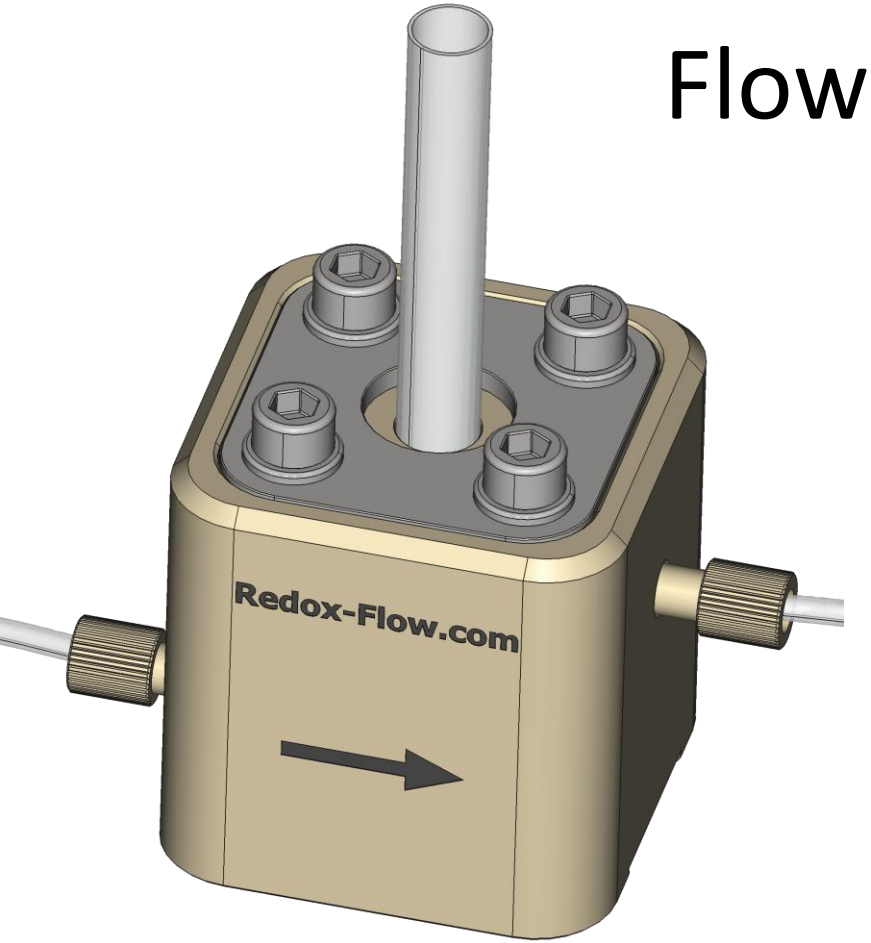


Flow-through electrode holder

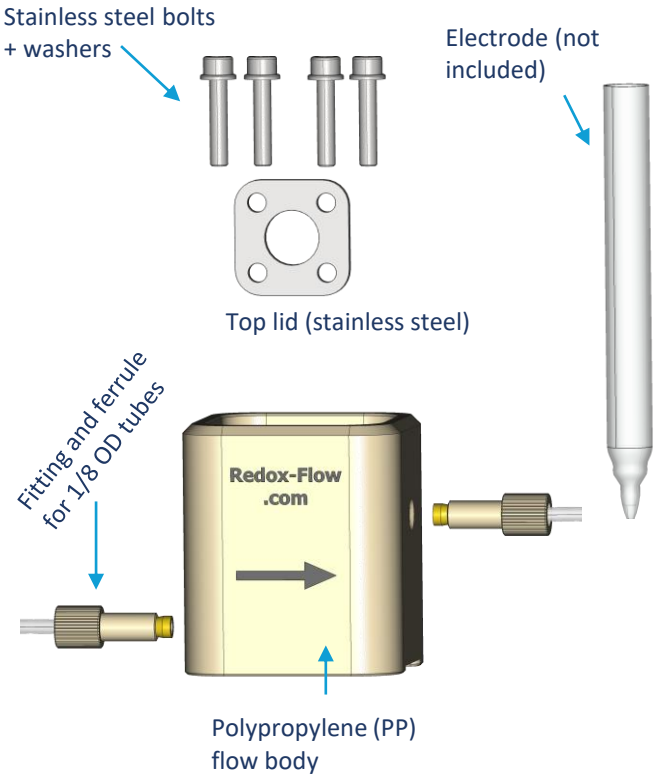
Overview & assembly manual

Version date	July 22- 2025
Manual version	3.0 - visit www.redox-flow.com for updated versions and spare parts
Notes	This equipment is intended for research purposes only and can be applied for different purposes. There is no guarantee on performance, corrosion or lifetime of the equipment. See https://redox-flow.com/termsandconditions/ for more information.

