Cirrus (LM99) User Manual

SP101013.111
October 2012

As part of our continuous product improvement policy, we are always pleased to receive your comments and suggestions about how we should develop our product range. We believe that the manual is an important part of the product and would welcome your feedback, particularly relating to any omissions or inaccuracies you may discover.

You can send your comments to:-

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MKS Instruments UK Ltd
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Crewe
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EC Declaration of Conformity

MKS Instruments UK Ltd declares that the:

Cirrus

Is in accordance with the following directives:

2004/108/EEC Electromagnetic Compatibility Directive
EN 61326-1:2006 Electrical equipment for measurement, control & laboratory use.

2006/95/EC Low Voltage Directive
EN 61010-1:2006 Safety requirements for electrical equipment for measurement, control & laboratory use.

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

Signed:

J.M.Higgins
General Manager
10th October 2009

CE 09

Additional Installation Maintenance and Operating Instructions

In order to comply with European regulations, the following procedures must be followed:

A) INSTALLATION

1. The installation procedures given in the operating and technical manuals must be followed in addition to these instructions.

2. The mains power cable must conform to local regulations and must have a protective earth (PE) conductor securely connected to the power plug protective earth contact.

3. Only cables supplied with the equipment may be used for interconnections. If extension cables are required, they must be supplied by MKS Instruments Ltd.

4. Cables attached to the analog and digital IO ports must have a maximum length of 3 meters. The Ethernet cable has a maximum length of 30 meters before a network hub or switch is required. If greater lengths are required, MKS Instruments Ltd. must be contacted for technical guidance on possible EMC and safety issues.

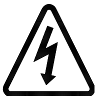
B) OPERATION

1. The equipment is not authorised for use as a critical component in a life support or safety critical system without the express written approval of MKS Instruments Ltd.

2. All instructions given in the operating manual must be followed.

3. Adjustments are strictly limited to those accessible from the control panel and computer keyboard and only when running software supplied by MKS Instruments Ltd.

C) MAINTENANCE



WARNING-DANGEROUS VOLTAGES EXIST INSIDE THE EQUIPMENT

1. Maintenance functions must only be carried out by competent persons.

2. During the warranty period, faulty equipment must be returned to MKS Instruments, Spectra Products Ltd., unless special arrangements are made.

3. There are no user serviceable parts in the electronic equipment. Certain components are EMC and safety critical and must not be substituted. Replacement parts are available from MKS Instruments, Spectra Products Ltd.

4. Equipment enclosures embody certain special fastenings and bonding devices that affect EMC and safety performance. These must be correctly re-fitted after servicing.

5. It is important that a yearly service schedule be maintained on both the diaphragm and turbo molecular pumps. This period should be reduced for corrosive applications.

The pump components such as the diaphragms and lubricant reservoirs can contain toxic substances from the media pumped.
Dispose of in accordance with local regulations.

Contents

1. Specification

1.1 Mechanical

Cirrus
Size: 430mm wide x 670mm deep (+100mm for connections) x 420mm tall.
Weight: 34.5 kg

Analyser
Triple mass filter, 1 -200amu or 1 – 300amu, Faraday and SEM detector.
Maximum operating pressure Faraday 2×10^{-5} mBar.

1.2 Electrical

Power Inlet: 100 to 120 VAC rms, 47-63Hz, 6.3A rms.
200 to 240 VAC rms, 47- 63Hz, 3.15A rms
Installation category (over voltage category) II to IEC664
Insulation Class I to IEC536

1.3 Fuses

Located on rear panel.
All fuses are 20mm X 5mm H.R.C. ceramic, 250V AC, characteristic (T) and compliant with IEC 127.

110VAC operation 6.3A
240VAC operation 3.15A

1.4 Environmental

Ambient temperature range 0 to 40^0C, 80%RH non-condensing, operating and storage.

Pollution degree 2 to EN61010
Enclosure IP20 to EN60529

1.5 Safety

IP20 to EN60529

The protective earth conductor of the power cord must be connected to the power source protective earth terminal.
There are no operator replaceable parts within the Cirrus unit.

This equipment must only be used in the manner specified in these instructions.

1.6 Connectors

The connectors for external circuits are for use only with MKS Spectra equipment, or equipment which has no accessible hazardous live parts.

The external circuits must comply with the requirements of EN61010-1 section 6.6.1.

Ports for connection of accessories do not carry hazardous potentials.

Installation Category II comprises mains powered, local level appliances.

Do not position the Cirrus unit so it becomes difficult to remove the mains power cord.

1.7 Warning labels

Caution – Risk of electric shock

On the connections panel refers to:
Accessible hazardous voltages on the internal printed circuit boards and connectors, which may result in electric shock if touched.

Caution – Risk of danger

On the connections panel refers to:
a. Read all instructions carefully before use.

b. The control unit and signal ports are designed for connection to MKS Spectra accessories via MKS Spectra supplied cables.
There are no accessible hazardous voltages or currents on these ports.
MKS Spectra must be consulted before any non-MKS Spectra supplied cables or accessories are connected to these ports.

Caution – Hot surface

On the internal oven refers to:
Hot surfaces inside the oven.

Caution – Heavy object

On the connections panel.
Refers to the this equipment weighing in excess of 18kg and should therefore be moved by at least two people.

To avoid muscle strain and or back injury, movers should employ lifting aids and the correct lifting techniques.

1.8 Ventilation

Openings in the front, top and bottom panels must not be obstructed.
Allow a minimum clearance of 50mm all round. Do not exceed the maximum operating ambient temperature.

2. Introduction

The Cirrus is a bench top, on-line gas analysis system designed specifically to analyze gases at atmospheric pressure.

Key to its analytical performance, the Cirrus is built around a Microvision plus IP Residual Gas Analyzer. This RGA is housed in a small stainless steel chamber which is pumped by a turbo molecular pump, which is in turn backed by a dry diaphragm pump.
The vacuum chamber is housed in an oven to assist with pumping when required.

A capillary inlet is used in order to achieve a suitable pressure differential between the atmospheric sample and the RGA itself. This flexible inlet can be seen to protrude from the Cirrus cabinet. The same diaphragm pump that backs the turbo pump also serves as a by-pass pump for the capillary inlet.

Because the Cirrus is based around the Microvision IP RGA, the unit operates with the same 'Process Eye' software as the Microvision (with some minor additions). As such either a PC or laptop running Windows 2000, XP or Vista is required for operation. Connection to the PC is via a Cat5 Ethernet screened (STP) cable. This computer and interfacing requirement must be considered when specifying your system.

This manual is written to accompany the Cirrus system. If you have any doubts as to whether this is the correct manual for your system, please examine the serial number of your system, it should begin with LM99-xxxxx. You should refer to the 'Process Eye Professional' manual for a detailed description of the software.

Please ensure you read the Maintenance sections of this manual, they contain important information on the service schedules required for this type of instrument.

3. Unpacking

When you receive the equipment, carefully check each item before removing the packaging to ensure that no physical damage has occurred during shipment. Also check that all boxes have been received by checking against the packing slip.

The Cirrus will be shipped in one box or crate, if you have also ordered a PC this will be shipped in a separate box.

If there has been obvious damage during shipment, or if there are items listed on the packing slip which have not arrived, immediately contact your local MKS sales/service representative.

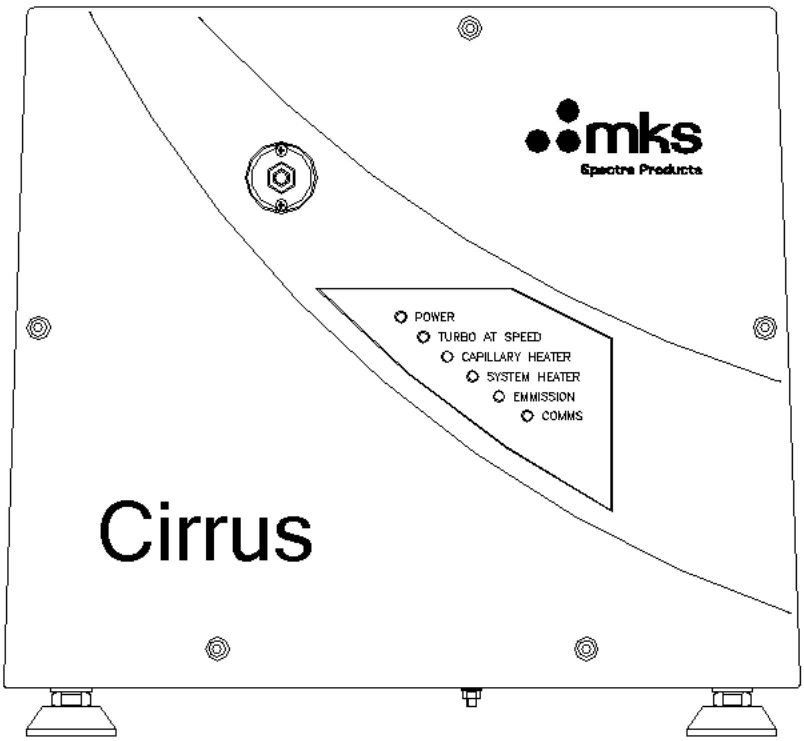
Carefully unpack the various parts of your Cirrus system. Again, check for any signs of damage.

Find the shipment report and check for any missing items. Keep the shipment report safe, this is an important document and you may need to refer to it later.

We suggest you keep the packaging material in the unlikely event you need to return the equipment for servicing.

4. Connections and Indicators

4.1 The front panel



Along with the capillary inlet, the front panel incorporates a bank of six status indicators to assist in the operation of the Cirrus.

The colour and function of each of these indicators is described below, as is the inlet.

Power

The indicator is green when power is supplied to the Cirrus unit.

Turbo at Speed

The indicator is amber while the turbo molecular pump accelerates, changing to green when it has reached normal operating speed.
The filament protect trip is interlocked to this signal to prevent operation of the filament before a suitable chamber pressure has been obtained.

Capillary Heater

The indicator is amber when the capillary heating element is on.

System Heater

The indicator is amber when the heater temperature is set to 80degC "Heat", and red when at the 180degC setting "Bake".

Please see Section 6.4 for details on baking the chamber.

Emission

The indicator is green when a filament is active and operating correctly.

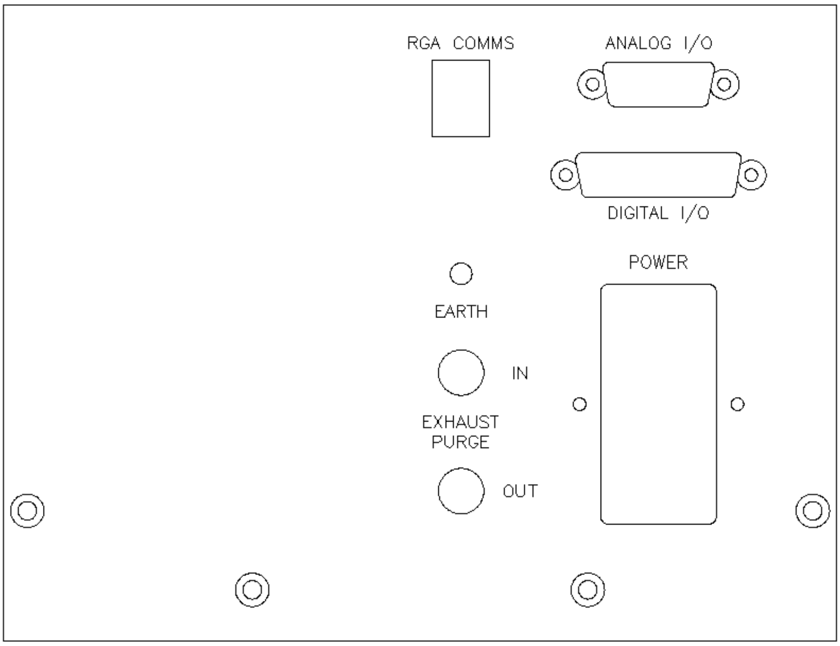
Comms

This indicator blinks green when communications have been established with the Cirrus

Capillary Inlet

The capillary terminates with a 1/4 inch (6.35mm) stainless steel pipe, ready to couple to a 1/4 inch Swagelok fitting. You may wish to use a shut off valve to prevent the loss of gas if the capillary needs to be removed for maintenance.

4.2 The rear panel



The rear panel incorporates all of the external connections required by the Cirrus, as well as exhaust purge connections.

The diagram above illustrates a standard configuration. On externally backed systems, ancillary connections are present.

A description of each of the connectors can be found below.

The signal and data ports must not be connected to ports that could become hazardous live.

RGA Comms

An RJ-45 socket is used for connection to the host PC.
A Cat5 STP cable MUST be used for connection to this instrument in order to comply with the immunity requirements of the EMC directive.
See Page 4 for maximum cable lengths.

Power

The mains power switch and fused IEC socket.

Analog I/O

The Analog I/O connector is a 15-way D-Type socket.
See Page 4 for maximum cable lengths.

The Analog I/O port provides:

- One analog output 0 to +10V
- Four, quasi-differential analog inputs, 0 to ±10V, with a maximum voltage on the return of ±0.5V
- ±15V power outputs both fused at 100mA, fuses are not self resetting.

Analog Connector pin assignment.

Pin	Function
1	-15V fused
2	Analog input 4 return
3	Analog input 3 return
4	Analog input 2 return
5*	Analog input 1 (Reserved)
6,7,14	Not Connected
8	0V analog
9	+15V fused
10	Analog input 4
11	Analog input 3
12	Analog input 2
13*	Analog input 1 return
15	Analog output

Note: The total power consumption on each rail (+5V and ±15V) for both the Analog and Digital I/O ports must not exceed 100mA.

* Analog input 1 and Analog input 1 return are reserved for use with the internal cold cathode gauge.

