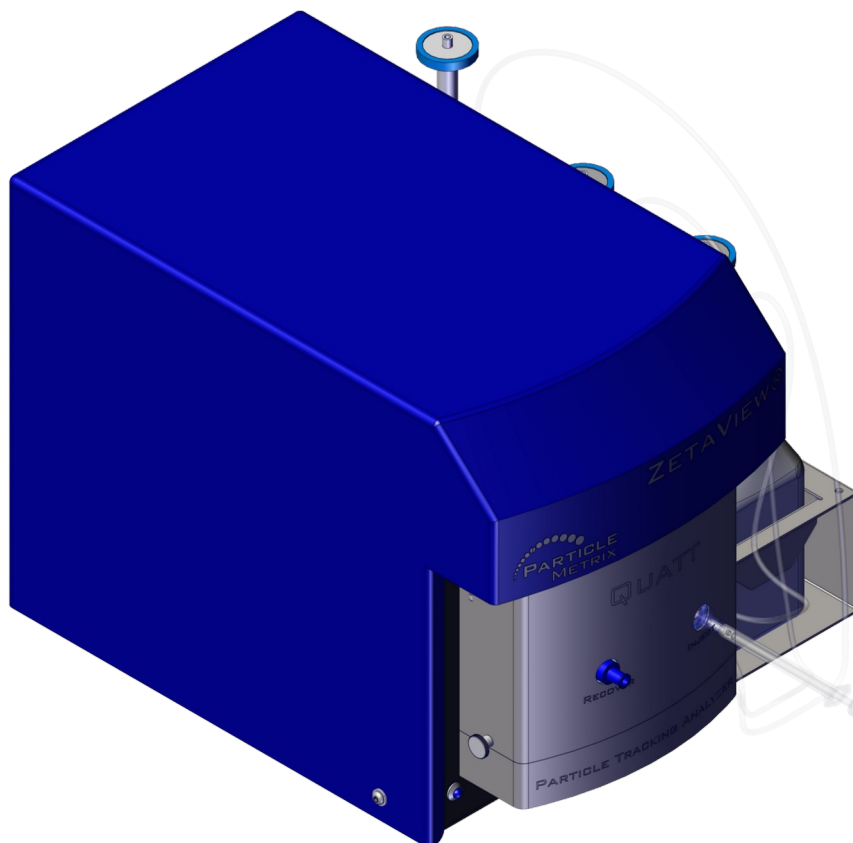


Hardware Manual

for ZetaView[®]

Nanoparticle Tracking Analyzers

PMX-130, PMX-230, PMX-430



Particle Metrix GmbH

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Version 1

Imprint

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About these Operating Instructions

These Operating Instructions apply equally to the ZetaView® Nanoparticle Tracking Analyzers PMX-130 (mono-laser instrument), PMX-230 (TWIN) and PMX-430 (QUATT), which are equipped with **software version 8.05.16 or later**. However, some functions described in this document only relate to a specific model or equipment variants. This is noted accordingly.

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1 Fundamental safety instructions

1.1 Obligations, liability

1.1.1 Observe details stated in the Operating Instructions

These Operating Instructions contain important precautions in order to operate the Particle Metrix ZetaView® NTA instrument models PMX-130 (mono-laser instrument), PMX-230 (TWIN) and PMX-430 (QUATT) in compliance with the pertinent safety regulations. Knowledge of and compliance with these safety precautions and the pertinent safety regulations are basic prerequisites to ensure a safe and trouble-free operation of the PMX instruments.

Moreover, the pertinent regulations and prerequisites applying to accident prevention at the place of installation shall be observed.

1.1.2 Obligations of the ZetaView® owner

The guaranteed properties and warranty shall only be applicable, if the following points are complied with:

- The ZetaView® instrument must be exclusively operated by persons trained by PARTICLE METRIX GmbH or its representative.
- The ZetaView® instrument may only be used in accordance with the regulations.
- All specifications defined by PARTICLE METRIX GmbH with regard to handling the ZetaView® must be observed. This term not only refers to operation, but also to maintenance and storage of the device.
- Maintenance and repairs may only be carried out by persons authorised explicitly by PARTICLE METRIX GmbH or its distributor to perform such tasks.
- If any parts of the ZetaView® instrument are replaced by other than original parts supplied by PARTICLE METRIX GmbH, this shall lead to a direct loss of all claims which can be raised vis-a-vis PARTICLE METRIX GmbH.
- Safety-relevant disturbances must be eliminated immediately and prior to the next operation of the ZetaView® instrument.
- If the ZetaView® instrument reflects any functional disturbances or visible damages, or if any damage is assumed, e.g. in the event of loose parts within the instrument, the device shall be put out of operation.

1.1.3 Warranty and liability

The ZetaView® instrument has been manufactured in compliance with the requirements stipulated in ISO 9001 and CE, tested and shipped in a proper condition with regard to safety engineering requirements. The owner and user are responsible for ensuring that all precautions listed in these Operating Instructions and the regulations applying to the installation site of the equipment are observed. Our Standard Sales and Delivery Terms which shall be available to the Owner at the latest at the point of undersigning the purchase agreement shall also be applicable. Warranty and liability claims shall be excluded in the event of damage to persons or property, if at least one of the following points is applicable:

- Use of the ZetaView® contrary to the regulations
- Non-authorized intervention into the housing, damage to the sealing on the housing screws
- Inappropriate installation, operation, maintenance and repair of the ZetaView® instrument
- Operation of the ZetaView® instrument with defective safety equipment or featuring damages which may affect safety
- Operation of the ZetaView® instrument without the prescribed or with non-functional safety installations
- Non-compliance with precautions stated in these Operating Instructions with regard to operation, storage, transport and maintenance of the ZetaView® instrument
- Any modification of the equipment is against the delivery conditions
- Damage as a result of intervention by a foreign substance, acts of God or catastrophes
- Faulty maintenance

If the equipment is sent to PARTICLE METRIX GmbH for repairs, always ensure that the appropriate measuring Cell assembly is enclosed in the shipment. The warranty period is 1 year from the date of delivery. PARTICLE METRIX GmbH shall not warrant under any circumstances for warranty damage exceeding the purchase price of the equipment. PARTICLE METRIX GmbH is only obliged within the scope of warranty to replace or repair parts classified as defective within the scope of the examination performed by PARTICLE METRIX GmbH at its own discretion, if these parts were returned within the given time schedule. Parts which are modified or damaged as a result of improper handling without written approval by PARTICLE METRIX GmbH, shall be exempt from warranty. Furthermore, PARTICLE METRIX shall not assume any further obligations in connection with selling the ZetaView® instrument.

1.1.4 Exemption from liability

The contents of these Operating Instructions have been verified. It is nevertheless impossible to exclude deviations to the device or errors. PARTICLE METRIX GmbH therefore does not assume any warranty for the correctness of the information provided in these Operating Instructions. If appropriate, modifications will be integrated into a following version.

1.2 Use according to regulations

The ZetaView® instrument was developed to determine the electrophoretic mobility, zeta potential and particle size distribution in aqueous solutions. Operation shall only be permitted in interior rooms. There is no protection against dust and spray water. Any deviating use or noncompliance with the Operating Instructions shall be deemed to be a use which is contrary to the agreed terms and shall lead to non-liability on the part of PARTICLE METRIX GmbH.

1.3 Use contrary to regulations

The following ZetaView® instrument shall be deemed to be use of the equipment contrary to the regulations (misuse):

- Each and any application deviating from the use of the equipment in accordance with the above-mentioned terms
- Non-compliance with instructions and safety precautions stated in these Operating Instructions
- Non-compliance with safety regulations
- Operating the equipment despite safety-relevant disturbances
- Operating the equipment despite functional disorder or visible damage
- Any modification of the equipment as against the delivery status

1.4 Qualification of staff

Persons who have been trained by PARTICLE METRIX GmbH or by an authorized representative shall exclusively operate the ZetaView® instrument.

1.5 Safety instructions

In handling the ZetaView® instrument, the following points must be observed:

- Only trained staff may put the device into operation or operate the equipment.
- Before performing any repair within the device, ensure that it is disconnected from the power supply.
- Only original parts supplied by PARTICLE METRIX GmbH may be used for maintenance or repairs.
- Only trained staff may carry out any maintenance operations, in so far as these are described in these Operating Instructions.
- PARTICLE METRIX GmbH or a service company, which has been explicitly authorised to perform such operations, may only execute any maintenance or repair operations, which are not described in these Operating Instructions.

