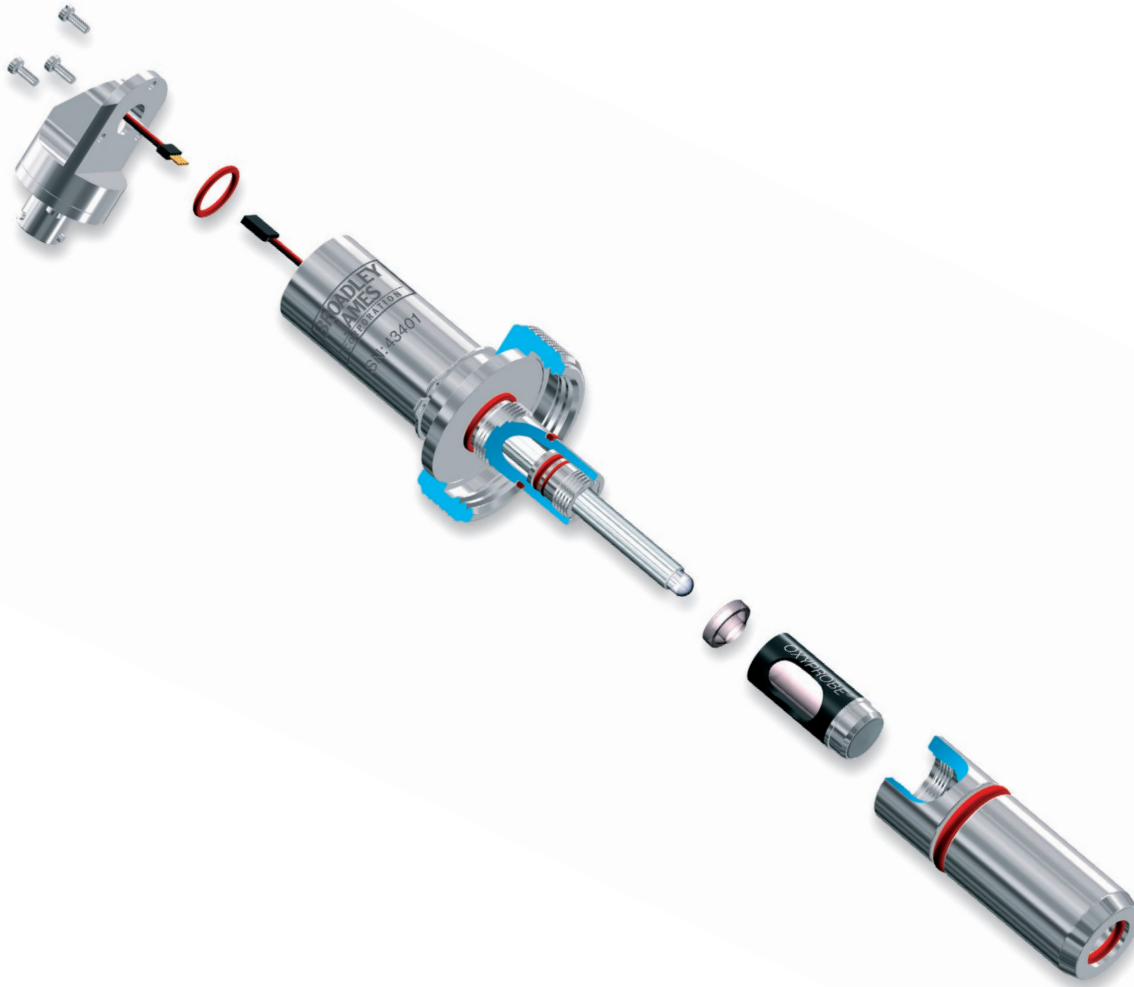


Instruction Manual



QUICK GUIDE

- Changing the Membrane Chapter 3
- Polarizing Chapter 4
- Replacement Parts Chapter 5

OxyProbe® Rebuild 19mm & 25mm Sensors



BROADLEY
TECHNOLOGIES

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Chapter 1: Getting Started

Procedures Checklist

You'll need the following items in order to rebuild an OxyProbe dissolved oxygen D.O. sensor. See Chapter 5 for ordering information.

- Cathode Removal Tool
- New Anode/Cathode Assembly
- New O-rings
 - Internal (4 and a conical gasket)
 - External (1)
- Membrane Cartridge
- D.O. Electrolyte Solution

These items are also necessary, but not provided by Broadley-James Corporation

- Desiccant
- Screwdriver (straight edge)
- Teflon Tape
- Cleaning Brush
- RTV Adhesive (Optional)

Before getting into the procedures consider the problems to be encountered with each component.

STAINLESS STEEL COMPONENTS:

These parts require a good visual inspection for general condition and cleaning. A couple of brushes and some warm soapy water will generally take care of any problems.

O-RINGS:

O-rings separate the media from the sensor's internal components. O-rings should be inspected and changed as often as possible.

MEMBRANE:

The membrane is perhaps the most critical component. It is made of gas permeable PTFE with a thicker

stainless steel reinforced silicone layer. A microscopic hole or tear can lead to erroneous readings.

CATHODE:

The cathode is the platinum wire centered inside a precision ground glass surface where oxygen is reduced. Any coating, chips, or cracks on the glass surface will impair the sensor performance. The glass tip can be cleaned, but any physical damage may necessitate replacement.

ANODE:

This is the silver element that surrounds the glass cathode body. It will become discolored with use, but proper cleaning will restore it to new condition. However, improper cleaning may damage it. Harsh cleaning methods may alter the anode's geometry thereby changing the sensor output.

TEMPERATURE COMPENSATOR:

Temperature compensators (TC) measure the solution's temperature and change the transmitter's response accordingly. TC's progressively age after repeated sterilization cycles. Since the membrane's ability to diffuse gas is temperature dependent, a TC working improperly due to age abuse or poor calibration, can cause a significant measurement error.

CABLES:

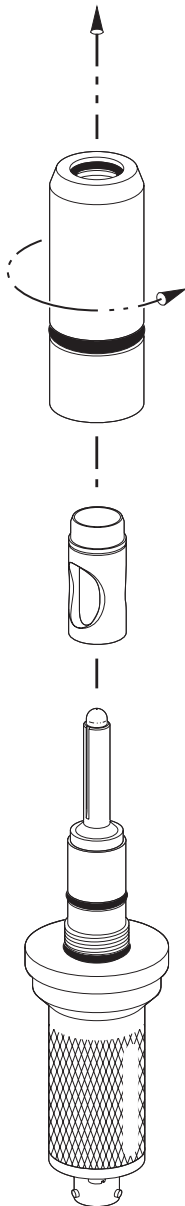
The D.O. sensor's output is in nanoAmps (nA). A working sensor has an output of 30 to 90 nA at 100% saturation. Any corroded connectors, nicked cables, or loose/contacts can lead to errors. Regular visual inspection is necessary.



Chapter 2: Replacing the Anode/Cathode Assembly

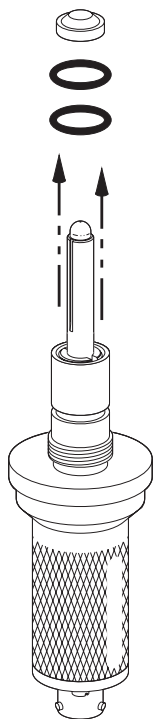
STEP 1

Remove the nosepiece and membrane cartridge.



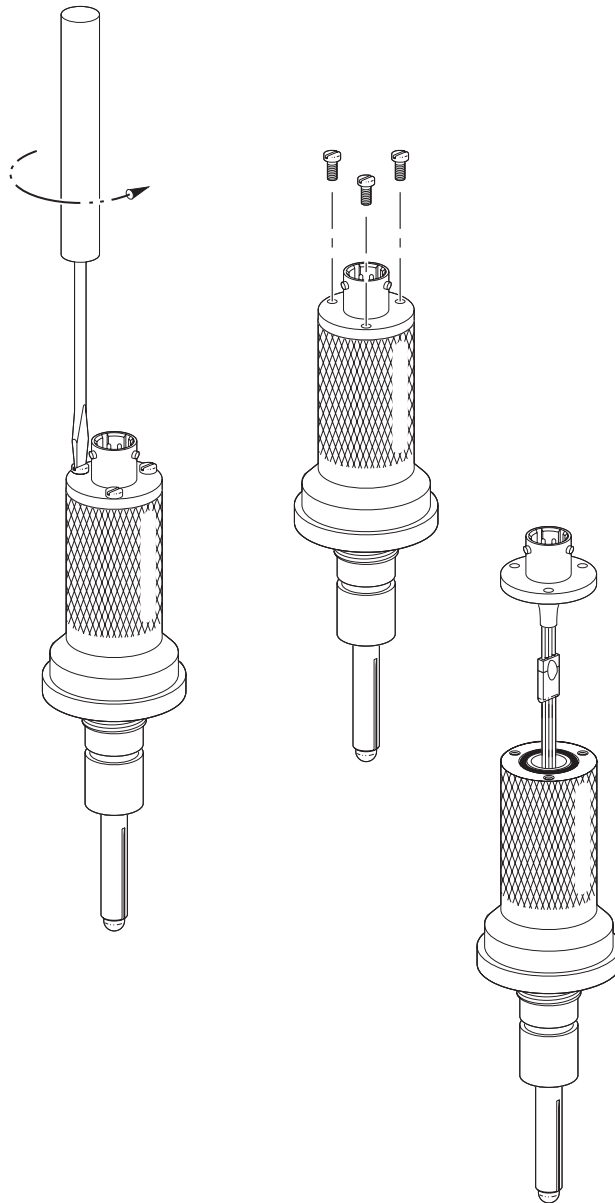
STEP 2

Remove conical gasket and o-rings.



