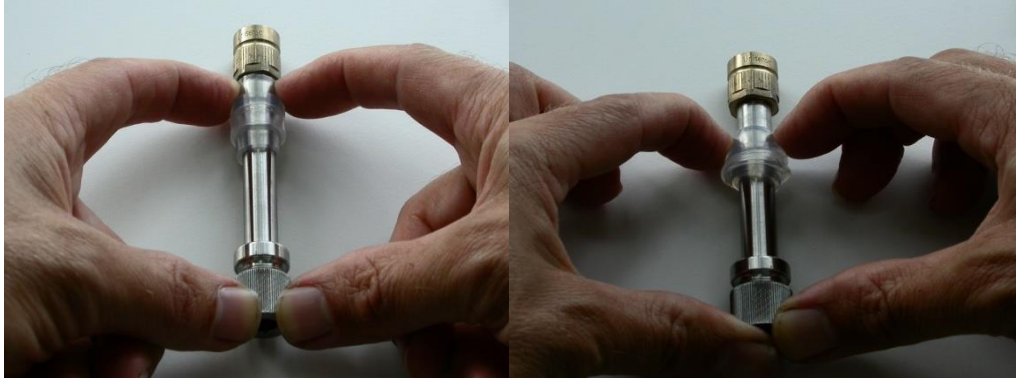


2.2. Before mounting the sensor in the in situ connector

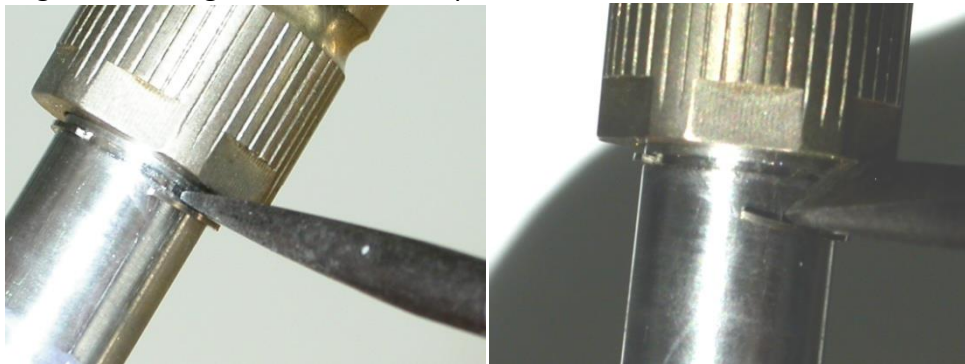
- Make sure that the sensor has the appropriate amount of electrolyte (see “Refilling electrolyte on in situ Sensors”)
- For sensors with silver wire for pressure compensation
 - Pull out the silver wire using a pair of tweezers. Grab the wire with the tweezers and wind the wire around the tip of the tweezers to get a good grip (see picture above, right). Pull gently and firmly to make sure the whole wire is pulled out and that a channel in the glue is created. This will allow oil, air and electrolyte to pass through when the sensor and in situ connector are exposed to pressure. This will maintain the same pressure inside and outside the sensor.
- Sensors without silver wire
 - May be mounted directly if electrolyte level is okay

3. Mounting of in situ microsensors in the in situ connector

1. First, check the sensor condition and performance as described in the sensor manual.
2. Pull the compensation membrane approx. 20 mm back with your fingers



3. Using a fine screwdriver, carefully pry one end of the engaging nut locking ring out of the groove by placing the screw driver between the engaging nut and one end of the locking ring and rotating the screwdriver tip.

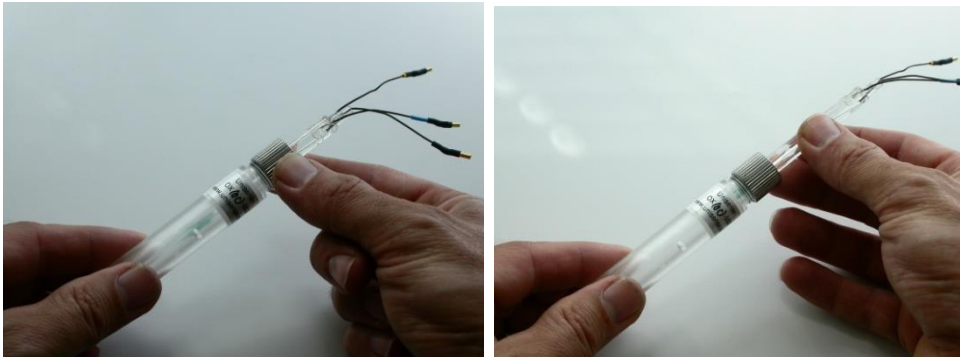


4. Carefully pry the locking ring progressively around the sleeve until it is completely clear of the groove.
5. Pull the locking ring down the sleeve to the compensation membrane.