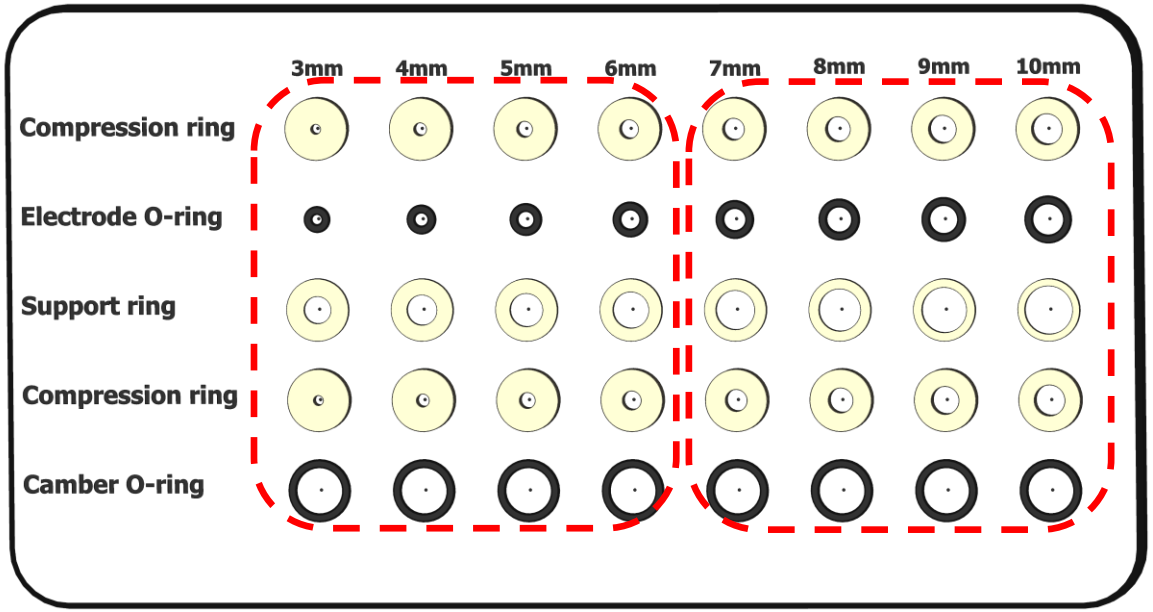
Overview of variants & components included – ø3-10mm electrodes

General notes

- The flow through holder for ø3-10 mm electrodes comes in two variants. One with components for ø3-6mm electrodes and the other with components for ø7-10 mm electrodes. The full ø3-10 mm range can be obtained by additional components
- IMPORTANT: It is not possible to use >ø10 mm electrodes in the ø3-10 mm electrode holder
- All wetted parts are only in contact with PP flow body, PP compression ring and O-rings (VITON or EPDM both are included)
- All components shown below are included, unless stated otherwise



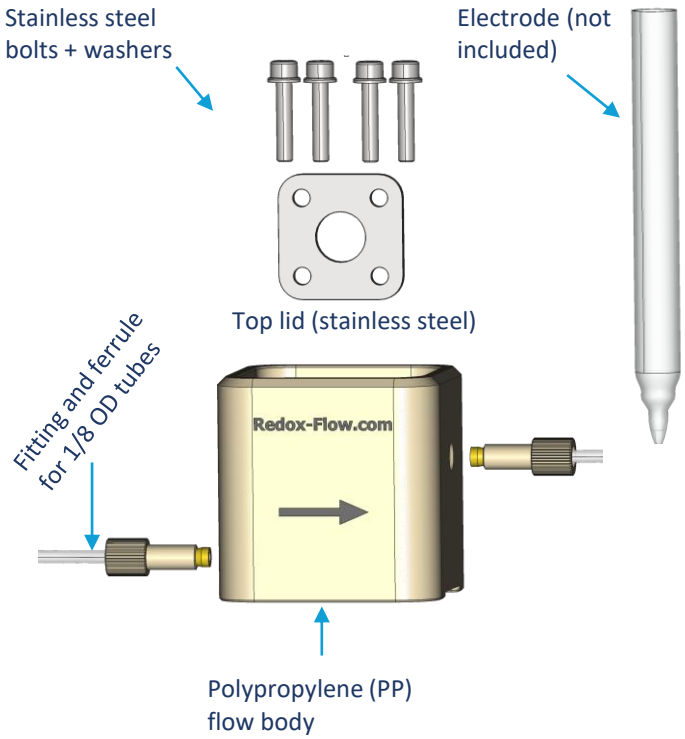
- Besides the main components shown on left side, the flow through electrode holder comes with a number of components that allows continuous ø electrodes from either ø3-6mm (red encircling on left) or ø6.1-10mm (red encircling on right).
- These components are
  - Compression rings (OD 20.8 mm and 5 mm thickness) – PP material
  - Support ring (OD 20.8 mm and 2 mm thickness) – PP material
  - Electrode O-ring in both EPDM and VITON – all with a thickness of 3 mm
  - Chamber O-ring (OD 21 mm and 3 mm thickness) in both EPDM and VITON
- The mm scale on the top of the figure refers to the
  - ID of the compression ring (+tolerance)
  - ID of electrode O-ring
  - The ID of the supporting ring is the diameter on the top + 6 mm



