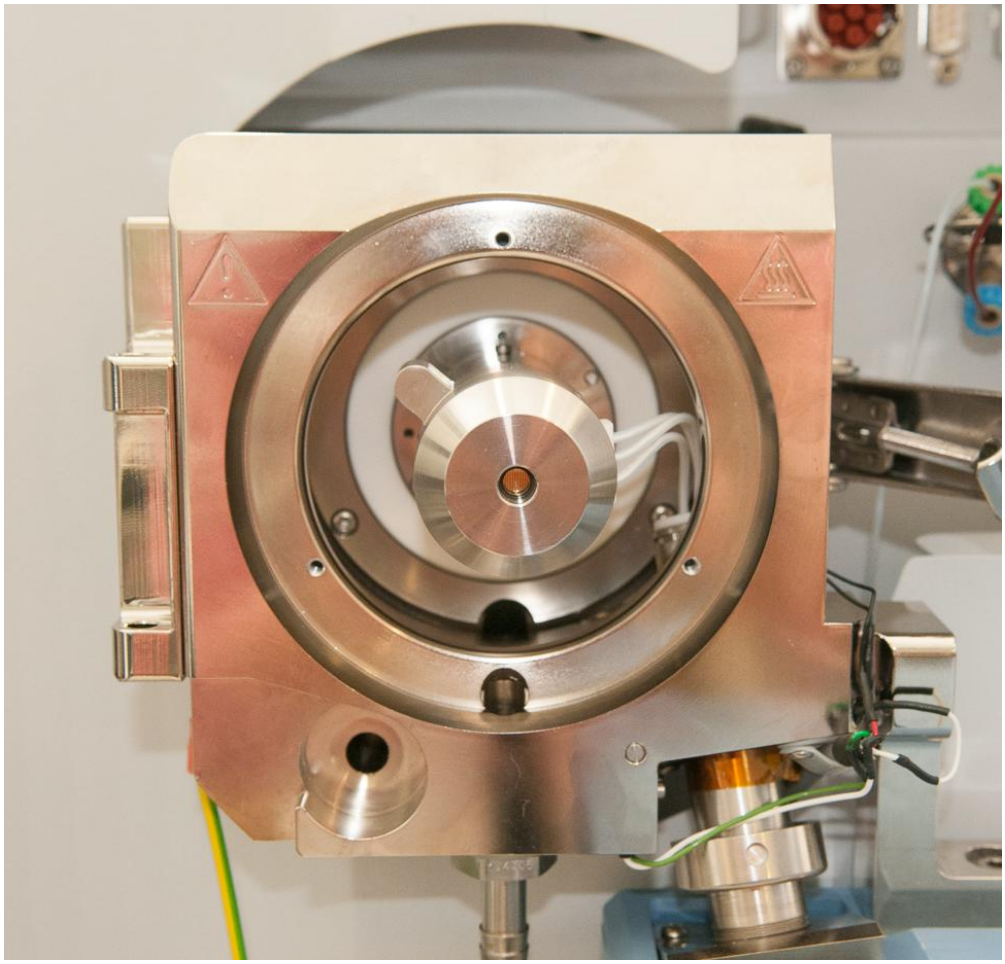
Owlstone ultraFAIMS-B1 User Guide



Contents

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Notice of Proper Use of Owlstone Ltd Instruments

The supplied system is in compliance with international regulations. If this system is used in a manner not specified by Owlstone Ltd, the protection provided by the system could be impaired

Safety notice

Always observe the following safety precautions

- Use only the mains adaptor and leads supplied.
- This equipment is for use in moderate climates only (see Appendix). Do not use the equipment in damp or wet conditions.
- Avoid excessive heat, humidity, dust & vibration.
- Do not use where the equipment may be subjected to dripping or splashing liquids.
- Do not block the cooling duct whilst system is in operation.

Ensure the system is properly installed on the mass spectrometer according to the enclosed instructions before attempting to power on. Never operate the system unless properly installed on the mass spectrometer.

Ensure the safety earth cable is connected to a suitable earth point on the mass spectrometer chassis before powering on and operating the system.

Do not operate the ultraFAIMS system without an ultraFAIMS chip or test load attached.

Caution: risk of electric shock. Remove power from system before disconnecting from the mass spectrometer. Do not remove covers.

The ultraFAIMS control unit is rated 24VDC, 60W max. It is fitted with a fuse of type F3.15AH 250VAC fast-acting. Replace only with a fuse of the same type and rating.

PLEASE READ THIS DOCUMENT BEFORE SETTING UP AND POWERING THE SYSTEM

Contacting OWLSTONE

Visit the OWLSTONE support website (http://support.owlstonenanotech.com) for up to date contact details and service support.

For general inquires please email ultrafaims@owlstone.co.uk.

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System Description

The Owlstone ultraFAIMS products are field-asymmetric waveform ion mobility (FAIMS) pre-separators for use on Mass Spectrometers. They are used to separate or filter ions before they enter the mass spectrometer. This may provide a reduction in chemical noise or allow observation of ions that would otherwise be difficult to resolve in the mass spectrum.

The ultraFAIMS-B1 system is the version intended for use on Bruker Mass Spectrometers. These notes are provided to assist with understanding how to set up and use the system safely.

See the *Owlstone ultraFAIMS user interface software manual (OW-003401-TM)* for further information on FAIMS separation.

System Familiarization

The system consists of the following items:

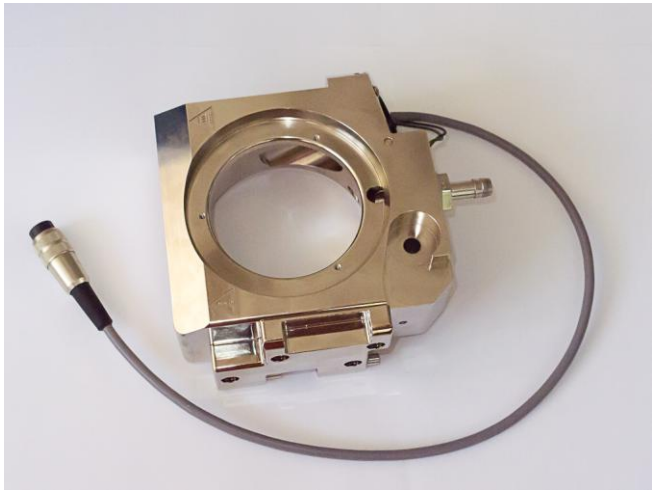
1. UltraFAIMS control unit

The control unit generates the FAIMS waveforms needed to drive the FAIMS chip. It is controlled by the PC software supplied.

2. UltraFAIMS chip module

The chip is the core of the ultraFAIMS system – this is the FAIMS device that produces the separation of ions as they pass through the fields applied across the channel.

3. Adaptor assembly



The adaptor assembly is the interface between the mass spectrometer, the FAIMS module and the ionisation source.

4. *Waveform feeder*

The waveform feeder connects the chip to the control unit so that the FAIMS waveforms can be applied.

5. *Capillary extender*

The capillary extender connects the chip module to the MS inlet capillary.

6. *Spray shield extender*

The spray shield extender holds the spray shield in place and provides the electrical connection to the spray shield.

7. *Spray shield cap*

The spray shield cap replaces the standard MS spray shield when the FAIMS chip module is fitted

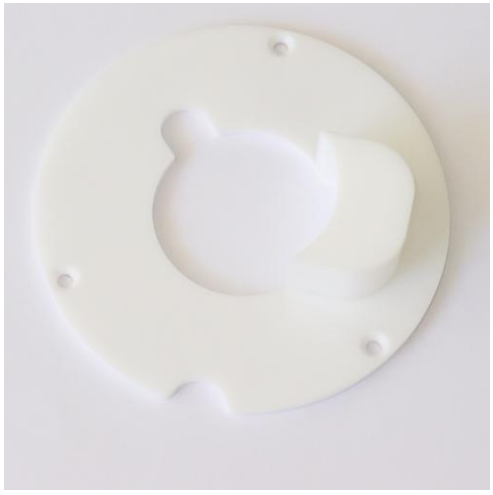
8. *Capillary support*

The capillary support keeps the capillary extender centralized within the spray shield extender.

9. *Fastener extender*

The fastener extender lengthens the catch for the door lock, enabling the source door to be held closed once the extra depth of the adaptor assembly is in place.

10. ***Separation disk &disk inlay***



The separation disk can be used to block off the extra volume added to the source chamber by the adaptor assembly, in order to keep gas flow patterns within the ionization source as close as possible to the standard configuration.