Digital I/O

The Digital I/O connector is a 25-way D-Type socket**.**
It is used to connect accessories such as a Remote Vacuum Controller.
The Digital I/O connector can also be used to provide alarm output signals and process trip signals.
See Page 4 for maximum cable lengths.

The Digital I/O port provides:

- Two 8 bit bi-directional ports
- One interrupt / strobe input
- +5V fused at 100mA
- ±15V fused at 100mA

Pin	Description	Notes
1	H1 interrupt / strobe	
2	PA1	
3	PA3	
4	PA5	
5	PA7	
6	PB1	
7	PB3	
8	PB5	
9	PB7	
10	0V Digital	
11	0V Analogue	
12	-15V fused	
13	+15V fused	
14	PA0	
15	PA2	
16	PA4	
17	PA6	
18	PB0	
19	PB2	
20	PB4	
21	PB6	
22	+5V fused	
23	Not Connected	
24	Not Connected	
25	Not Connected	

Note: The total power consumption on each rail (+5V and ±15V) for both the Analog and Digital I/O ports must not exceed 100mA.

Exhaust Purge IN/OUT

You may want to connect the Cirrus to a nitrogen purge system, or vent the exhaust gas to an extractor system. You may have been advised whether we feel for your particular application nitrogen purging is necessary, desirable or absolutely vital.

Optional: The Cirrus includes the facility to purge the turbo pump bearings and vent the vacuum chamber with nitrogen. This feature is usually used when the unit is likely to be exposed to corrosive and/or toxic gases.

Flushing the pump exhaust
Connect a dry nitrogen supply at a pressure of 1 - 2 p.s.i. above atmospheric pressure to the IN port to improve detection levels.
Connect a second pipe to the port labeled OUT to exhaust the dry nitrogen safely. The exhaust nitrogen may now contain corrosive/toxic gases.

Exhaust the pump only
Even if you are not using nitrogen purge you MUST connect the Cirrus to an exhaust system.
Blank off the port marked IN and use only the OUT to exhaust the pump.

The standard configuration of Cirrus does not use rotary pumps, so there will be no hydrocarbon vapors emitted by the vacuum pumping.
However, options are available that may use external rotary pumps. These should always be vented into an exhaust system.

It is important that the pumps exhaust gases are ALWAYS vented safely. Even if they are not toxic or corrosive, they may cause asphyxiation.

Never block, or obstruct any pump exhaust, as this may cause dangerous internal pressure buildup.

5. Installation

The Cirrus instrument should be installed on a flat, level bench top with adequate ventilation as discussed in Specifications. Periodic maintenance will be required during the lifetime of the unit, with this in mind, some thought should given to the units location.

All connections should be easily accessible, with the Cirrus positioned so that strain is not placed on any of the cables or connectors.

Important

Once the Cirrus is running it must not be moved or damage to the turbo pump will occur. Once shut down, allow adequate time for the turbo to reach a complete stop.

5.1 Default IP Address

The Cirrus is supplied with a default IP address of 192.168.0.250 and a subnet of 255.255.255.0. This may need to be changed if you intend to connect the Cirrus to your company network for example.

5.2 Changing the IP Address

In order to change the IP address to suit your network IP scope, we recommend using a PC that is not part of a network, with a fixed IP address of 192.168.0.x (where x is a number of your choosing, but NOT 250) and the subnet set to 255.255.255.0.

Connect the PC to the Cirrus using a "cross-over" cable, run "ConfigureTCPIP.exe" from the Program Files\Spectra\RGA Applications\Hardware directory, connect to the remote server at 192.168.0.250 and then click on the IP Address button and enter the IP address and subnet mask that you wish to use.

Shut down the Cirrus by disconnecting it from the mains supply and the reconnect and power the unit up. The Cirrus will now be configured to use the new IP address.

5.3 Re-setting the IP Address

Note: This is not an operator function, only competent persons may carry out this operation

Re-setting the IP address back to the default, will require the removal of the Cirrus cover as detailed in Section 7.1.

Once the cover has been removed, locate the "preset" and "reset" buttons located on the top left hand side of the main PCB.

With power applied to the Cirrus, press the "reset" button and immediately press and hold the "preset" button until a "beep" is heard from the unit.

Press the "reset" button to reboot the Cirrus which will now use its default IP address.

Note: If the unit has been configured to make use of DHCP, this procedure can take up to **90** seconds before the beep is heard.

Replace the cover before allowing operator access.

6. Operation

6.1 Connections

Using a Cat5 STP cross-over cable, or standard patch cable with the supplied adaptor fitted, connect the host PC's network interface card to the Cirrus using the "RGA Comms" connector.

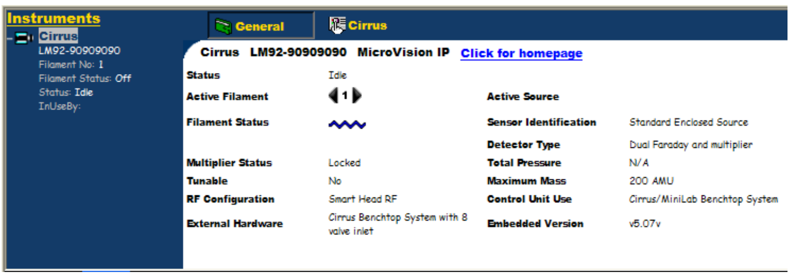
Connect the "Power" socket to the mains supply using a suitable power lead.

6.2 Powering up

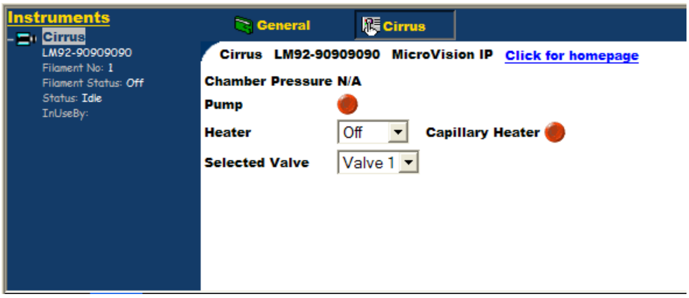
Switch on the Cirrus.
The internal cooling fans will start, but none of the pumps should be running, the only indicators lit on the front panel should be "Power" and a blinking "Comms" Led. This is due to interlocking preventing the powering up of components until the turbo pump is switched on and is up to speed.

Use the RGA Device Manager to locate and install your unit ready for use. This is explained in the Process Eye Professional User Manual.

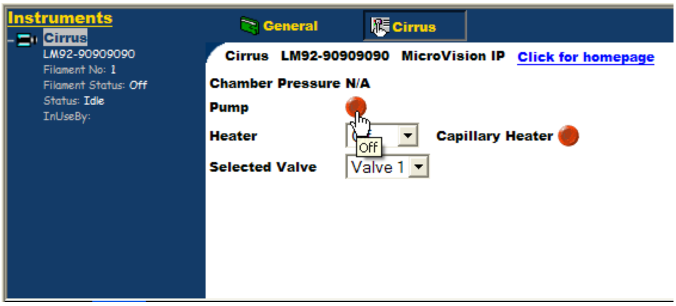
Once the unit has been installed, start the Process Eye software, once loaded you will see the unit information is displayed.



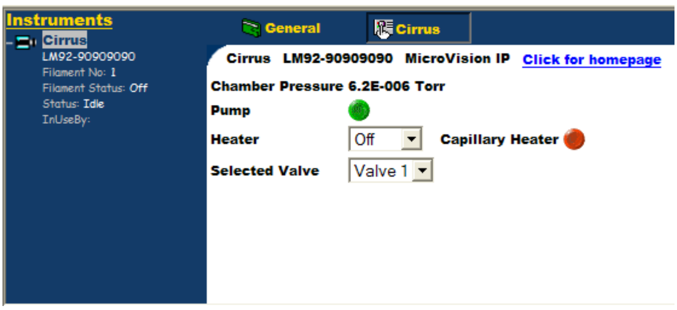
Clicking on the Cirrus tab allows control of the unit



To start the unit pumping, click the "Pump" button



Once the turbo pump is up to speed, the indicator will change to green



6.3 Starting the Quad

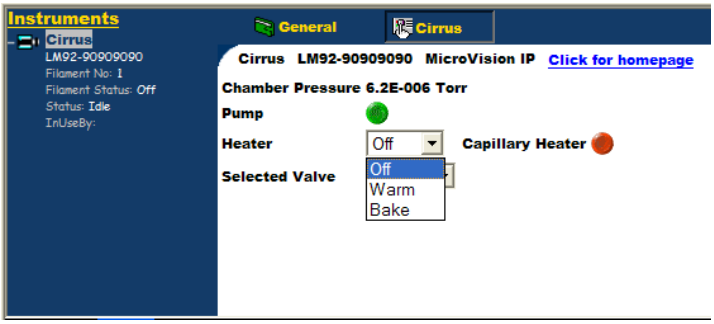
Ideally you want the pressure to reach $2x10^{-5}$ Torr before switching on a filament on the quadrupole. The trip contact on the cold cathode gauge is connected to the external trip on the RGA control unit to prevent filament operation until the pressure falls below this level.

6.4 Baking

Before you can start to use the system properly, it will need to be run for sufficient time to allow the background peaks to drop. This amount of time can be significantly reduced by baking the system.

This should be done after the system has run for at least an hour to allow the pressure in the system to drop below $2x10^{-5}$ Torr.

From the Heat/Bake pull-down list, choose the Bake option. A dry, inert gas should be flushed continuously through the capillary inlet during bake out. The quadrupole should be running with the filament on but only using the faraday detector.



The multiplier detector will be unavailable during baking

The total pressure should gradually start to rise as the system outgases and you should bake the system at least until the pressure starts to fall. In normal operation an initial bake of at least 24 hours is required, although in general the longer the system is baked the better.

To improve the background further, it is recommended that you run and degas both filaments. The amount of time spent in reducing the background peaks depends entirely on the application and is left to the discretion of the customer. If the Cirrus is switched off, it will vent to atmosphere introducing water vapour and should be baked again.

6.5 Temperature Settings

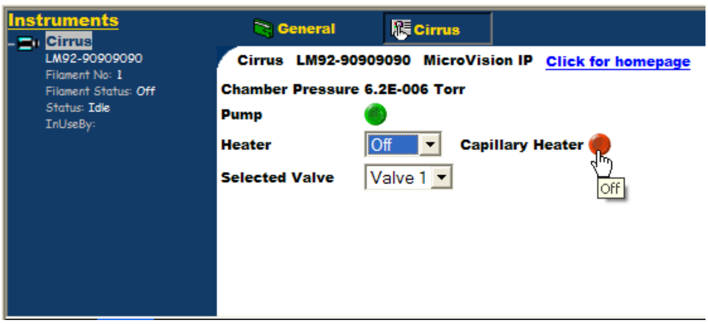
The Heat/Bake option should be set to Bake for the initial bake out to reduce the water background. After this period, running at the lower temperature of Heat is adequate in preventing the condensation of vapours in the vacuum chamber which could lead to memory effects.
Often it is not necessary to have the system heater on at all, but this will depend on the application.

The Cirrus is designed to allow continuous operation using the Faraday detector, with the system heater on Bake or Heat.

6.6 Capillary Heater

Use the Capillary Heater to lessen the chance of vapour condensing in the capillary leading to memory effects, or even blockage. Whether you need to heat the capillary or not depends on the application and the nature of the gases being sampled.

The Cirrus is designed to allow the capillary heater to be run continuously.



6.7 Shutting Down

The Cirrus should be left to run continuously unless it is not to be used for an extended period of time, or it needs to be shut down for maintenance.

To shut down the Cirrus:

1. Switch off the Capillary and System heaters.
2. Switch off the quadrupole filaments.
3. Wait 10 minutes to allow the filaments to cool.
4. Stop the turbo by clicking the "Pump" button, you should be able to hear the pumps stop and the vent valve open.
5. Wait 5 minutes for the system to cool further and come to a full stop.

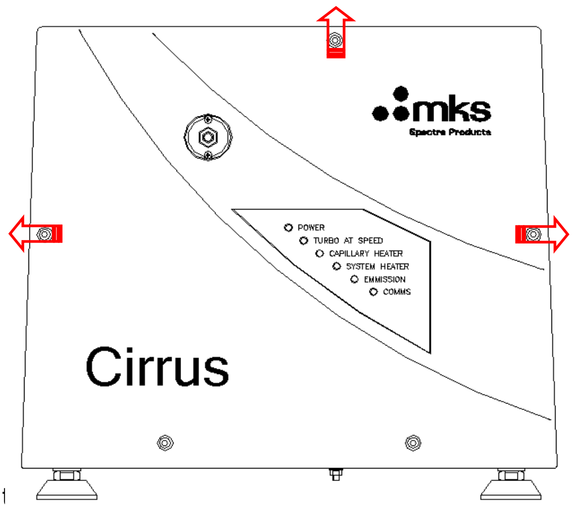
7. Maintenance

Note: These are not operator functions, only competent persons may carry out these operations

7.1 Removing the Cover

Before removing any of the Cirrus covers, ensure the unit is disconnected from the mains supply and has had adequate time to cool.

To remove the outer cover, remove the three Allen head bolts indicated from front panel.