1.6 Provision of the safety instructions

These Operating Instructions, as well as any regulations applicable at the place of installation shall be stored in direct vicinity of the equipment and must be observed. If the documents mentioned become illegible for example due to damage, they must be replaced.

1.7 Packaging & Transport

In the case the ZetaView® should be transported and installed at alternating locations, the following must be observed:

For truck, train, sea and air freight or shipment by mail an appropriate sturdy outer packaging is required.

- If the device temperature after transportation is more than 10°C below the ambient temperature at the place of installation, it is necessary to ensure that the device reaches room temperature before putting it into operation.
- For transportation it is necessary to clean the measuring cell and fluid connectors (both ends) before packing into the extra box.
- Some smaller parts may be packed with the ZetaView®, but have to be properly wrapped and stowed in a way to avoid shifting around during transport and by this damaging the ZetaView®
- In order to prevent harm to service personnel, remove all residual fluids from the fluid containers and the ZetaView®. If the fluids are considered to be dangerous, e.g. biohazard, the parts in contact with the liquid have to be

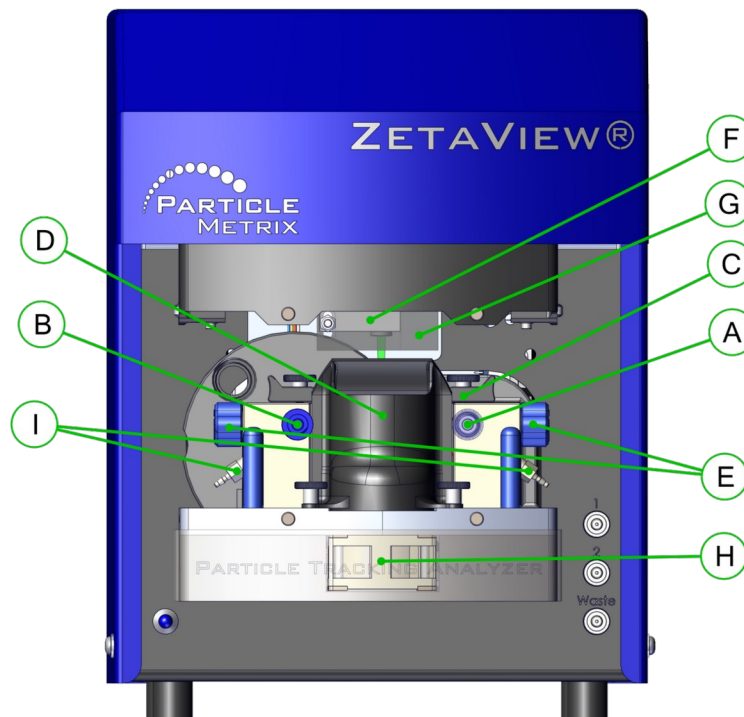
Product description

sterilized properly and rinsed with sufficient amount of distilled water afterwards

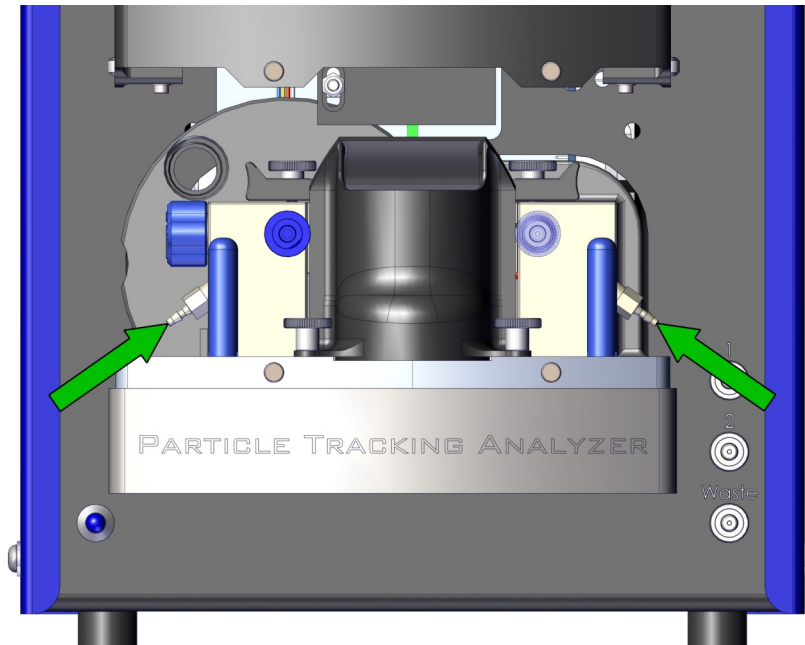
- In case of shipping the ZetaView® instrument, eject the Cell assembly and store it in the designated box to prevent damage to the instrument.
- Before shipping, take 3 (or 4, depending on model) M6x25 mm screws and fix at the bottom of ZetaView® instrument (hand tight). Take a size 5 Allen key to carefully tighten the screws. Do not apply force.

2 Product description

The x30 series has been optimised for simplicity. No tools are required for day-to-day work and normal maintenance tasks.



- [A] Inlet: Attach a syringe here to load a sample
- [B] Front outlet (normally closed): Attach a tube or syringe here if you want to recover a sample
- [C] Cell: The measurement cell
- [D] Air flow channel: The air flow channel optimizes air flow for the cooling unit
- [E] Electrodes: The electrodes close the measurement chamber on each side. They are used for
 - alignment purpose and for zete potential measurement (if enabled)
- [F] Laser
- [G] Laser interlock system: The interlock system prevents laser from emitting light, while the front cover is not attached.
- [H] Fan
- [I] Drainage for cleaning liquids

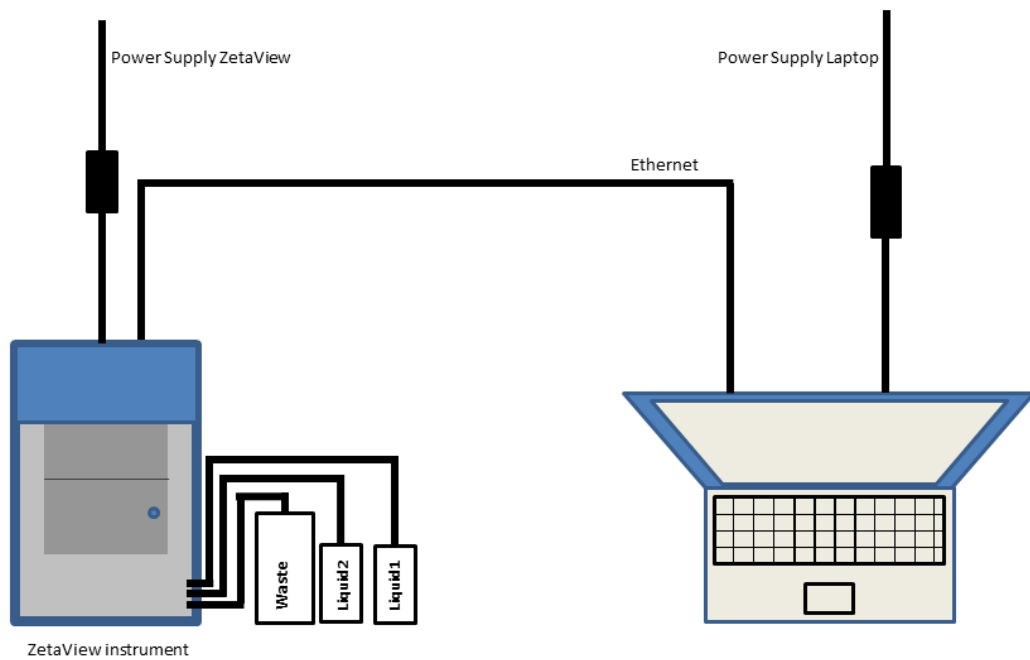


The drainage for cleaning liquids are open. There is no need to attach something. Optional you can put a tube onto the drain outlet for cell cleaning.