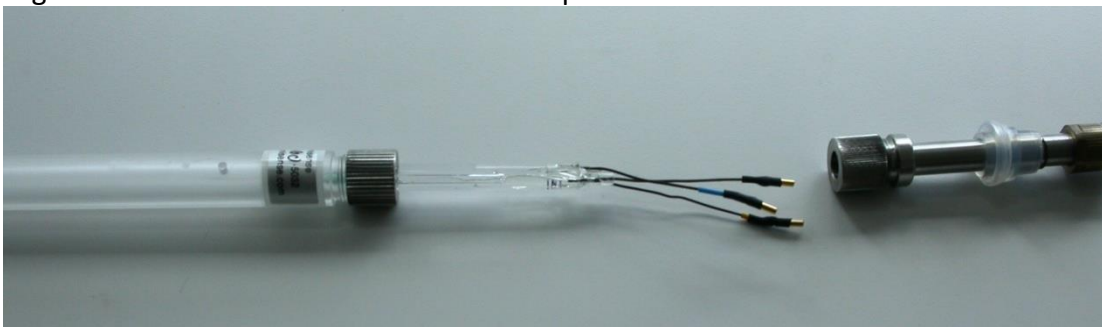
6. Pull the engaging nut down the sleeve to the locking ring



7. Loosen the tightener on the sensor protector and pull the sensor somewhat back to expose approx. 5 cm of the parallel-sided part of the sensor glass casing and tighten the tightener again. **CAUTION: do not pull the sensor so far that the tapering enters the tightener. This may cause the sensor tip to break against the walls of the sensor protector.**
NOTE: the tighteners should never be removed completely – which can cause the O-ring and conical disk to fall out – only loosened and fastened.