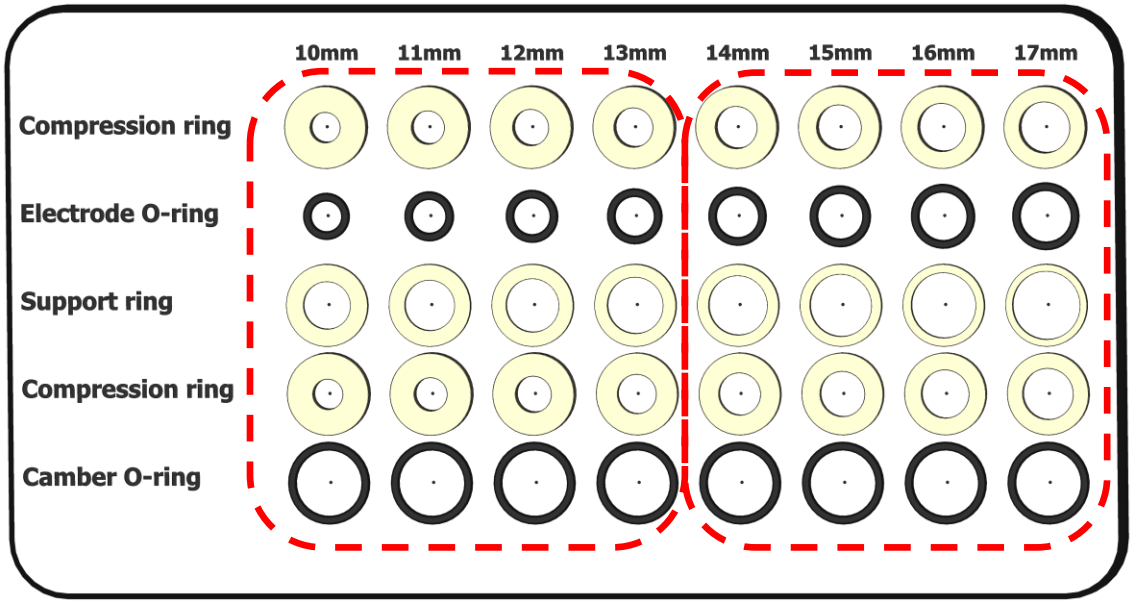
Overview of variants & components included – ø10-17mm electrodes

General notes

- The flow through holder for ø10-17 mm electrodes comes in two variants. One with components for ø10-13mm electrodes and the other with components for ø13-17 mm electrodes. The full ø10-17 mm range can be obtained by additional components
- IMPORTANT: It is not possible to use <ø10 mm electrodes in the ø10-17 mm electrode holder
- All wetted parts are only in contact with PP flow body, PP compression ring and O-rings (VITON or EPDM both are included)
- All components shown below are included, unless stated otherwise



