FlowVIEW

Aquarius Starter Kit

User Manual

The information provided in this User Manual is believed to be accurate. It’s the user’s responsibility to confirm the technical aspects and the suitability of the technology for any particular application.

FlowVIEW

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Contents

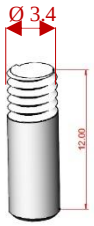
1 Safety

Please observe the following cautions while using the Aquarius Starter Kit:

1. It is noted that **HF base acid** and **hot H_3PO_4** are forbidden.
2. Please wear **gloves** during operation.
3. To confirm the integrity of the Microscopic Fluid Chip before installing it onto SEM, it is recommended that customers go to the OM to observe whether the Microscopic Fluid Chip is a complete surface.
4. When putting the Micro-Channel Substrate, confirm it is in the center. Loading the liquid sample into the Micro-Channel Substrate **0.5-1μL(Max)**. Do not use too much sample liquid to avoid window damage during sealing.
5. Check the fluid Microscopic Fluid Chip and the Micro-Channel Substrate are completely sealed.
6. The membrane is one time used (which cannot be disassembled).
7. The liquid sample should be under **15°C-30°C**.
8. Storage of Aquarius Starter Kit: we recommend putting Aquarius Starter Kit in a moisture-proof box. Room temperature does not exceed **40°C**, humidity should be **under 50%RH** and dark location, dust-free environment.
9. The liquid leakage caused by membrane breakage (and any other reasons) of Starter Kit may affect any possible failure or damage to the scanning electron microscope (SEM). To avoid this, please operate the product according to the user manual. Do not crack or drop down the microscopic fluid chip. Do not detect one specific point continuously and avoid repeating fine scanning. Do not leave samples in the same location for an extended period to prevent them from drying out.

2 Technical data

1. **Storage of Aquarius Starter Kit**
   We recommend putting Aquarius Starter Kit in a moisture-proof box. Room temperature does not exceed **40°C** and humidity should be **under 50%RH** and dark location, dust-free environment.
   O-Ring for sealing should be checked every 3 months (If no damage is found, there is no need to change the O-ring). If any damage is found, O-ring replacement is required.
2. **Warranty period**
   The warranty period for this product is one year and is conditional upon the adherence to specific storage requirements. These requirements include maintaining a room temperature below 40°C, humidity levels under 50%RH, and storage in a dark, dust-free environment after delivery to the customer. It is important to note that the warranty does not extend to any damages resulting from mishandling by users.
3. **Disposal**
   Please adhere to local government regulations for the disposal of all kit parts, materials, and liquids. Manufacturers are not accountable for disposal.
4. **Operation temperature:** We suggest using the Starter-kit from 15°C to 30°C.
5. **Material Compatibility:**
   Adapter (**P/N: M50070003A)**

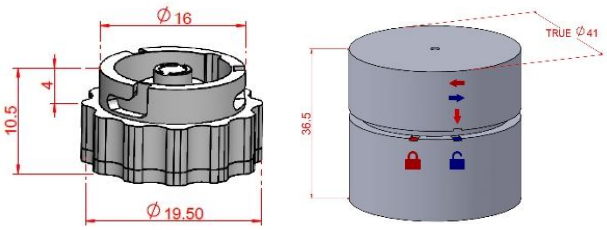


   1. Specification:
      - Pitch: M4x0.7
      - Length: 12 mm
   2. Material: Stainless

   Acrylic case with holder
   Acrylic case (P/N: M50080001B)
   Holder (P/N: M50070001A)

   1. Specification:
      - Diameter: **Holder** – 16 mm and 19.5 mm
        Acrylic case—41 mm
      - Height: **Holder**—10.5 mm
        Acrylic case—35 mm

2. Material: **Acrylic case**—Acrylic
   Holder—Stainles

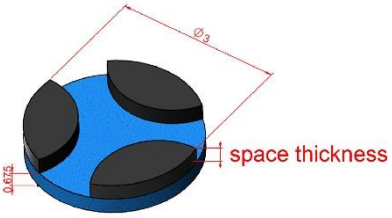


Microscopic Fluid Chip
Standard (P/N: M50011001A)
High mag. (P/N: M50013001A)
Large window (P/N: M50012001A)