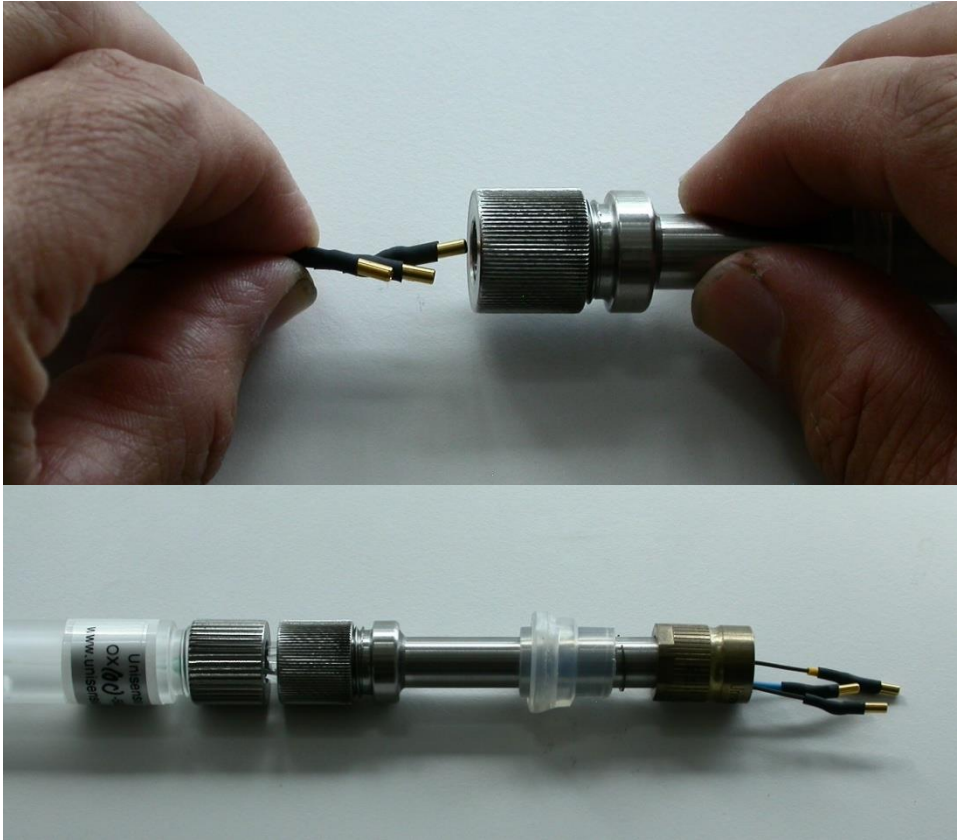


8. Align the sensor and the sleeve on a desktop

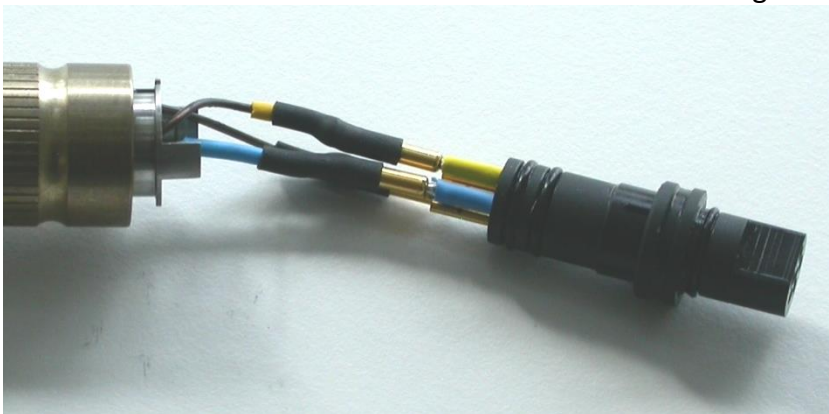


9. Loosen the sleeve tightener

10. insert the sensor wires through the sleeve tightener and push the sensor in until the sensor wires appear through the top of the sleeve unit



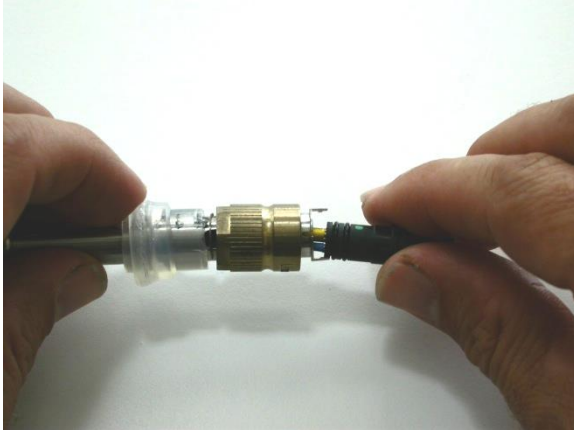
11. Take a sensor connector insert with the right color code (see color code section below) for the sensor to be used. Check that the O-rings are present, lubricated, and intact. Regarding lubrication of the O-rings of the sensor connector insert: after cleaning (if necessary) apply O-ring grease such that the O-rings and grooves are covered. Remove excess grease with a dry clean cloth until the O-rings only have a thin shiny layer of grease.
12. Connect the sensor wires to the connector insert according to the color code.



13. Gently pull the sensor protector and sensor out until there is approx. 15 millimeters between the connector insert and the sleeve. **CAUTION: in this step, make sure that the**

sensor wires are not getting caught on the edge of the sleeve. If the wires are caught on the sleeve and the sensor is pulled, the connections between the wires and sensor may get damaged.

14. Gently rotate the connector insert quarter turns back and forth while pushing it into the sleeve. When the insert has been pushed a few millimeters in, the protector with the sensor should be pulled out correspondingly.