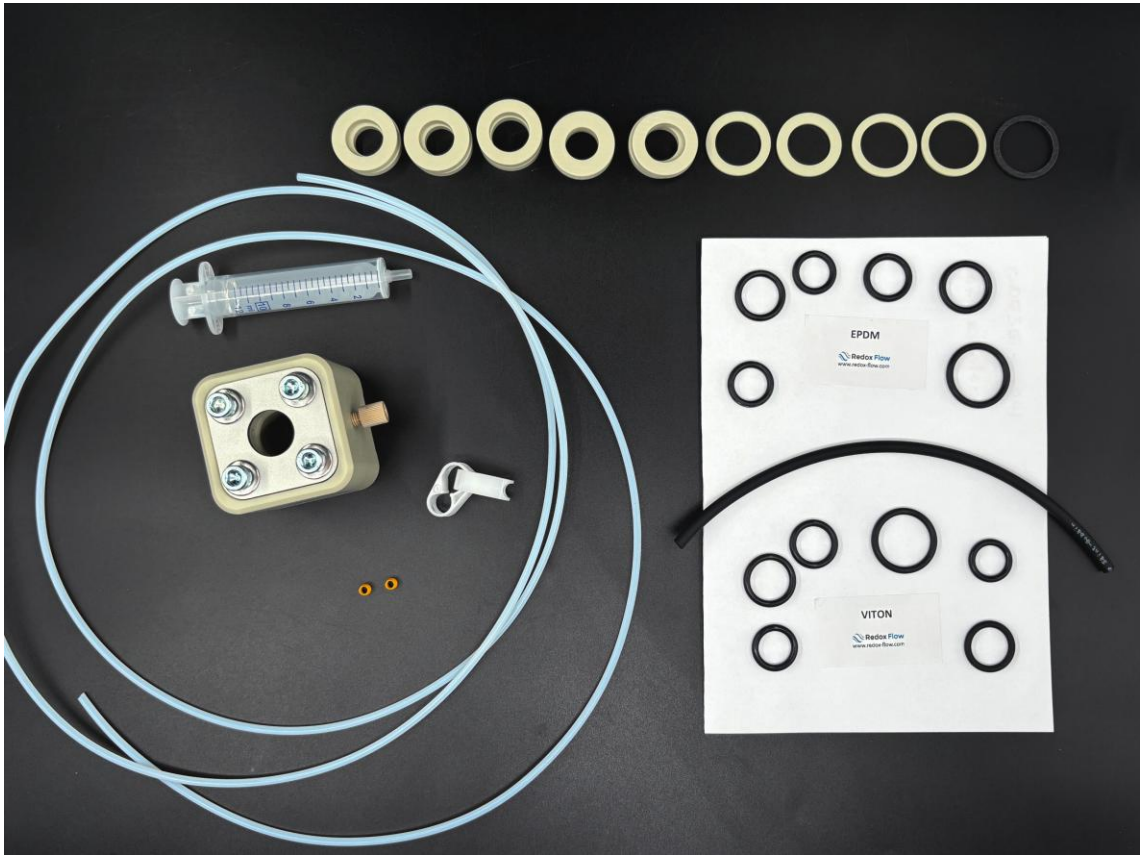
- Besides the main components shown on left side, the flow through electrode holder comes with a number of components that allows continuous ø electrodes from either ø10-13mm (red encircling on left) or ø13.1-17mm (red encircling on right).
- These components are
  - Compression rings (OD 27.8 mm and 5 mm thickness) – PP material
  - Support ring (OD 27.8 mm and 2 mm thickness) – PP material
  - Electrode O-ring in both EPDM and VITON – all with a thickness of 3 mm
  - Chamber O-ring (OD 28 mm and 3 mm thickness) in both EPDM and VITON
- The mm scale on the top of the figure refers to the
  - ID of the compression ring (+tolerance)
  - ID of electrode O-ring
  - The ID of the supporting ring is the diameter on the top + 6 mm



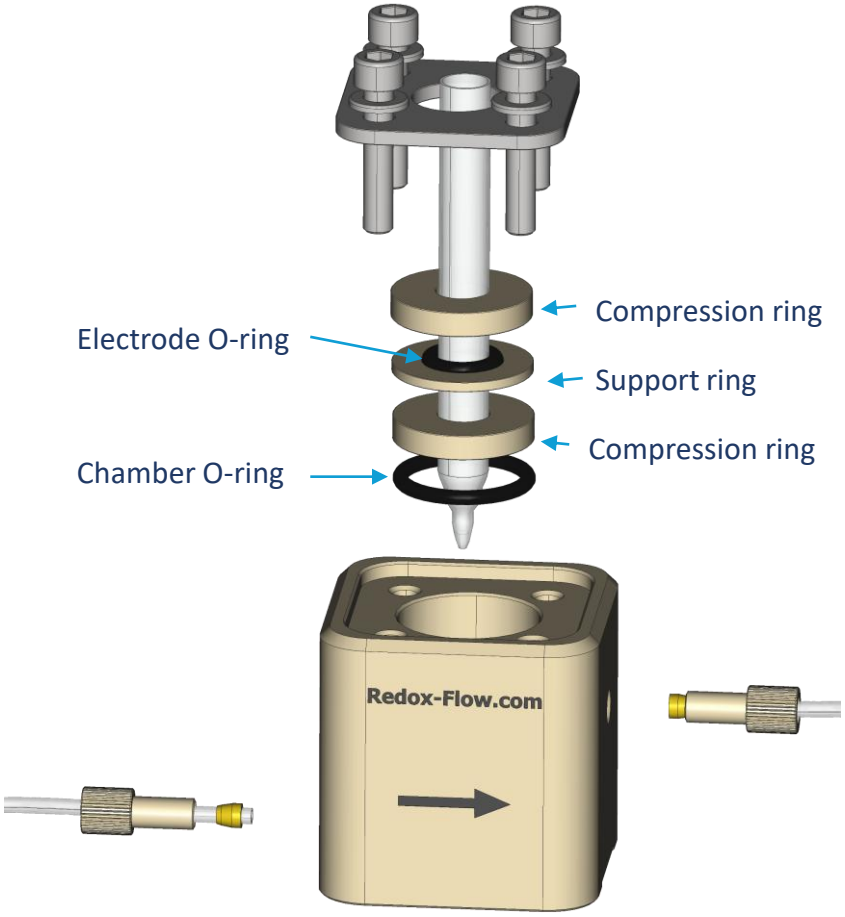
Additional components included

In addition to the components described on page 3 and 4. The package includes

- 2 m 1/8'' OD PTFE tubing
- 1 Syringe
- 2 hose clamps
- Flexible tubing for connection between syringe and PTFE tube