1. Specification:
   - Diameter: 19.5 mm
   - Height: 5 mm
   - Membrane specification is depending on the product
2. Material:
   - 5Mounting: Conducting plastic
   - Pin: Stainless
   - Membrane: Si_3N_4

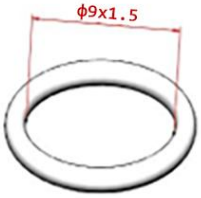
Micro-Channel Substrate:
Space thickness 2μm (P/N: M50022001A)
Space thickness 0.5μm (P/N: M50021001A)

1. Specification:
   - Diameter: 3 mm
   - Height: 675 μm (depend on space thickness 2 μm or 0.5 μm)
2. Material: Si and SiO_2



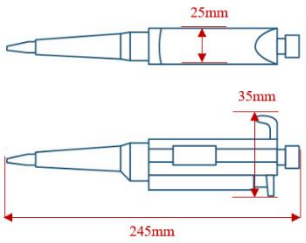
O-ring (P/N: M50050002A)

1. Specification: ϕ9x1.5 mm
2. Material: Viton



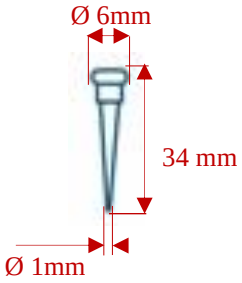
Pipette (P/N: M50040001A)

1. Specification:
   - Volume: 0.5-10 μL
   - Size: 245 mm*25 mm*35 mm
2. Material: Fortron



Tip (P/N: M50060001A)

1. Specification:
   - Volume: 10 μL
   - Length: 34 mm
2. Materia: PP



Tweezer (P/N: M50030001A)

1. Specification:
   - Length: 130 mm
2. Material:
   - Body: ALSI302
   - Head: PPS

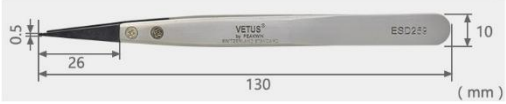


TABLE1: Materials of components

Components	Materials
Adapter	γ-Fe
Acrylic case	polymethylmethacrylate (PMMA)
Holder	C, Si, Mn, P, S, Ni, Cr, Mo
Microscopic Fluid Chip	Nylon and thermoplastic polyurethane, Si_3N_4
Micro-Channel Substrate	Si, SiO_2
O-ring	Viton
Pipette	Fortron
Tip	PP
Tweezer	C, Si, Mn, P, S, Cr, Ni

TABLE2: Prohibited material of components

Prohibited material	**Adapter**	**Acrylic case**	**Holder**	**Microscopic Fluid Chip**	**Micro-Channel Substrate**	**O-ring**	**Pipette**	**Tip**	**Tweezer**
Cadmium and Cadmium Compounds	○ <100ppm	X	○ <100ppm	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Hexavalent Chromium Compounds	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Lead and Lead Compounds	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Lead and Lead Compounds (wire coating) *1	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury and its compounds	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Lead, Cadmium, Mercury, Hexavalent Chromium (package and wrapping only) *2	○ <100ppm	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Polybrominated Biphenyls (PBBs)	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Polybrominated Diphenyl ethers (PBDEs)	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
DecaBDE	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bis(2-ethylhexyl) (DEHP)	N/A	X	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Butyl benzyl phthalate (BBP)	N/A	N/A	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Dibutil phthalate (DBP)	N/A	N/A	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Diisobutyl phthalate (DIBP)	N/A	N/A	N/A	○ <100ppm	N/A	N/A	N/A	N/A	N/A
Perfluorooctanoic acid (PFOA) and its salts and PFOA-related compounds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Polychlorinated Biphenyls (PCBs)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Polychlorinated Terphenyls (PCTs)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Short Chain Chlorinated Paraffins	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Tri-substituted Organostannic Compounds *3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ozone Depleting Substances	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Radioactive Substances	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PFOS and its Analogous Compounds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-(2H-1,2,3-benzotriazol-2-yl)-4,6-di-tert-butylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hexachlorobenzene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dimethyl fumarate (DFM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hexabromocyclododecane (HBCD)	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,4,6-Tris(tert-butyl) phenol (2,4,6-TTBP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Phenol,Isopropylated Phosphate(3:1) (PIP 3:1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pentachlorothiophenol (PCTP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hexachlorobutadiene (HCBD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Remark:

1. “◯” indicates that the content of the restricted substance does not exceed the ppm of reference value.
2. “X” indicates that the component doesn’t include the prohibited substances.
3. “N/A” indicates that the component known the material but does not include prohibited substances.