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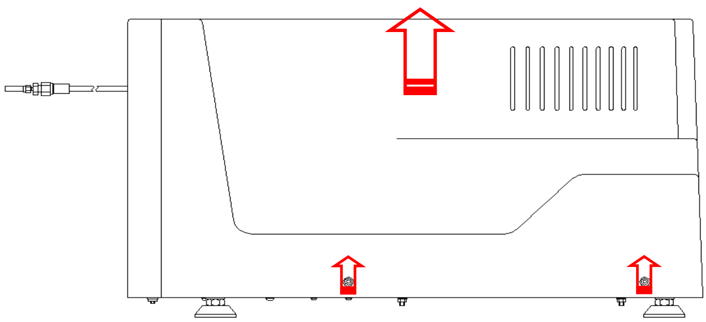
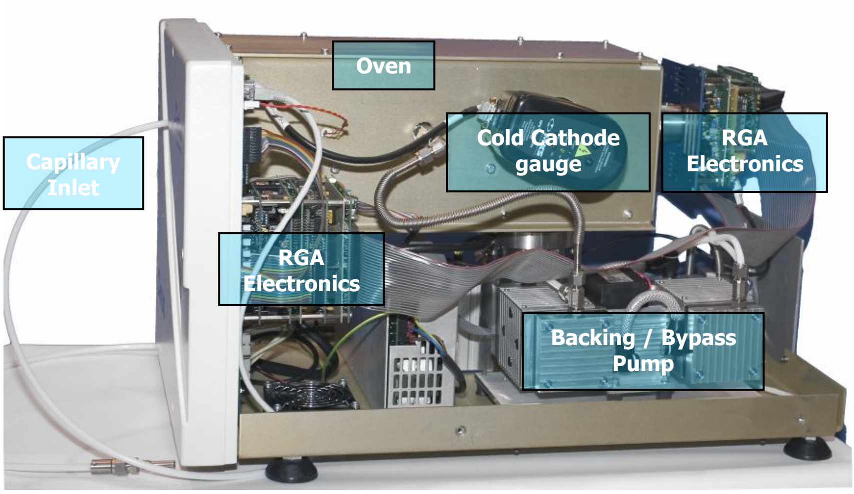


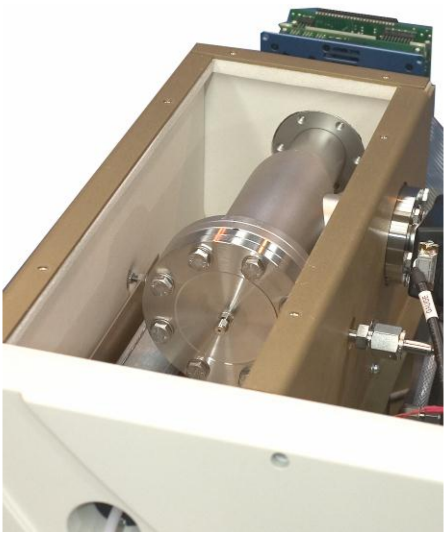
Gently remove the outer cover vertically from the chassis.

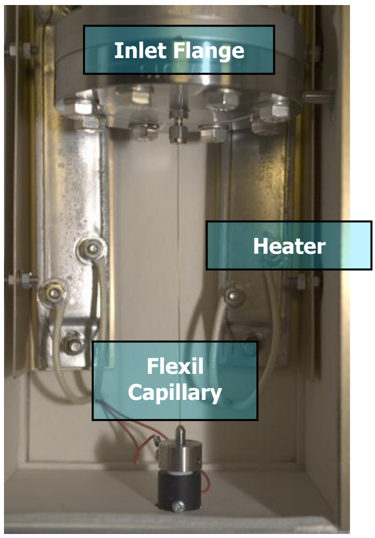
7.2 Internal Components



Before removing the oven top plate, ensure the oven has had adequate time to cool after baking.

To remove the oven plate, remove the eight Philips screws and lift the plate clear of the oven.





Turbo Molecular Pump

The turbo pump utilizes a “wet bearing” and <u>must</u> be serviced yearly to avoid premature failure of the pump.

Diaphragm Pump

Diaphragm replacement <u>must</u> be carried out on a yearly basis to avoid premature failure of the pump.

MKS can supply you with a kit of replacement diaphragms and a lubricant reservoir, if you would prefer not to carry out the work yourself, service contracts are available. Contact your nearest MKS facility for details.

RGA Electronics (Microvision IP)

There are no user serviceable parts within the RGA electronics package.

Capillary Inlet

Before carrying out ANY operations that involve the capillary system, take precautions to prevent contact with any hazardous substances that may have been sampled.

Allow all parts of the inlet and oven to cool before commencing.

The Cirrus system uses a capillary inlet to admit sample gas into the chamber for analysis. MKS Spectra produce a variety of capillary inlets but the Flexil capillary is dealt with in this manual.

The Flexil capillary inlet assembly consists of a white PTFE tube containing a fine bore stainless steel tube, down the centre of which is threaded a 0.32mm I.D. fused silica tube.
A low voltage power supply is connected across the stainless steel tube to provide heating of the fused silica tube.

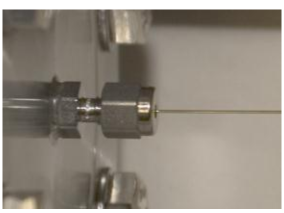
You may need to replace the fused silica capillary tube which forms part of the capillary inlet assembly, if it has been damaged or becomes blocked.

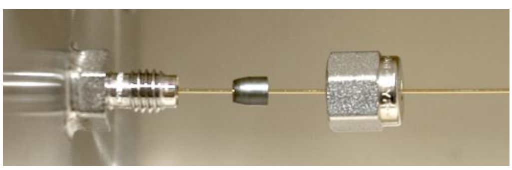
1. Shut down the Cirrus by following the instructions in Shutting Down then disconnect from the mains supply. Remove the outer cover.

2. Disconnect the high pressure end of the capillary from the gas source. If there is a shut off valve, remember to close it.

3. Remove the oven lid.

4. In the oven compartment, use a 5/16 inch spanner to undo the nut on the inlet flange and slide it, and the ferrule, along the fused silica tube towards the front of the oven.





5. Carefully slide the fused silica tube down the capillary assembly away from the inlet flange and remove the nut and ferrule. Once the fused silica capillary appears at the

high pressure end you can pull it out of the assembly.

6. Take the cassette of fused silica tubing and carefully feed one end down the capillary assembly from the high pressure end. The fused silica tubing is quite fragile but should slide freely down the inner bore of the capillary assembly. Continue to feed the tube down the capillary until it emerges inside the oven.

7. Thread the Swagelok nut and then the ferrule onto the silica tubing as shown in the picture above.

8. Thread the fused silica tube into the Swagelok reducer and continue until you feel it butt up against the vacuum chamber inlet, then withdraw the fused silica tube by 5mm.
Slide the ferrule into place then tighten the nut **FINGER TIGHT**. With a 5/16 inch spanner tighten the nut a further **1/4 TURN** only.

9. At the high pressure end of the capillary, carefully cut the fused silica tube flush with the end of the 1/4 inch stainless steel tube. Ensure the cut is clean and the tubing has not been crushed.

10. You will now need to leak check the inlet, see Leak Checking before refitting the oven lid.

7.3 Replacing the Orifice Disk

Before carrying out ANY operations that involve the orifice disk, take precautions to prevent contact with any hazardous substances that may have been sampled.

Allow all parts of the inlet and oven to cool before commencing.

You may need to replace the orifice if it becomes blocked or, more likely, you wish to fit a different size orifice in order to monitor an environment operating at a different pressure.

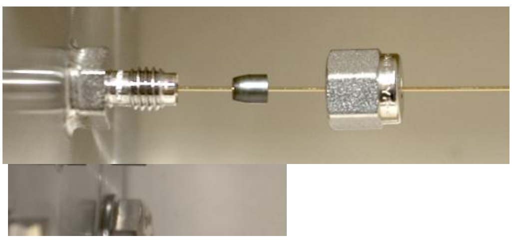
The orifice is a small disc, with a number of holes in it, which is fitted into a holder machined into the CF flange.
The inlet flange is mounted on the end of the quadrupole vacuum chamber opposite to the analyser flange. The flange is held in place by eight M8 stainless steel bolts.
The analyser in your Cirrus will almost certainly be fitted with a PVD source, so there will be a ceramic coupling which mates with the gas inlet tube on the top of the analyser. You may wish to remove this to get easier access to the orifice holder, although it is not essential.

1. Shut down the Cirrus by following the instructions in Shutting Down then disconnect from the mains supply. Remove the outer cover.

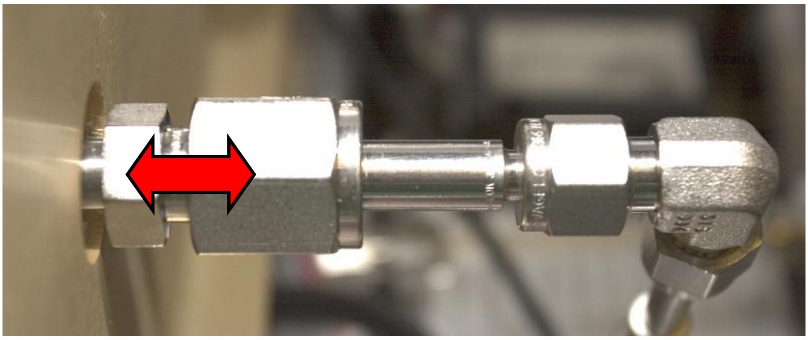
2. Disconnect the high pressure end of the capillary from the gas source. If there is a shut off valve remember to close it.

3. Remove the oven lid.

4. In the oven compartment, use a 5/16 inch spanner to undo the nut on the inlet flange and slide it, and the ferrule, along the fused silica tube towards the front of the oven.



5. Using both a 5/8″ and ¾″ spanner, separate the bypass joint on the cold side of the oven.

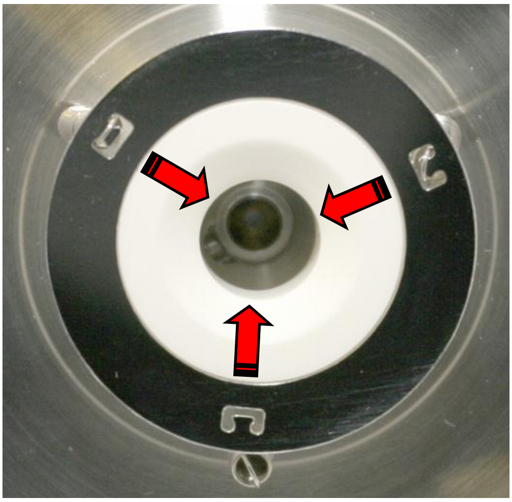


6. Using a ½″ spanner, remove the eight bolts which secure the CF inlet flange to the vacuum chamber. Gently free the inlet flange from the chamber and slide out the bypass line through the oven wall.

You can now see the ceramic coupling, which sits over the PVD inlet of the quadrupole.

In order to use the orifice disk insertion and removal tools, this coupling must be removed from the inlet flange.

7. Remove the springs from the retention plate, by pushing them towards the centre of the inlet.



8. Remove the retaining plate and ceramic coupling from the inlet flange.

The ceramic coupling and retaining ring are held in place on the inlet flange by three springs fixed to threaded grub screws. The grub screws are then screwed into the flange.

Once all three springs have  been removed we can proceed to remove the orifice disk using the removal tool.

7.4 Orifice Disk Tools

Orifice disk insertion and removal tools are supplied as part of the Cirrus toolkit. Do not attempt to remove or insert an orifice disk without using these tools. If they are missing from your toolkit, please contact you local MKS Spectra facility for replacements.

Clean each tool before use using IPA.

Tool Guide

The "Tool Guide" is fixed to the inlet flange using the three screws supplied, replacing the ceramic coupling assembly, and acts as the name suggests, as a guide for either the removal or insertion tools.

Removal Tool

The removal tool has a smaller diameter head than the insertion tool, this is to deform the orifice disk and allow easy removal from the tapered hole into which the orifice disk is fitted.

Insertion Tool

The insertion tool has a head slightly less in diameter than the orifice disk itself, and is used to fit the orifice disk into the tapered hole.

7.5 Fitting the Tool Guide

Fit the Tool Guide to the inlet flange using the three screws supplied.

7.6 Removing the Orifice Disk

Insert the Removal Tool into the guide and push the tool into the orifice disk. Press firmly until the tool bottoms against the guide.

Remove the tool and Tool Guide and remove the Orifice Disk from the flange.

DO NOT RE-USE THE ORIFICE DISK

7.7 Fitting a new Orifice Disk

Ensure you have purchased the correct size orifice disk, which should be a 15 Micron, 4-hole array.
P/N. 800010079

Keep the disk in its original packaging until needed.

Do not handle the Orifice Disk, use tweezers gently as not to deform or scratch the disk.

Offer the new disk to the tapered hole in the inlet flange, this should be done with the Tool Guide removed, as the disk needs to be offered as squarely as possible to the hole to avoid fouling.

Without disturbing the new Orifice Disk, carefully re-fit the tool guide to the inlet flange.
Once the guide is secured, check again that the new Orifice Disk is lying squarely in the tapered hole. If not, it must be re-positioned.

Use the Insertion Tool to push the Orifice Disk into the tapered hole. Some resistance will be felt as the disk seats into position. There should be a slight gap between the shoulders of the tool guide and the insertion tool.

Once the disk has been pushed fully home, remove the Insertion Tool and Tool Guide.

Inspect the orifice disk for correct seating, with no gaps visible around the disks edge.

Note: The disk will be slightly cupped after correct fitting.

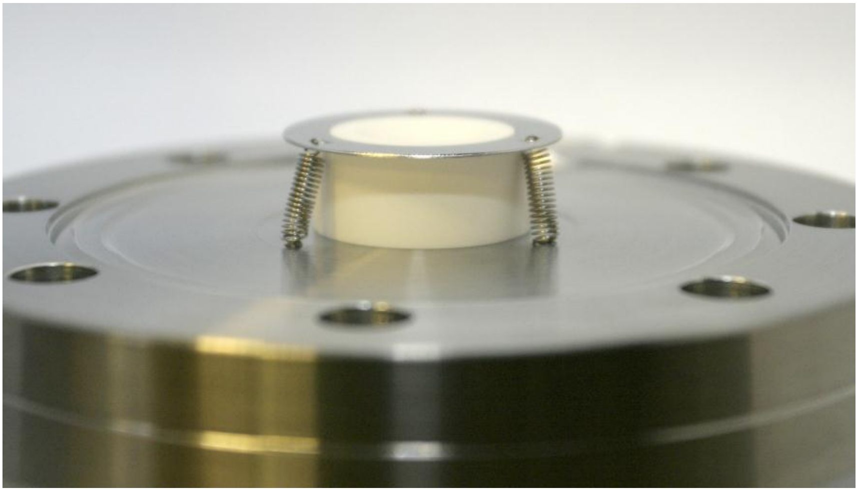
7.8 Re-assembling the Inlet Flange

1. Re-fit the springs to the Inlet Flange, ensuring that they are not cross-threaded and inserted until the uppermost face of the grub screw is flush with the face of the Inlet Flange.