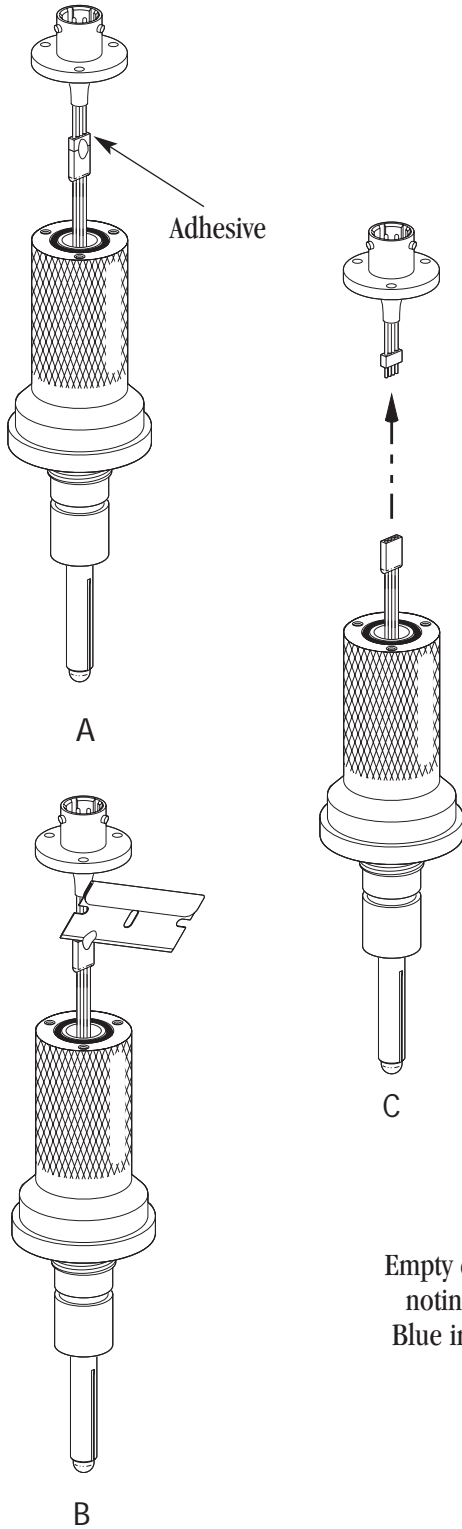
STEP 3

Remove the three screws and lift the sensor connector.



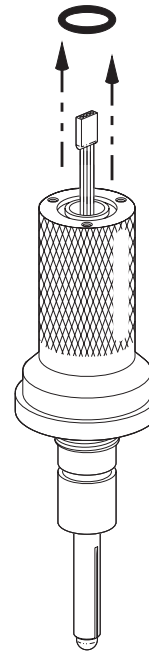
STEP 4

Using a razor blade, remove adhesive and disconnect the black anode/cathode connection



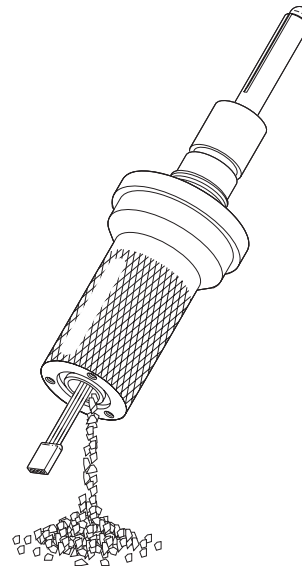
STEP 5

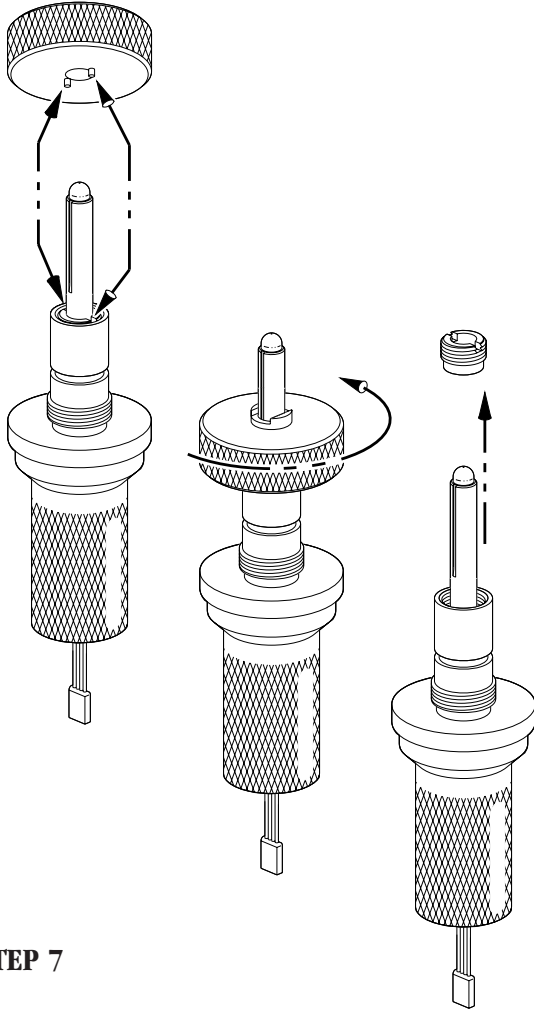
Remove o-ring.



STEP 6

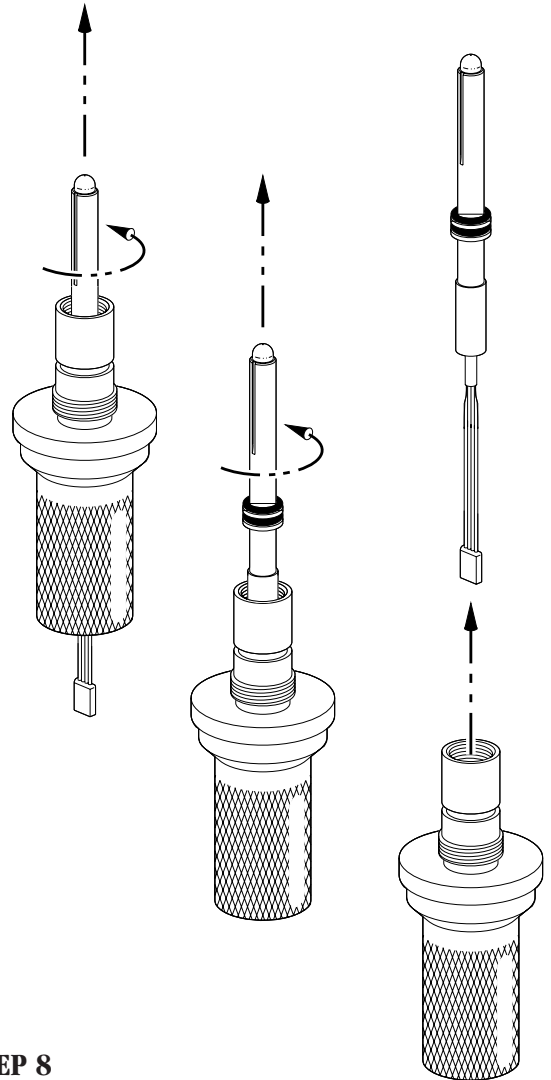
Empty desiccant from the sensor, noting the color and condition. Blue indicates possible moisture intrusion.





STEP 7

Using the cathode removal tool (P/N AM-9213), unscrew the cathode retainer ring.



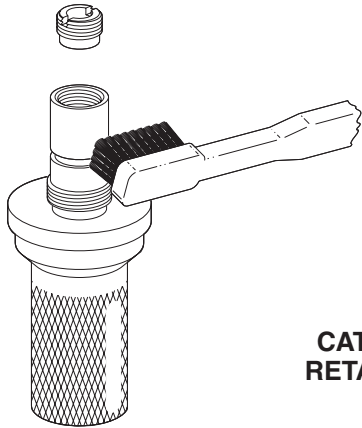
STEP 8

Remove the anode/cathode assembly by using a turning/twisting motion while pulling it free from the body.

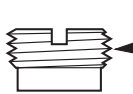


STEP 9

With the OxyProbe completely disassembled, clean all internal and external threads. It will take a few minutes, a couple of brushes, and hot soapy water.