15. When the insert O-rings meet the sleeve the resistance increases. Push a bit harder to overcome this resistance. **CAUTION: make sure the alignment ridge on the insert is aligned with the alignment cut-out of the sleeve.**



16. Push the insert completely in.
17. Pull the engaging nut in place and secure it with the locking ring
18. The sensor position can now be adjusted some millimeters out or in by pulling or pushing the protector with the sensor. **CAUTION: do not use excessive force when adjusting the sensor position, as this may damage the sensor wires.**
19. Tighten the sleeve tightener to secure the sensor position.
20. Place the sensor/holder unit in a slightly tilted position with the sleeve window facing up and a piece of paper tissue under. Fill a syringe with a needle with paraffin oil. Slowly drip paraffin oil into the sleeve window. Allow a few minutes for the oil to displace all air inside and continue dripping oil until the oil level is constantly close to the window. Any excess oil

should be captured by the paper tissue. **CAUTION:** excess oil on the outside of the sensor/holder unit should be removed, as the oil can damage especially pH electrodes and as oil increases the risk of accident during handling.



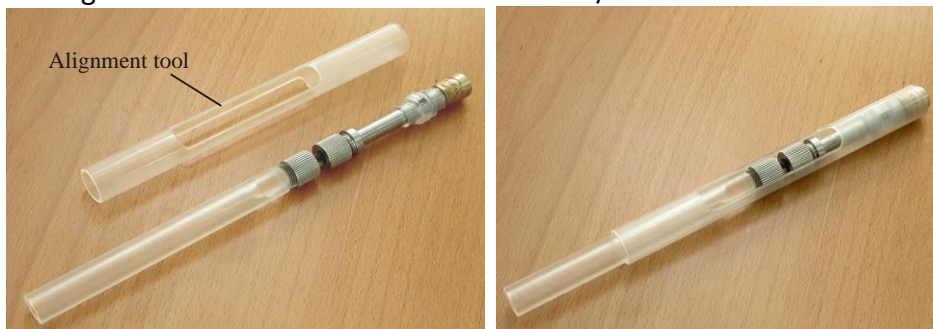
21. Slide the membrane back over the window.
22. Carefully slide the needle under the membrane and fill the membrane with oil, while allowing the air to escape along the needle. Take care to capture excess oil in a paper towel. Let the sensor rest for 5 minutes with the window pointing up to allow time for remaining air to flow into the membrane. To get the last air out, it may be necessary to rotate the sensor such that the window points down and the remaining airbubble is trapped on the opposite side and fill oil from that side.



CAUTION: it is important for proper pressure compensation that only a small amount of air (a bubble of max. 5-8 mm diameter) remains in the membrane.



23. The sensor unit can now be attached to the amplifier and function tests and calibrations of the sensor can be performed with the sensor protector mounted. Unplug the sensor unit from the amplifier before proceeding to the next step.
24. To remove the sensor protector before measurements (and perhaps final calibrations) slide the alignment tool over the assembled sensor/holder unit.



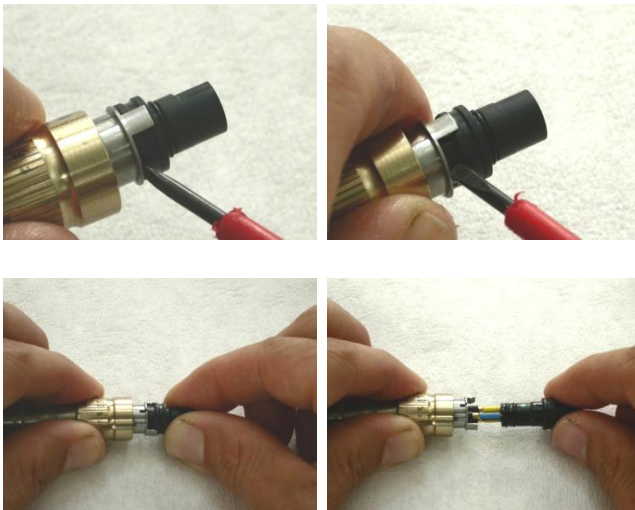
25. Tighten the sleeve tightener, and loosen the sensor protector tightener. Pull the sensor protector out.



26. Slide the alignment tool back over the sleeve. **CAUTION: the sensor tip is now unprotected and will easily break on contact with solid objects.**
27. Carefully mount the sensor unit on the amplifier before measurements and final calibrations.