General Overview of Assembly



Assembly of the electrode holder follows the same procedure for all ø electrodes

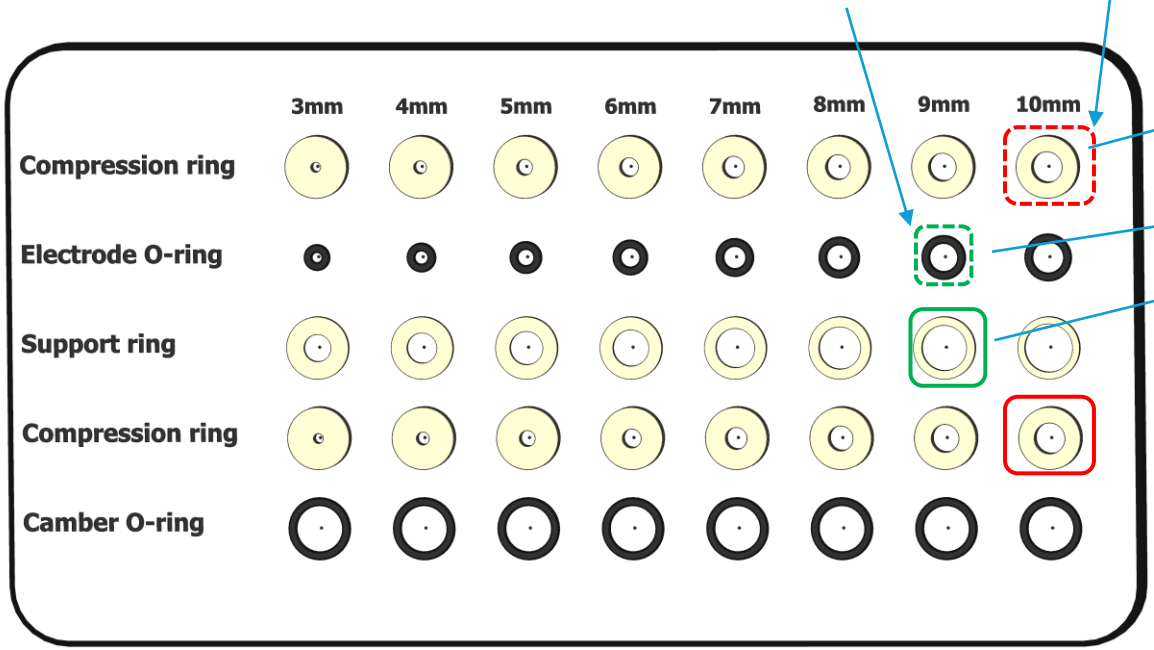
Picture on the left shows the overall assembly and will be explained in details on the following pages.

Assembly 1.

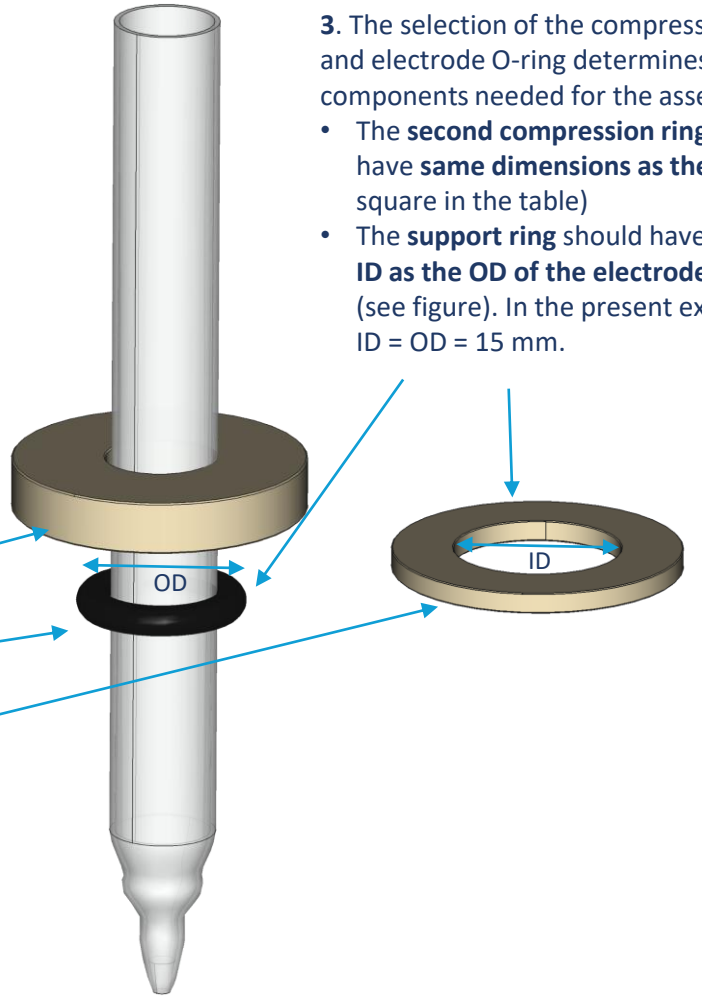
The following example is based on mounting of a ø9.5 mm electrode. All continuous diameters from ø3mm to ø17 mm can be used (but subject to the specific variant of the electrode holder).