TABLE3: Solvent Compatibility Table

Chemical Name	Microscopic Fluid Chip	SiN membrane	Micro-Channel Substrate
Hydroflouric Acid	×	×	×
Hot Phosphoric Acid	×	×	×
Acetic<20%	○	○	○
Acetone	○	○	○
Ammonium Chloride (24%)	○	○	○
Ammonium Hydroxide (28%)	○	○	○
Ammonium Sulfate	○	○	○
Aqua Regia	×	○	○
Benzene	○	○	○
Bleach Solution<20%(Sodium hypochlorite)	○	○	○
Bromine	○	○	○
Calcium Chloride(38%)	○	○	○
Chloroform	○	○	○
Citric Acid	○	○	○
Copper Sulfate	×	○	○
Cyclohexane	○	○	○
Diethylether	○	○	○
Diethylamine	○	○	○
Dimethyl Sufloxide 10%	○	○	○
Dimethyl Formamide	○	○	○
Ethanol	○	○	○
Ethylene Diamine	○	○	○
Ethyl Acetate	○	○	○
Ethylene Glycol (Undiluted)	○	○	○
Glycerin (Undiluted)	○	○	○
Gold Chloride	×	○	○
HEPES Buffer	○	○	○
Hexane	○	○	○
Heptane	○	○	○
Hydrogen Peroxide (30%)	○	○	○
Hydrochloric Acid (2%)	×	○	○
Isobutanol	○	○	○

Chemical Name	Microscopic Fluid Chip	SiN membrane	Micro-Channel Substrate
Isopropanol	○	○	○
Ketones	○	○	○
Magenesium Sulfate	○	○	○
Methanol	○	○	○
Methylene Chloride	○	○	○
Mineral Oil	○	○	○
Nitric Acid (10%)	○	○	○
Oleic Acid (40%)	○	○	○
Petroleum Oil Undiluted	○	○	○
Perchloric Acid	×	○	○
Phosphate Buffered Saline	○	○	○
Phosphoric Acid	○	○	○
Potassium Hydroxide	○	○	○
Pyridine	○	○	○
Sodium Bicarbonate (50%)	○	○	○
Sodium Carbonate (20%)	○	○	○
Sodium Chloride (30%)	○	○	○
Sodium Hydroxide (10%)	○	○	○
Sodium Nitrate	○	○	○
Sodium Phosphate (5%)	○	○	○
Sulfuric Acid (<5%)	×	○	○
Tannic Acid (10%)	○	○	○
Tartaric Acid	○	○	○
Tetramethylammonium hydroxide	○	○	○
Toluene	○	○	○
Trichloroacetic Acid	×	○	○
Vegetable Oil	○	○	○
Water	○	○	○
Urea	○	○	○
Xylene	○	○	○
Zinc Chloride	×	○	○

3 Introduction

3.1 Aquarius Starter Kit

3.1.1 An entry level product that is easy-to-operate

If you'd like to observe in-situ liquid sample inspection, this product is designed to satisfy basic observation needs and is customizable to various brands of SEMs. The anti-vacuum sample holder of the Aquarius Starter Kit possesses nano-membrane and microfluid channels, which can create an atmospheric environment in the SEM and keep the liquid sample remain its original state.

Place a drop of stock solution onto the sample holder, you can complete the sample packaging in 30 seconds without any preprocessing such as dilution, drying, or frozen section procedures. The e-beam can fully penetrate since the nano-membrane is merely 20 to 50 nanometers and provides you a 7-nm resolution.

Combined with FlowVIEW Lite software, you can receive a complete analysis of the material such as size distribution, aggregation/diffusion, concentration, shape, composition, etc. In the future, the wet nano-scale material beyond optical inspection is destined to become universal. The in-situ inspection is the greatest weapon for you to stay ahead of the curve.