**CATHODE
RETAINER
RING**



A RETAINER RING
THREADS

B INTERNAL THREADS

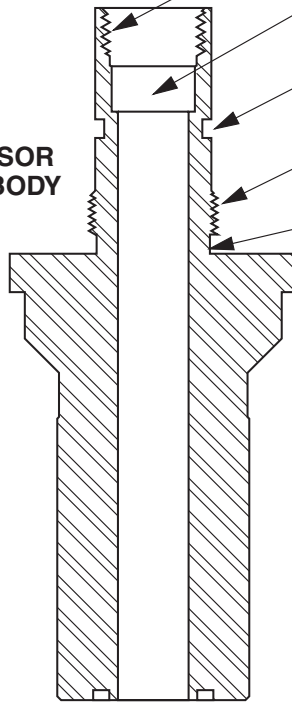
C SOCKET

D MIDDLE SLEEVE
SEAL

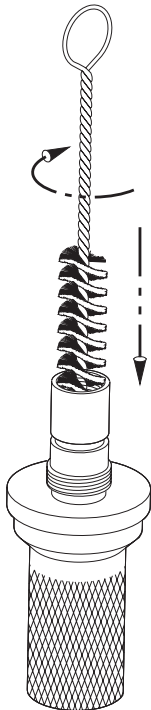
E SLEEVE
THREADS

F REAR SLEEVE SEAL

**SENSOR
BODY**

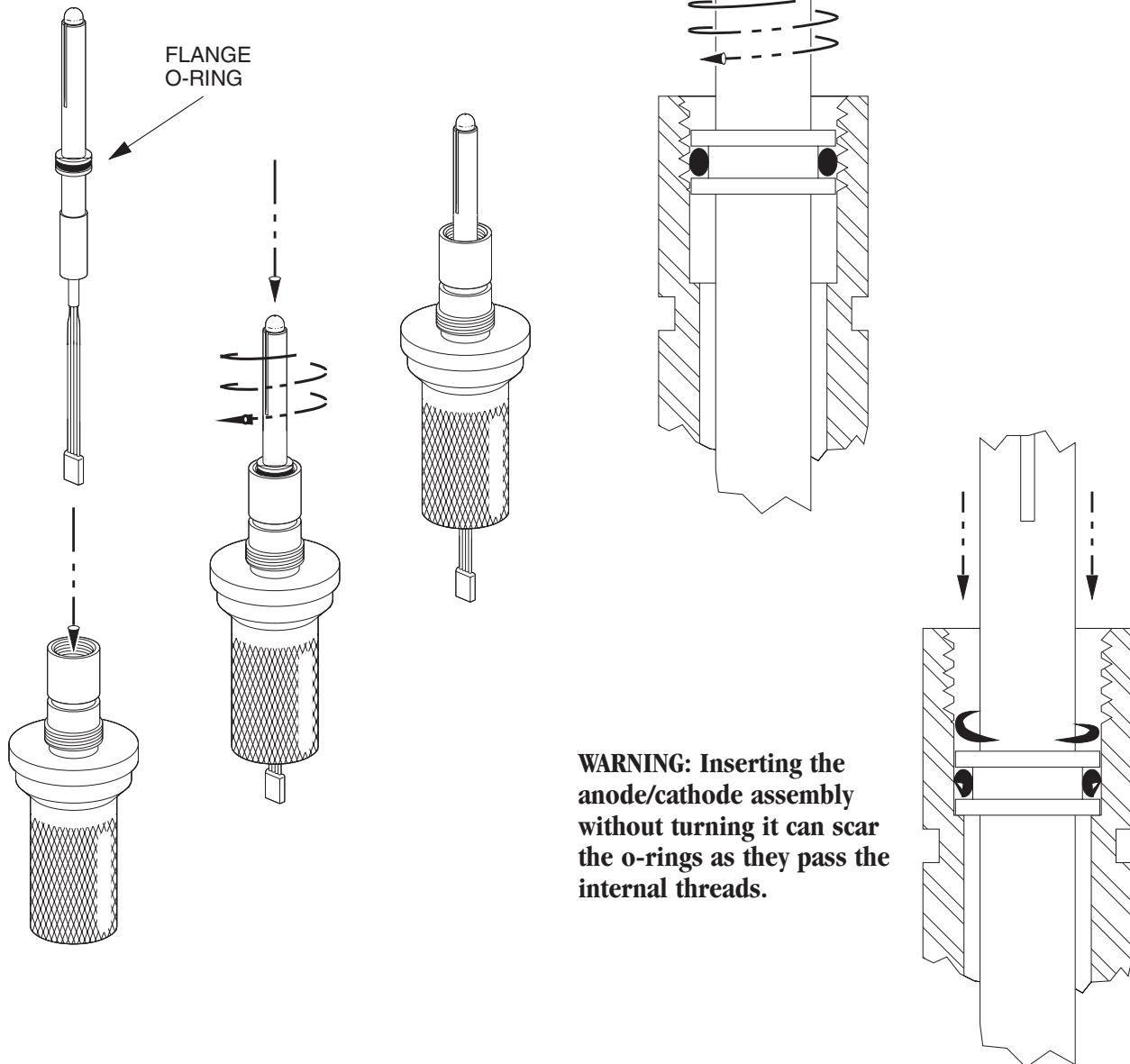


G REAR SEAL FOR
CONNECTOR
FLANGE



**STEP 10**

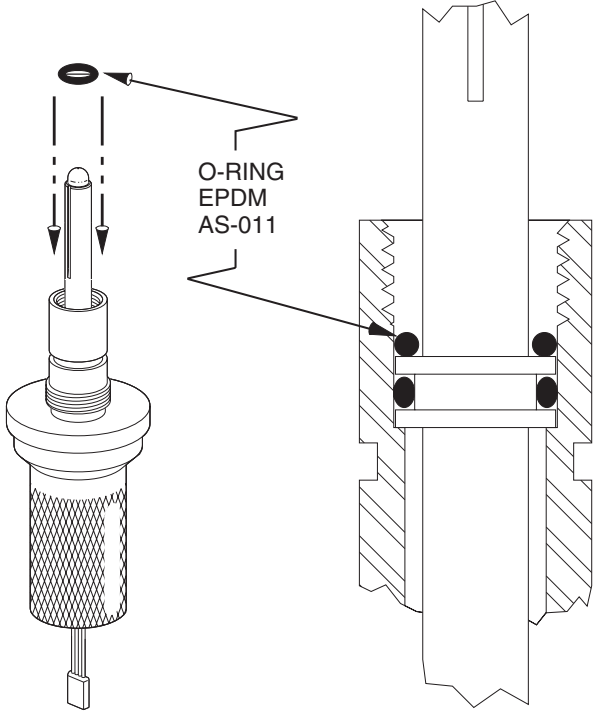
Install the new anode/cathode assembly by pushing down and turning it clockwise.





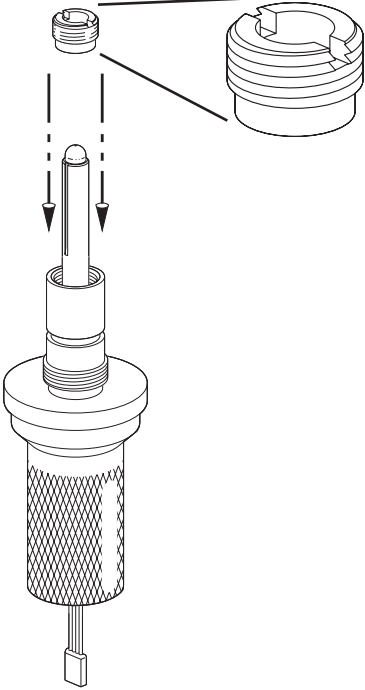
STEP 11

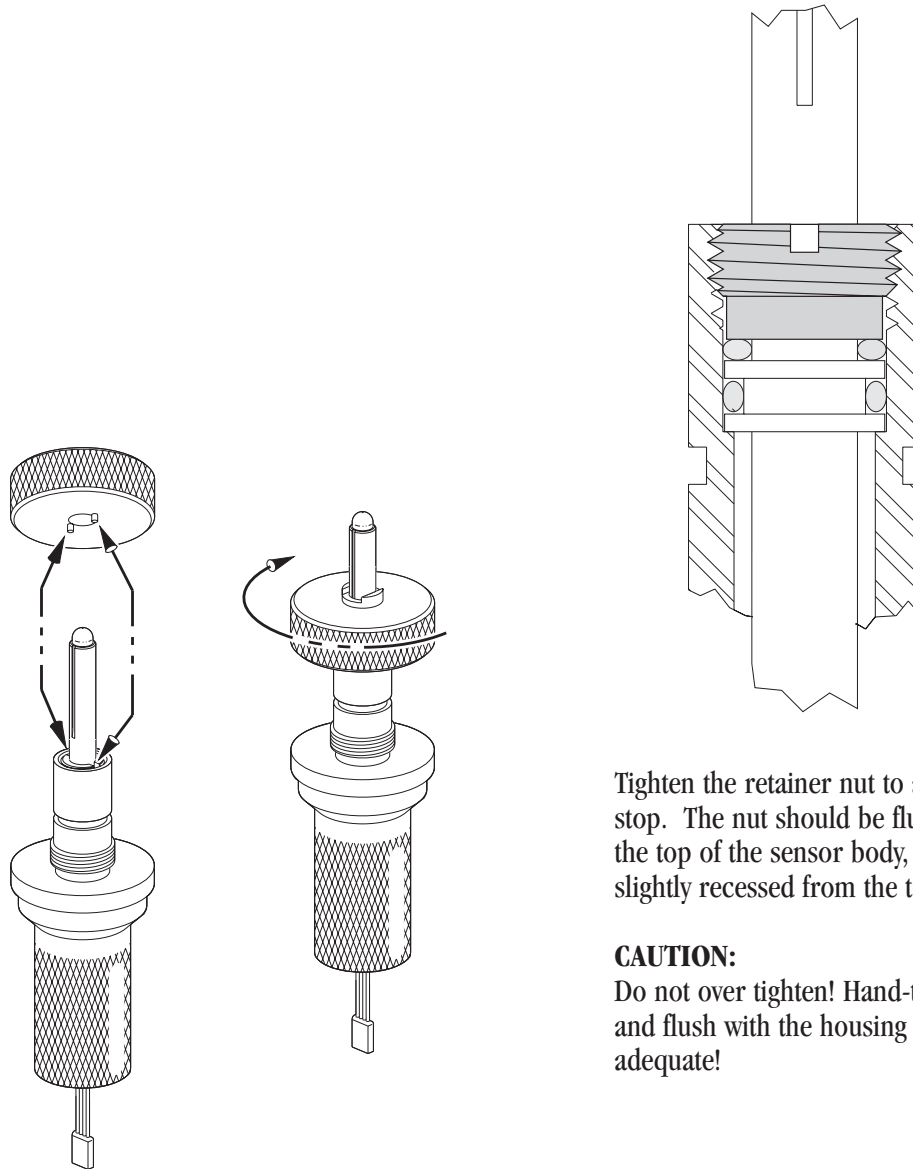
Install the second o-ring.



STEP 12

Wrap the retainer ring with Teflon tape, and install by hand.





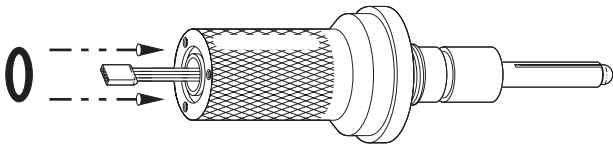
STEP 13

Tighten the retainer nut into place using the cathode removal tool.

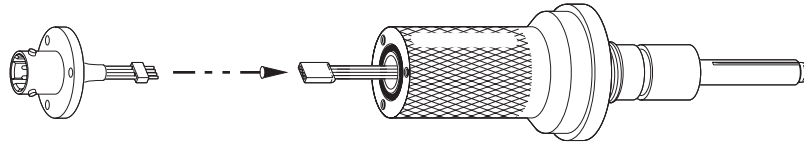
CAUTION: Use care when placing the tool on the cathode. Do not “tap” or bump the glass with the tool!