3 Setup

3.1 Connection of cables

The instrument is connected with a laptop or NUC computer according to the following sketch

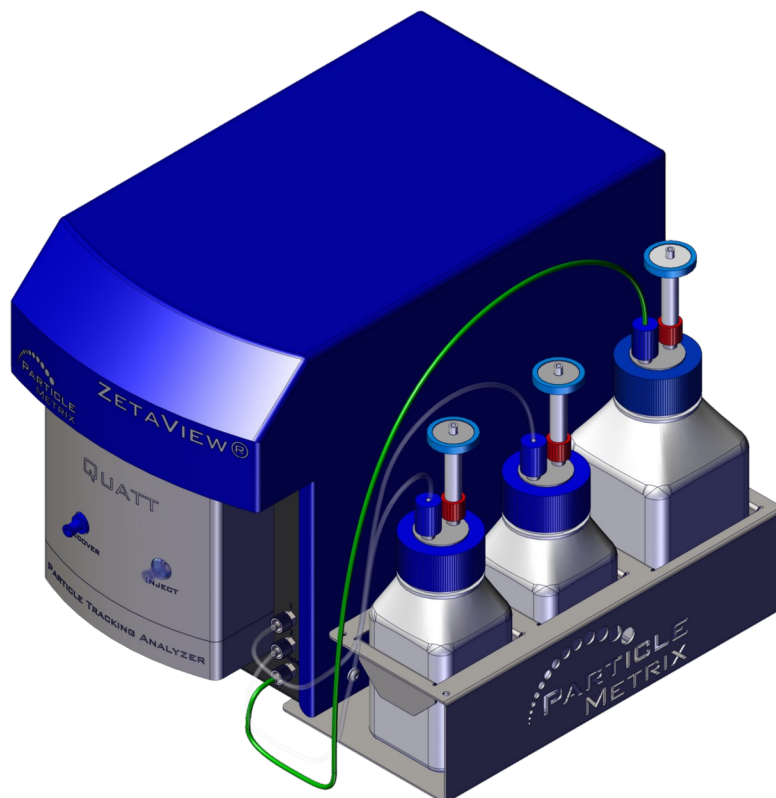


1. Connect Power Supply
2. Connect ethernet cable to PC

3.2 Connection of waste, water and buffer

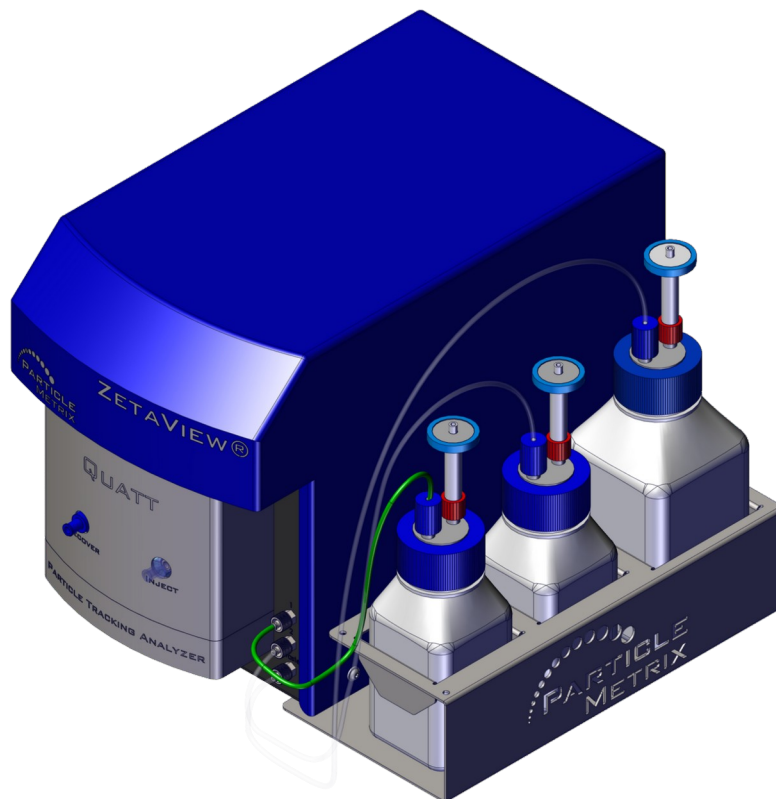
There are 2 bottles (250ml) for liquid 1 and 2 and one big bottle (500ml) for the waste. The waste bottle (500ml) is equipped with a check valve (one-direction-valve) with a Luer plug, the bottles for “liquid 1” and “liquid 2” are not equipped with a check valve but with Luer plugs as well. For connecting the bottles with the instrument, please screw the plugs into the threads located at the front of the instrument.