11. ***Attachment bracket***

The attachment bracket is used to attach the ultraFAIMS control unit to the adaptor assembly for correct waveform feeder positioning

12. Power supply and mains lead

13. External trigger cable

Information on how to use the external trigger cable is available on the Owlstone support website.

14. USB cable

A standard USB A-to-B cable is used to connect the control unit to a PC.

Safety Information

Although FAIMS voltages can be hazardous, the ultraFAIMS-B1 system has protection in place to prevent users being exposed to any hazardous voltages during normal operation when the system is used with a standard Bruker Apollo II electrospray ionization source.

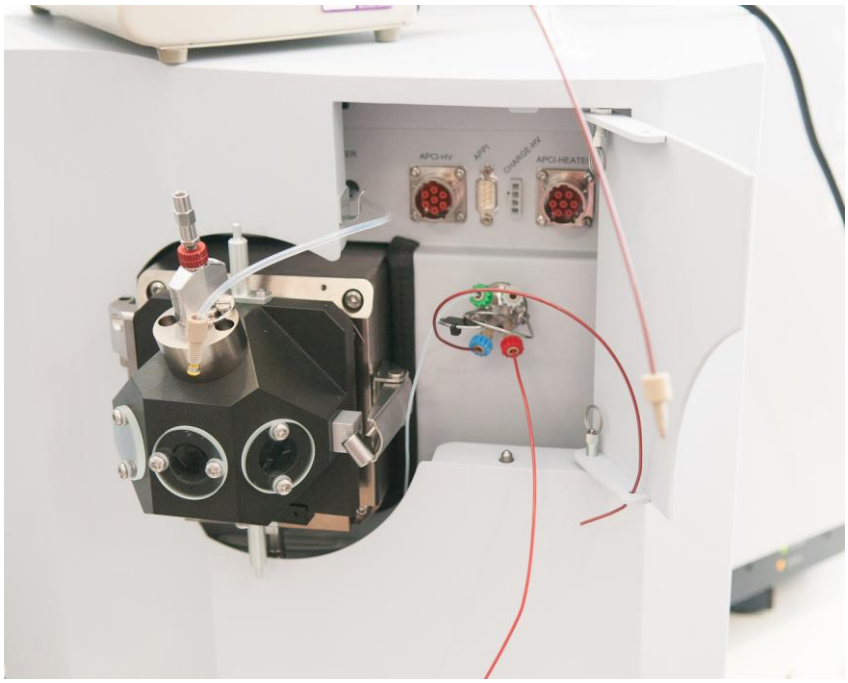
Users should take note of the following:

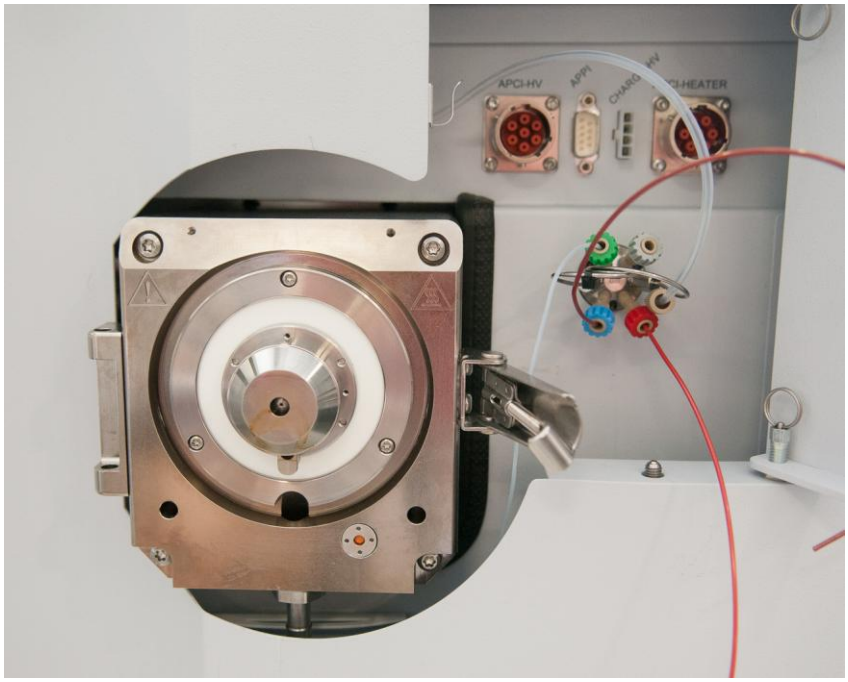
- When a FAIMS sweep is underway, the RF voltages applied to the chip via the waveform feeder are considered hazardous live. Never try to operate the ultraFAIMS system unless it is properly installed on the mass spectrometer with the ionization source door closed.
- Ensure the safety earth cables are connected from the ultraFAIMS control unit to suitable safety earth connections on the mass spectrometer chassis, on the adaptor and on the ionization source before powering on the ultraFAIMS system.
- The ultraFAIMS system is not designed to operate without a chip installed. Do not try to run the system without the chip module present .This could cause damage to the ultraFAIMS system.

Use of the system with a different ionization source may invalidate compliance with the applicable safety standard (IEC 61010-1:2010). In this case, it is the user's responsibility to ensure hazardous voltages are not accessible.