2. Secure the Retaining Ring by using two of the three springs.

3. From the side without a spring fitted, slide the Ceramic Coupling under the Retaining Ring, paying attention to the couplings orientation, which should be with the shouldered face uppermost.

4. Once the Ceramic Coupling is in place, check that the Retaining Ring is seated correctly around the shoulder of the Ceramic Coupling.



5. Clean all handled parts with a suitable solvent and re-fit the Inlet Flange to the chamber using a new copper gasket, by firstly sliding the bypass connection through the oven wall and then carefully locating the Ceramic Coupling over the PVD ion-source of the quadrupole.

6. Re-fit and tighten the eight M8 bolts to secure the Inlet Flange to the chamber.
7. Re-connect the bypass line and tighten up the connectors.
8. Re-start the Cirrus and perform a leak check before re-fitting the oven lid and outer cover.

8. Analyser Maintenance (PVD and Open Source)

Before carrying out ANY operations that involve the analyser, take precautions to prevent contact with any hazardous substances that may have been sampled.

Allow all parts of the inlet and oven to cool before commencing.

8.1 Overview

The quadrupole analyser is the front end of your mass-spectrometer, it produces electrical signals which, when presented to your electronics, display the contents of your vacuum chamber in a meaningful fashion.

The analyser can be broken down into four separate areas by virtue of their function.

1. The ion source or ioniser
This is located at the top (furthest from the flange) of your analyser and its function is to take a representative sample of molecules and atoms from your vacuum chamber, convert them into ions and present them to the quadrupole filter.

2. The quadrupole filter
This is the centre section of your analyser. Its function is to take the ion beam generated in the source and separate the various ions by their mass to charge ratio (m/e) and present the single selected m/e to the collector.

3. The detector
This area of your quadrupole analyser is "hidden" inside the flanged housing. Its function is simply to convert the filtered ion beam presented by the quadrupole filter into a small electrical current, which can be passed to the electronics for amplification and subsequent display to the outside world.

4. The flanged housing
This is the only part of your analyser that you will see under normal operating conditions. Comprising of an industry standard 2.75" Conflat® flange with an electrical feedthrough, which carries the various supplies and signals to and from the quadrupole analyser.

All quadrupole analysers require periodic maintenance, the regularity of which is determined by its use. The cleanliness of the vacuum, hours of operation and the type of sample being analysed all have an effect on the analyser's performance.

Apart from these considerations there are times when the analyser will require maintenance and these are when accidents happen i.e. the vacuum is vented with the filaments on, or someone forgets to turn on the water cooling for the oil diffusion pump.

Routinely there is only one area of the analyser that requires any maintenance, this is the ion source. The ion source contains two filaments, only one of which will be in use at any one time. The filament is heated to approximately 2000 deg K at which temperature it emits electrons, which are used to produce the ions required by the quadrupole filter. At this high temperature, there are two deleterious effects.
The filament material slowly evaporates and condenses upon the surrounding surfaces. This effect is extremely slow but would require, from time to time, the cleaning of the surrounding source plates and ceramics and the replacement of the filaments.

The second effect is similar to the first except that the vacuum, under which the source is operating, has either a high oxygen or water content. Then instead of metal being deposited upon the surrounding source plates, layers of metal oxides are deposited. Being insulators, these have a far more noticeable effect upon the performance of the source and therefore a more frequent cleaning program should be adopted.

CAUTION

THE QUADRUPOLE'S FILTER IS ACCURATELY ALIGNED BY SKILLED PERSONNEL USING SPECIALIST TOOLS AND JIGS.

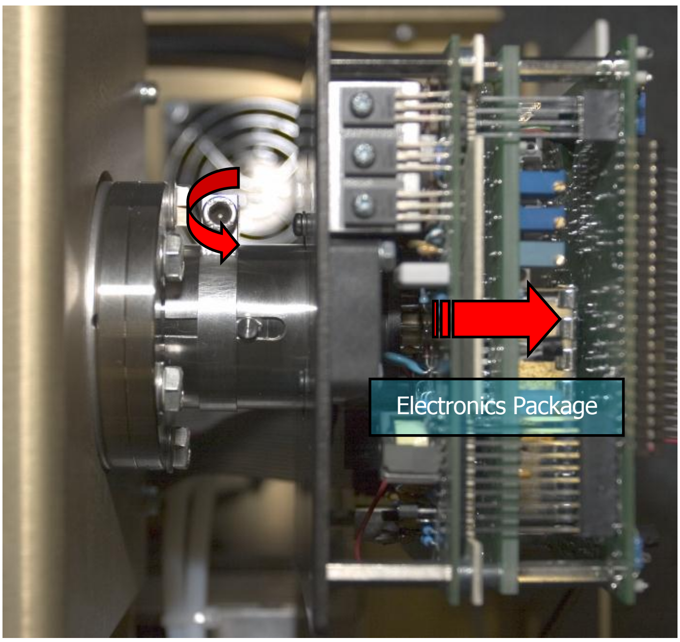
UNDER NO CIRCUMSTANCES SHOULD THE FILTER ASSEMBLY BE DISMANTLED.

IF YOU ARE IN ANY DOUBT WHEN SERVICING YOUR ANALYSER, PLEASE CONTACT YOUR LOCAL SERVICE CENTRE.

8.2 Removing the Analyser

Ensure the Cirrus is disconnected from the mains supply, the turbo has stopped and the oven has had adequate time to cool.

1. Slacken the locking ring using a suitable sized Allen key.



2. By holding the front panel of the Electronics Package, carefully slide it free of the analyser.

3. Make a note of the orientation of the analyser with respect to the vacuum chamber. Use the locking pip on the analyser flange as a reference (it will usually be in the 12 o'clock position).

4. Remove the six M6 bolts and washers which fasten the CF35 flange of the analyser to the vacuum chamber.

5. Carefully withdraw the analyser from the vacuum chamber. Leave the old copper gasket in place until you are ready to fit the new one, it will help protect the knife edge from accidental damage.

Analyser maintenance is fully described in the next section.

8.3 Refitting the Analyser

1. Note the gas inlet tube on the top of the analyser (if it is fitted with a PVD) source. Look into the vacuum chamber and note the ceramic socket which the gas inlet tube must mate with when you re-fit the analyser.

2. Clean, using a suitable solvent, and dry the new copper gasket then slip it over the analyser in place of the old one.

3. Carefully, insert the analyser into the vacuum chamber trying not to let the leads touch the wall of the vacuum chamber. Make sure the gasket does not slip out of its slot as you push the flanges together. Make sure that the gas inlet tube on the top of the analyser mates with the ceramic socket.

4. Rotate the analyser flange so that it is in the correct orientation.

5. Bolt the flanges together remembering to tighten opposite bolts equally.

6. Carefully re-fit the Electronics Package, not forgetting to re-tighten the locking ring.

7. Perform a leak check of the system

8.4 Ohmmeter analyser checks

There are a number of circumstances when carrying out some simple checks with an ohmmeter can be worthwhile. If you suspect a failed filament or want to check for shorts following some maintenance, performing some simple checks can save a great deal of time.

In carrying out these checks, we can legitimately accept two ranges of meter readings as possibly acceptable and anything outside these ranges as being a definite fail. Any readings less than 1 ohm we can take as a short and any reading above 5 Meg Ohm ($5x10^6$ ohms) as being open circuit. The following assumes that the analyser is still on the vacuum system and goes through all the possible tests.

Tools required: Ohmmeter with leads

Please refer to Page 34 for analyser pin numbers.

1. Attach a meter lead to pin 1 of the analyser feedthrough.

2. Connect the other lead to the analyser flange, you should read a short circuit. If not, you have either a serious problem, or more likely a faulty meter/meter leads. If after checking your meter, an open circuit still exists, contact your nearest MKS Spectra service center for advice.

3. Move the lead from the flange and connect to pins 2 to 12 on the analyser feedthrough in turn. Each one should give an open circuit. If not, you have a short to earth.

There are two types of short to earth, an internal short between one part of the analyser and an earthed part of the analyser, or more commonly, a short between part of the analyser and the vacuum chamber.
In either case, remove the analyser from the vacuum chamber and repeat the test. If the result is the same, then you have an internal short and should contact your local MKS Spectra facility for advice.

Otherwise, you have a short to the vacuum chamber, check the dimensions of the vacuum chamber around the quadrupole analyser, or try refitting the analyser in a slightly different orientation.
Repeat the ohmmeter test before pumping down the vacuum chamber. Remember that the ion source gets very hot during operation and the stainless steel components will expand slightly. Sometimes a short will only develop when the analyser has been run for a while and is up to temperature.

4. Move the meter lead from pin 1 and attach it to pin 2 of the analyser feedthrough. Connect the other lead to pins 3 to 12 on the analyser feedthrough in turn. Each one should give an open circuit. Now move the meter lead from pin 2 to pin 3 and check to pins 4 to 12. Proceed around the feedthrough until all possible connections have been checked.
All the pins should show an open circuit to all other pins, EXCEPT pin 4 to pin 8 and pin 8 to pin 10, which should show short-circuit as these are the filament connections.

If any of the pins read short-circuit to another pin, contact your local MKS Spectra service center with the results of your tests and they will advise you how to proceed.

8.5 Checking filaments

Filament status is constantly monitored by the control unit and the operating software. This is achieved by measuring the flow of electrons emitted by the hot filament, referred to as the emission current, flowing to the ion source cage.
This is normally maintained at a fixed value of 1mA. The current flow through the filament is increased until the value of emission current is reached. If, however, the control electronics reaches the limit of its filament current supply capability and the emission current has still not reached 1mA, a filament fail condition will exist.

In the vast majority of cases, this will be due to a blown filament, more correctly described as an open circuit filament. There are other conditions, such as a heavily contaminated ion source, which will result in a filament fail condition when the filament is not open circuit.

If you suspect a blown filament, carry out the following test before removing the analyser from the vacuum system.

Connect meter lead one to analyser feedthrough pin 8, which is the common connection to both the filaments.
Connect the second meter lead to pin 4 (Filament 1). You should read a short-circuit.

Now connect the second meter lead to pin 10 (Filament 2), again your meter should indicate a short-circuit.

If either or both filaments are blown, the meter will indicate an open-circuit and the filaments will need to be replaced.

If the meter reading suggests that the filament is good but the control unit shows a filament fail, the most likely cause would be a break down in electrical continuity.

Ensure that the face of the analyser connector housing on the control unit butts up to the analyser flange.
Examine the RF/analyser connector on the front of the control unit and check that none of the gold sockets are pushed out of place.

8.6 Changing filaments

The analyser is fitted with dual filaments mounted on a single plate. Changing filaments is the most common maintenance event with quadrupole analysers. For this reason, the MKS Spectra analyser has been designed to make this task as quick and easy as possible.

Below is a list of the tools and equipment you will require. We recommend that you assemble the following items before you start. Remember that the instrument is supplied with a tool kit that contained some of the things you will need.

small jewelers screwdriver (2mm)
pair of tweezers
small pair of smooth jawed needle nosed pliers
pair of clean cotton gloves
clean bench on which to work
Ohmmeter
clean container in which to put small parts
replacement filament
a method of holding the analyser securely in an upright position, (a small bench vice is ideal).
pen and paper on which to make notes and sketches

Refer to the exploded views of the Filament Plate shown on Page 36 (open) or 39 PVD).

8.6.1 Removing the filaments

1. Remove the analyser from the vacuum system making sure that you do not touch the exposed internal surfaces and place it on the bench in an upright position.

2. The filaments are located on the very top of the analyser and are retained by two M2 x 4 pan head screws (Item 3). The electrical connections are made via three barrel connectors (Item 2), one to each filament and one to filament common.

3. Hold one of the barrel connectors firmly with your pliers and slacken the outermost screws (Items 1 and 6) until the barrel connector can be removed from the filament plate and the connecting lead.

4. Repeat the above for the other two barrel connectors.
5. Remove the two M2 x 4 pan head screws that hold the filament plate in place and remove the filament plate assembly. Carry out this step carefully so as not to damage the Source Cage.

6. Remove the Filament Screen (Item 5).

It is worthwhile at this stage to see if the source requires any attention, especially if the filament(s) have broken because of an over pressure situation in your vacuum system.
With the filaments removed you have a clear view of the source cage. The signs to look for are powdery deposits, these will vary in colour but may be brown, blue, canary yellow or white depending upon the precise circumstances which led to their formation.
If these oxides are present, it is recommended that you refer to the section on source removal and cleaning before proceeding, see Section 7.5.

8.6.2 Fitting new filaments

The fitting of new filaments is simply the reversal of the procedure for removing them. Care should be taken at all stages to ensure that no shorts are introduced and that the analyser is kept clean.

1. Place and align the new Filament Screen on the source plate mounting posts.

2. Using tweezers, carefully offer the filament plate onto the mounting posts. Be careful not to touch the source cage with either filament. There is no orientation of the filament plate required, except that the mounting holes line up with the mounting posts.

3. Re-fit the two M2 x 4 pan head screws through the filament plate and filament screen and tighten securely. Do not over tighten.