1. Connect waste line

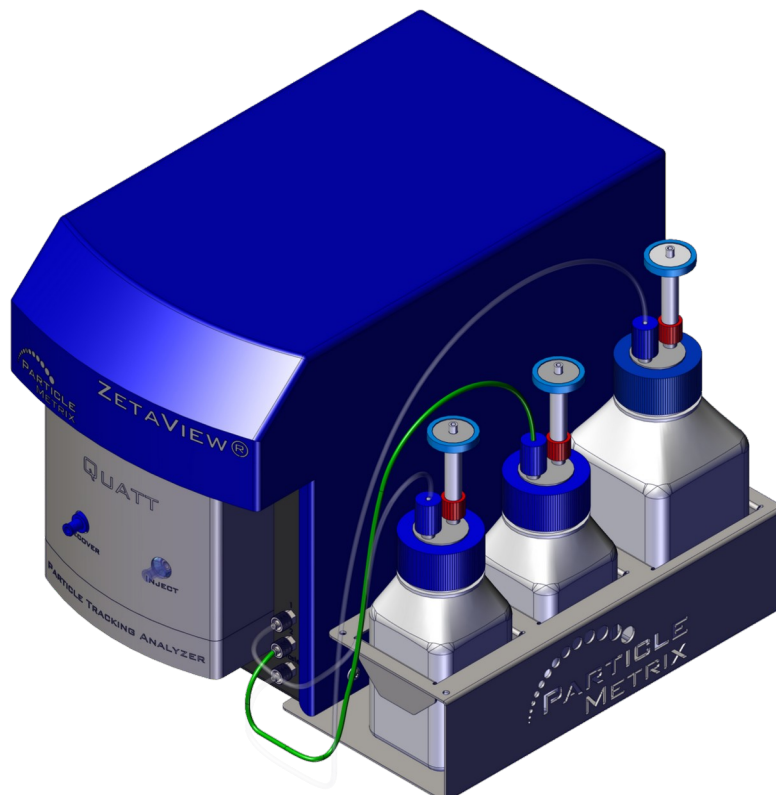


Product description

2. Connect tubing for bottle 1

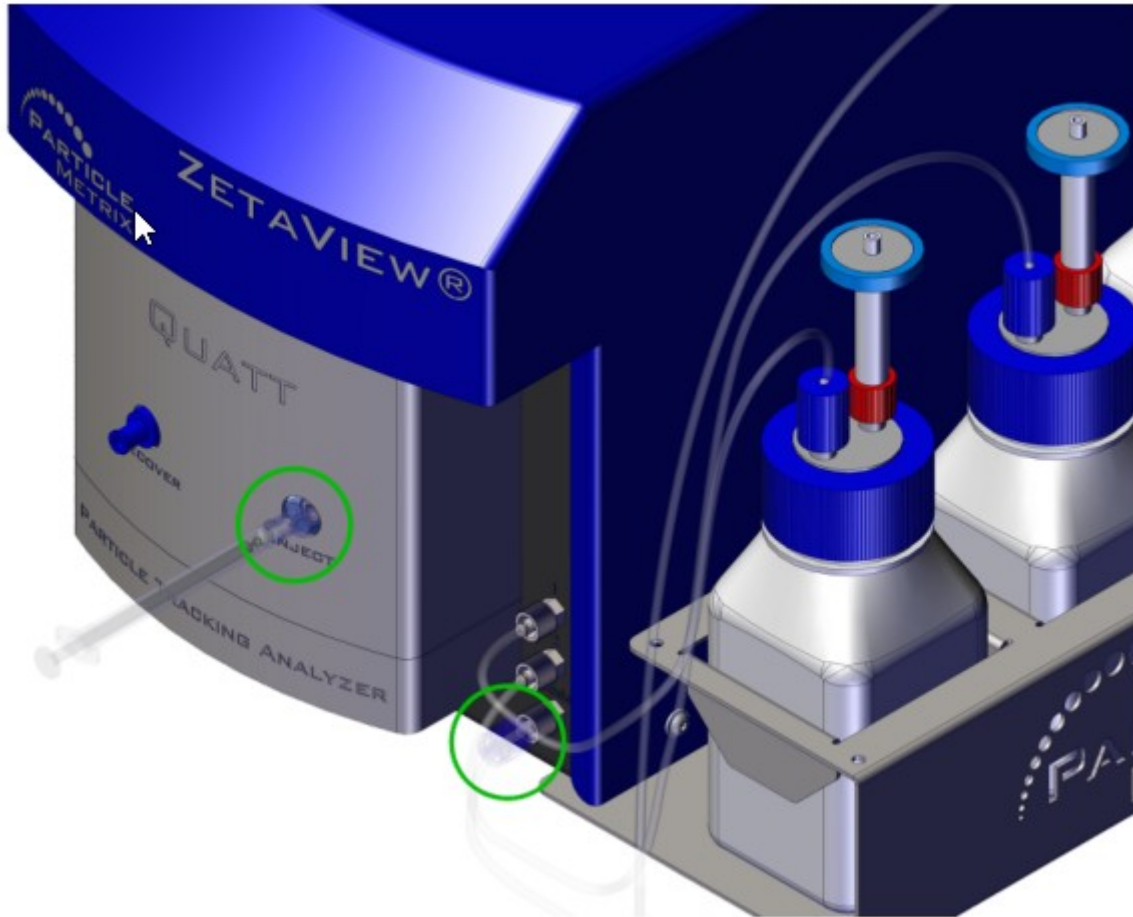


3. Connect tubing for bottle 2



Product description

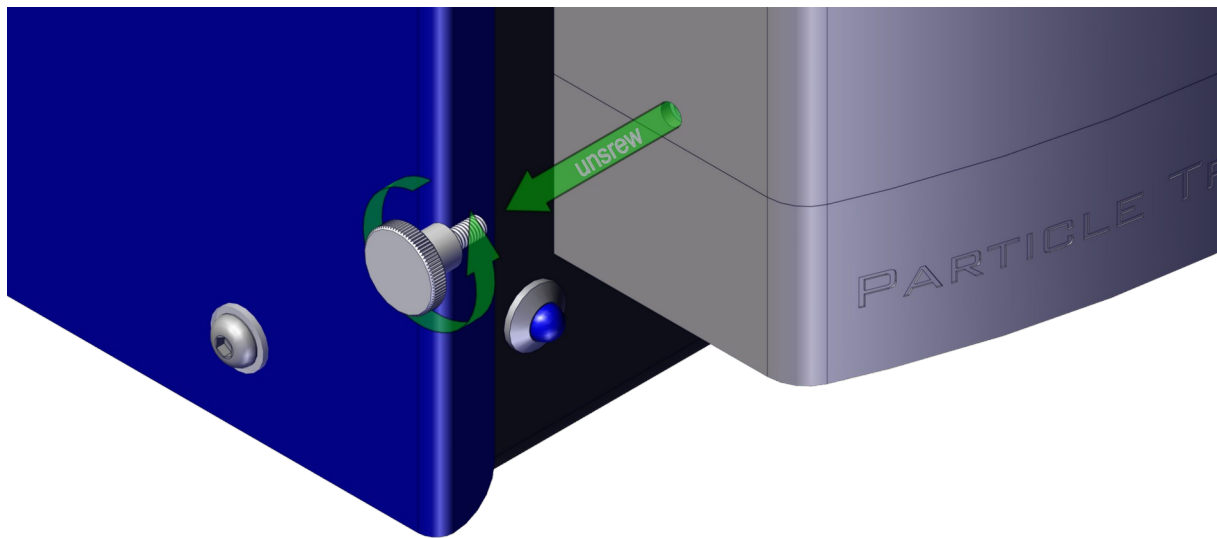
Make sure there is a check valve at the inlet and a blind stop at the recover outlet attached. At the waste outlet, there needs to be a check valve as well.