Tighten the retainer nut to a hard stop. The nut should be flush with the top of the sensor body, or slightly recessed from the top.

CAUTION:
Do not over tighten! Hand-tight and flush with the housing is adequate!

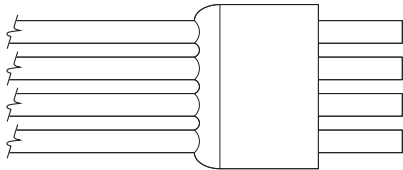


STEP 14
Install silicone o-ring.



STEP 15
Attach the mini-connector by matching wire colors.

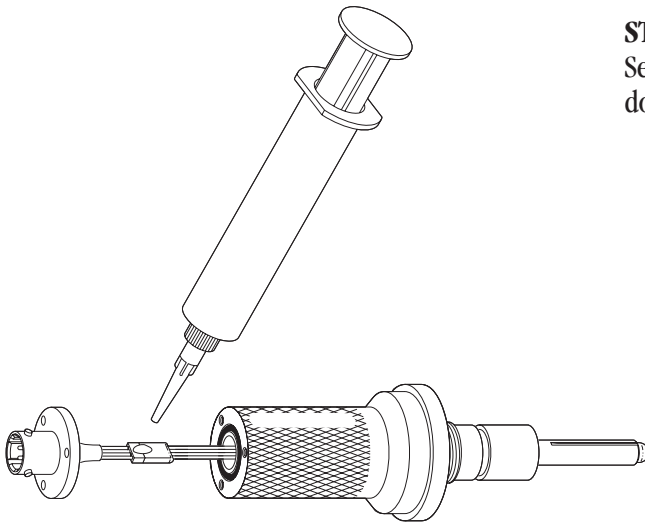
WHITE
RED
BROWN
BLACK



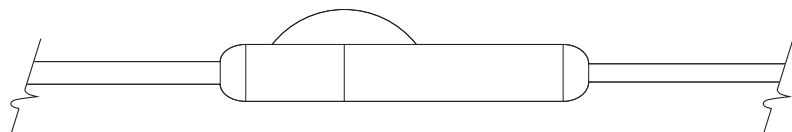
WHITE
RED
BROWN
BLACK

ENLARGED VIEW OF MINI-CONNECTOR

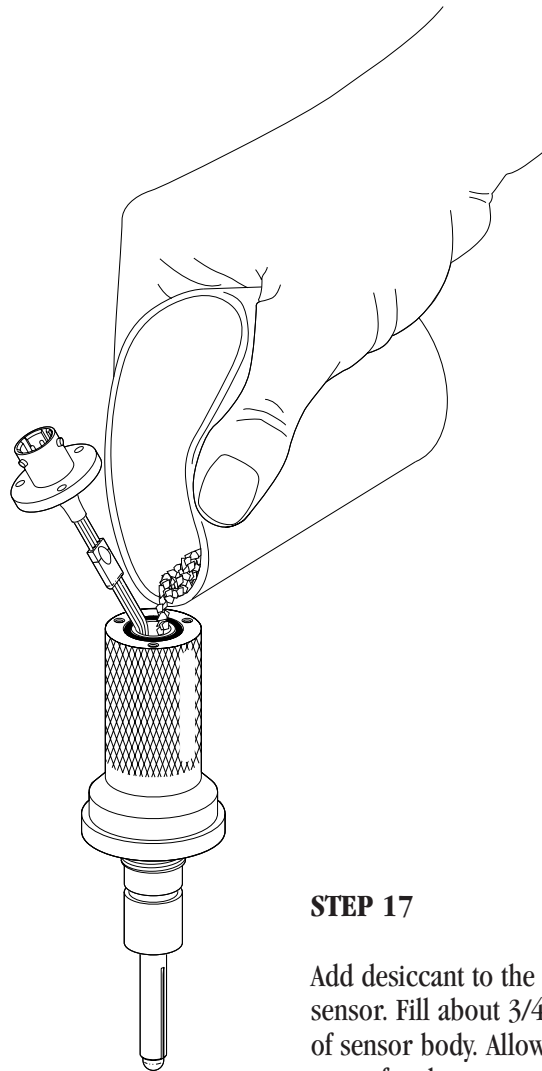
STEP 16
Secure the mini connector with a small dollop of RTV adhesive (optional).



NOTE:
Allow to cure for 3–5 minutes before proceeding to the next step.



SIDE VIEW OF MINI-CONNECTOR WITH ADHESIVE



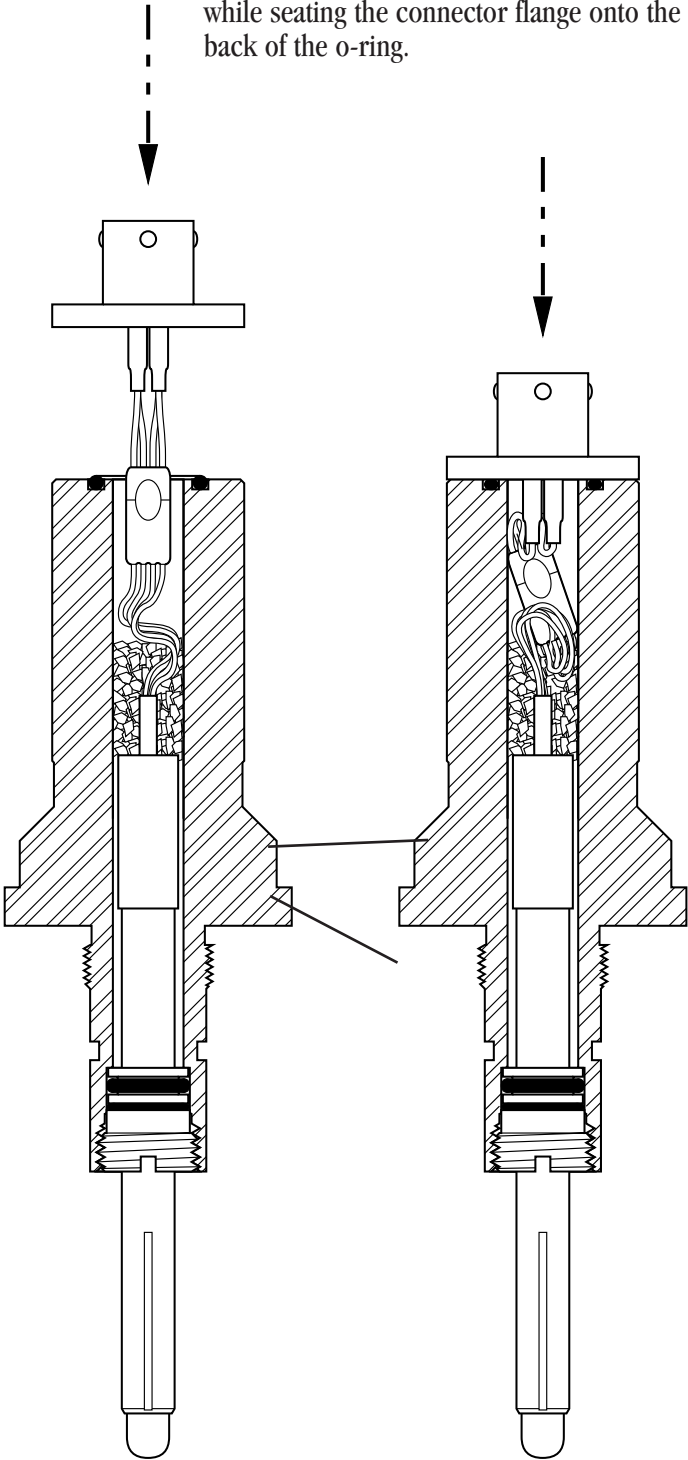
STEP 17

Add desiccant to the sensor. Fill about 3/4" of sensor body. Allow space for the connector and wires.



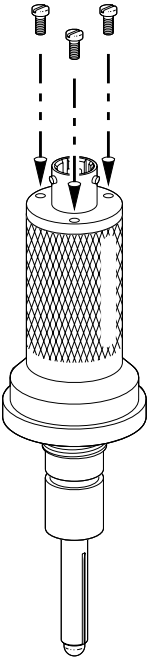
STEP 18

Push the mini-connector into the sensor body while seating the connector flange onto the back of the o-ring.