4. Re-fit each barrel connector in the same orientation as removed, sliding each barrel connector over the connecting lead and filament post and while holding the barrel connector firmly with pliers, tighten all screws.

5. Before re-fitting the analyser to your vacuum chamber, carry out Section 7.2 to check for any short circuits.

6. Replace the analyser into your vacuum housing and again check for shorts or grounding to the outer vacuum housing.
You are now ready to pump down and continue the operation of your quadrupole.

8.7 Ion Source cleaning

Sometimes it is possible to clean the ion source without removing it from the analyser. For the user who has the necessary equipment available including a means to suitably dry the analyser, it is usually worth trying this method before removing or replacing the ion source.
However, it is likely only to be successful where the source is contaminated with loose or alcohol soluble deposits.
Below is a list of the tools and equipment you will require. We recommend that you assemble the following items before you start. Remember that the instrument is supplied with a tool kit that contained some of the things you will need.

Small jeweller's screwdriver (2mm)
Pair of tweezers
Small pair of smooth jawed needle nosed pliers
Pair of clean cotton gloves
Clean bench on which to work
Ohmmeter
Clean container in which to put small parts
Ultra-sonic bath
Measuring cylinder
Iso-propyl-alcohol
Some method of holding the analyser securely in an upright position (a small bench vice is ideal).

Remove the analyser from the vacuum chamber and place it on the bench in an upright position (the use of a small bench vice is recommended), remove the filaments as described in Section 8.6.1 .

Insert the analyser into the measuring cylinder so that the knife edge side of the flange rests on the lip of the cylinder. Note the level which the ion source comes to on the measuring cylinder before removing the analyser and filling the measuring cylinder with sufficient iso-propyl-alcohol to cover the ion source.
Note: the measuring cylinder should be of a diameter and length to accommodate the analyser.

Put the measuring cylinder into the ultra-sonic bath for 10 to 15 minutes.

Remove the analyser and allow any excess alcohol to drain off. Keep the analyser inverted (feedthrough upper most) until it is dry. <u>Do not let any alcohol run down the analyser into the flange assembly,</u> as this will seriously damage the multiplier.

Check the condition of the ion source. A second or third wash may be required.

Note: The ultra sonic bath may loosen some of the screws in the ion source, take care not to throw these away when discarding the alcohol.

The analyser must be dried of cleaning solution before it can be used. We recommend the use of a clean oven for this purpose. The oven should be set at 80 deg. C and the analyser baked for at least two hours.

Note: Check the documentation on your cleaning solution for guidelines on handling the substance and any fire or explosion risks involved.

After the bake period, check all the screws in the ion source are tight and re-fit the analyser to the vacuum chamber.

A further bake under vacuum will be required to drive off any remaining residue.

8.8 Cleaning or replacing the ion source

The analyser design permits the removal of the ion source as one complete assembly, which can be replaced or dismantled for cleaning.
The ion source automatically aligns on the main analyser assembly allowing easy replacement without the need for special jigs.

Below is a list of the tools and equipment you will require. We recommend that you assemble the following items before you start. Remember that the instrument is supplied with a tool kit that contained some of the things you will need.

Small jeweler's screwdriver (2mm)
Pair of tweezers
Small pair of smooth jawed needle nosed pliers
Pair of clean cotton gloves
Clean bench on which to work
Source alignment jig
4 Pieces of straight clean wire (NOT tinned or insulated) 1mm x 25mm
Ohmmeter
Clean container in which to put small parts
Replacement filaments
Replacement source parts if necessary
Set of replacement ceramics is highly desirable if none are cracked and essential if any are broken
Some method of holding the analyser securely in an upright position, a small bench vice is ideal.
Pen and paper on which to make notes and sketches
Refer to the exploded views of the Analyser shown on Page 35.

8.8.1 Removing the ion source

1. Remove the analyser from the vacuum system, place it on the bench in an upright position (holding the analyser in a small bench vice is recommended) and remove the filaments as described in Section 7.4.1.

2. Loosen the three M2 x 4 that secure the three insulated wires that run from the analyser flange assembly to the Source, Repeller and extractor plates and slightly bend the wires out of the way.

3. Remove the four M2 x 4 screws (Item 2) that hold the source assembly to the filter assembly and carefully withdraw the source assembly from the filter.

8.8.2 Dismantling the source assembly

Before proceeding with this section, please ensure that you have the correct <u>Source Alignment Jig</u> and spare ceramics and screws available.

Refer to the exploded views of the Source Assembly shown on Page 37 (Open) or 40 (PVD).

1. Carefully unscrew the four M1.6 x 8 screws (Item 1) and withdraw them from the assembly.

2. Using tweezers, remove the four ceramic washers (Item 3), if undamaged keep in a safe, clean place ready for the re-assembly.

3. The Repeller Plate (Item 4) can now be removed from the mounting ring.

4. Using tweezers, remove the four ceramic washers (Item 3) and the four ceramic tubes (Item2), if undamaged keep safe as before.

5. The Source Plate (Item 5) can now be removed from the mounting ring.

This is normally as much as you will need to dismantle for cleaning or replacing source components. The Extract plate does not usually require service, as it is furthest away from potential contamination. However, if you wish to remove the Extract Plate, see the exploded view on Page 38.

8.8.3 Source Re-assembly

Refer to the exploded views of the Alignment Jig shown on Page 41 and the Source Assembly shown on Page 37 (open) or 40 (PVD).

1. Place the source alignment jig flat on the bench and slide in the source mounting ring, aligning the extract plate's barrel connector with the alignment mark on the jig.

2. Insert each of the four lengths of wire into the four castellations, which will hold the ceramic parts in place while the source assembly is rebuilt.

3. Slide one ceramic tube (Item 3) down each of the wires and then a ceramic washer (Item 4).

4. Orientate the source plate so that the largest circular cutout is above the extract plate's barrel connector and carefully slide it down the wires and over the ceramic tubes.

5. Place one ceramic washer over each of the exposed ceramic tubes.
6. Orientate the repeller plate so the circular cutouts align with the two visible barrel connectors and slide it down the wires over the ceramic tubes and onto the ceramic washers.

7. Place one ceramic washer over each of the exposed ceramic tubes.

8. Carefully remove one of the wires and replace with a M1.6 pan head screw (Item 2) and the M1.6 stainless steel washer (Item 1), which should be screwed down but not tightened, repeat this for the remaining three wires.

9. Check that all the plates and ceramics are seated properly before tightening the screws fully. Be careful not to over-tighten, as this will damage the ceramic spacers.

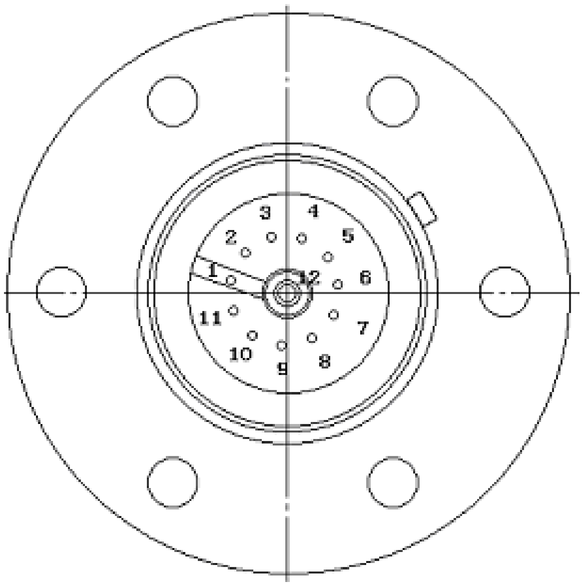
10. Push out the completed source assembly from the jig and place it on a clean, non-conducting surface. Using an Ohmmeter, check that there are no short circuits present between any of the three plates or the source mounting ring.

If any shorts are discovered, correct them before continuing.

11. The filament plate can now be re-fitted and the remaining connection made.
Once again, check all connections with an Ohmmeter before returning the analyser back to the vacuum chamber.

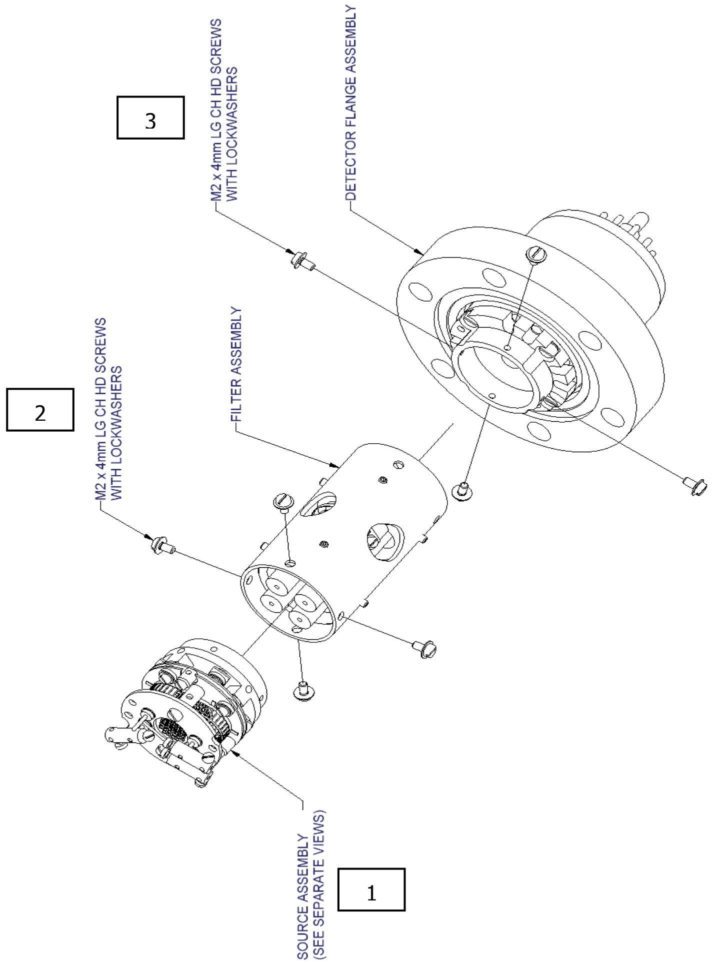
9. Exploded Views

9.1 Analyser Flange pin-outs



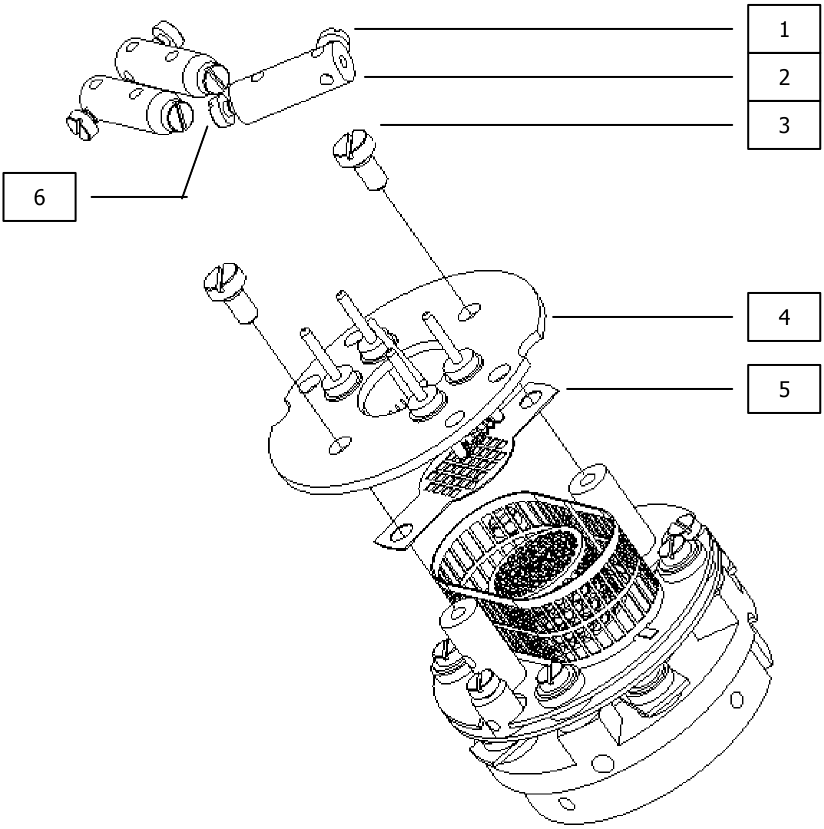
Pin Descriptions	
Pin	Connection
1	Earth
2	Source plate
3	Electron Multiplier
4	Filament 1
5	Extraction plate
6	Suppressor plate
7	RF.1
8	Repeller plate / filament common
9	No connection
10	Filament 2
11	RF.2
12	Collector