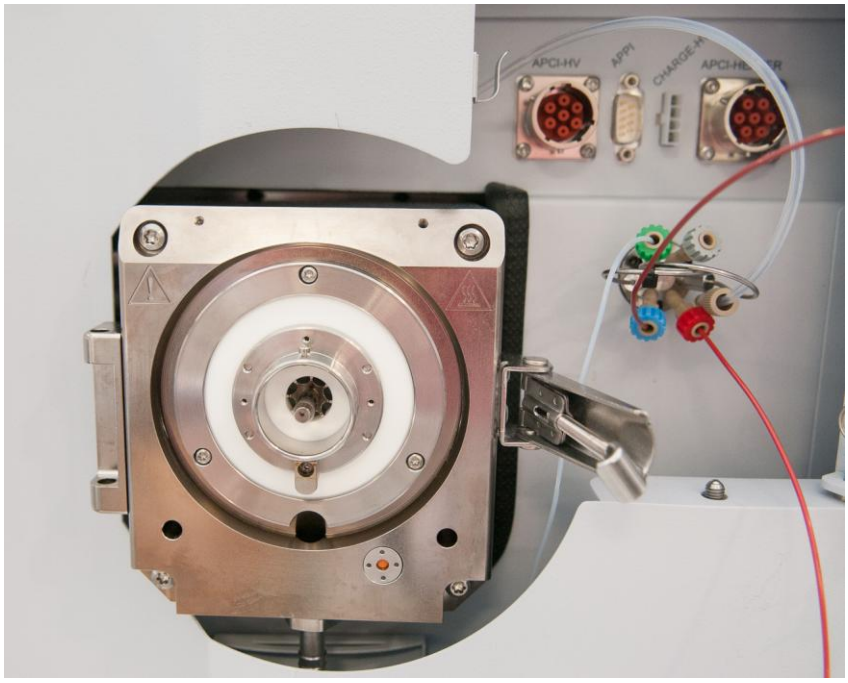
Installing the B1 System

1. Remove the ionization source from the mass spectrometer, and then remove the plastic cosmetic cover from the source.

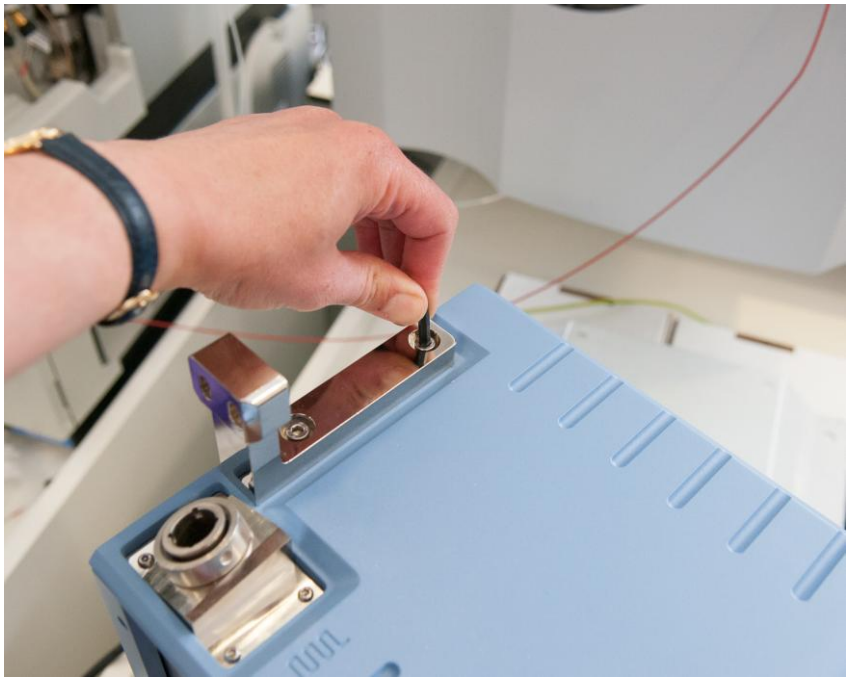




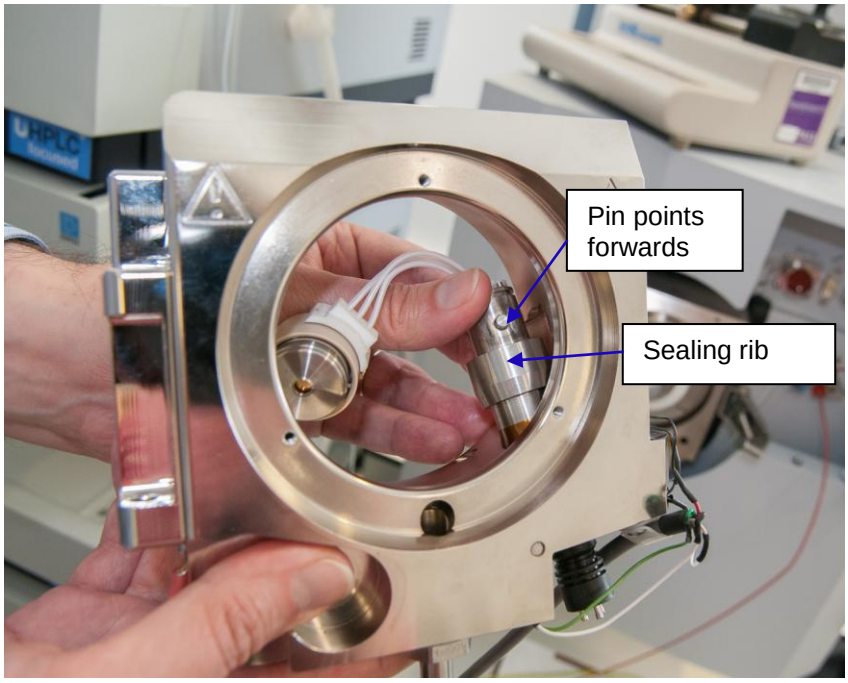
2. Remove the spray shield and capillary cap, leaving the bare capillary visible

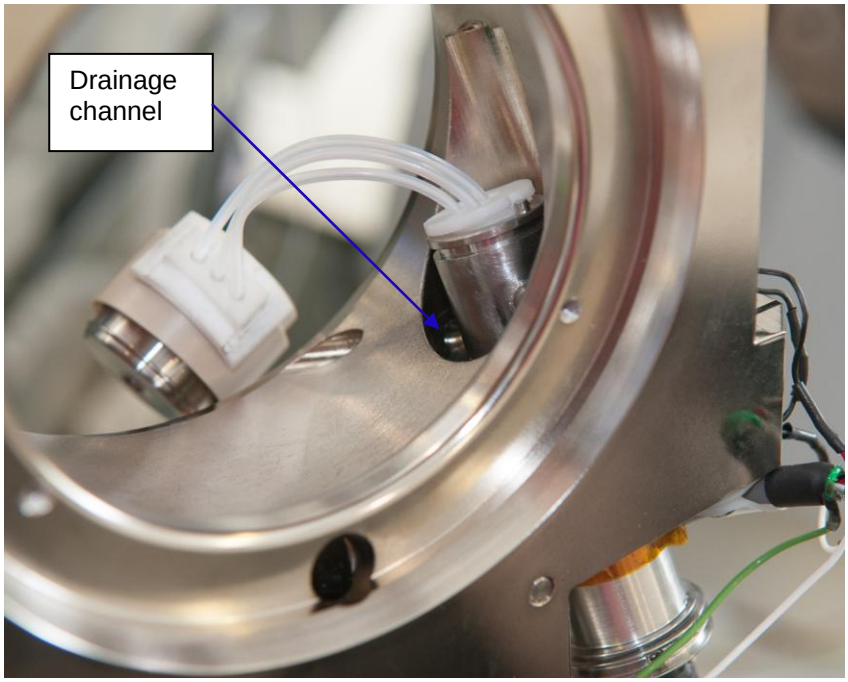


3. Fit the attachment bracket to the control unit using the screws provided



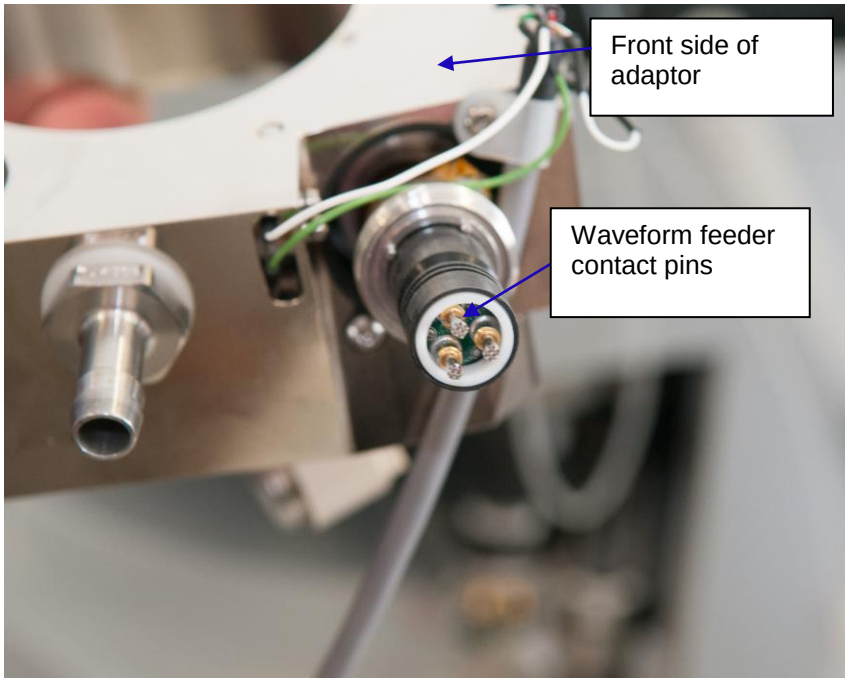
4. Slide the waveform feeder into the hole in the adaptor. Note, the pin on the front of the waveform feeder points forwards. Gently push the waveform feeder down until the flat top of the sealing rib is level with the bottom of the drainage channel in the adaptor block.