1. Identify which minimum ID compression ring that can be fitted around the electrode
Note: In this case this would be the compression ring with ID 10 mm (red dotted square in the table)

2. Identify which maximum ID electrode O-ring that will be self-holding when mounted on the electrode (i.e., it cannot sit loose or fall of the electrode)
Note: In this case this would be the electrode O-ring with ID 9 mm (green dotted square in the table)



Electrode ø9.5 mm

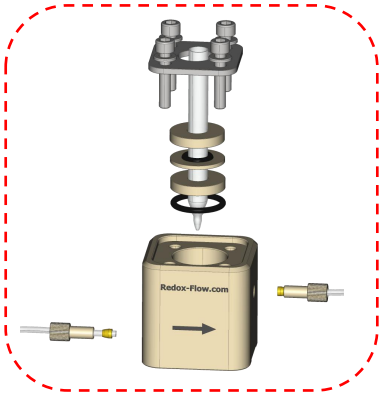


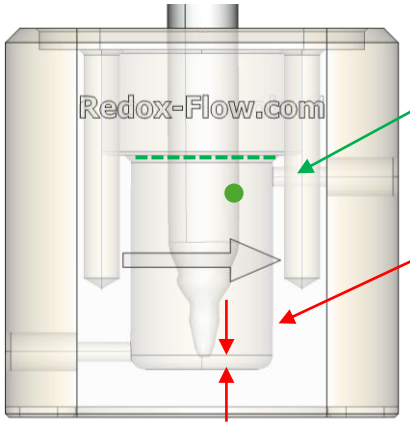
3. The selection of the compression ring and electrode O-ring determines the other components needed for the assembly

- The **second compression ring** should have **same dimensions as the first** (red square in the table)
- The **support ring** should have the **same ID as the OD of the electrode O-ring** (see figure). In the present example the ID = OD = 15 mm.

Assembly 2.

General overview of assembly (p.5)

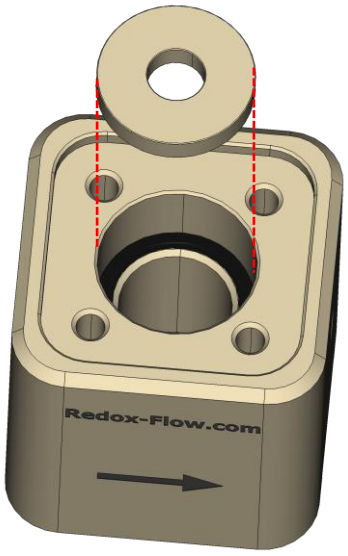




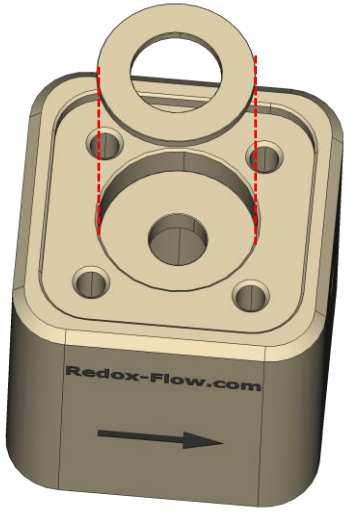
4b. Combination electrodes that include reference electrodes (e.g., pH electrodes) have in many case the reference sensing point on the side of the electrode (marked by green). Ensure that the sensing point is inside the flow of the PP body (marked by green dotted line)

4c. It is recommended to mount the electrode as far to the bottom of the holder as possible (2-4 mm)

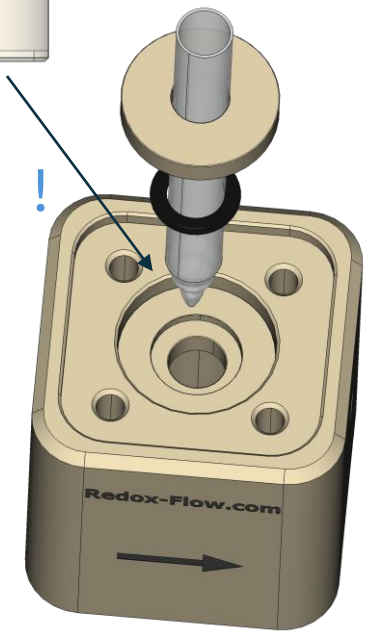
1. Chamber O-ring is inserted into PP body
Note: There is only one size of the chamber O-ring