9.2 Exploded view of the Analyser (Open ion-source shown)



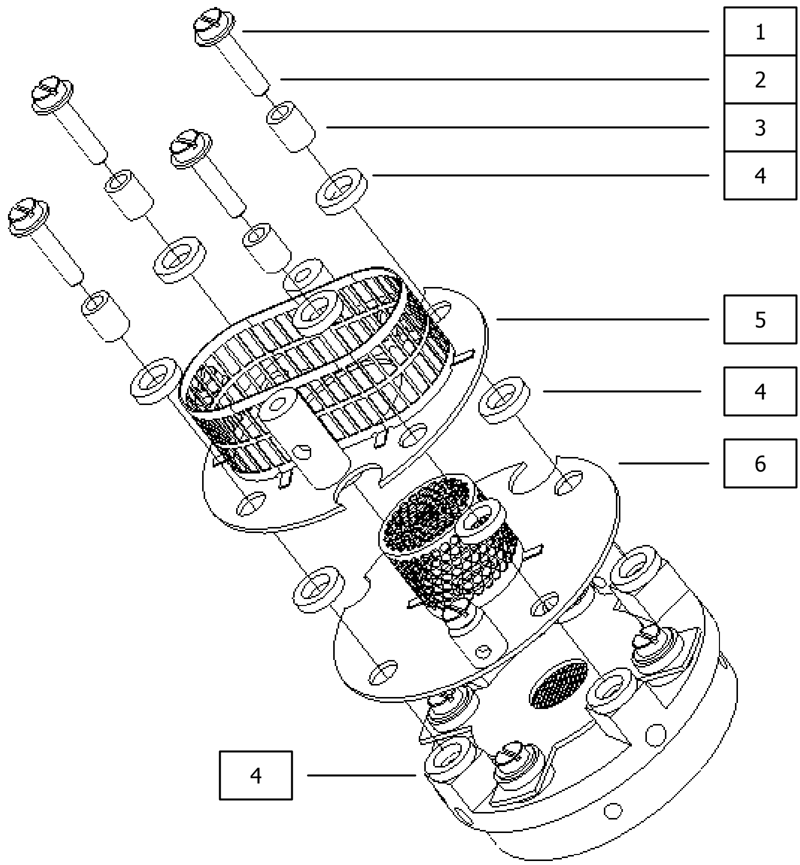
Item	Description (Dimensions in mm)	Part Number
1	Source Assembly Tungsten Fils	842-021
1	Source Assembly Thoria Fils	842-022
1	PVD Source Assembly Tungsten Fils	842-045
1	PVD Source Assembly Thoria Fils	842-047
2+3	Screw M2 x 4	200902004

9.3 Filament Plate (open ion-source)



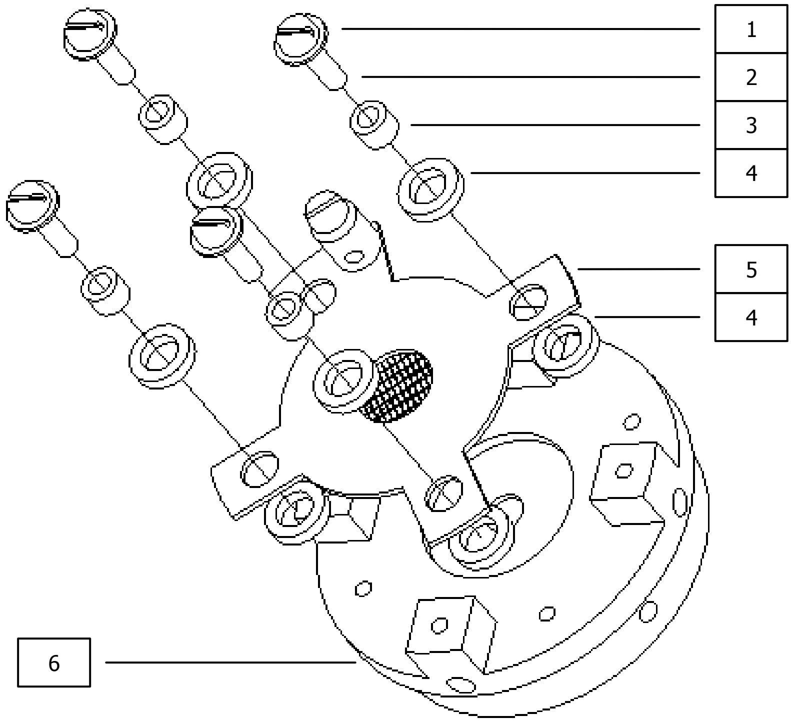
Item	Description (Dimensions in mm)	Part Number
1	Screw M1.6 x 3 (3 off)	200901603
2	Barrel Connector	305040214
3	Screw M2 x 4	200902004
4	Filament Plate Tungsten Fils	LM508-015PL
4	Filament Plate Thoria Fils	LM508-020PL
5	Filament Screen	305080594
6	Screw M1.6 x 4 (3 off)	200901604

9.4 Source Assembly (open ion-source)



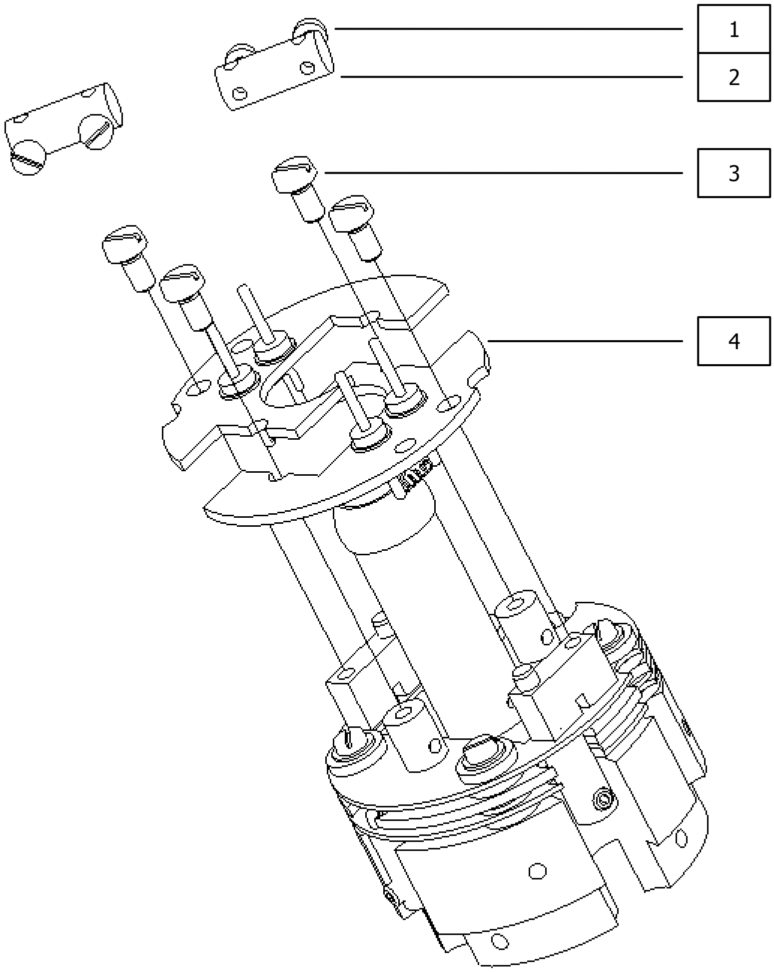
Item	Description (Dimensions in mm)	Part Number
1	Plain Washer SS M1.6	27031600
2	Screw M1.6 x 8	200901608
3	Ceramic Tube 2.8D x 3.5L	400020035
4	Ceramic Washer 4.7D x 1L	400010203
5	Repeller Plate Assembly	LM508-018PL
6	Source Plate Assembly	LM508-017PL

9.5 Extract Plate (open ion-source)



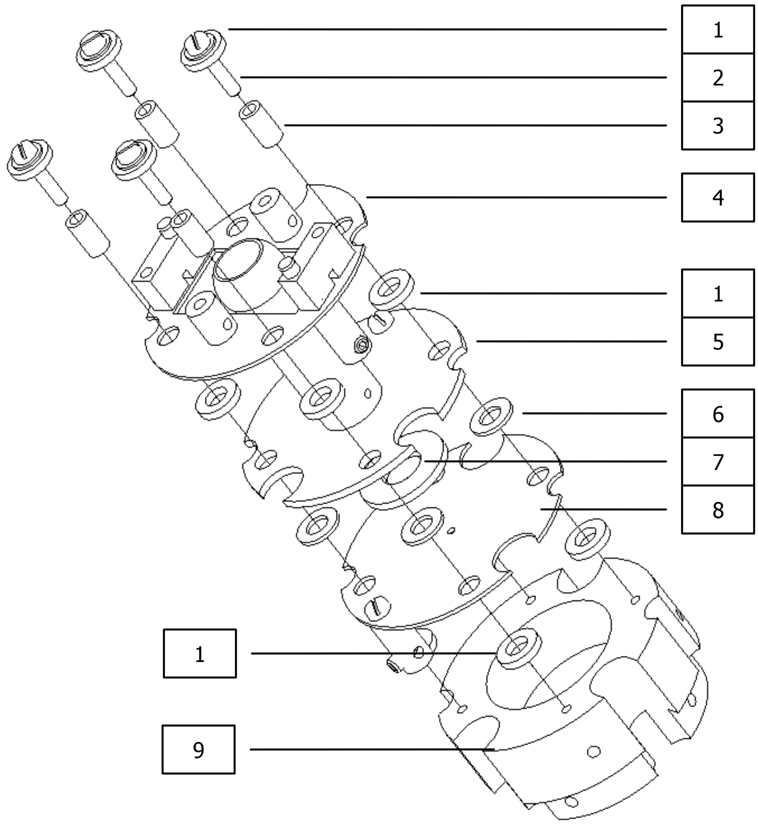
Item	Description (Dimensions in mm)	Part Number
1	Plain Washer SS M1.6	27031600
2	Screw M1.6 x 6	200901606
3	Ceramic Tube 2.8D x 2L	400020020
4	Ceramic Washer 4.7D x 1L	400010203
5	Extract Plate Assembly	LM508-016PL
6	Source Mounting Ring	305080603

9.6 Filament Plate (PVD ion-source)



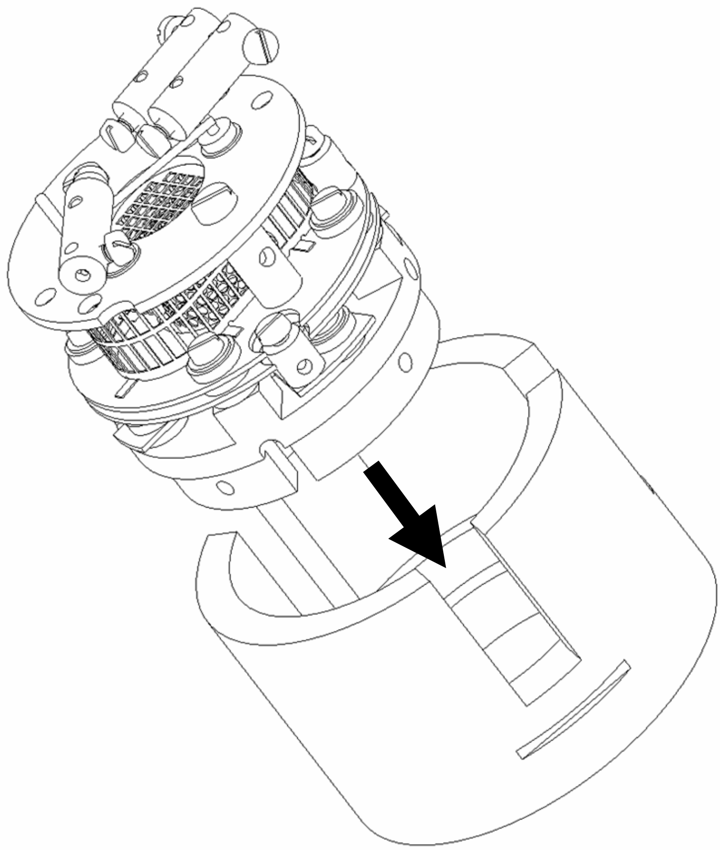
Item	Description (Dimensions in mm)	Part Number
1	Screw M1.6x3	200901603
2	Barrel Connector	305040434
3	Screw M2x4	200902004
4	Filament Plate Tungsten Fils	842-060
4	Filament Plate Thoria Fils	842-002

9.7 Source Assembly (PVD ion-source)



Item	Description (Dimensions in mm)	Part Number
1	Ceramic Washer 1.0L	400010202
2	Screw M1.6x8	200901608
-	Plain Washer for above screw	270316000
3	Ceramic Tube 5.1L	400020051
4	Repeller Plate Assembly	LM504-063PL
5	Source Plate Assembly	LM504-066PL
6	Ceramic Washer 0.5L	400010207
7	Ceramic Restrictor	400010206
8	Extract Plate Assembly	LM504-064PL
9	Mounting Ring	305040233

9.8 Source Alignment Jig (common)



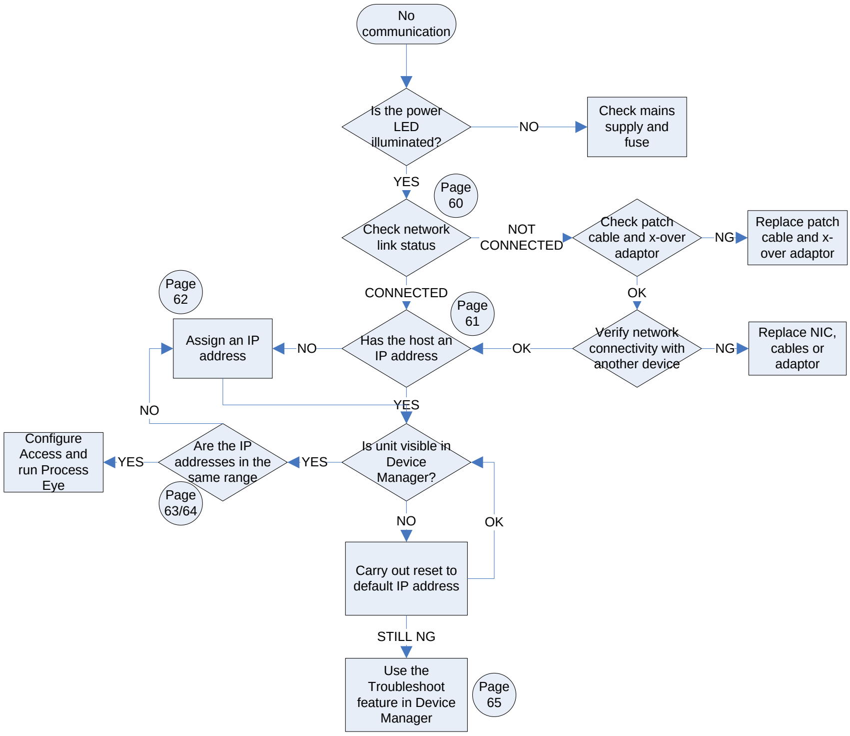
Note the orientation of the source assembly when inserted into the jig. Align the extract plate's barrel connector with the alignment indicator on the jig.