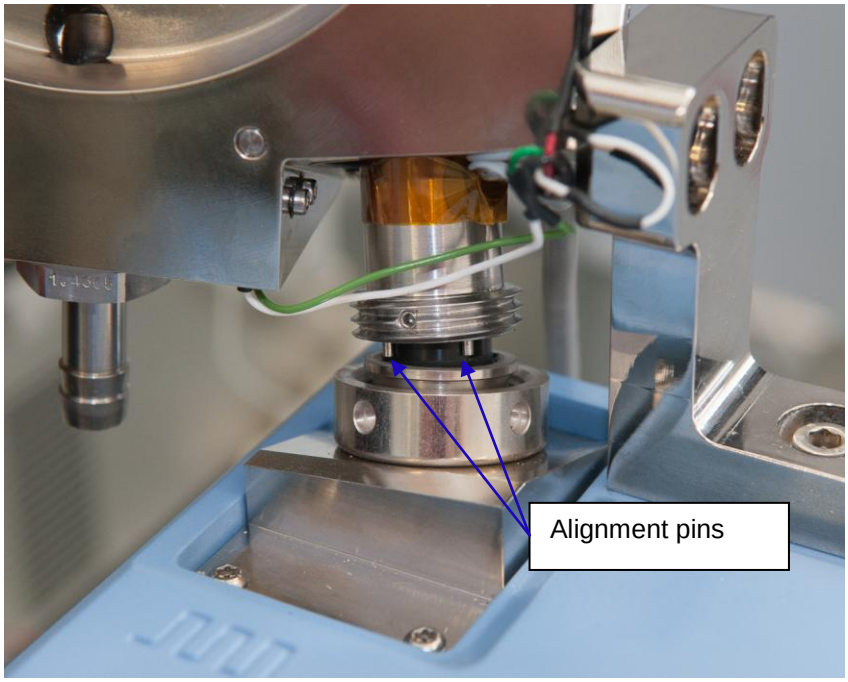




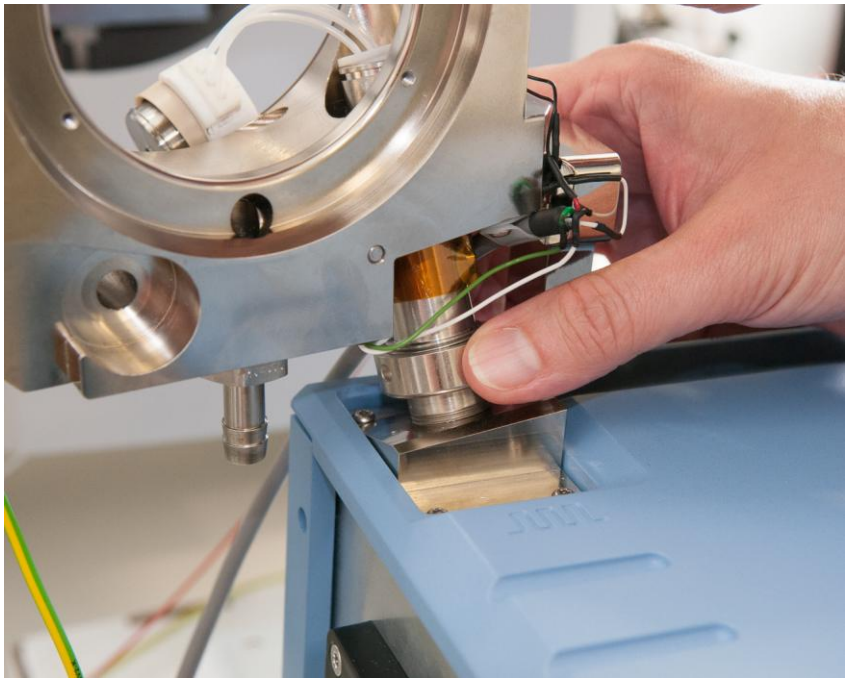
5. With the waveform feeder already fitted into the adaptor block, slide the base of the feeder into the socket on the control unit.

   Note the correct orientation of the contact pins on the bottom of the waveform feeder – these line up with the contact pads inside the control unit socket. Alignment pins on the waveform feeder fit into locating features in control unit socket.

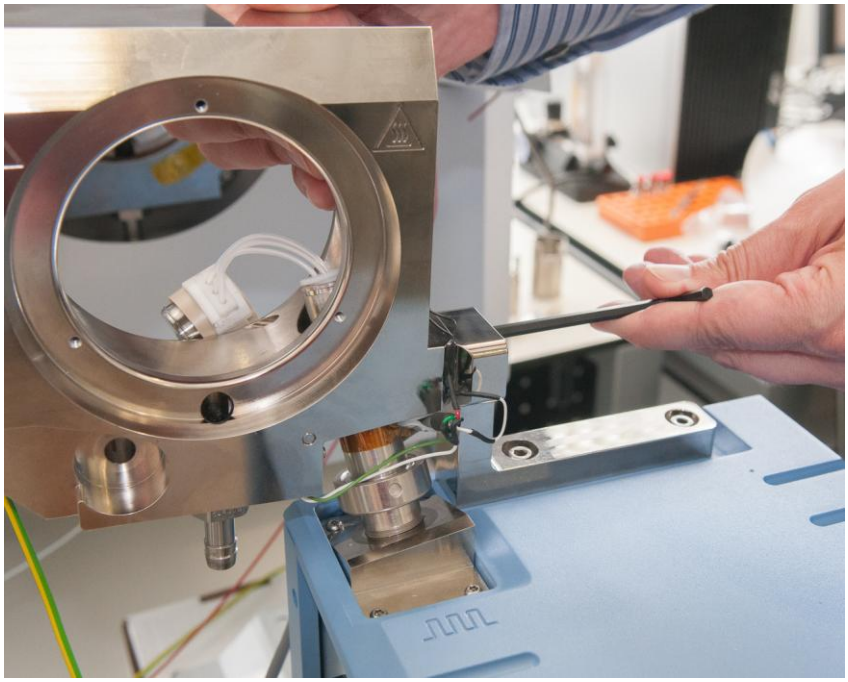




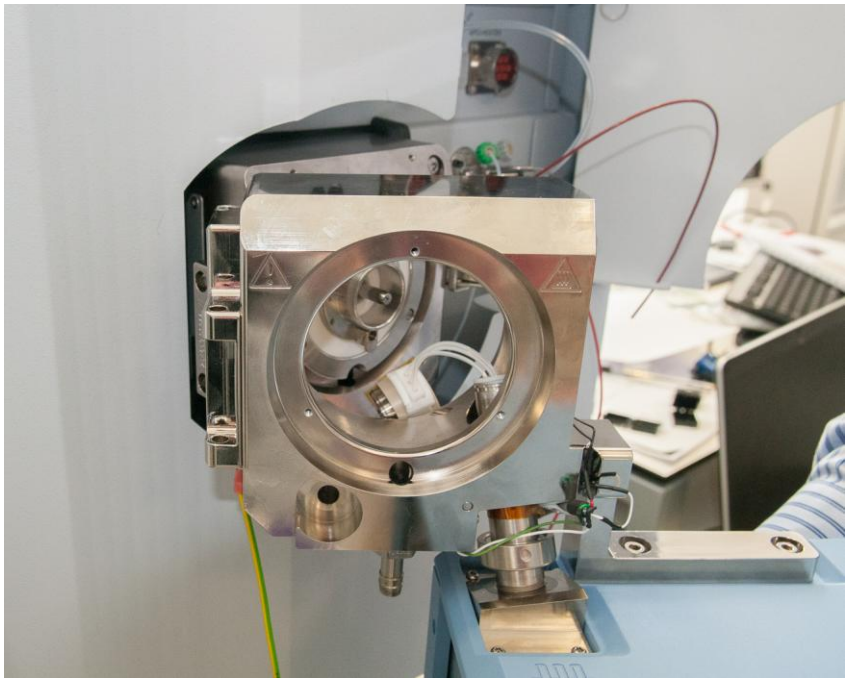
6. Tighten the locking nut to secure the waveform feeder in place.

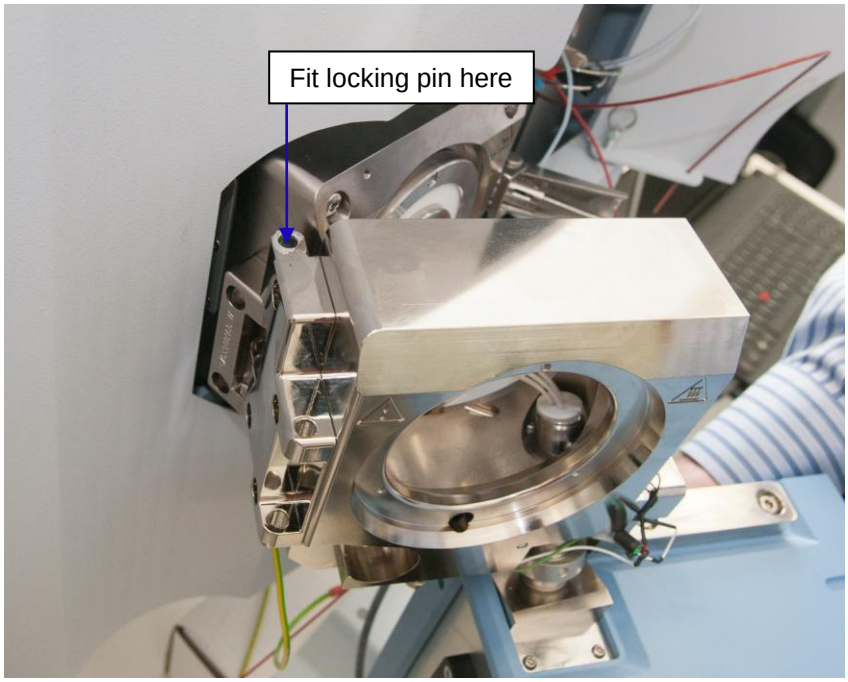


7. Fit the remaining two screws in the attachment bracket to secure the adaptor at the correct height.



8. Lift or slide the adaptor plus control unit assembly into place, so that the adaptor block hinges line up with the hinges on the MS desolvation chamber. Secure the hinges with the locking pin provided.