STEP 19

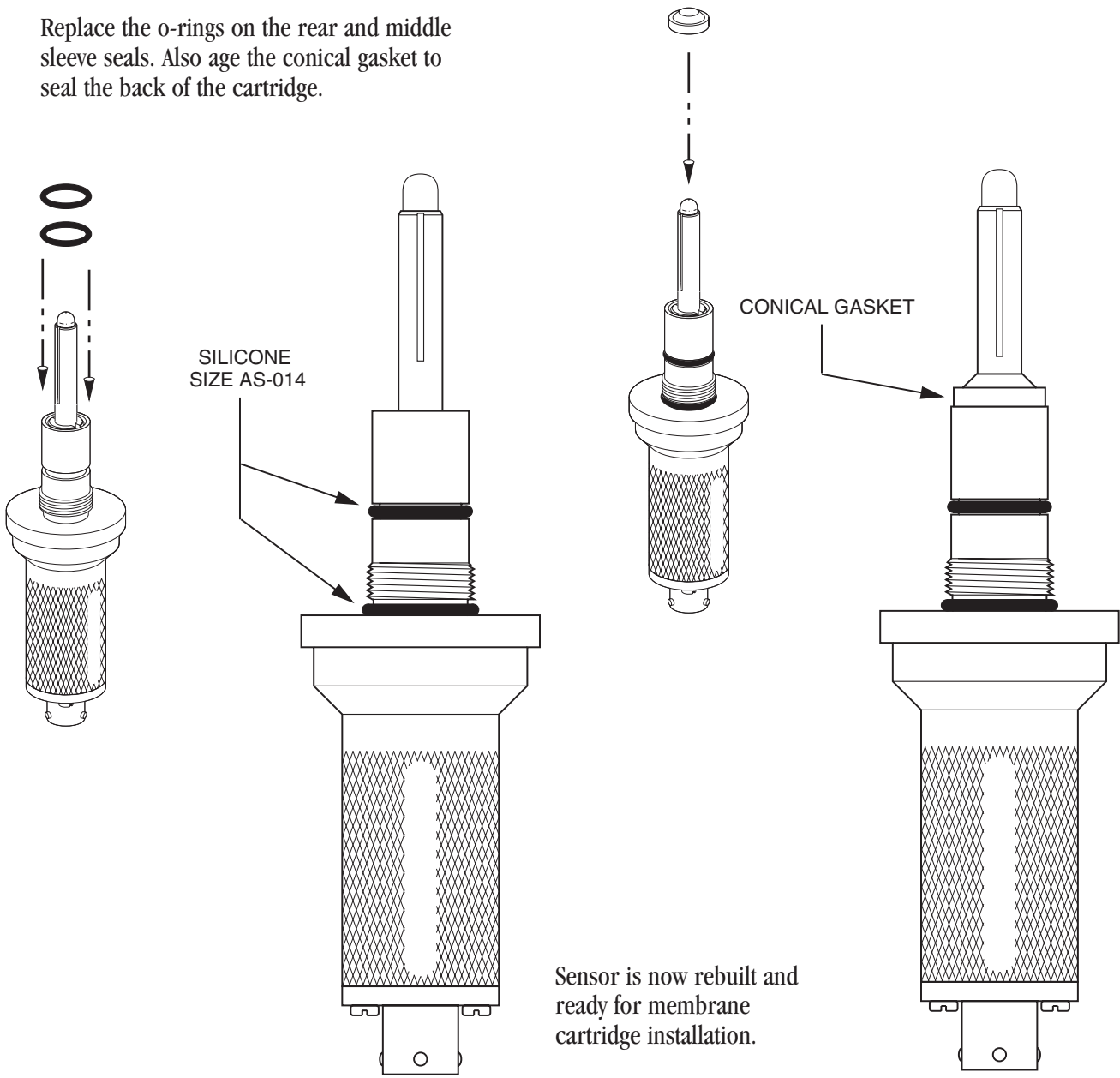
Install the connector screws.





STEP 20

Replace the o-rings on the rear and middle sleeve seals. Also age the conical gasket to seal the back of the cartridge.



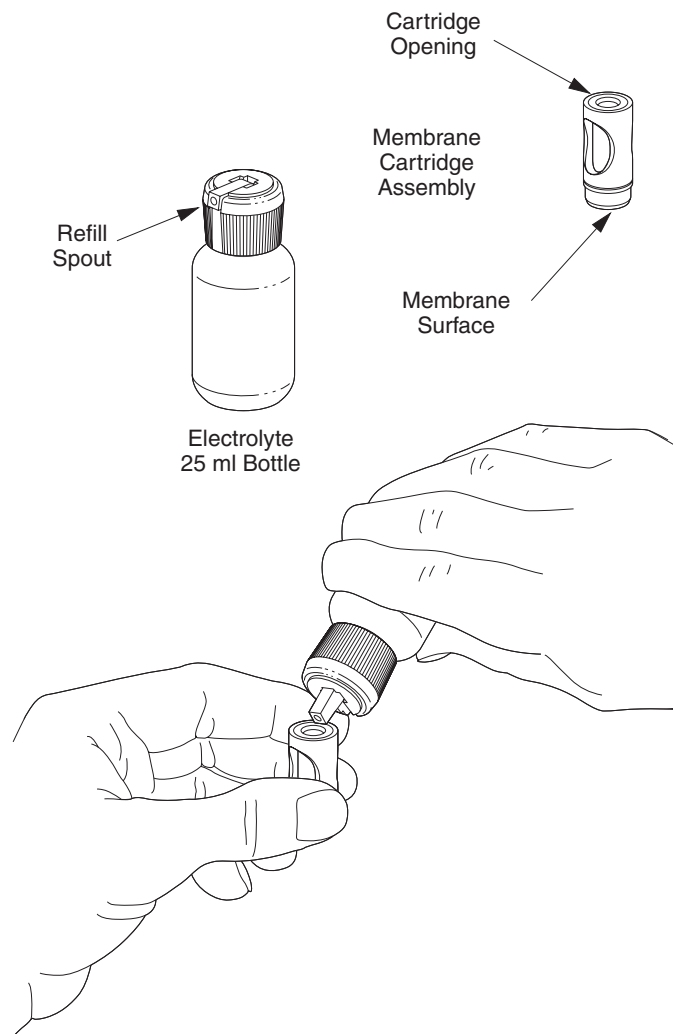


Chapter 3: Replacing Membrane Cartridge

CAUTION: WEAR SAFETY GLASSES DURING THIS PROCEDURE

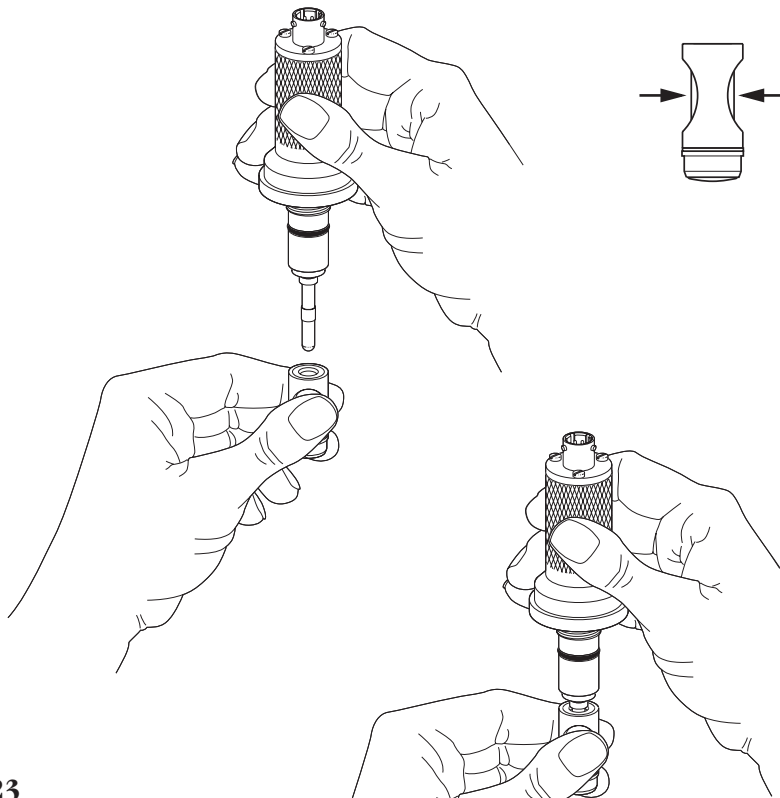
STEP 21

While holding the membrane cartridge upright (opening up) in one hand, carefully add the electrolyte from the bottle into the cartridge until it is approximately 75% full. Remove any large air bubbles by tapping on the side of the membrane cartridge. Try not to spill the electrolyte.



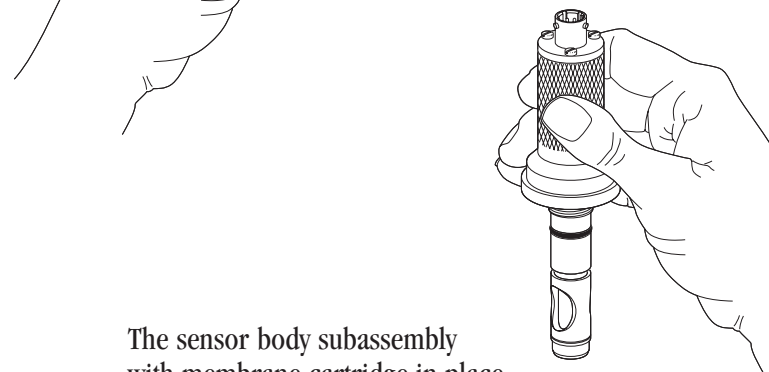
STEP 22

Grip the filled membrane cartridge, by the thumb and forefinger slots in one hand, while holding the sensor in the other as shown.



STEP 23

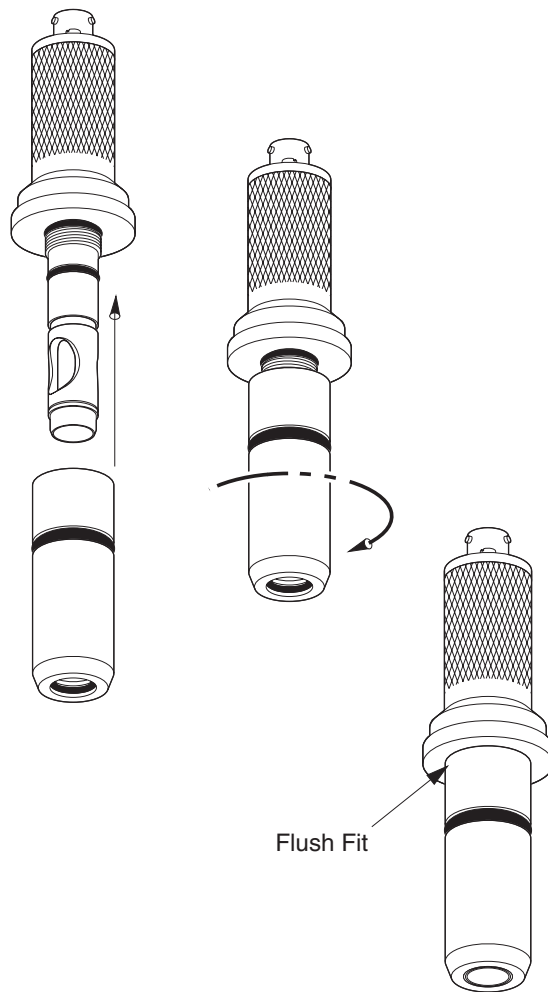
While compressing the membrane cartridge with the thumb and forefinger, slide the cartridge over the anode/cathode assembly until the cartridge seats against the conical gasket. Release the pressure from the thumb and forefinger. Rinse the lower portion of the subassembly with DI water to remove any excess electrolyte and blot dry with a clean tissue.