Remove the source by pushing it out from the bottom of the jig, do not pull out the source.

Item	Description (Dimensions in mm)	Part Number
1	Source Alignment Jig	842-029

11. Communications Troubleshooting

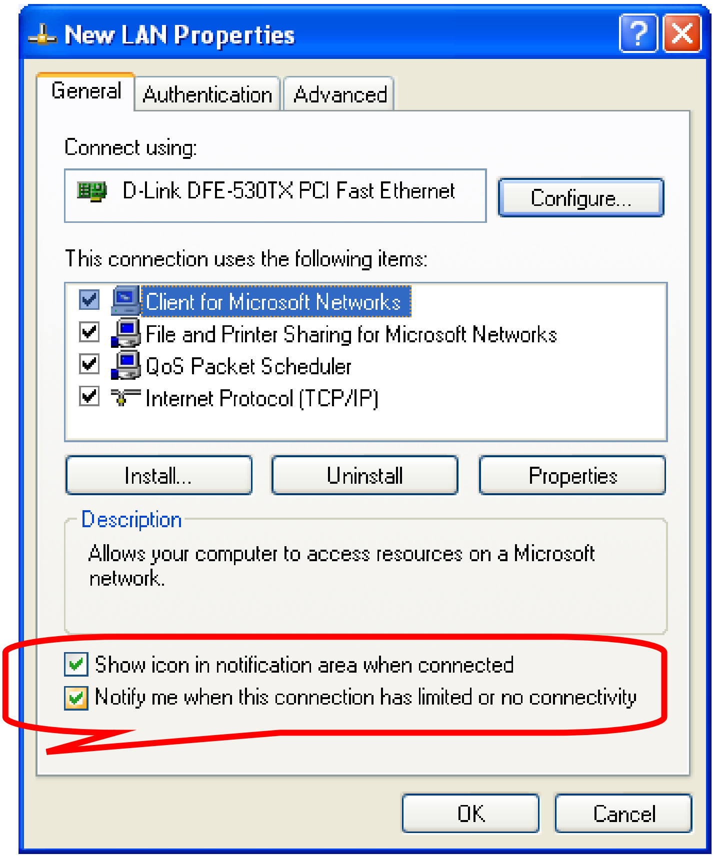
The following flowchart should help you through any connection problems you may encounter. Note that this assumes you are connecting directly from the host PC to the instrument. If the instrument is to become part of a network, then assistance should also be sought from your IT staff.



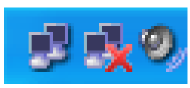
Enabling the Network Connection Notification

To aid in troubleshooting, the network status notification should be enabled. The following paragraph explains the procedure.

Open Windows Control Panel and select the NETWORK CONNECTIONS icon. Choose the network connection you are using for the link with the instrument, right-click and choose PROPERTIES.



Check the options shown above. Your network connection status is now displayed in the task-bar, near the clock. Mouse-over the icon to check the status of the connection.

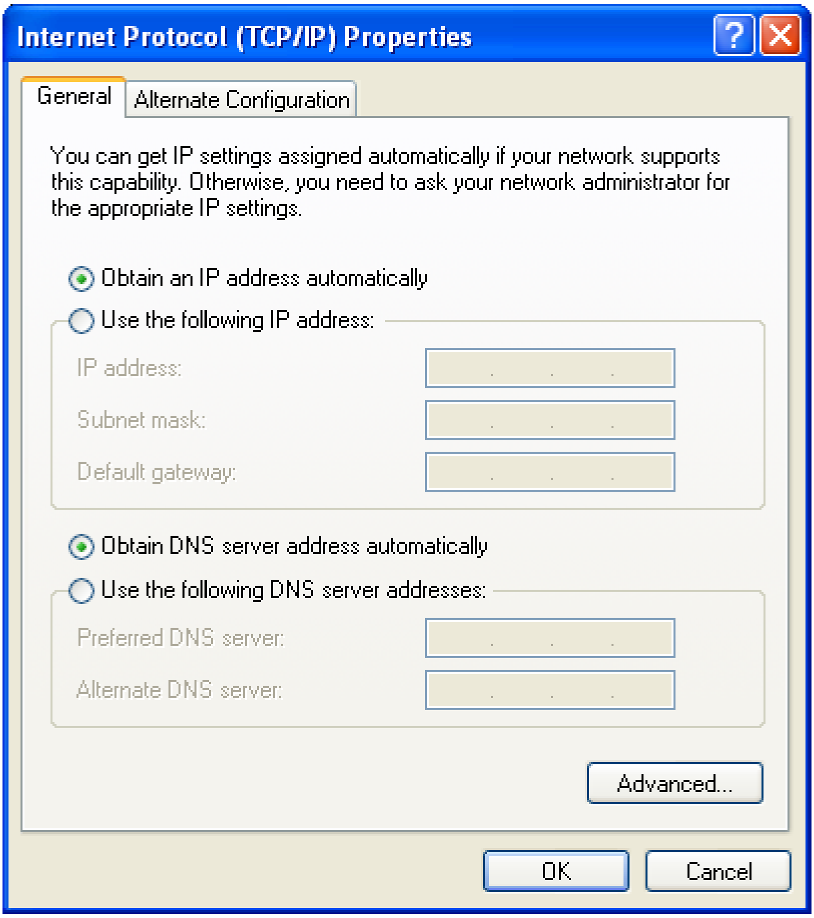


Check the IP Address of the Host Computer

Open Windows Control Panel and select the NETWORK CONNECTIONS icon. Choose the network connection you are using for the link with the instrument, right-click and choose PROPERTIES.

Highlight the INTERNET PROTOCOL (TCP/IP) entry from the list and click on the PROPERTIES button.

The following displays a computer configured for automatic IP addressing (DHCP). If you are not part of a DNCP network or intend to directly connect to the instrument, you will need to assign a static IP address.

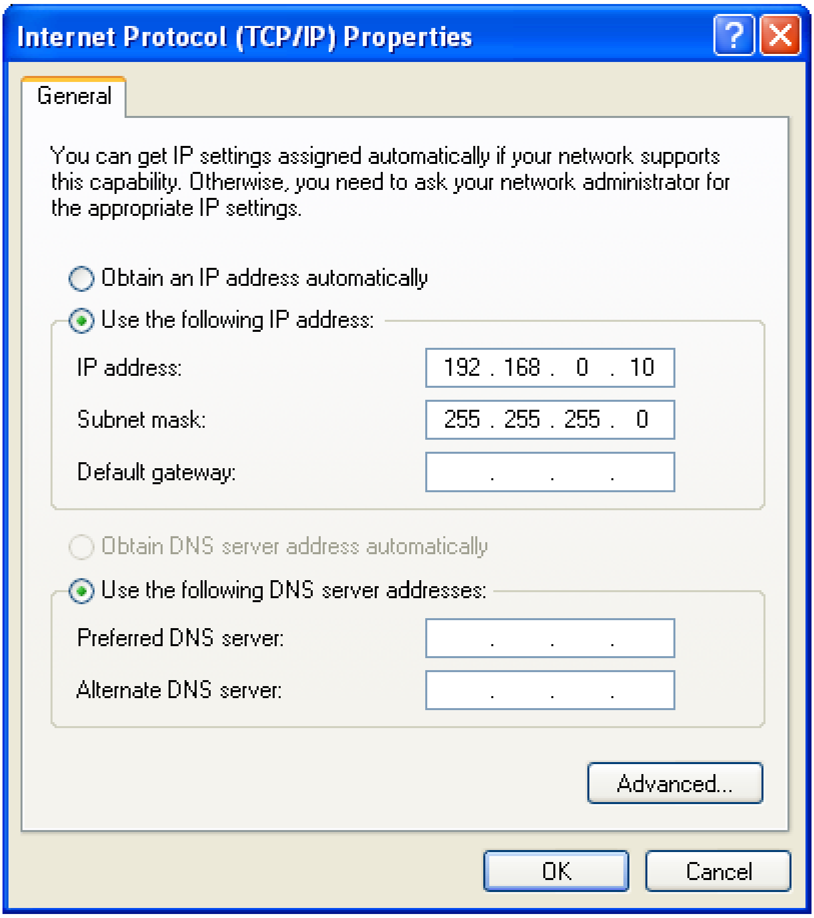


Assign a Static IP Address

Open Windows Control Panel and select the NETWORK CONNECTIONS icon. Choose the network connection you are using for the link with the instrument, right-click and choose PROPERTIES.

Highlight the INTERNET PROTOCOL (TCP/IP) entry from the list and click on the PROPERTIES button.

The default IP address of the instrument is 192.168.0.250, the host PC address needs to be in the same range, but not the same number. As you can see below, this host's IP address ends in 10, but could have been any number up to 255 excluding 250. Use the Subnet shown.

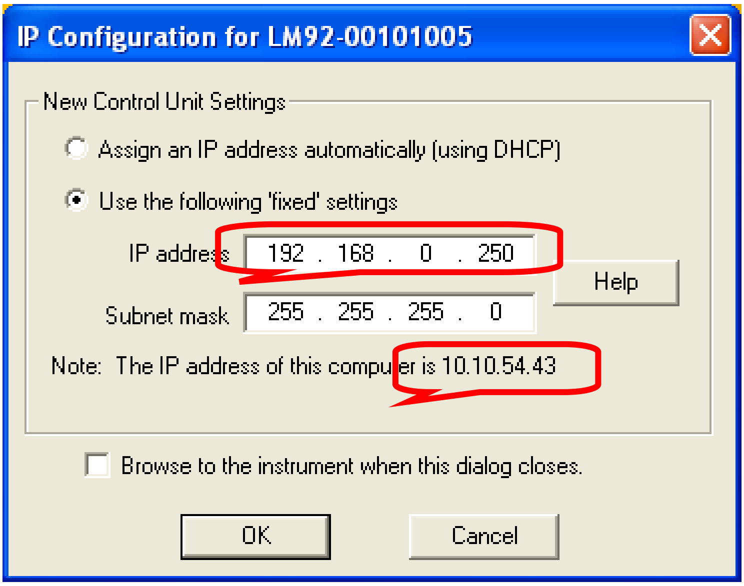


PC and Instrument on different IP ranges

You can use Process Eye's Device Manager to check on the current IP address status of both the host PC and the instrument.

Start DEVICE MANGER, highlight the instrument, click the CONFIGURE button and choose CHANGE THE IP ADDRESS from the list.

You can see in the dialog below, that the IP address of the instrument differs from the IP address of the host computer.



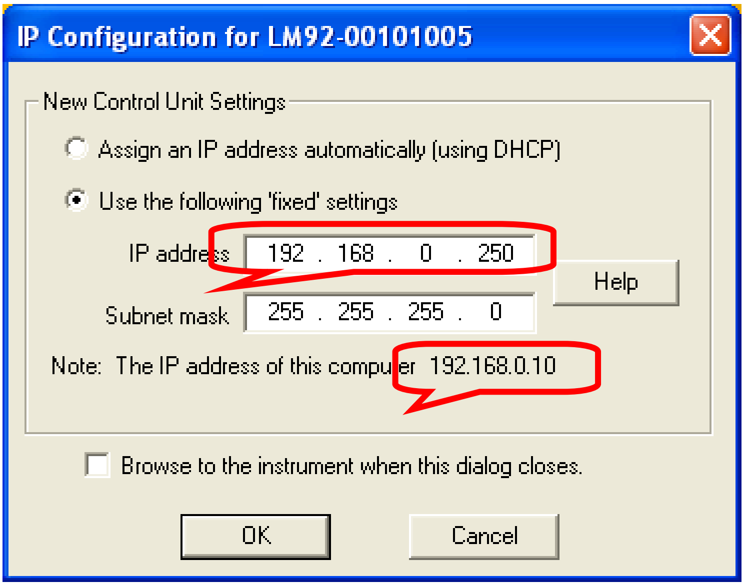
In this example, the host PC will not be able to communicate with the instrument while the two IP addresses are in different ranges.

There are two options. Change the IP address of the host PC, or change the IP address of the instrument.
To change the IP address of the instrument, overtype the current address with the new one.

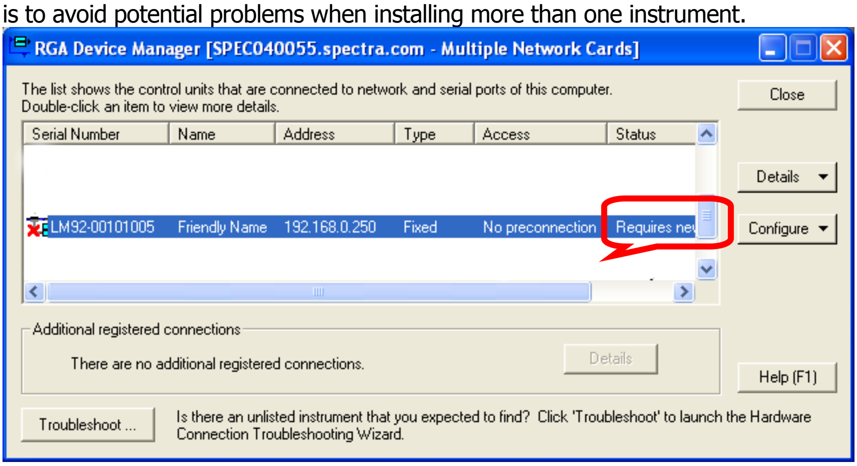
Note: If the host PC is part of your network, then changing its IP address is not recommended without seeking advice from your IT staff. Likewise, assigning a new IP address to the instrument must be done under advice or network conflicts could occur.