3.1.2 Content & product specs

	Standard	High Mag.	Large window
Applicable Sample	For (metal) samples with high atomic number and greater-than-100nm particle size. eg. silver paste	Samples with low atomic numbers and less-than-100nm particle size require High mag. version regardless of the size. eg. biological samples, carbon black, SiO_2	Designated for EDS analysis, low-concentration samples, or dry magnetic powders.
Chip Window (Si_3N_4)	Chip thickness: 50 nm Window size: 150 μm * 150 μm	Chip thickness: 20 nm Window size : 20 μm * 20 μm	Chip thickness: 30 nm Window size250 μm * 250 μm
Contents	24 Microscopic Fluid Chips / 24 Micro-Channel Substrate / 24 Tips / 1 Adapter / 1 O-Ring / 1 Tweezer / 1 Pipette / 1 Acrylic Case with Holder / 1 Lite Software		
Supplementary Pack	12 Microscopic Fluid Chips / 12 Micro-Channel Substrate		

Introduction Micro-Channel Substrate

Materials	**Size: 0.1μm - 0.5μm**	**Size: 0.5μm - 2μm**
Descriptions	**Space thickness: 0.5μm** 	**Space thickness: 2μm** 

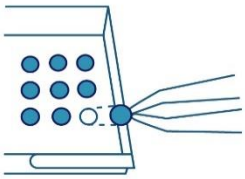
4 Operation process

4.1 Operating step with substrate

1
Open up starter kit.

2
Take out acrylic case equipped with holder.

3
Take out substrate with tweezer.

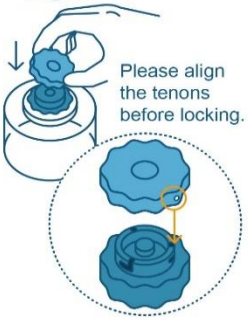


4
Put substrate onto the center of holder and align the substrate with tangent line.

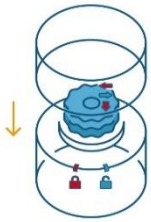
5
Take out pipette and install a tip.

6
Draw up 0.5-1μL liquid sample and drip liquid onto center of substrate.

7
Cover Microscopic fluid chip on the holder stage.

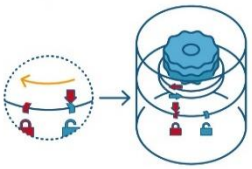


8
Twist acrylic case to fit holder.

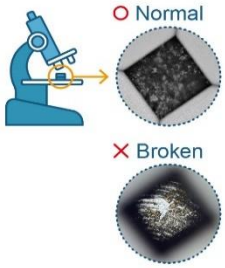


9
Please align the red downward arrow with the blue dot, then place it and keep it flat.

10
Rotate left in the direction of the red arrow so that the downward red arrow aligns with the red dot.



11
Please ensure the chip's integrity by examining it under the optical microscope.



12
Take out the holder and reverse it to assemble the adapter.

13
Finished!

※ Operation video link provided in 5.5.

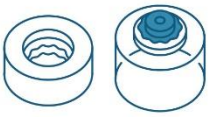
4.2 Operating step without substrate

1

Open up starter kit.

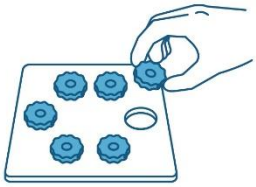
2

Take out acrylic case equipped with holder.



3

Take out Microscopic Fluid Chip.

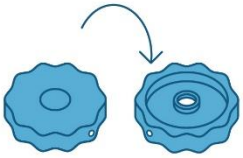


4

Take out pipette and install a tip.

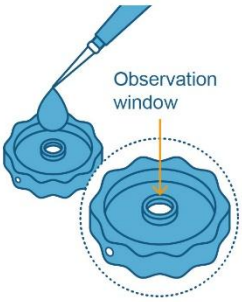
5

Reverse the Microscopic Fluid Chip.



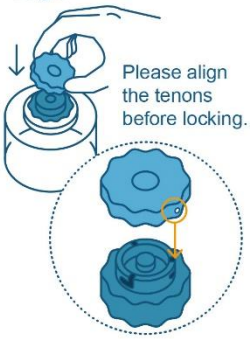
6

Drop 0.5-1μL liquid sample in the center of the observation window.



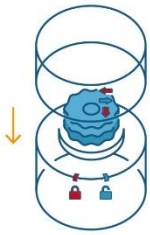
7

Cover Microscopic fluid chip on the holder stage.



8

Twist acrylic case to fit holder.

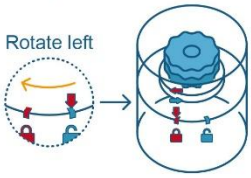


9

Please align the red downward arrow with the blue dot, then place it and keep it flat.