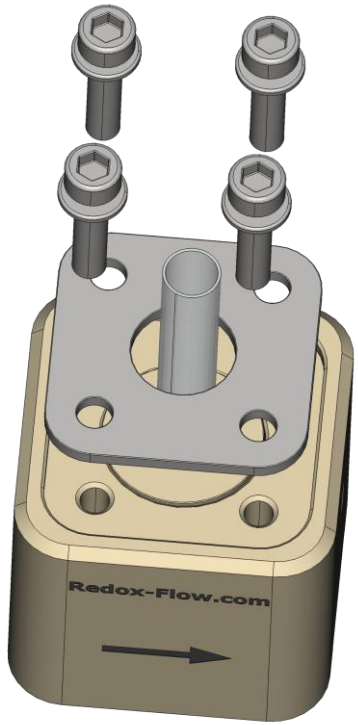
2. Bottom compression ring is inserted into PP body



3. Support ring is inserted into PP body

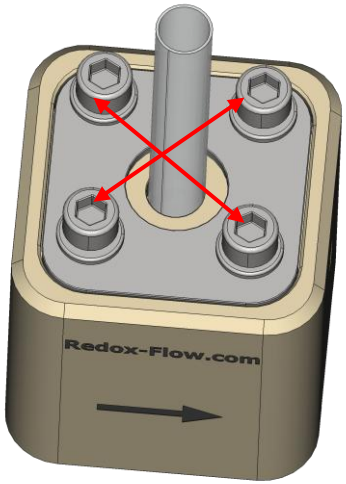


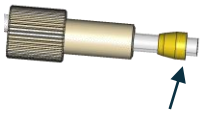
4a. Electrode with electrode O-ring and top compression ring is inserted into PP body
Note: Ensure that the O-ring is inside the support ring



5. Mount top plate, washers and bolts

Assembly 3.





Important that ferrule is turned in the same way as shown

1. Bolts are cross tightened by hand with an Allan key

Note:

- *Stop tightening once the top plate is in contact with the PP body. This is felt easily – do not overtighten, this will destroy the threads in the PP body*
- *Check integrity of assembly by pulling gently in the electrode. It should remain in the holder.*

2. Fittings are mounted on tubing and screwed in the flow body

IMPORTANT

- The ferrule (yellow part) should be mounted as shown on picture (i.e., with the wider end towards the hole/thread)
- ONLY TIGHTEND WITH FINGERS (NO TOOLS) – DO IT GENTLE, EVEN SOFT TIGHTENING WILL SEAL. If overtightened, the tube will be constricted, and the ferrule will be damaged,
- The ferrule can be reused if not overtightend, but must from time to time be replaced.
- If the tube is reused, remember to cut of the outermost 5-10 mm of the tube to remove the marks from the previous ferrule.

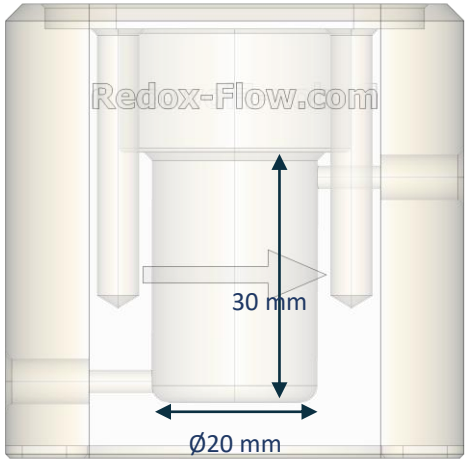
3. Holder is now ready for use

Note:

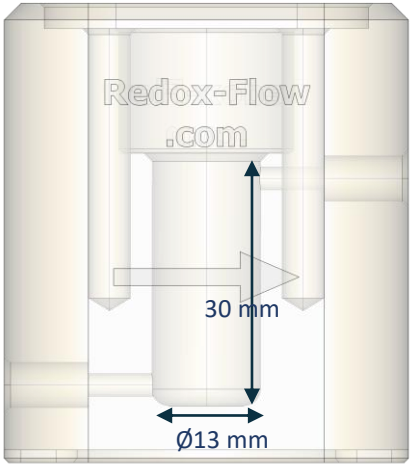
- *The arrow on the PP body shows the flow direction. When flow is in this direction, bubbles are easier removed.*
- ***When operating the electrode holder, it is paramount that no bubbles are present in the chamber.** If present, the bubbles can be flushed out by increasing flow rate for 5-15s, reverse flow direction and 'shake' the holder. Noise in the electrode readings is typically a sign of bubbles in the holder.*

Application notes – Internal volume inside the holder

The internal (dead) volume inside the electrode holder depend on the diameter and how far it is placed towards the bottom of the holder, but can be estimated from the dimensions given below.