PC and Instrument on the same IP ranges

You can see in the dialog below, that the IP address of the instrument and the IP address of the host computer are in the same IP range.



In the above case communication between the host PC and the instrument is possible, though Device Manager will recommend you change the instruments IP address to another, not ending in .250. This is to avoid potential problems when installing more than one instrument.



Resetting the Default IP Address

To reset the instrument to its default IP address of 192.168.0.250, carry out the following procedure:

Power on the unit
Press the RESET button and immediately press and hold the PRESET button for 20 seconds.

Important:
If the instrument has been configured for DHCP, keep the PRESET button pressed for 90 seconds, or a reset will not occur.

12. Returning Your Unit for Service

If you wish to return the instrument for service, please follow these simple guidelines.

Contact your local MKS Spectra service facility to obtain a Returns Material Authorisation (RMA) number. We will require some details, such as the serial numbers, date of purchase and a detailed fault description.

Complete the relevant sections of the Health and Safety Returns Form on pages 67 and 68 of this manual.

This form MUST accompany the instrument when returned, delays in providing this completed form will lead to delays in the servicing of the instrument.

Securely package all items to be returned, using the original packaging where possible and send to the address provided by the relevant service department.

Support Contact Numbers

Europe (UK) +44 (0) 1270 250150
USA +01 408-750-0347

RETURNS FORM

Please complete the form and fax or send by first class post to the appropriate MKS Spectra facility. Fax numbers and addresses can be found on the inside front page of this manual. Please ensure that we have this information before we receive the equipment. A copy should also be given to the carrier.

FAILURE TO COMPLETE THIS FORM OR COMPLY WITH THE PROCEDURE WILL LEAD TO DELAYS IN SERVICING THE EQUIPMENT

Please Complete The Following

Our RMA number: Customer P.O. No.

Customer Bill to Address:
Company
Department
Address

City
Zip/Postal Code

Customer Return to Address (if different from above):
Company
Department
Address

City
Zip/Postal Code
User's Name: Phone No.:

Equipment Shipped
Item 1: Serial No.:

Item 2: Serial No.:

Item 3: Serial No.:

Please describe the system fault in detail:

Details of all substances pumped or coming into contact with the returned equipment.
Chemical names:

Precautions to be taken in handling these substances:

Action to be taken in the event of human contact or spillage:

I hereby confirm that the only toxic or hazardous substances that the equipment specified above has been in contact with are named above, that the information given is correct and that the following actions have been taken:

1. The equipment has been securely packaged and labelled.
2. The carrier has been informed of the hazardous nature of the consignment.

Signed: Title:

Date: Phone No.

13. Optional Hardware

13.1 Multi-stream Inlet

The Multi-stream Inlet allows the independent sampling of four or eight streams depending on the option chosen.

Connecting the sample lines

The valve is supplied with all the fittings required for connecting to 1/16th stainless steel tubing.

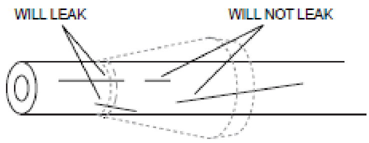


Figure 2: Scratches on tubing

Cleaning

After it has been polished, the tubing must be cleaned to remove residual metal shavings and grit from the sand paper. This is best accomplished by using a syringe or pipette to force a solvent such as methyl or isopropyl alcohol or acetone through the tubing and then drying it with clean, dry compressed air or carrier gas.

CAUTION:

Exercise good laboratory safety practices when using solvents, particularly when subjecting them to pressure.

Polymeric Tubing Preparation

Polymeric tubing should be clean, with ends cut square to the tube axis and free of external and internal burrs. Our Clean Cut tubing cutter, product number JR-797, does a good job.

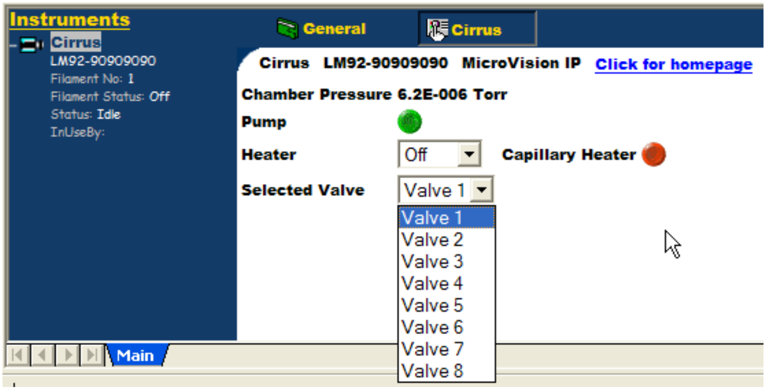
Fitting Assembly

1. Slide the nut and ferrule onto the tubing in the order shown in **Figure 1**.
2. Insert this assembly into the fitting detail, screwing the nut in two or three turns by hand.
3. Push the tubing all the way forward into the detail so that it seats firmly. This is essential for a proper Zero Dead Volume connection.
4. Manually turn the nut into the detail until it is finger tight.
5. Using the appropriate open end wrench, turn the nut 1/4 turn (90°) past the point where the ferrule first starts to grab the tubing. Fittings larger than 1/8" will require more than 1/4 turn (as much as 180°). The amount of force required can vary considerably due to the friction between the nut and the threads and the composition and wall thickness of the tubing used. Because of these variables a torque specification is unreliable.

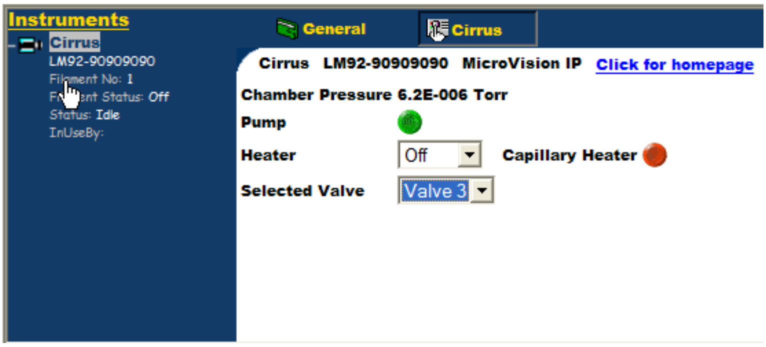
Software Operation

Control of the inlet and therefore which line is chosen for sampling is done via the Cirrus control tab.

Clicking on the "Selected Valve" pull-down opens a list of the available lines.



Here valve three has been chosen.

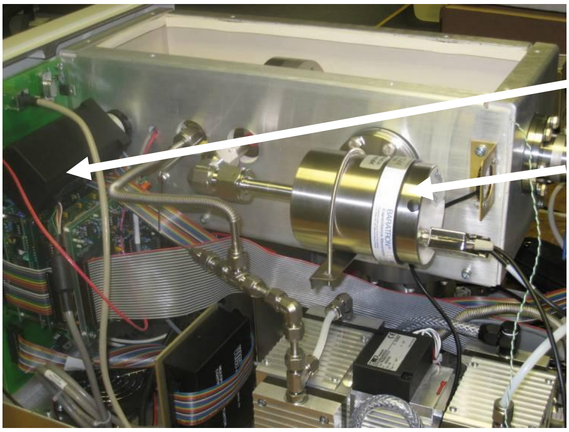


13.2 UDV

In applications where constant sample pressures across all inlet streams cannot be maintained, ion-source pressure is regulated by a Pfeiffer UDV140 Regulating Valve and RVG050C Control Unit in conjunction with an MKS Baratron gauge with a 10V output at 0.1mBar. There may be other types of gauge used in the future, so adjust your calculations accordingly.

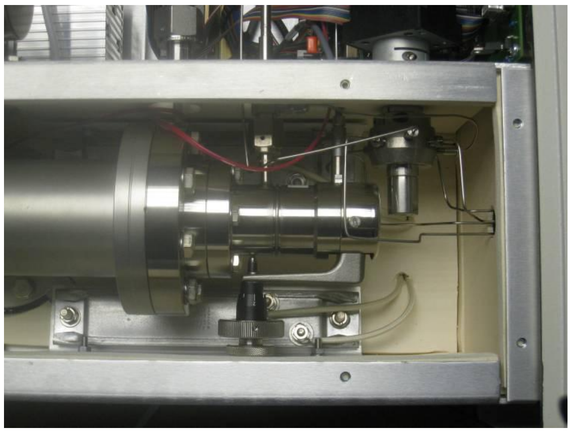
This procedure details the on-site set-up required and should be used in conjunction with the Pfeiffer Operating Manuals supplied with the UDV and UDV Controller.

Location of key components



Vicci Multi-stream valve controller

MKS Baratron gauge



Vicci Multi-stream valve

Pfeiffer UDV140

Before you begin

Ensure that the correct voltage and fuse ratings have been selected on the UDV Controller - see Operating Manual Page 16.

All connection made to sample points.

The UDV should be fully closed – DO NOT OVERTIGHTEN.

The Cirrus should be powered up and pumping, the RGA's filaments should be OFF.

Zero all front panel controls on the UDV Controller.

Connections

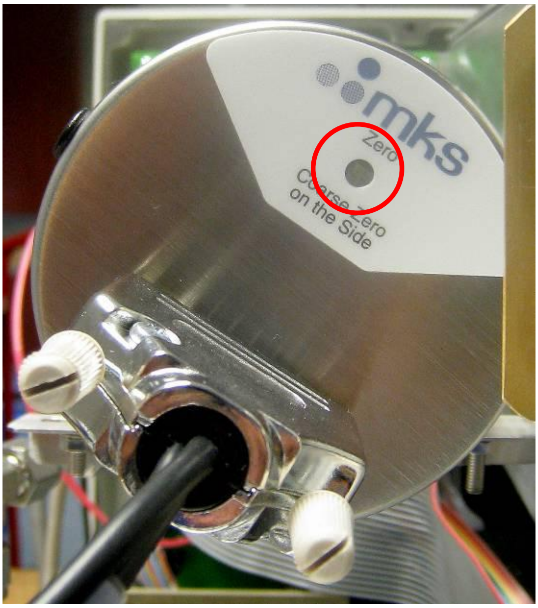
Connect the 3-core Baratron Output cable and the UDV signal cable to the sockets on the rear of the UDV Controller as shown below.

Move the Set Point switch to the INTERNAL position.
Connect a voltmeter to the RED and BLACK cores of the Baratron Output Cable.

Check Baratron Zero

Note: Allow at least 3 – 4 hours warm-up time for the Baratron to settle before moving on

With the UDV fully closed, your meter should read zero volts. If it does not, then the Baratron must be zeroed which can be done at the fine adjustment point shown below.



If a zero cannot be achieved with the fine adjustment, there is a coarse adjustment on the side of the gauge.

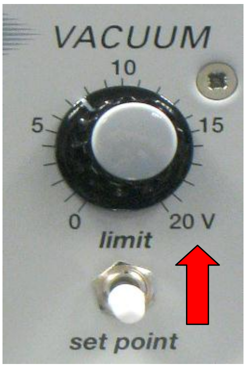
Setting the UDV - Basics

The UDV's manual valve is opened to allow a pressure of 10x the required ion-source pressure, the desired ion-source pressure is then maintained electronically by the UDV controller.

As an ion-source pressure of 5mTorr is required, open the manual valve until the voltmeter indicates 6.7V (approx 0.067 mBar). This is 10x the desired pressure.

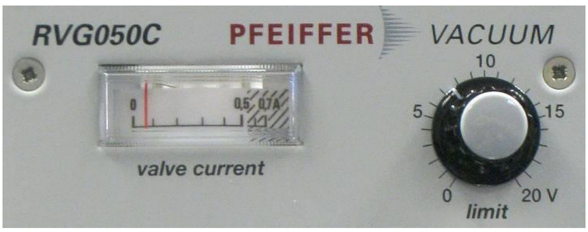
Switch on the RGA's filaments and run a Bar Chart recipe, masses 1 – 50.

Now we need to adjust the amount of current needed to fully close the valve. This process takes some time and is a critical adjustment. Simply turning the "Limit" adjustment to full current would be the same as over tightening a manual valve.



Set the switch indicated to the "Limit" position.

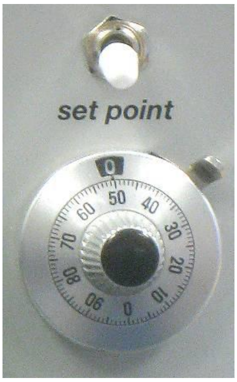
Slowly adjust the "Limit" control, while watching the "Valve Current" display, making sure that the current does not rise into the hatched area.



An easy indication of the full closure of the valve is to keep an eye on the Air peak and the voltmeter. Once the air peak has decreased to the base-line and the voltmeter reads zero, we can assume the valve is closed.

Note: You may find that you have to increase voltage slightly negative of zero for the air peak to disappear completely, if the value is small (1-5mV) then continue the set-up. If the voltage is 5mV+, then ensure the manual valve is fully closed and re-zero the Baratron before moving on.

Switch back to "Set Point"



Adjust the "Set Point" control to give a control voltage of 670mV (5mT)

After a short time, the air peak should begin to rise as the gauge opens. Once fully open, check the voltmeter for a 670mV output of the Baratron.

Check page 35 of the Operator Manual which describes the process of fine-tuning the gauge using the "Proportional Gain" and "Reset Time" adjustments.

Once correctly set-up, a sample line with a HIGHER pressure should be selected and the voltmeter checked for a 670mV output from the Baratron. If the reading from the voltmeter is higher or lower than 670mV, give the gauge more time to settle, re-check the zero point and repeat the set-up procedure.

Baking the UDV

See the UDV Manual, page 16, Sections 3.2 and 3.3 for details on when and how to bake the valve. The Cirrus chamber has a built-in heater which can be used to bake the valve at 180C, or to run the valve warm at 80C. If sampling moisture heavy compounds, you may use either temperature setting.