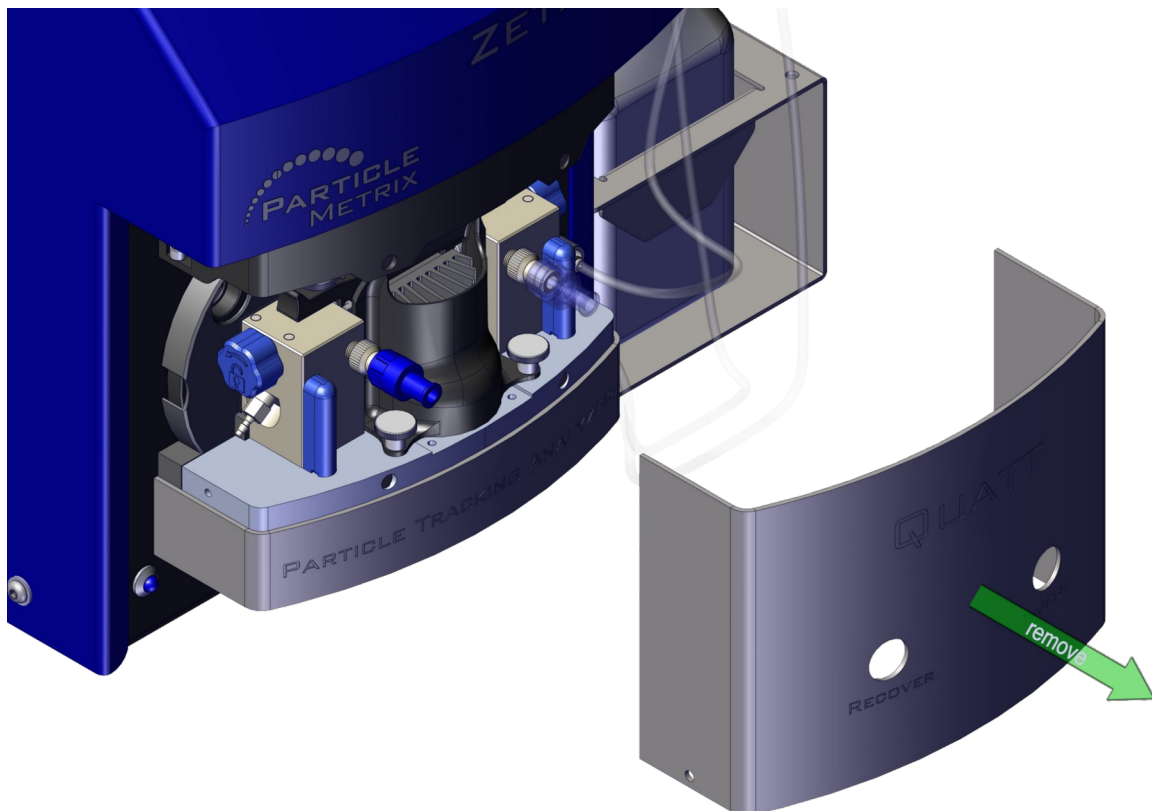
4 General usage

4.1 How to open the cover

1. In case the transport lock knurled screw is still in place, please unscrew it.

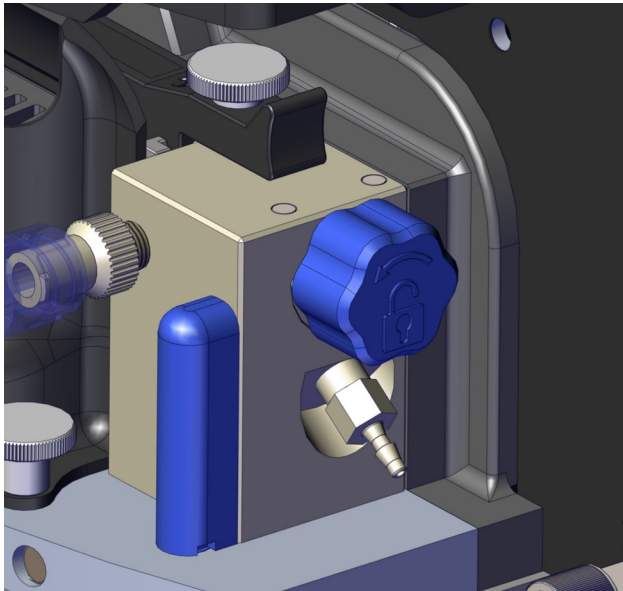


2. The cover is held by magnets and can be easily removed just by pulling the cover.



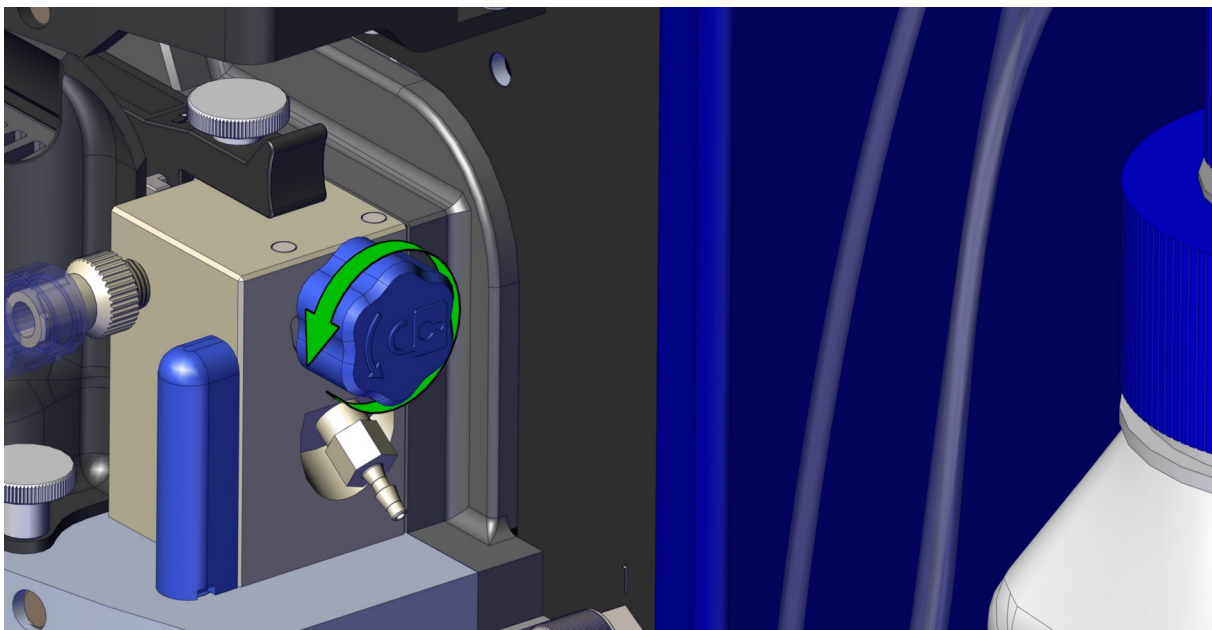
4.2 Remove/replace electrode

The electrodes are locked by a bayonet mount. You don't need tools to remove them.