The sensor body subassembly with membrane cartridge in place is now ready for the installation of the stainless steel sensor sleeve.

**STEP 24**

Slide the stainless steel sensor sleeve over the membrane cartridge, being careful not to nick the o-rings. Be certain the threads of the sleeve and sensor body are free of any dirt or debris.



Thread the stainless steel sensor sleeve onto the sensor body in the direction shown by the arrow. Be certain that the sleeve is flush with the sensor body so that no o-rings are visible. Do not overtighten. Hand tight is all that is necessary. The sensor is ready to be polarized.



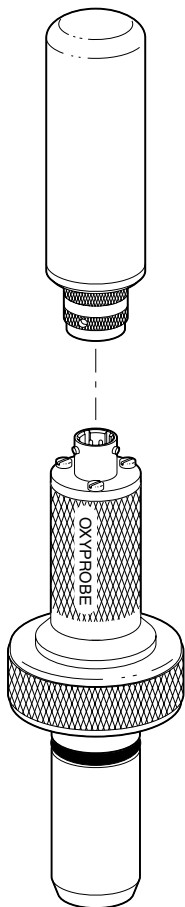
Chapter 4: Polarizing the Sensor

When the polarizer is attached to a dissolved oxygen sensor (as shown below) the internal battery circuit is completed. A polarization voltage of 675mV is applied between the anode and the cathode of the D.O. sensor. The sensor's current is initially very high as oxygen is depleted from the internal electrolyte solution, but then falls off exponentially and settles down to a steady state after a few hours.

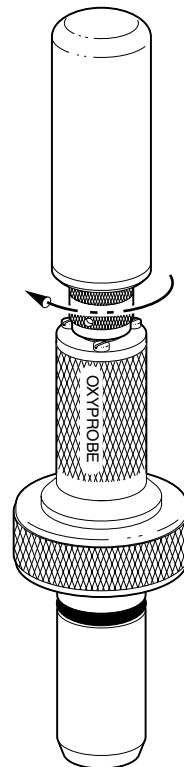
Since this polarization period is relatively long the sensor should be connected to a powered transmitter

or polarizing unit when not in use. Owing to the very small current flowing through the sensor under these conditions, its life will not be shortened.

If for any reason the sensor is disconnected (or the transmitter power switched off) for an extended period, the sensor must be repolarized before it is ready for further use. During the polarization period, the sensor current will fall off, even in an oxygen-free solution. For this reason an excessive zero current may indicate incomplete polarization.



Insert the OxyProbe polarizing unit (P/N AM-9221) into the 4-pin connector of the sensor. Take care to align the pins first.



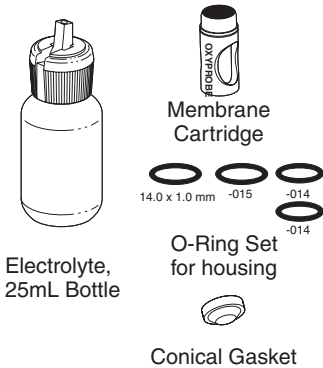
Twist-lock the connector of the polarizing unit clockwise, in the direction of the arrow.



Chapter 5: Parts and Accessories

Membrane Cartridges for 19 mm and 25 mm D.O. Sensors

Single Cartridge Kit

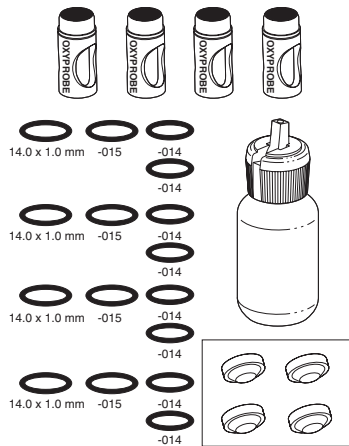


| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|--------|--|
| KA2501 | Single Membrane Cartridge Kit for 19mm & 25mm OxyProbes, includes 1ea. membrane cartridge, 1 ea. 25 mL bottle of electrolyte, 1 set of internal Si Rubber O-rings & 1 ea. Conical Gasket . |
|--------|--|

Use O-ring sizes as follows:
 OxyProbe Rebuilds: 1 ea. 14.0 x 1.0 mm, - 014, & - 015
 Other Rebuilds: 2 ea. - 014, & 1 ea. - 015

Four Cartridge Kit



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|--------|---|
| KA2504 | Membrane Cartridge Kit for 19mm & 25mm OxyProbes, includes 4 ea. membrane cartridges, 1 ea. 25 mL bottle of electrolyte, 4 sets of internal Silicone O-rings & 4 ea. Conical Gaskets. |
|--------|---|

Use O-Ring Sizes for each sensor as follows:
 OxyProbe Rebuilds: 1 ea. 14.0 x 1.0 mm, - 014, & - 015
 Other Rebuilds: 2 ea. - 014, & 1 ea. - 015

25 Piece Cartridge Pack



x 5
25 pcs.

| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|--------|---|
| KA2525 | Membrane Cartridge Kit for 19mm and 25mm OxyProbes, includes 25 ea. membrane cartridges only, bulk packed. O-rings, gaskets, and electrolyte must be ordered separately. |
|--------|---|



Accessories



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------------|--|
| AS-3140-C30-0025 | D.O. Electrolyte Solution, 25 mL Bottle with Pour Spout – Approx. 10 cartridge refills |
| AS-3140-C30-0250 | D.O. Electrolyte Solution, 250 mL Bottle with Pour Spout – Approx. 100 cartridge refills |

| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------|---|
| AG-9206-10 | Internal o-ring Kit, Silicone, for 19 mm and 25 mm D.O. Sensors, with Conical Gasket, 10 sets O-ring sizes: 14 x 1.0, -014, -015 |
|------------|---|

| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------|--|
| AG-SR15-10 | O-ring Kit, Silicone, External for D400 Series 25 mm sensors, pack of 10 O-Ring Size: R15 |
|------------|--|



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------|---|
| AG-S016-10 | O-ring Kit, Silicone, External for D200 Series 19 mm sensors, pack of 10 O-Ring Size: -016 |
|------------|---|



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------|--|
| AG-E117-04 | O-ring Kit, EPDM, External o-ring for 25 mm B.Braun Biotech sensors, pack of 4 |
|------------|--|



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

| | |
|------------|--|
| AG-SF25-10 | O-ring Kit, Silicone, Oversized o-ring for 25 mm housings and D.O. sensors, pack of 10 |
|------------|--|



| Part Number | Description |
|-------------|-------------|
|-------------|-------------|

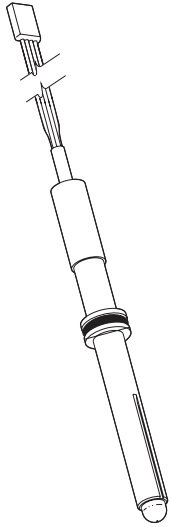
| | |
|---------|--------------------------------------|
| AM-9211 | Conical Gasket Kit, Silicone, 4 pcs. |
|---------|--------------------------------------|



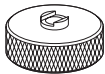


Replacement Parts

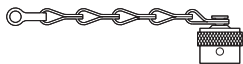
OxyProbe CT25 CATHODE ASSEMBLY



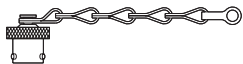
| Part Number | Description |
|---------------|---------------|
| CT25-PT-050MP | 70 mm Sensor |
| CT25-PT-130MP | 150 mm Sensor |
| CT25-PT-200MP | 220 mm Sensor |
| CT25-PT-300MP | 320 mm Sensor |
| CT25-PT-400MP | 420 mm Sensor |



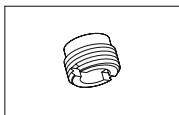
| Part Number | Description |
|-------------|---|
| AM-9213 | Cathode Removal Tool, Dual Purpose for use with D200 (19 mm) & D400 (25 mm) series OxyProbe sensors |



| Part Number | Description |
|-------------|---|
| AM-9212 | Sensors Dust Cap 4-Pin Connector, Moisture Proof. For use with OxyProbes and all conventional D.O. Sensors. |



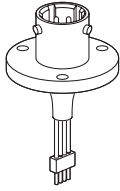
| Part Number | Description |
|-------------|--|
| AM-9219 | Dust Cap for Cable Plug, Moisture Proof. For use with OxyProbe Cables and All Conventional D.O. Sensor Cables. |



| Part Number | Description |
|-------------|---|
| AM-9210 | Retainer Nut, 316L SS, for use with CT25 Cathode Assembly |

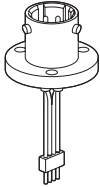


Replacement Parts



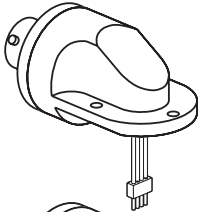
Part Number **Description**

AM-9202 **4-Pin Connector for D400 Series 25 mm**



Part Number **Description**

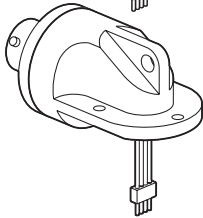
AM-9203 **4-Pin Connector for D200 Series 19 mm**



Part Number **Description**

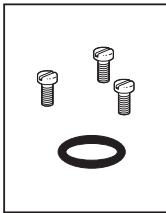
AM-9204 **Right Angle assembly for 25 mm Sensors**