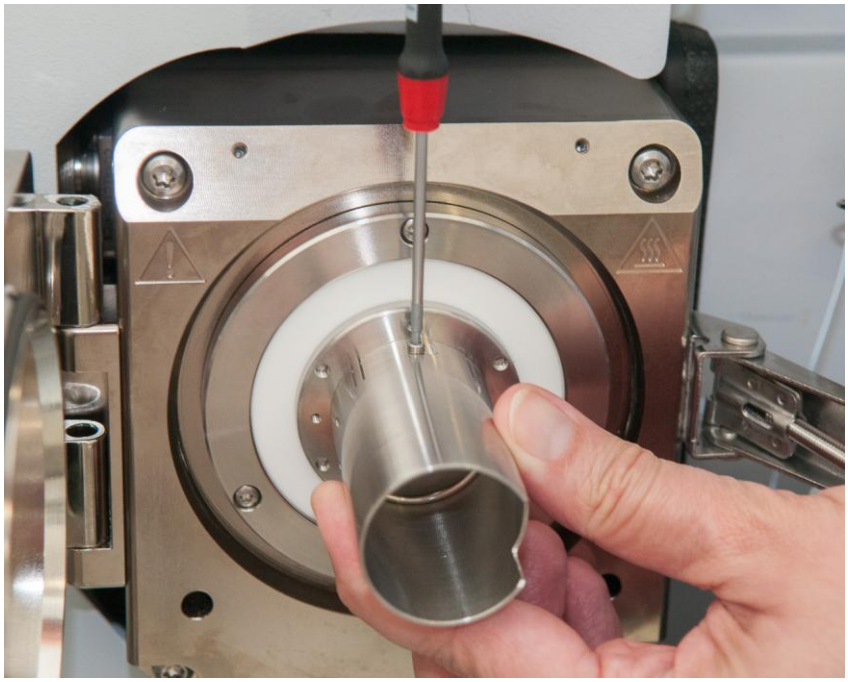




9. At this point, the control unit will be suspended from the adaptor block. Adjust the control unit feet to the correct height to support the weight of the control unit.

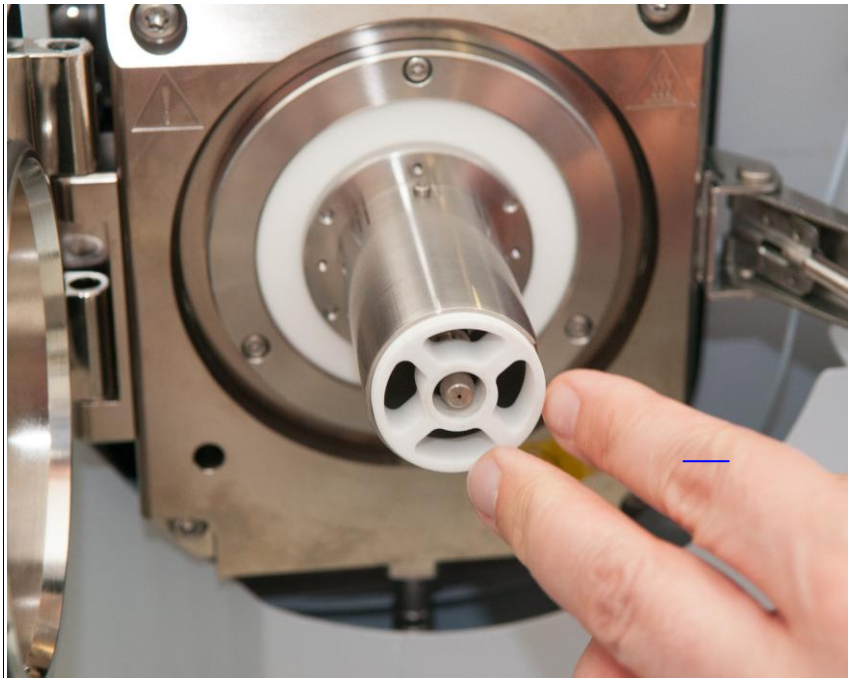
   This completes the initial height adjustment process. Subsequently, the interface can be removed and installed without dismantling the adaptor/waveform feeder/control unit assembly. Just remove the hinge locking pin and lift the assembly off the hinges of the desolvation chamber.

10. Now with the adaptor swung to the open position, insert the spray shield extender into position as shown and tighten the retaining screw.



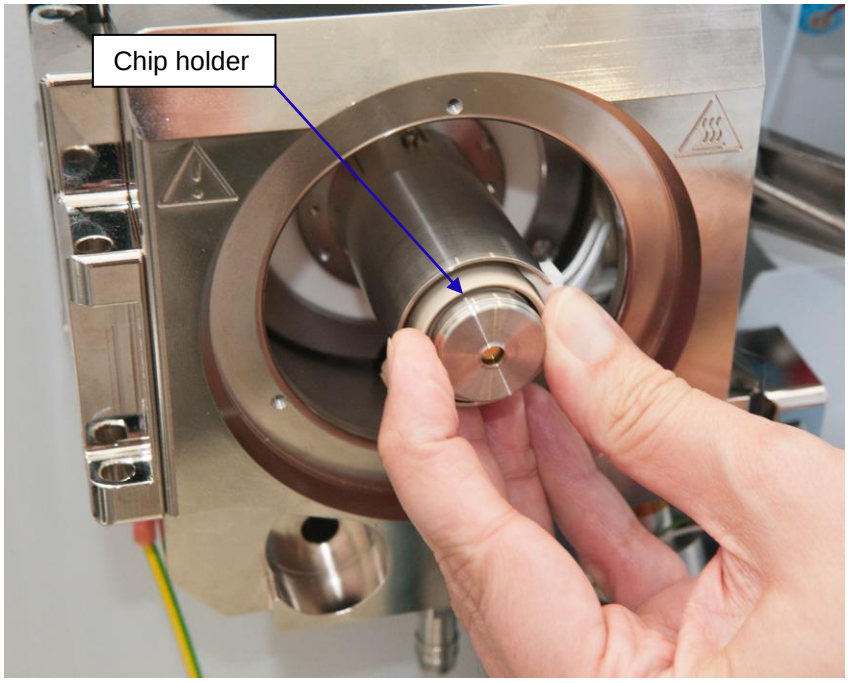
11. Push the capillary extender onto the capillary.

12. Fit the capillary support over the capillary extender and push it into place (until it hits the stop)

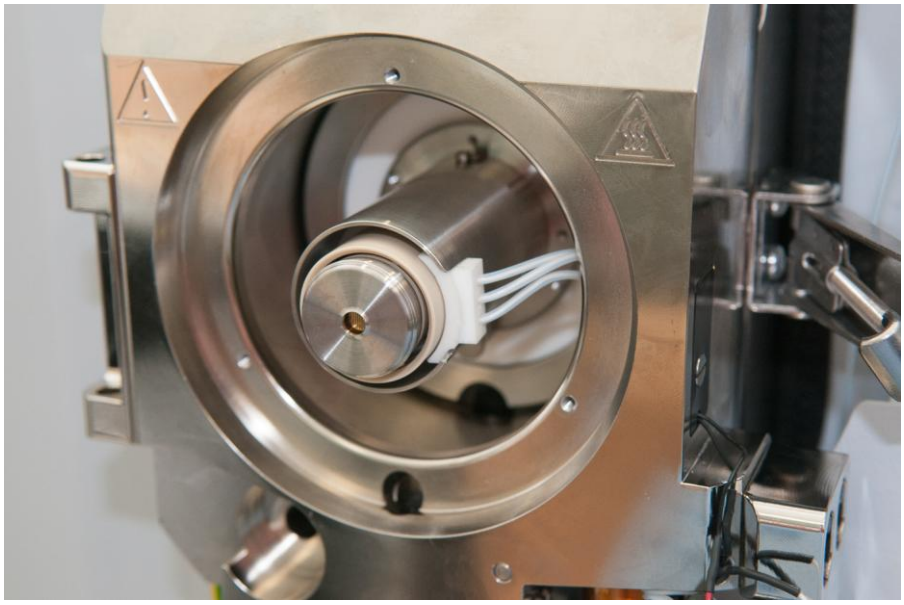


13. Swing the adaptor back into the closed position, then push the chip holder (the loose end of the waveform feeder) into position on the capillary extender.