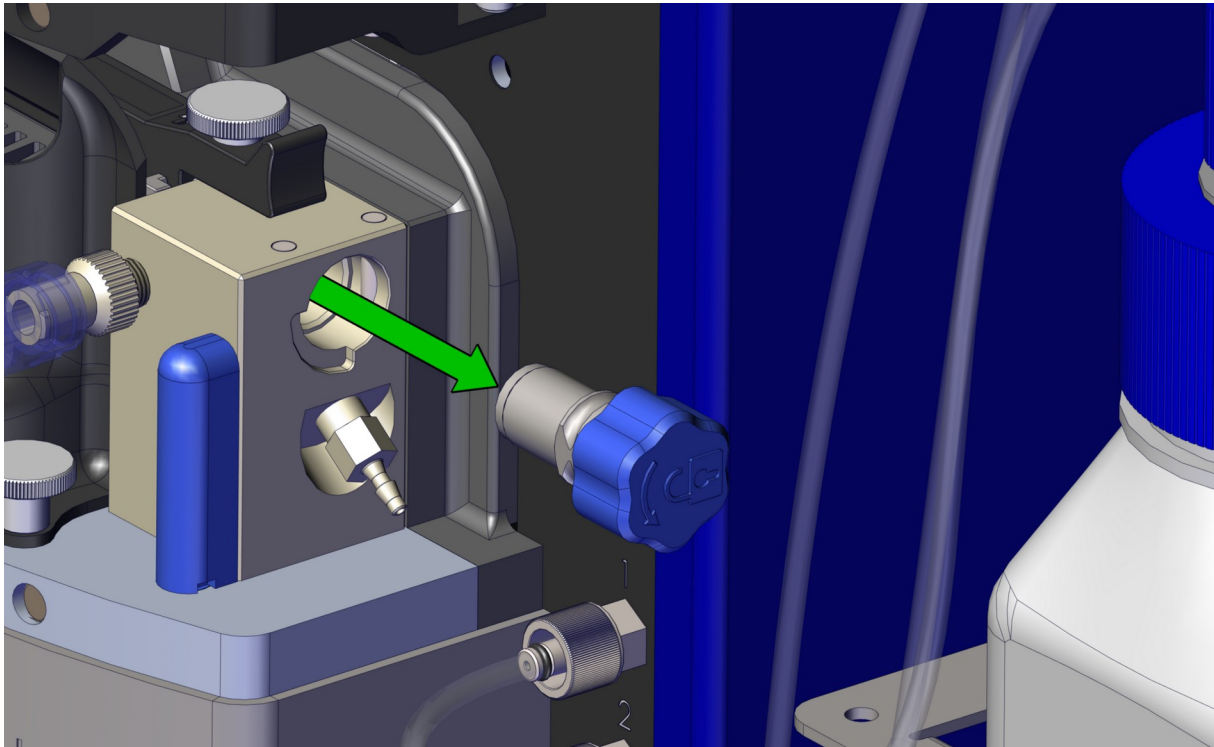


4.2.1 Right side of the instrument

1. Turn the electrode by 90 degree to unlock it

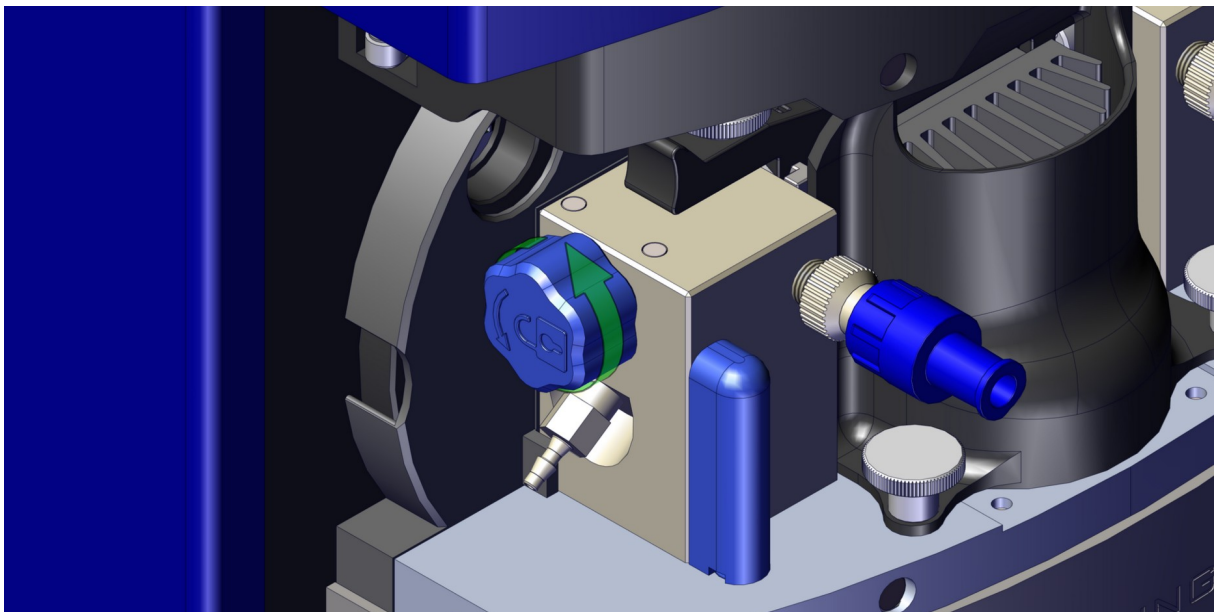


2. Pull the electrode out.

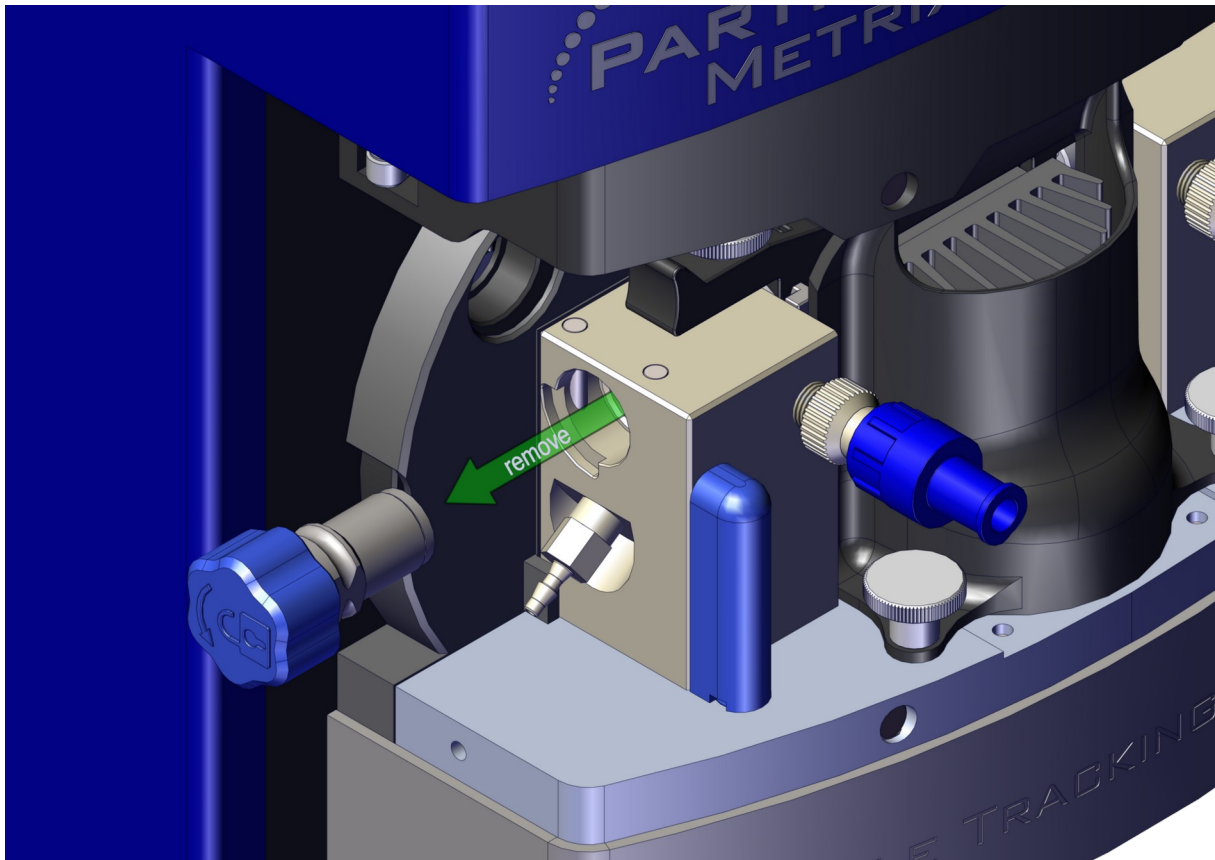


4.2.2 Left side of the instrument

1. Turn the electrode by 90 degree to unlock it.

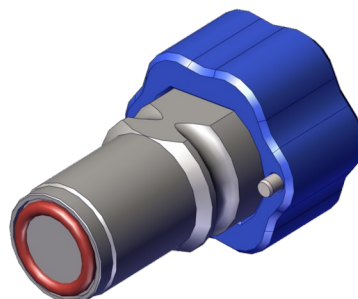


2. Pull the electrode out.



4.2.3 General advice for the electrodes

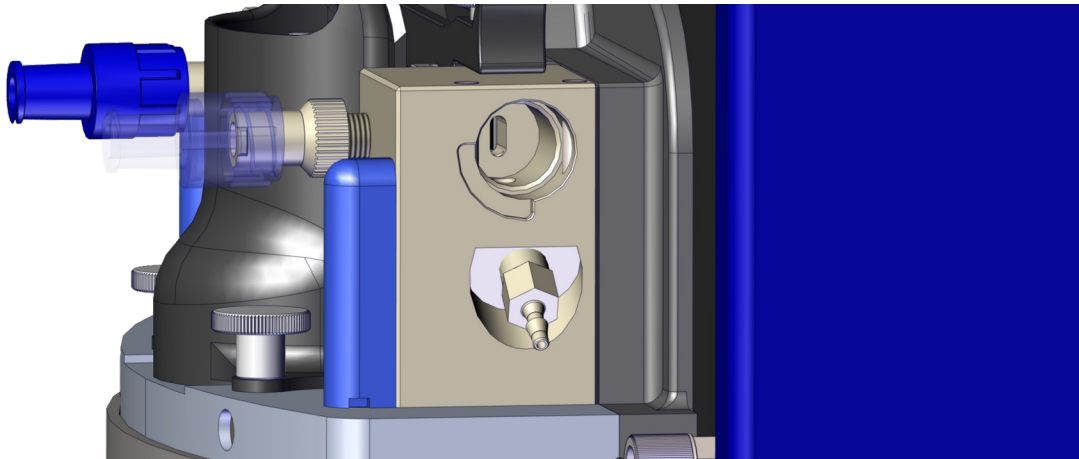
Keep an eye on the red rubber sealing ring. This needs to be in place when the electrode is put back in place.



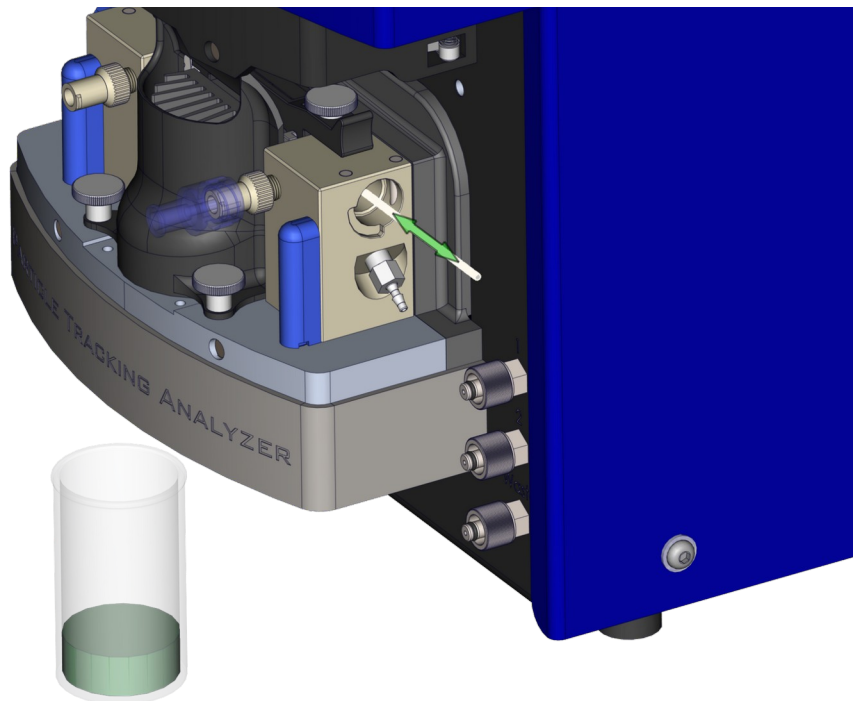
To mount the electrode just plug it into to the unit and lock it by turning it by 90 degrees.

4.3 Cleaning Cell

1. Remove electrode on right side of the instrument
2. Clean Cell using green solvent and pipecleaner



- Prepare green solvent
- Put a tissue under the drainage on the right side
- Use pipecleaner



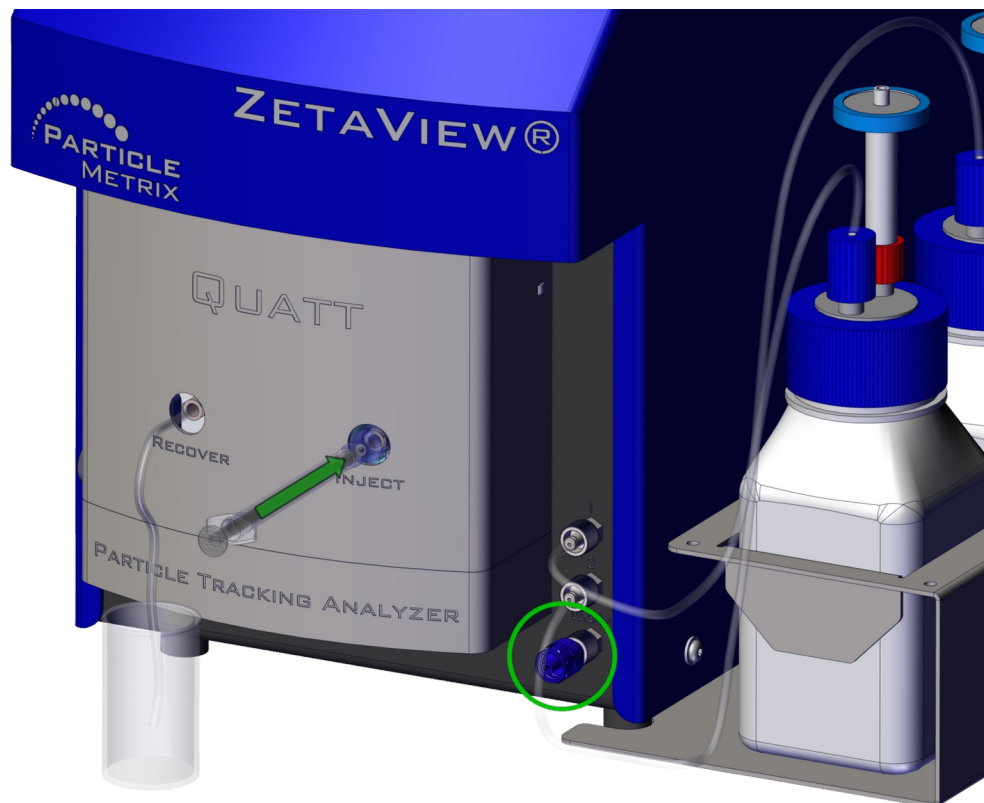
3. Put electrode back

- Make sure, that the red rubber sealing ring is still in place while putting back the electrode.