AM-9266 **Right Angle assembly for 19 mm Sensors**



Part Number **Description**

AM-9386 **Extended Right Angle assembly with hole for 25mm Sensors**



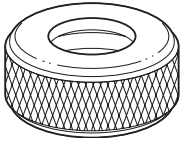
Part Number **Description**

AM-9205 **Screw, 316L SS and O-ring kit for use with 25 mm 4-pin connector**
O-ring size: -014 , EPR

AM-9263 **Screw, 316L SS and O-ring kit for use with 19 mm 4-pin connector**
O-ring size: 10.4 x 1.0, EPDM



Accessories



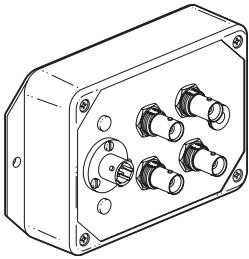
Part Number **Description**

AM-9200 **Retainer Ring, 316L stainless steel, for 25mm D.O. Sensors**



Part Number **Description**

AM-9201 **Retainer Ring, 316L stainless steel, for 19mm D200 Sensors**



Part Number **Description**

E-1807-AAM-DZ **115VAC powered polarizing unit to keep up to four (4) OxyProbe sensors conditioned between uses. Also has a self test terminal.**



Part Number **Description**

AM-9221 **Battery-powered OxyProbe® Polarizing Unit For keeping OxyProbe sensors conditioned between uses**



Part Number **Description**

AM-9222 **OxyProbe® Simulator For troubleshooting and verifying installations, cables, and transmitters**

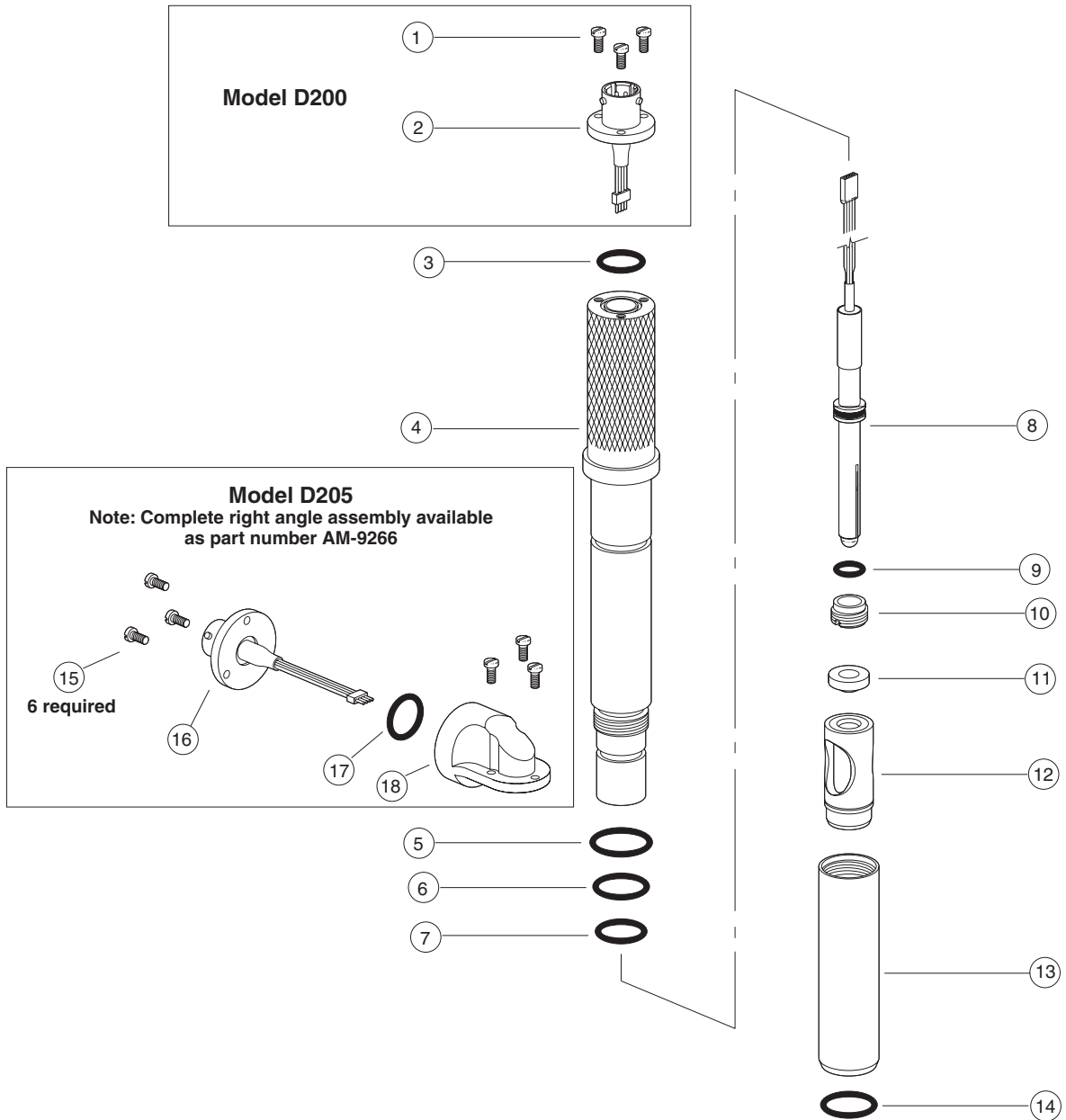


See next pages
for an exploded view
and itemized parts list
for the 19 mm and 25 mm
OxyProbe D.O. Sensors



Figure 1
**19 mm Sensor
 D200/D205 OxyProbe® Assembly**

See next page for Part Number & Description



D200 & D205 OxyProbe® Sensor Assembly ITEMIZED PART NUMBERS and DESCRIPTIONS

| ITEM | PART NUMBER | DESCRIPTION |
|------|---------------|--|
| 1 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 |
| 2 | AM-9203 | 4-Pin Connector, glass to metal seal with micro cable disconnect |
| 3 | AM-9316 | O-ring, EPDM, size: 10.4x1.0 |
| 4a | AM-9341 | Sensor Body, 316L stainless steel, for B = 150 mm D200/205 sensors |
| 4b | AM-9342 | Sensor Body, 316L stainless steel, for B = 220 mm D200/205 sensors |
| 4c | AM-9343 | Sensor Body, 316L stainless steel, for B = 320 mm D200/205 sensors |
| 4d | AM-9344 | Sensor Body, 316L stainless steel, for B = 420 mm D200/205 sensors |
| 5 | AM-9345 | O-ring, Silicone, size: AS-016 |
| 6 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 7 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 8 | CT25-PT-130MP | *Anode/Cathode w/ dual EPDM, AS-011 O-rings for B = 150 mm D200/205 |
| 9 | AM-9307 | O-ring, EPDM, size: AS-011 (included with item #7) |
| 10 | AM-9210 | Retainer Nut, 316L SS for CT25 Anode/Cathode assembly |
| 11 | AM-9233 | Conical Gasket, silicone |
| 12 | AM-9234 | Membrane Cartridge for D200 and D400 Series sensors |
| 13 | AM-9239 | Sensor Sleeve, 316L SS, D200 / D205 sensors |
| 14 | AM-9236 | O-ring, Silicone, size: AS-015 |
| 15 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 (2 sets required) |
| 16 | AM-9347 | 4-Pin Connector with micro cable disconnect |
| 17 | AM-9315 | O-ring, EPDM, size: AS-014 |
| 18 | AM-9348 | Right Angle Adapter |

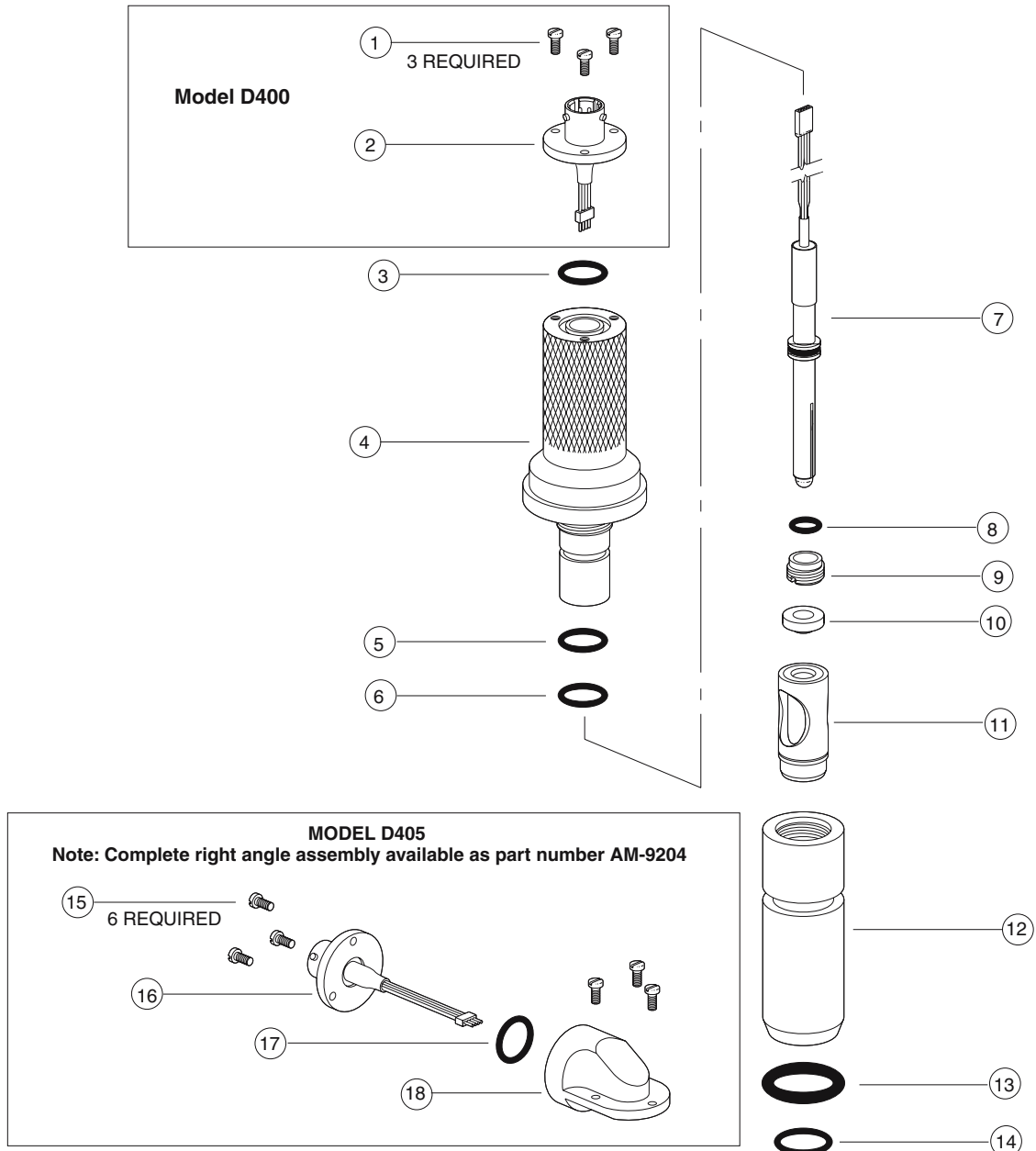
*Other lengths available for longer sensors