4. *Unmounting the microsensor from the sensor holder unit*

1. Detach the sensor/holder unit from the amplifier. Take care not to break the sensor tip.
2. Push the alignment tool over the connector end of the sleeve until the sensor tip is at least 50 millimeters inside the opposite end of the alignment tool.
3. Insert the sensor protector into the alignment tool after making sure that the tightener is loose and push until the sensor is well inside the protector.
4. Tighten the protector tightener.
5. Pull the membrane approx. 20 millimeters down.
6. Pry the locking ring off and pull down the engaging nut.
7. Loosen the sleeve tightener and push the sensor slightly in until there is resistance from the wires. Catch the oil that spills out of the window in paper tissue.
8. Push the tip of a fine flat screwdriver in between the connector insert and the top of the sleeve on the side opposite to the alignment ridge. Carefully pry the insert out of the sleeve and subsequently pull the insert gently out until the sensor wires resist. If the connection between sensor wires and connector insert is not exposed, push the sensor a bit further in and pull the insert correspondingly out. Catch the oil that spills out in paper tissue or a beaker.



9. Detach the sensor wires by holding the connector insert in one hand and in turn pushing each gold connector on the sensor wires off with the other hand. A pair of tweezers can be used. **CAUTION: be care not to pull the sensor wires, they make break if pulled.**



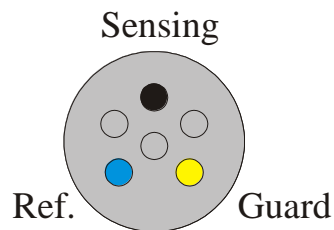
10. Pull the sensor out, while making sure that the sensor wires are not caught on the sleeve.
11. wipe excess oil off the sleeve and sensor.

5. Sensor connector color codes:

The sensor connector insert viewed from the sensor side:

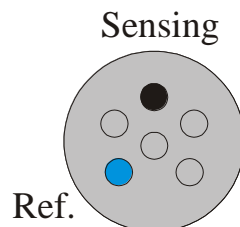
Amperometric:

- Oxygen
- H₂S
- H₂

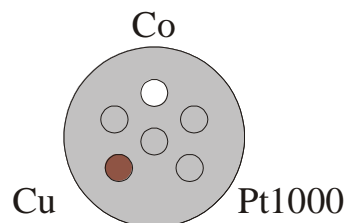


Potentiometric:

- pH
- redox



Temperature:



6. Refilling electrolyte on in situ Sensors

Important for deep sea in situ sensors:

To enable pressure compensation in the electrolyte reservoir, the in situ sensors for depths > 50 m are equipped with a channel through the glue that binds the inner and outer glass tubes together at the top of the sensor (closed with a silver wire when shipped). Furthermore, part of the space between inner and outer glass tubes is sealed with silicone. Over time electrolyte in the sensor can evaporate or leak through the channel and the silicone. Sufficient levels of electrolyte in the sensor are required for connection between the anodes and the cathodes of Unisense amperometric gas sensors, and for connection between the internal reference of redox and pH electrodes. Furthermore, sufficient electrolyte volume shields against electrical noise. Therefore, it is **critical to maintain appropriate electrolyte volume** in the sensor. The sensor has appropriate electrolyte volume when only a small air bubble (>0.1mL) is present in the electrolyte reservoir.

A minor leak of electrolyte (<10%) can be restored by injecting distilled water into the sensor. In case of an over 10 % leak, the electrolyte should be refilled with the specific electrolyte described in the recipes below.

6.1. Electrolyte for in situ sensors:

pH/redox electrodes:

1 M KCl

Oxygen sensors:

Add to 1 L of distilled water:

11.25 g KHCO_3

25.90 g K_2CO_3

39.00 g KCl

H₂S:

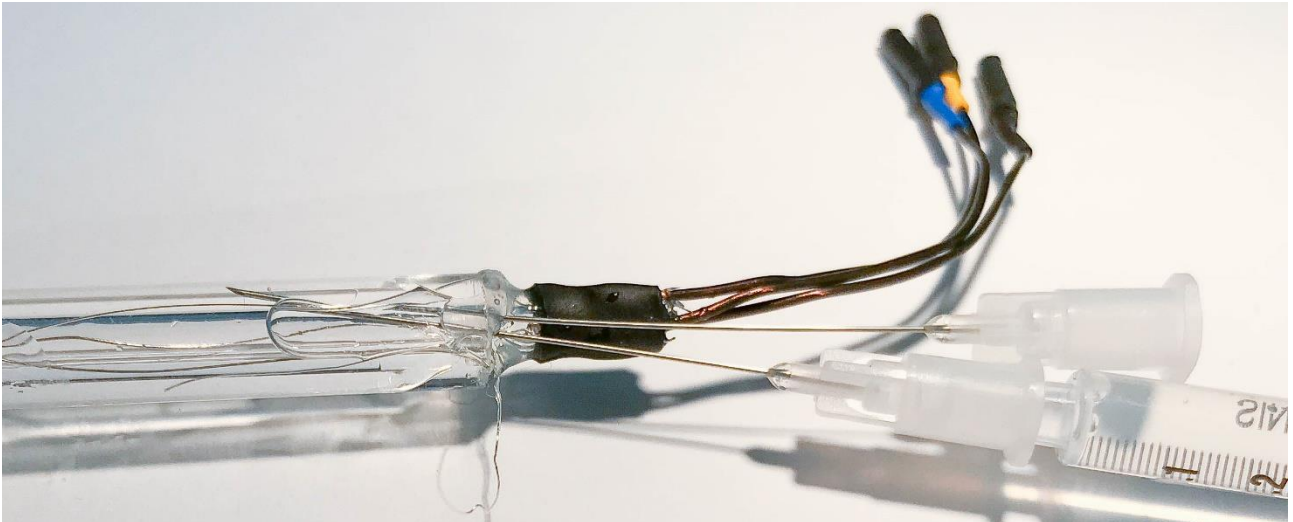
50 mL 0.5 M KHCO_3 + 50 mL 0.5 M K_2CO_3 giving solution A

Add and dissolve 1.64 g $\text{K}_3\text{Fe}(\text{CN})_6$ in solution A.

Chemical grade: Pro analysis, use double distilled water. The solution must be absolutely clean, and kept absolutely dark.

7. Procedure for refilling in situ sensor electrolyte

CAUTION: The cavity in the centre glass tube of the sensor/electrode with the blank wire is also pressure compensated with a channel, therefore be careful not accidentally to fill electrolyte into this cavity, as this may destroy the sensor.



At receipt of the microsensor you will find a silver wire extending through the top seal of the sensor (see picture above). Leave this wire in place until mounting of the sensor in the in situ connector (see 2.2. above). When removed, it leaves a channel through which pressure compensation of the microsensor occurs.

Refilling of electrolyte or water (see 6. above) is done by injecting it with syringe and needle through the silicone part of the seal between the inner and outer glass tubes at the top of the sensor (see picture above). The largest part of this seal consists of glue and a small part consists of silicone rubber. The silicone rubber part is slightly more opaque than the glue and is soft and can be penetrated with a hypodermic needle. The glue is hard and can not be penetrated by the needle.

Use a clean syringe with a needle of 0.4 mm and fill electrolyte or water (see 6. above) into the syringe. Remove any air bubbles from the syringe. Locate the silicone part of the seal and insert the needle through this, while keeping the sensor vertical (tip down). Insert a second open needle through the silicone. The tip of the open needle must be just below the silicone seal and will act as a vent to let out air. The tip of the needle on the syringe must be just at the surface of the electrolyte in the sensor.

With the needles in place, inject slowly. The electrolyte levels should now increase, with the air escaping through the open needle in the top seal of the microsensor. If electrolyte escapes instead of air try tilt the sensor so the air is on the side of the sensor where the open needle is, reposition needles, inject faster/slower etc. Keep a piece of paper tissue around the top of the sensor to catch spills.

8. Warranty and liability

The In Situ Connector System is covered by a one year warranty.

The warranty does not include repair or replacement necessitated by accident, neglect, misuse, unauthorized repair, or modification of the product. In no event will Unisense be liable for any direct, indirect, consequential or incidental damages, including lost profits, or for any claim by any third party, arising out of the use, the results of use, or the inability to use this product.

Repair or adjustment

Equipment that is not covered by the warranty will, if possible, be repaired by Unisense with appropriate charges paid by the customer. In case of return of equipment please contact us for return authorization.

For further information please see the documents Conditions for Sale and Delivery for Unisense and Warranty and Shipping Information as well as the manuals for the respective products.