4.4 Setup to recover sample

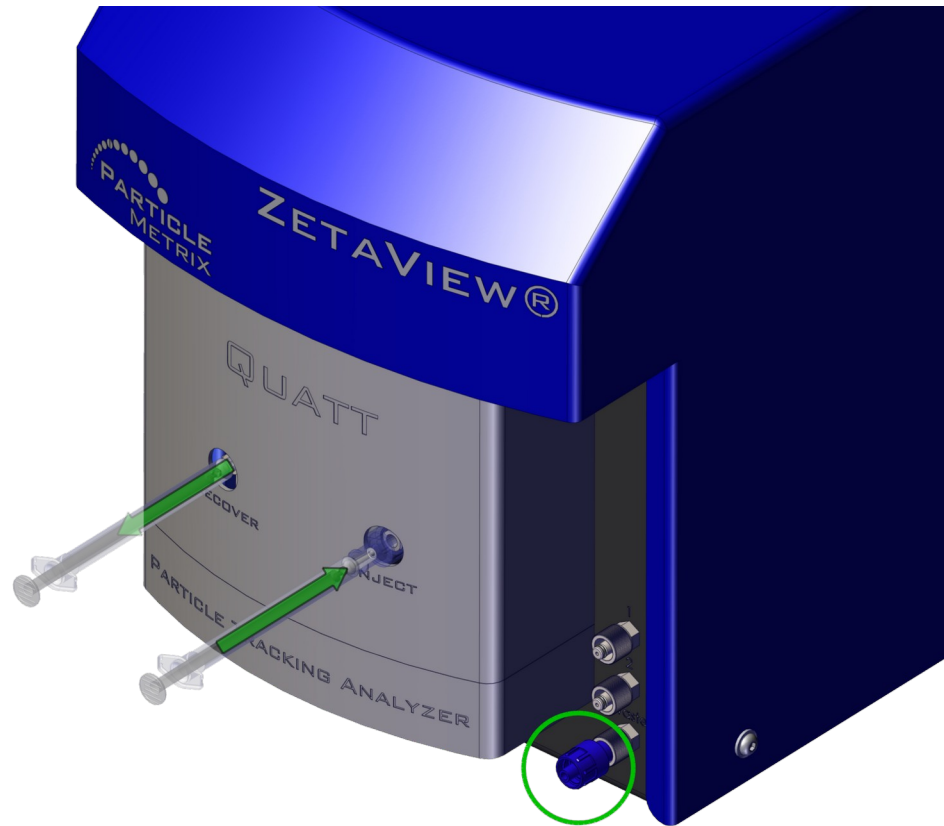
1. Remove the luer stop.
2. Unplug the waste line leading to the waste bottle.
3. Put the luer stop onto the waste outlet

Option 1: Connecting a tube to the front outlet



4. Connect a tube to the front outlet and put it into a waste beaker
 5. Before you load a sample, make sure you push air through the unit Put the tube into beaker to collect the sample.
 6. Load the sample by pushing the syringe until you can observe the sample in the microscope.
- For size, concentration and fluorescence measurements, it is fine to fill the sample cell this way.
 - In case you want to measure zeta potential, it is necessary to make sure, that the dead volumes in the system are filled with water or the buffer of your choice as well.

Option 2: Connect a Syringe to the front outlet

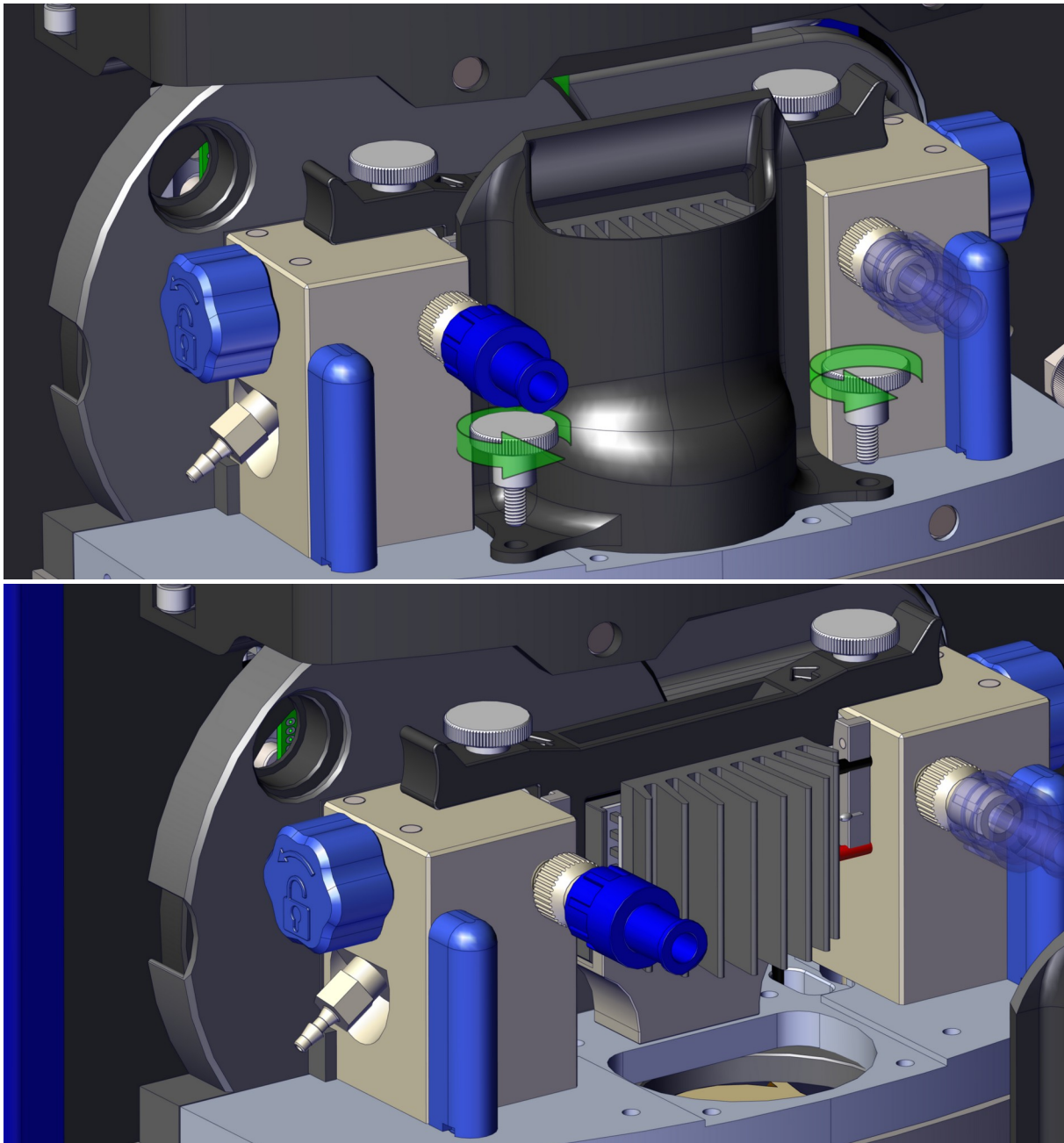


4. Push the sample into the sample cell (1ml).
5. To recover the sample, plug a syringe into the outlet, now remove the syringe from the inlet.
6. Pull the syringe to get the sample back into the syringe.