    Note: there is an o-ring in the rear aperture of the chip holder. Check this is seated correctly before trying to fit the chip holder onto the capillary.

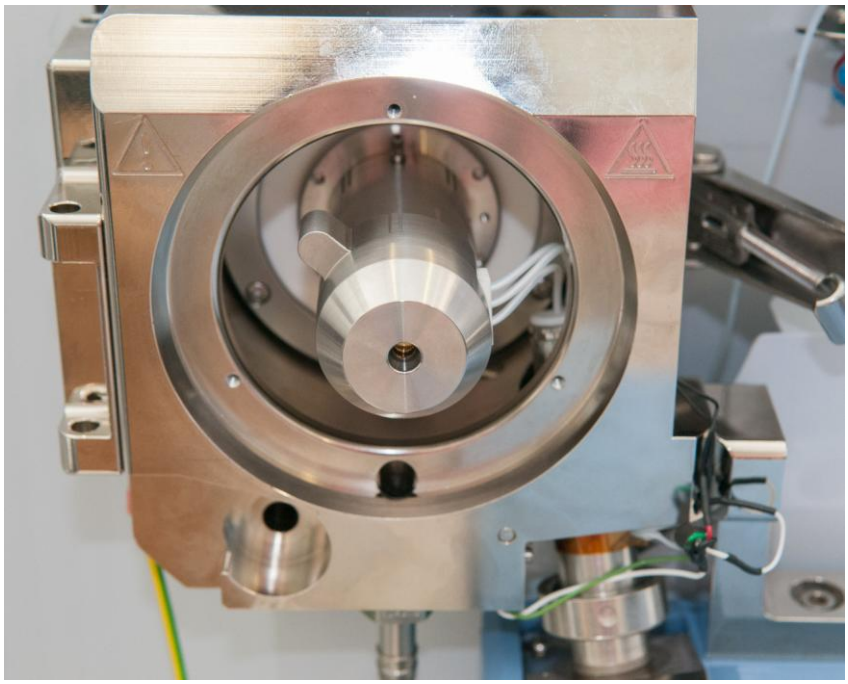


14. Ensure the ceramic cable holder is seated in the recess in the spray shield extender.

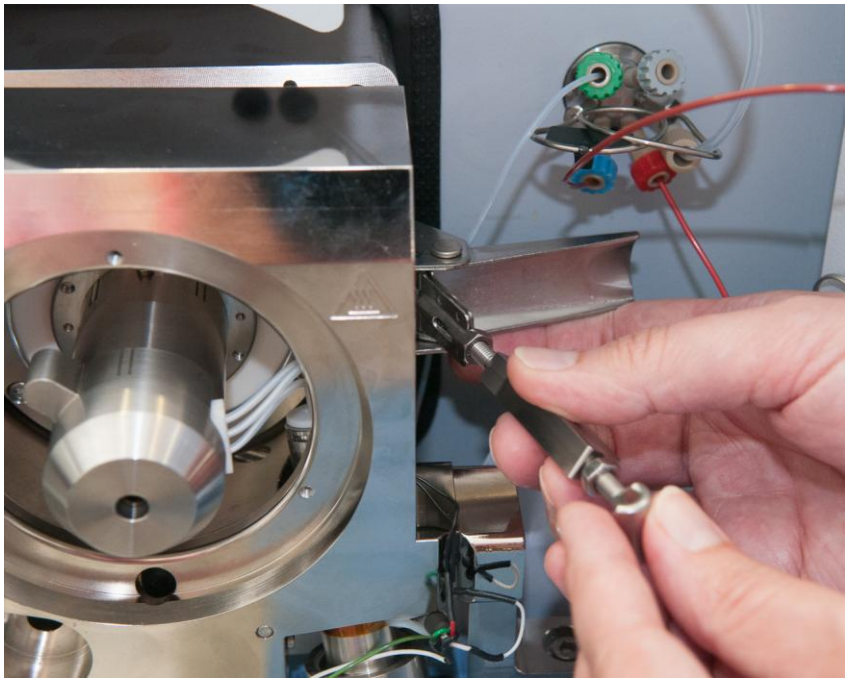


Note – when reversing these steps to uninstall the system, use caution when sliding the chip holder off the capillary extender. The capillary extender will initially slide forwards with the chip holder. Once the capillary support disk is visible, hold this in place to stop the capillary extender sliding further forward while you pull the chip holder off the capillary extender. **DO NOT STRETCH THE WIRES BETWEEN THE CHIP HOLDER AND THE WAVEFORM FEEDER.**

15. Fit the spray shield cap onto the spray shield extender.

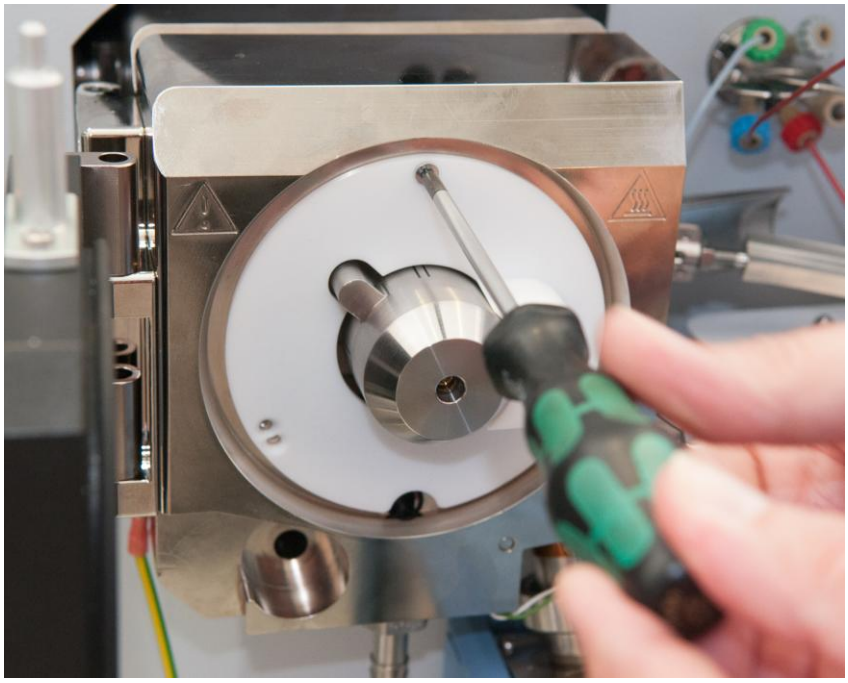


16. Unscrew the hook from the latch and replace it with the latch extender. Fit the hook to the end of the latch extender.