Internal dimensions of ø10-17mm electrode holder

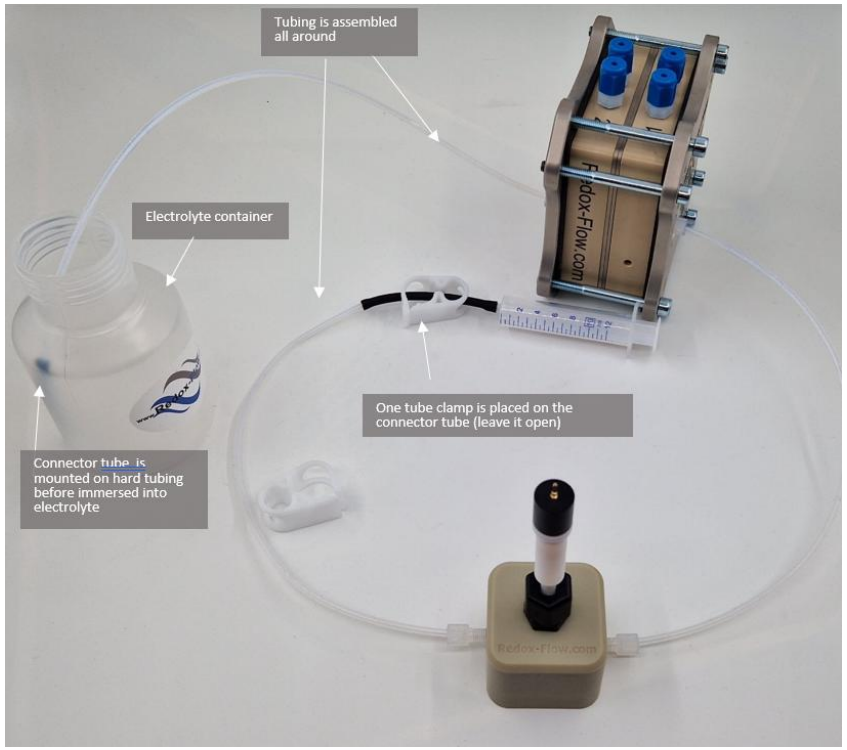


Internal dimensions of ø3-10 mm electrode holder

Application notes – Luggin capillary/dead-end

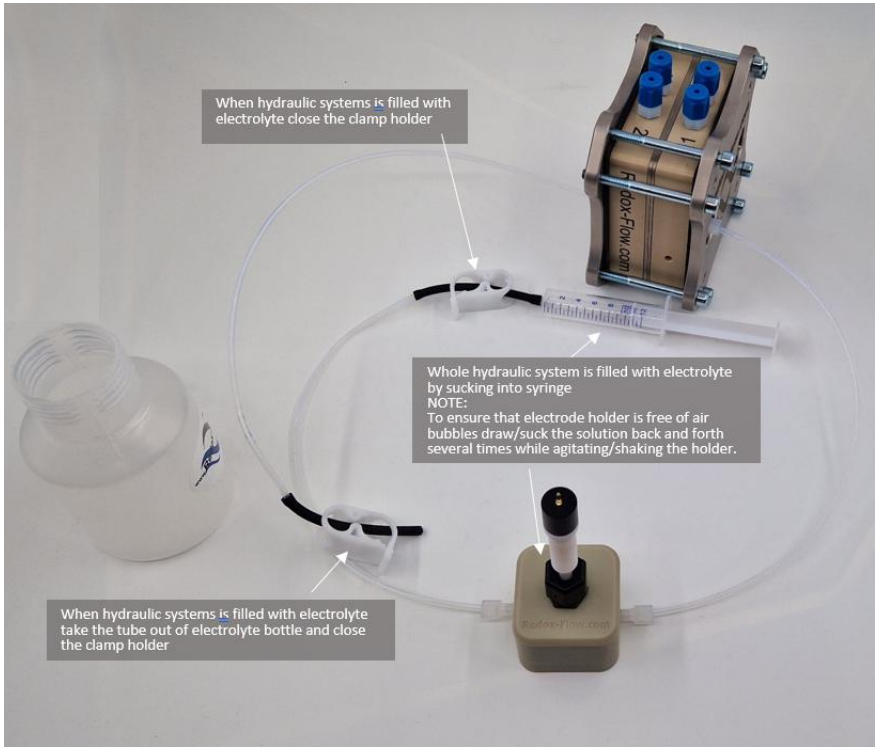
In many cases it is advantageous to mount the electrode holder in a dead-end configuration with no flow through the electrode holder. i.e.,

1. Luggin Capillary type setup in applications where the holder/tube works as a liquid/galvanic connection to the point for the (reference) electrode measurement.



2. High temperature measurements – In many cases reference electrodes cannot withstand high temperature operation. With the dead-end configuration, the electrode can be placed outside/away from heating chamber or area of high temperature.

Below is an example of the assembly on an X-cell with additional ports for measurements inside the cell (see manual for the cell for more info on the cell). But the assembly is general and can be used for other applications too.



Note: the electrode holder on the picture is an older version.