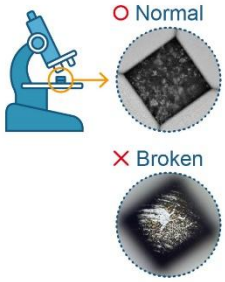
10

Rotate left in the direction of the red arrow so that the downward red arrow aligns with the red dot.



11

Please ensure the chip's integrity by examining it under the optical microscope.



12

Take out the holder and reverse it to assemble the adapter.

13

Finished!

※ Operation video link provided in 5.5.

4.3 Operation conditions

1. Liquid condition to be observed:
   - pH value is not specifically restricted. It is noted that **HF base acid** and **hot H_3PO_4** are forbidden.
   - Liquid viscosity is not specifically restricted.
   - It is recommended that the liquid sample is observed at room temperature.
2. It is recommended that the membrane is one time used (which cannot be disassembled).
3. To confirm the integrity of the film before installing it onto SEM, it is recommended that customers go to the OM to observe whether the film is a complete square after packaging.
4. Please focus on the borderline at first under SEM (Figure 1).
5. Since the product contains a membrane, please handle it with care.

4.4 Key step instruction

1. When using the pipette, to avoid poor placement due to hand shaking, use the other hand to support the Pipette firmly (Figure 2).
2. When the holder is combined with the upper cover, an acrylic case must be used to fasten it tightly. It is completely in line with the shape, which means that it is completely tight (Figure 3).
3. When putting the Microscopic Fluid Chip to the holder, please align the tenons before locking (Figure 4).
4. O-ring can be removed and fitted from the extraction hole (the red circle in Figure 5). We suggest using the finer tweezers to remove and fit the O-ring. After changing the O-ring, it should have a sealed vacuum test.

※ Sealed vacuum test：

A. Draw up the 1uL water and drip water onto the center of holder. (**Figure 8**)
B. Cover Microscopic fluid chip on the holder stage.
C. Follow steps to lock the kit.
D. Put the kit into the vacuum chamber and close the chamber.
E. Start vacuuming to $10^{-4}10^{-4}$ Pa and lasts one hour.
F. Close it and take out the kit to check the water state.
G. If water is still present, it means the vacuum is normal. If water does not exist, it means that the vacuum level is wrong.

5. The liquid leakage caused by membrane breakage (and any other reasons) of Starter Kit may affect any possible failure or damage to the scanning electron microscope (SEM). To avoid this, please operate the product according to the user manual. Do not crack or drop down the microscopic fluid chip. Do not detect one specific point continuously and avoid repeating fine scanning. If leave the samples for a period, the samples will dry out and cause the results out of perspective (Figure7).
6. The customers go to the OM to observe the Microscopic Fluid Chip if find the dusty before using, the customers can use the blowing dust tools to remove the dust and do not blow the Microscopic Fluid Chip in straight (Figure 6). If customers find that there are broken through the chip's window under optical microscopes, use the new holder.

Figure 1

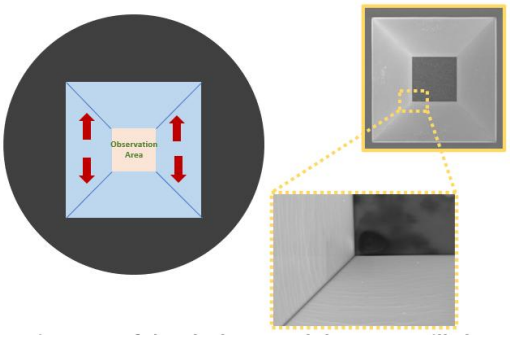


Figure 2

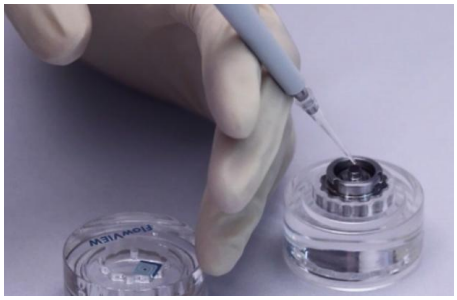
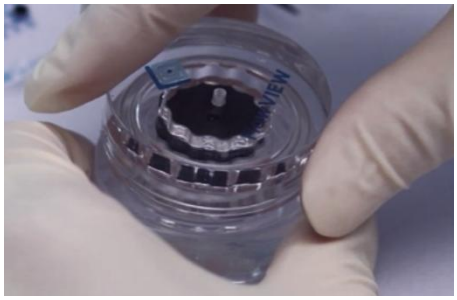