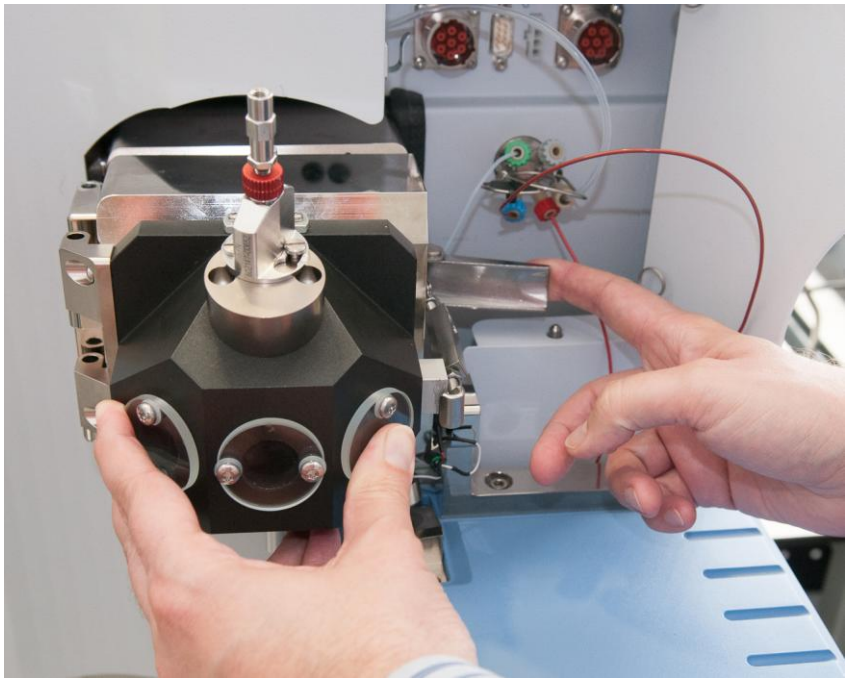


17. Mount the separation disk, if required, using the small screws provided.

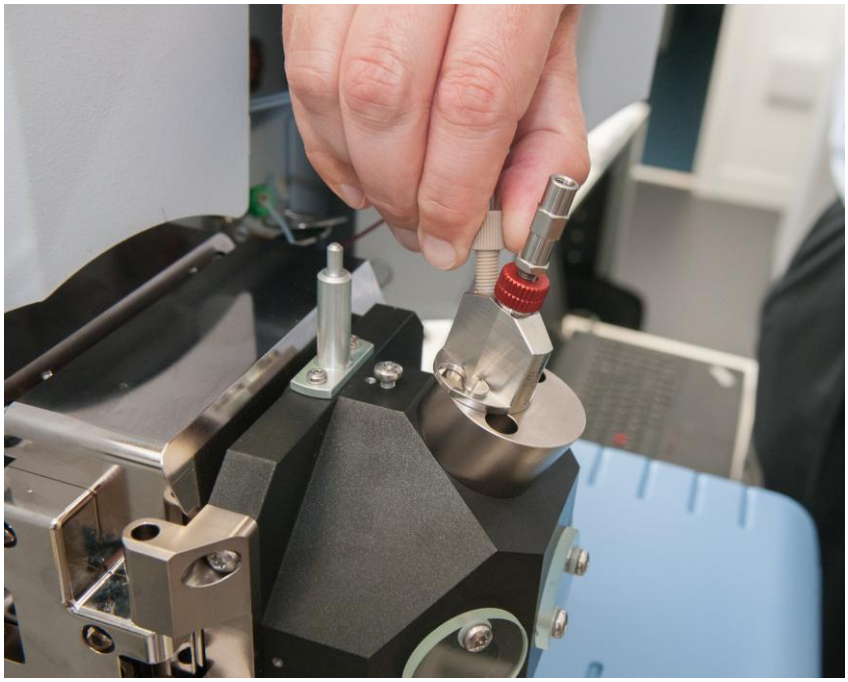
    IMPORTANT: It is critical for safety compliance that there is a 1mm air gap between the separation disk and the spray shield. Ensure the disk is correctly positioned and firmly secured (see figure)



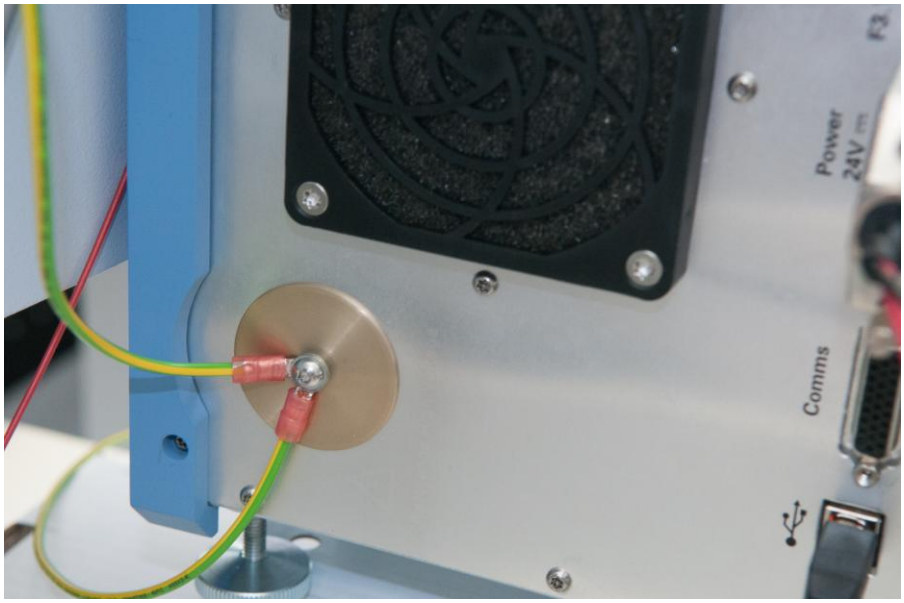
18. Fit the ionization source into position onto the hinges of the adaptor assembly and close the source door. Adjust the length of the latch extender until the hook can close over the latch block and clamp the source shut.



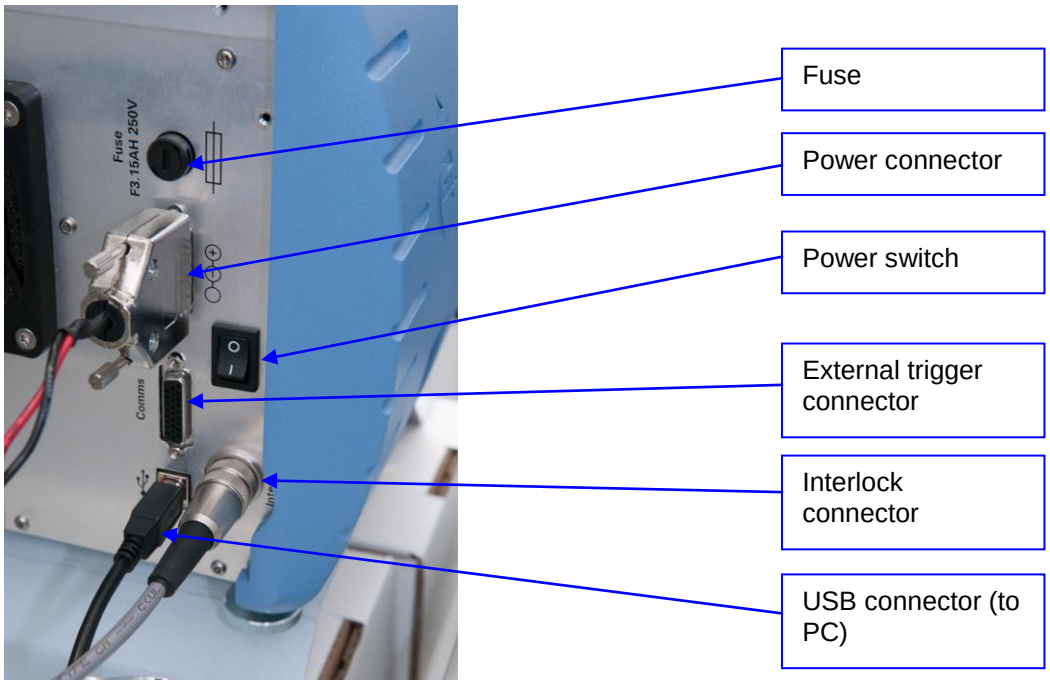
19. Reconnect the gas and liquid lines to the nebulizer.



20. Connect the safety earth cables from the contact point on the control unit to the adaptor and mass spectrometer chassis. If a non-standard ionization source is used, also connect a safety earth cable from this point to the ionization source.



21. Install the PC interface software (see software user manual for details of how to do this).
22. Connect the USB cable from the PC to the control module.
23. Connect the power cable from the external power supply to the control module and plug in the power supply.
24. Connect the interlock cable (attached to the adaptor) to the *Interlock* socket on the control module.
25. If using the external trigger cable, connect this to the socket labelled *Comms*.



Getting Started

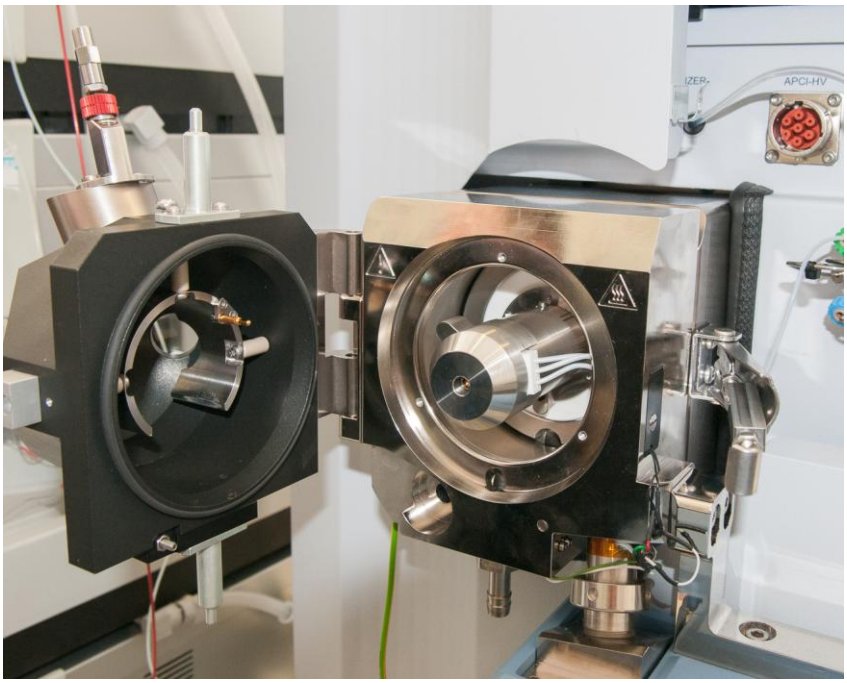
See *OW-003401-TM Owlstone ultraFAIMS-MS user interface software manual* (available on the Owlstone support website: http://support.owlstonenanotech.com/categories/20097286-UltraFAIMS-MS-Development-Kit) for instructions on how to operate the system using the PC software.

