Vision 1000-P Manual

SP102002 Rev 2.12
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.

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EC DECLARATION OF CONFORMITY

Spectra SensorTech Ltd.
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DECLARES THAT THE FOLLOWING PRODUCTS:
LM62, LM10 VACSCAN 100
LM63, LM10, LM4 VACSCAN PLUS 100, 200
LM61, LM10, LM4, LM9 SATELLITE 100, 200, 300
LM56 MICROVISION
LM70,LM76 MICROVISION PLUS
LM77 VISION 1000P
LM78 VAC CHECK
LM80 MINILAB
ARE IN CONFORMITY WITH THE FOLLOWING EUROPEAN DIRECTIVES:

2004/108/EEC ELECTROMAGNETIC COMPATIBILITY DIRECTIVE
73/23/EEC LOW VOLTAGE DIRECTIVE AS AMMENDED 93/68 EEC

THE APPLICABLE STANDARDS ARE:
EN 61326:1998 ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL & LABORATORY USE
EN 61010-1:1993 SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL & LABORATRY USE.

SIGNED:

J.M.Higgins
GENERAL MANAGER
DATE: 7th July 2009

MKS Products provided subject to the US Export Regulations.
Diversion or transfer contrary to U.S. law is prohibited.

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) The short earthing braid supplied with some products must be fitted between the terminal on the RF head and one of the CF40 vacuum flange bolts.
4) Only cables supplied with the equipment may be used for interconnections. If extension cables are required to obtain a greater separation between control unit and RF head, or if longer serial communications cables are required, they must be supplied by Spectra SensorTech Ltd.
5) Cables attached to all other ancillary signal and control ports must have a length of less than 3 metres. If greater length is required, Spectra SensorTech Ltd must be contacted for technical guidance on possible EMC and safety issues.
6) The vacuum system on which the analyser/RF head is mounted must be earthed, to a protective earth, preferably to the same protective earth as the control unit.

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 Spectra SensorTech 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 Spectra SensorTech 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 Spectra SensorTech Ltd., unless special arrangements are made.
3) There are no user replaceable parts in the electronic equipment. Certain components are EMC and safety critical and must not be substituted. Replacement parts are available from Spectra SensorTech Ltd.
4) Equipment enclosures embody certain special fastening and bonding devices that affect EMC and safety performance. These must be correctly re-fitted after servicing.

Contents

Section 1.
Safety

WARNING

This section of the manual contains important safety information.
Please read it carefully.

1.1. Manual conventions

Important safety information is highlighted by the use of WARNING and CAUTION boxes. The use of these boxes is described below.

WARNING

WARNING boxes are used where failure to observe the instructions could result in personal injury or death.

CAUTION

CAUTION boxes are used where failure to observe the instructions could result in damage to the equipment or associated equipment.

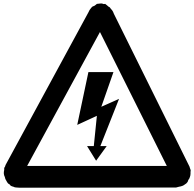
Instructions in CAUTION and WARNING boxes MUST be observed. MKS Spectra accepts no liability for any injury or damage resulting from a failure to observe instructions in CAUTION or WARNING boxes.

1.2. Warning symbols

Various warning labels and symbols may be attached to the instrument their general use is explained below.

The Exclamation Mark (ISO 3864, No.B.3.1) label.

General caution.
Refer to the manual for detailed instructions.



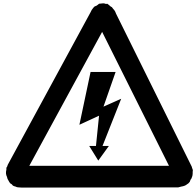
The Electric Shock (ISO 3864, No.B.3.6) symbol.

This is generally used on the instruments to warn of the presence of hazardous voltages.

The following warning labels used on the Vision 1000-P system are explained below.

The Exclamation Mark (ISO 3864, No.B.3.1) label.

On the rear panel of the Microvision Plus refers to:
Read all instructions carefully before use.
The control and signal ports are designed for connection to MKS Spectra accessories via MKS Spectra cables.



The Electric Shock (ISO 3864, No.B.3.6) symbol on the:

Turbo controller, refers to possible risk of Electric shock, if the covers are removed.
Only competent Service personnel should gain access.

Remote Vacuum Controller, refers to possible risk of Electric shock, if the covers are removed.
Only competent Service personnel should gain access.

Front panel of the Microvision Plus, refers to accessible hazardous voltages on the analyser connector, when not mated to the analyser, which may result in a non-hazardous electric shock if touched.
Tuning adjustment holes, which are not for operator use.

1.3. Fuses

The Vision 1000-P system must be powered down and disconnected from the mains supply before changing fuses.

Although the fuses on the RVC1A and turbo pump controller are accessible, they should only be changed by competent persons.

Although fuses sometimes wear out, this is rare. In most cases, fuses blow due to a fault condition. When a fuse blows, every effort should be made to clear the fault before the fuse is replaced.

For continued protection against risk of fire, replace only with fuses of specified rating and type.

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

Details of fuse types and ratings can be found in the Turbo Pump Controller manual and the RVC1A manual.

1.4. Electrical connections

The Vision 1000-P must be powered down and isolated from the mains power supply before any electrical connections are made.

On the rear panel of the Microvision Plus there are no hazardous voltages on any of the ports (electrical connectors). Connections must not be made that may place hazardous voltages or currents on these ports. MKS Spectra must be consulted before any non-MKS Spectra cables or accessories are connected to these ports.

If you are unclear about any of the safety information contained in this section of the manual please contact your local MKS Spectra facility before proceeding.