Figure 3



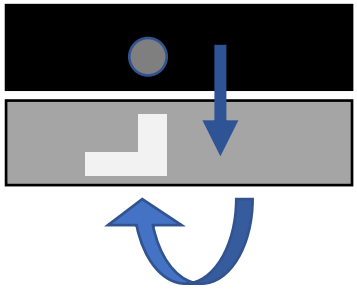


Figure 4

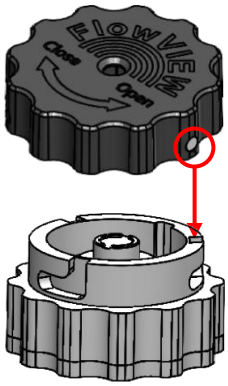


Figure 5

Figure 6

Aquarius Starter Kit
Correct vs. Incorrect Operation Demonstration

Figure 7

Figure 8

4.5 Matters needing attention

1. Please wear gloves during the whole operation to avoid affecting the sample.
2. The Microscopic Fluid Chip(lid) film on the top cover is very thin and easy to break. When the film breaks, it will affect the observation image. Be very careful when picking it up. It is mainly moved horizontally, and the resistance of moving up and down may damage it. Do not touch and use air guns. If there are abnormal streaks in the image, it may be that the Microscopic Fluid Chip(lid) film on the cover has been damaged.
3. If the connection between the Adapter and the stage is not locked, placing the SEM may affect the observation image.
4. The holder and the Microscopic Fluid Chip(lid) must be completely tight to avoid the risk of contamination or leakage caused by putting in the SEM.
5. The Microscopic Fluid Chip (lid) is a disposable item, it is recommended not to reuse it.
6. After using the holder, clean it with the wiper moistened with ethanol or acetone.
7. Only use water to clean the Acrylic case.
8. Do not press the upper cover when the holder is combined with.

5 Appendix

5.1 Disclaimer

Manufacturers are not responsible for any damage to the Aquarius Starter Kit and SEM equipment, nor are they responsible for any claims by government authorities and any third parties if users do not follow the above operation conditions, remarks, etc.

5.2 Product verification specification

A sealing test will be done before delivery, and protocols are as described below.

1. Drop 1 μL of water into the holder and place the holder into the vacuum chamber.
2. After 60 mins pumping, we'll open the lid and check the liquid status, the base pressure will be around 10^{-4} Pa.
3. Water droplet is still in its native state and not being dried out after 60 mins pumping.

5.3 Aquarius Starter Kit – EDS

EDS Recommended Use – Large Window

The wafer is an inverted pyramid from the side, with an included angle of 54.7 degrees (all versions of the film are 54.7 degrees, the difference is only in the gray dotted line area, which is the window size we marked: high mag is 20 μm, the standard is 150 μm and large window is 250 μm.

No matter the take-off angle is 30 degrees or 50 degrees, the angle is fixed without tilting, so the longer the horizontal distance of the window, the higher the height that the x-ray signal can move in the vertical direction, and there are more chances to fly over the Si frame wall and be received by the detector.

The window size of the High mag membrane is only 20 μm*20μm, and the take-off angle of the x-ray is about 30 degrees, so it may be blocked by the Si frame and cannot reach the detector.

5.4 The connection of Lite software and software user manual

Software user manual link

https://flowview.synology.me/Lite/Lite Software user manual.rar

Lite Software installation link

https://flowview.synology.me/Lite/Lite Software installation.rar

5.5 The operation video of Starter Kit

The operation video of Starter Kit with substrate QR code

link:
https://www.youtube.com/watch?v=CFHWvLWEwYU

The operation video of Starter Kit without substrate QR code

link:
https://www.youtube.com/watch?v=Sc4kgWPWp54

The operation video of Starter Kit correct vs. incorrect operation Demonstration

link:
https://www.youtube.com/watch?v=oIxKZfiHOFE

For more product information, please refer to the FlowVIEW Tek website

https://www.flowviewtek.com/

FlowVIEW Starter Kit