We recommend that customers download and review the training material available on the Owlstone support site: http://support.owlstonenanotech.com/forums/21192315-UltraFAIMS-Customer-Training-Material

Changing a Chip

To remove a chip from the system, for cleaning or to replace it with another chip:

1. Disconnect the gas and liquid lines from the nebulizer and open the source door. **WARNING: Let the internal metal parts cool down to a safe temperature for handling.**

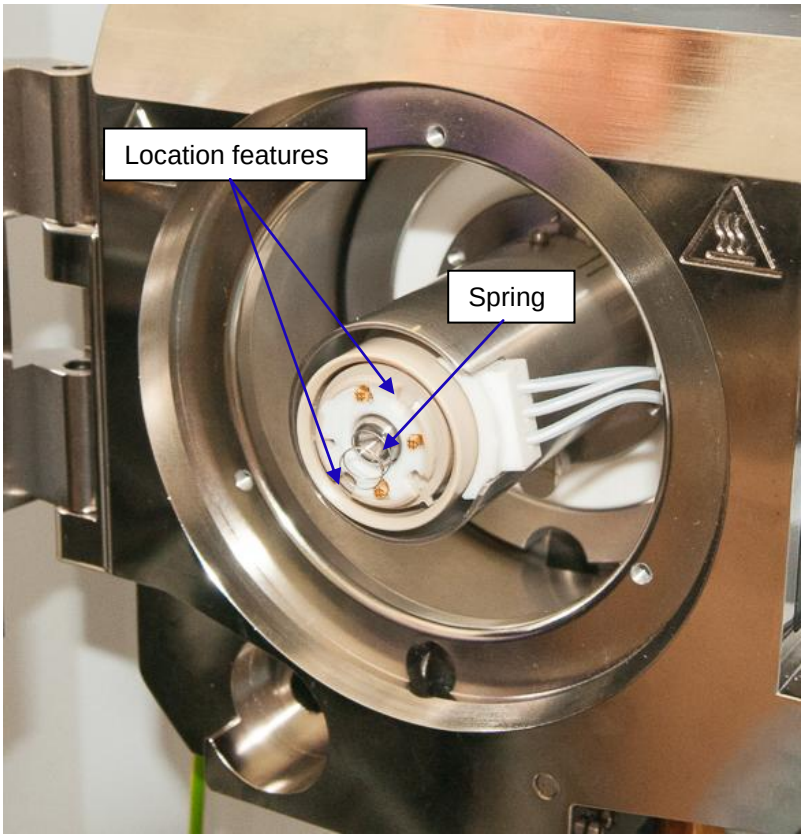


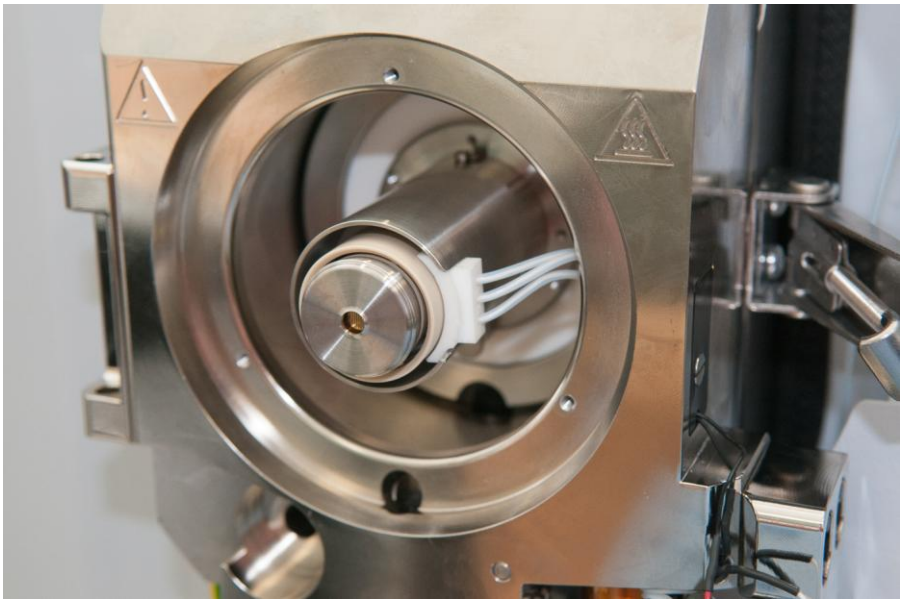
2. When cool enough to handle, slide the spray shield off.

3. Unscrew the chip module

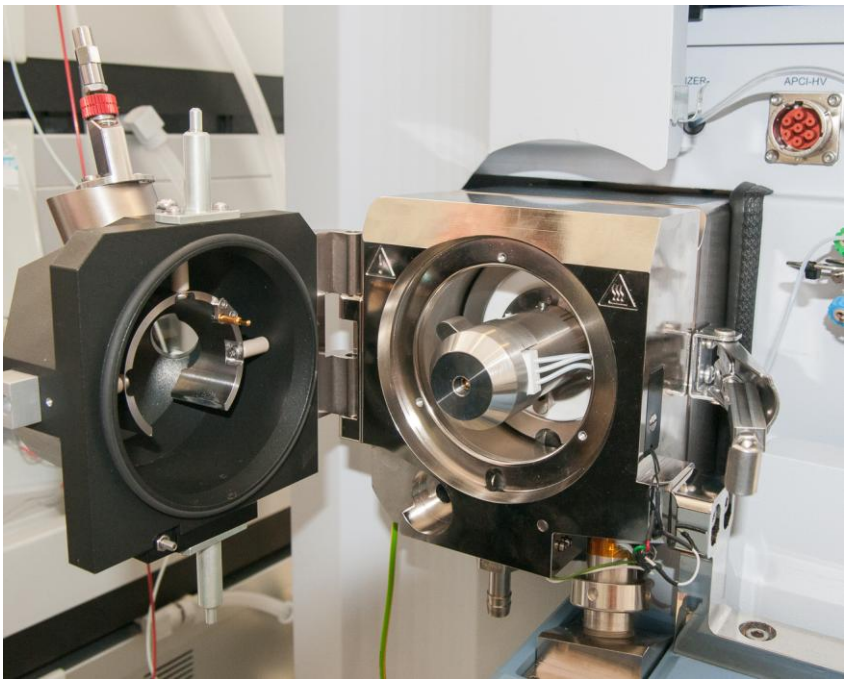
4. The chip module can be cleaned by immersing in suitable solvents and sonicated, or by heating (up to 150°C). Exposure to vacuum (e.g. in vacuum oven) is not recommended and may distort the chip mount. Ensure the chip is completely dry before applying FAIMS waveforms to the cleaned chip. Further advice on cleaning can be found on the Owlstone support website (http://support.owlstonenanotech.com/categories/20097286-UltraFAIMS)

5. To replace the chip module in the cap, align the alignment features on the rear of the chip module with the corresponding locations on the chip module holder and ensure the contact spring is in place before screwing the chip module into position.





6. Replace the spray shield.



Reminder: Do not operate the system without a chip attached.

Troubleshooting

Please contact Owlstone via the support website http://support.owlstonenanotech.com or by emailing support@owlstone.zendesk.com for technical support and troubleshooting information.

Appendix – Operating Conditions

Type	Specification
Ambient operating temperature	15-35°C
Ambient storage temperature	5-50°C
Humidity	20-85% relative humidity at 35°C
Operating altitude	Up to 2000m