Figure 2

**25 mm x 70 mm Sensor
D400-B070 & D405-B070 OxyProbe® Assembly**

See Itemized List for Part Number & Description



D400-B070 & D405-B070 OxyProbe® Sensor Assembly ITEMIZED PART NUMBERS and DESCRIPTIONS

| ITEM | PART NUMBER | DESCRIPTION |
|------|---------------|--|
| 1 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 |
| 2 | AM-9202 | 4-Pin Connector, glass to metal seal with micro cable disconnect |
| 3 | AM-9315 | O-ring, EPDM, size: AS-014 |
| 4 | AM-9232 | Sensor Body, 316L SS, 70 mm length D400/405 sensors |
| 5 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 6 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 7 | CT25-PT-050MP | *Anode/Cathode w/ dual EPDM, AS-011 O-rings for B = 70 mm D400/405 |
| 8 | AM-9307 | O-ring, EPDM, size: AS-011 (included with item #7) |
| 9 | AM-9210 | Retainer Ring Nut, 316L SS for CT25 Anode/Cathode assembly |
| 10 | AM-9233 | Conical Gasket, silicone |
| 11 | AM-9234 | Membrane Cartridge for D200 and D400 Series sensors |
| 12 | AM-9235 | Sensor Sleeve, 316L SS, for B = 70 mm D400 / D405 sensors |
| 13 | AM-9237 | O-ring, Silicone, size: AS-209 |
| 14 | AM-9236 | O-ring, Silicone, size: AS-015 |
| 15 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 (2 sets required) |
| 16 | AM-9349 | 4-Pin Connector with micro cable disconnect |
| 17 | AM-9315 | O-ring, EPDM, size: AS-014 |
| 18 | AM-9238 | Right Angle Adapter for D405 Sensors |

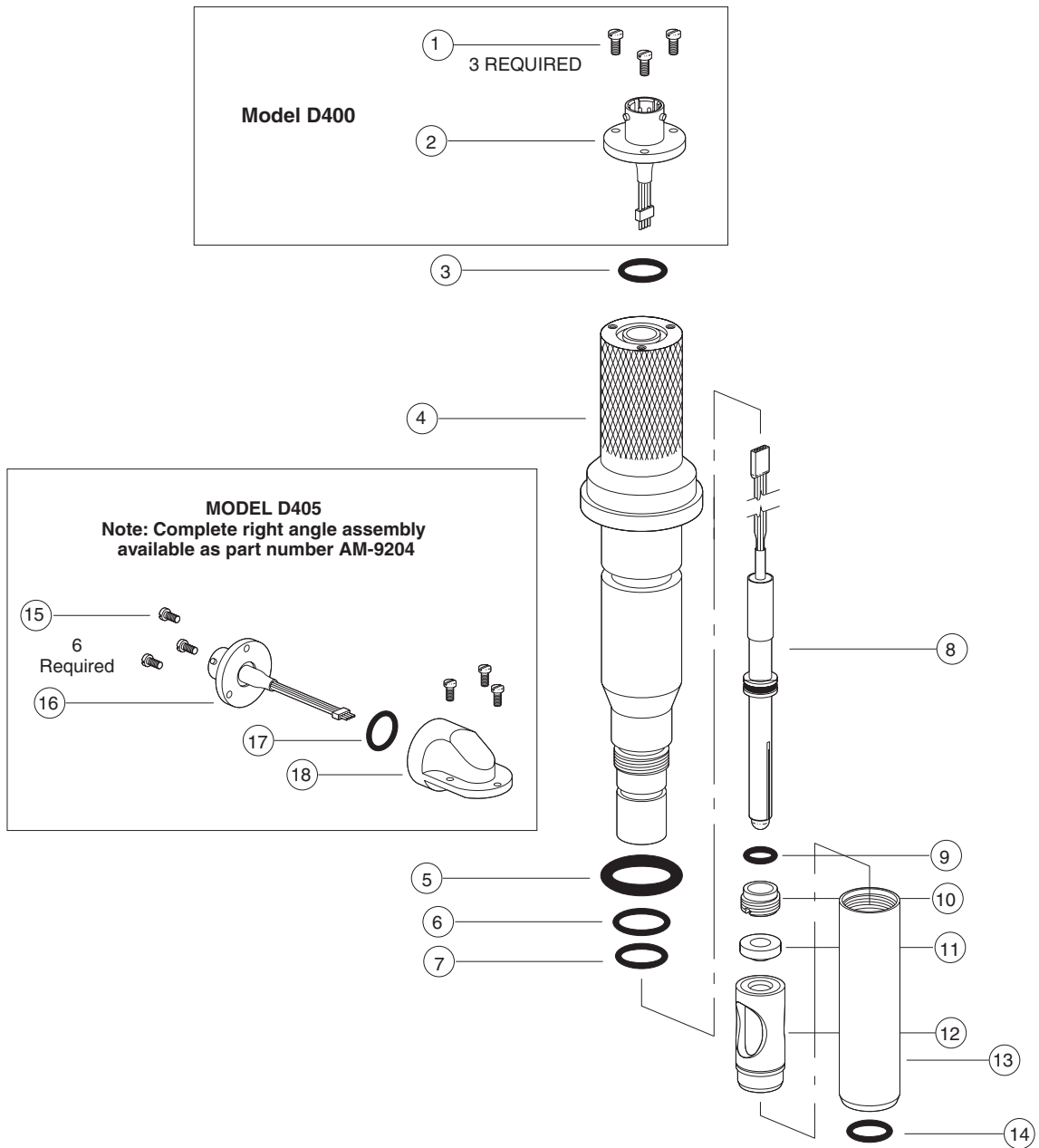
*Other lengths available for longer sensors



Figure 3

25 mm x 150 mm Sensor D400-B150 & D405-B150 OxyProbe® Assembly

See Itemized List for Part Number & Description





D400-B150 & D405-B150 OxyProbe® Sensor Assembly ITEMIZED PART NUMBERS and DESCRIPTIONS

| ITEM | PART NUMBER | DESCRIPTION |
|------|---------------|--|
| 1 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 |
| 2 | AM-9202 | 4-Pin Connector, glass to metal seal with micro cable disconnect |
| 3 | AM-9315 | O-ring, EPDM, size: AS-014 |
| 4 | AM-9346 | Sensor Body, 316L SS, B = 150 mm D400/405 sensors |
| 5 | AM-9237 | O-ring, Silicone, size: AS-209 |
| 6 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 7 | AM-9231 | O-ring, Silicone, size: AS-014 |
| 8 | CT25-PT-130MP | *Anode/Cathode w/ dual EPDM, AS-011 O-rings for B = 150 mm D400/405 |
| 9 | AM-9307 | O-ring, EPDM, size: AS-011 (included with item #8) |
| 10 | AM-9210 | Retainer Nut, 316L SS for CT25 Anode/Cathode assembly |
| 11 | AM-9233 | Conical Gasket, silicone |
| 12 | AM-9234 | Membrane Cartridge for D200 and D400 Series sensors |
| 13 | AM-9239 | Sensor Sleeve, 316L SS, for B = 150 mm D400 / D405 sensors |
| 14 | AM-9236 | O-ring, Silicone, size: AS- 015 |
| 15 | AM-9230 | M2.5 x 0.45 x 1/4" Stainless Steel Screw, set of 3 (2 sets required) |
| 16 | AM-9349 | 4-Pin Connector, with micro cable disconnect |
| 17 | AM-9315 | O-ring, EPDM, size: AS-014 |
| 18 | AM-9238 | Right Angle Adapter for D405 sensors |

* Other lengths available for longer sensors



Appendix A: Technical Specifications

Operating Conditions

| | |
|---------------------|----------------|
| Ambient Temperature | -20°C to +60°C |
| Relative Humidity | 0 – 90% |

Measure

| | |
|--|--|
| Display Range | 0 – 14 pH (Can measure down to -3 pH) -1500 mV – 1500 mV -20°C to 200°C (- 4°F – 392°F) |
| Display Resolution | 0.01 pH / 0.1 pH (adjustable) 1 mV 0.1°C |
| Repeatability | ±0.02 pH ±1 mV ±0.2°C |
| Temperature Sensor | Pt 100 / Pt 1000 |
| Automatic Temperature Compensation Range | -20 to 200°C -4 to 395°F |
| Temperature Compensation Range | Nernst Ultrapure water Other tables |
| Electrode Type | - glass (with or without preamplifier) - antimony - redox - programmable (slope + Uiso + pHiso) |
| Cable Length | 0 to 25 m (high impedance) 0 to 100 m (low impedance) |
| Sensor Inputs | Differential Measurement |
| Input Impedance | > 10 ¹² Ω |
| Impedance Measurement | Glass: 5MΩ 1GΩ Reference: 100Ω ... 1MΩ |