5 Maintenance

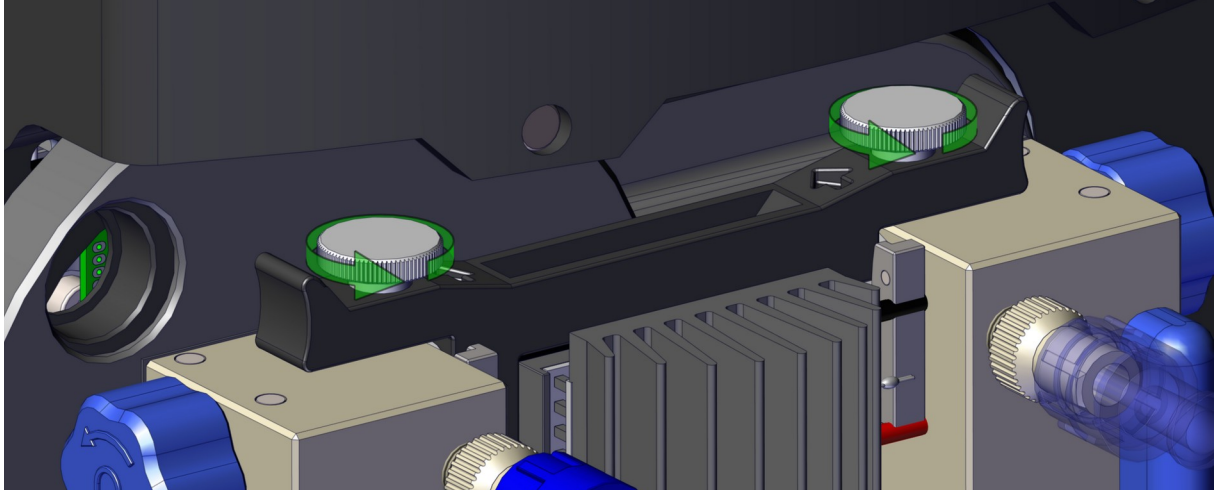
5.1 Replace cell

1. To remove the cell, it is recommended to remove the airflow channel. This can be removed by opening the two knurled screws.

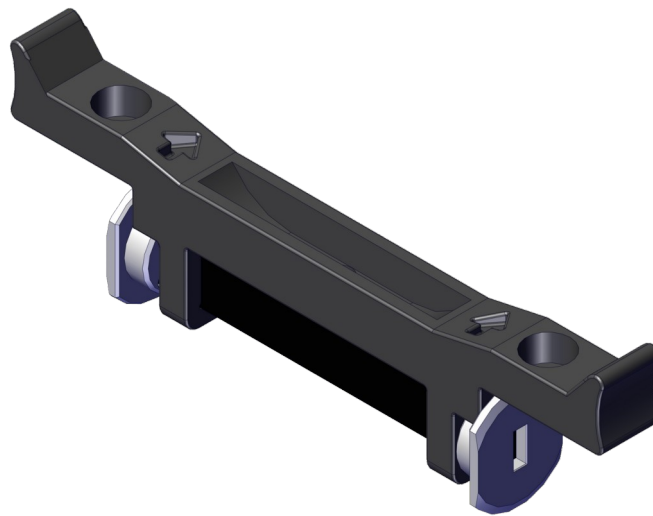


Product description

2. To remove the cell, open the two knurled screws. Now you can pull the cell carrier to the top.



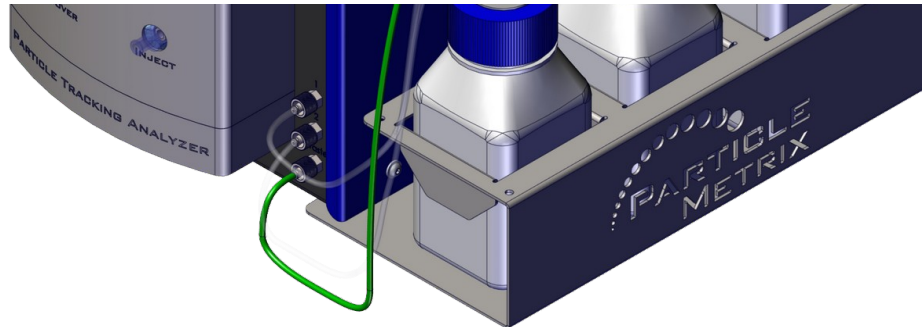
3. Put the new cell into the cell carrier



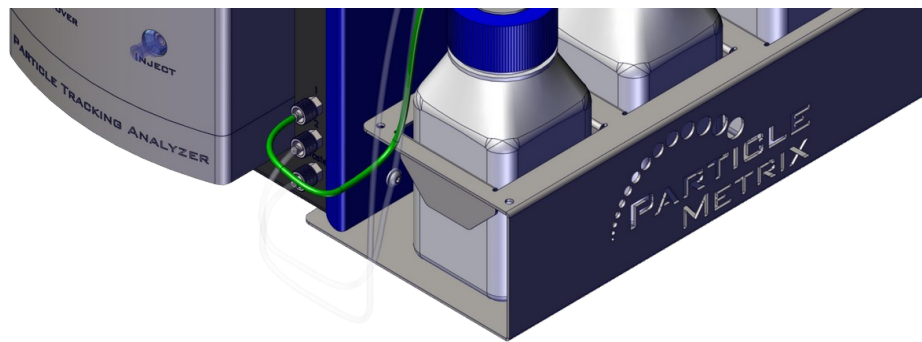
- Make sure, the arrows in the carrier point in direction of the Instrument. Windows of the cell need to face the instrument as well. If you are not able to observe particles once you replaced the cell.
 - Please check cell orientation.
4. Put the cell carrier with attached cell back in place, insert the knurled screws and secure them.
 5. Put the air flow channel back in place, insert the knurled screws and secure them.

5.2 Maintenance - Replacement of tubing

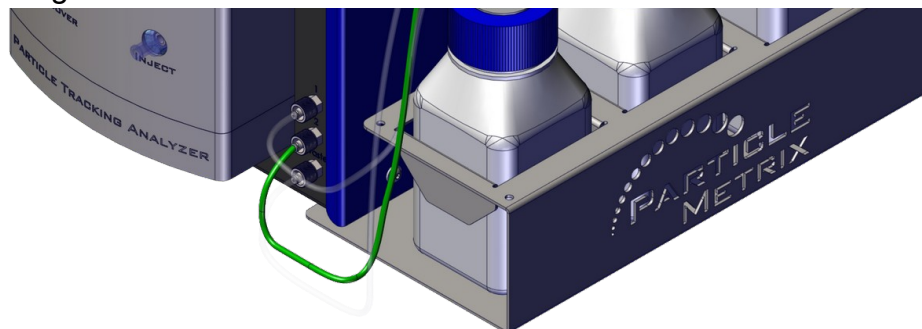
1. Replace waste line tubing



2. Replace tubing bottle 1 to inlet 1



3. Replace tubing bottle 2 to inlet 2



6 Chemical resistance

When measuring nanoparticles of various materials, the solvent needs to be fit for purpose, i.e. it should be ideal to disperse the nanoparticles to prevent agglomeration.

The following table lists the materials of the ZetaView® instrument that come into direct contact with the liquid.

When choosing your buffer, make sure that the chemical resistance is given from all materials to prevent damage of the instrument. When working with acidic or alkaline buffer solutions or aggressive buffers, reduce exposure time (measurement time) as much as possible and rinse thoroughly with water after the measurements. Using aggressive buffers leads to shorter maintenance intervals; change the O-rings, injection ports/check valves and, if necessary, silicon tubes more frequently.

Table 17.1: Chemical resistance of materials in the ZetaView® instrument

Part		Injection port Bottles Connectors	Tubes Connectors O-rings	Measuring cell	Measuring cell Z-NTA cell assembly Fluidic feedthrough	Cell assembly
Material		Polycarbonate	Silicone	Fused silica	Stainless steel	PEEK
Medium	tested?					
Distilled water	YES	YES	YES	YES	YES	YES
Phosphate buffered saline(PBS)	YES	YES	YES	YES	YES	YES
Acetone	YES	NO	YES	YES*	YES	YES
Isopropanol	YES	YES	YES	YES**	YES	YES
EtOH 98%	YES	YES	YES	YES	YES	YES
NaOH (1M)****	YES	YES	YES	YES	YES	YES
Sodium perchloride (5%)	YES	YES	YES***	YES	YES	YES

* with pipe cleaner or cotton swap / Q-tip

** resistant but not recommended for cleaning

*** No experience. Avoid exposure, may lead to discoloration or corrosion of silicone.

**** pH >13 only briefly for disinfection purposes

This table is subject to continuous development. If you have any questions about the compatibility of other chemicals not mentioned here, please contact the Particle Metrix Support at support@particle-metrix.com.