Section 2.
Installation

The Vision 1000-P is a self contained RGA system for sampling directly from PVD process chambers. It consists of five main parts :

The RGA vacuum chamber that bolts directly on to the process chamber.
The backing pump.
The equipment sub-rack.
The interconnecting cables and trunking.
The operating PC.

The RGA vacuum chamber contains the quadrupole residual gas analyser with a differentially pumped PVD source, a high conductance isolating valve, a turbomolecular pump, and the sampling orifice interface with optional pressure reduction. This assembly is surrounded by an electrical heating jacket. A bracket fitted to the turbo pump supports a cooling fan and acts as a securing point for the cable trunking. An electrically operated pneumatic valve to actuate the isolating valve may also be fitted to the bracket.

The backing pump is a dry diaphragm pump and a stainless steel foreline connects it to the turbo pump.

A 19inch sub rack houses the Remote Vacuum Controller and the turbo pump controller. The cables running between the sub rack and the RGA vacuum chamber are fitted into trunking to give additional protection.

CAUTION

There may be minor differences between one Vision 1000-P system and another.

There are small differences between Vision 1000-P systems. Variations are usually due to the type of process tool to which the Vision 1000-P is to be fitted, the type of process to be monitored and the pressure regime from which the system will be sampling. The design variations are purely to give the user the best possible system to meet the needs of the application. This manual covers all variations of Vision 1000-P. The shipment report will detail your particular system and you should refer to this when the manual gives details of options.

2.1. Safety

WARNING

There are no operator serviceable parts within this unit.

2.2. Initial checks

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 the boxes have been received by checking against the packing slip.

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

Carefully unpack the various parts of your Vision 1000-P 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 until the system is up and running as this seems to dramatically reduce the chances of something

needing to be returned!

Most insurance claims for shipment damage must be placed within 7 days from the date of delivery - in WRITING. So, don't delay Check It Out !

You are now ready to assembly the Vision 1000-P system.

2.3. Vacuum system installation

As much of the system as is practically possible has been shipped pre-assembled. The whole of your Vision 1000-P system has been assembled and tested before being partially dissembled prior to shipping.

CAUTION

The vacuum system interface components are of high precision and should only be fitted by competent personnel.

2.3.1. RGA vacuum chamber overview

The Vision 1000-P is supplied with the RGA vacuum chamber already assembled; the quadrupole analyser is fitted into the chamber, the turbomolecular pump is also fitted as is the isolation valve. This isolation valve we refer to as the process valve and it will either be:
an Electropneumatic Mini UHV Gate Valve
or
an Electropneumatic Angle Valve
In either case the valve will be controlled from the Remote Vacuum Controller (RVC1A).
If the system incorporates a gate valve the electropneumatic actuating valve will be mounted on the bracket fitted to the turbo pump. A small stainless steel pipe will connect the actuating valve to the gate valve. If the system incorporates an angle valve the electropneumatic actuating valve is fitted directly to the angle valve.
In either case the compressed air supply will be connected to the actuating

valve. Please refer to the shipment report to see which type of valve your system uses.

Fitted between the quadrupole housing part of the RGA vacuum chamber and the process valve is a double sided CF35 flange to which is fitted the ceramic PVD source coupling. This double sided flange may include a sampling orifice and orifice holder which provides a relatively high degree of pressure reduction between the process chamber and the quadrupole analyser. For monitoring processes where only a small amount of pressure reduction is required the doubled-sided flange will have a small hole drilled in it rather than an orifice and holder. The third option is a double sided flange with a large hole which will give virtually no pressure reduction.

On newer Vision 1000-P systems using a right angle isolation valve there is no double-sided flange. The orifice disk holder and the fixing for the PVD ceramic source coupling are built into the flange on the right angle valve.

Which configuration of double sided flange your system uses will depend on the processes you are monitoring in particular the pressure regime it operates under. Please refer to the shipment report for details of the inlet configuration. The type of inlet system which your Vision 1000-P has makes no difference to the installation.

It is possible to change the double sided flange and/or the orifice which may be desirable if at a future time the Vision 1000-P is moved to another process tool or the process being monitored changes. Changing the inlet is detailed later in this manual but it is important to consult your local MKS Spectra facility before making any changes.

Between the double sided flange and the gate valve there is a short adapter nipple. In systems fitted with an angle valve there is no nipple, the valve fits directly to the double sided flange.

Fitted to the other side of the process valve will be an elbow, an elbow and nipple or two elbows. The exact configuration will depend on the type of process tool to which the Vision 1000-P is to be fitted.

2.3.2. Main chamber installation

This is a job that requires two people; one to support the Vision 1000-P

system while the other fits the bolts to the flange.

Fit the assembly to the process chamber using a clean CF35 copper gasket. The Vision 1000-P will operate in any orientation but mounting with the turbo pump hanging vertically and the quadrupole analyser horizontal is preferred.
Tighten the six M6 nuts making sure that the gasket has not moved out of place.

2.3.3. Connecting the backing pump

The diaphragm pump is supplied with an isolation valve fitted to the inlet and this valve has been wired up to the diaphragm pump. The isolation valve is normally closed. When the pump is powered up there will be a delay of between 5 to 10 seconds before the valve opens. When power is removed from the diaphragm pump the isolation valve closes immediately.

Position the diaphragm pump close to the Vision 1000-P RGA vacuum chamber and connect the stainless steel foreline to the turbo pump using a KF16 centring O ring and clamp.
Connect the other end of the foreline to the isolation valve on the diaphragm pump by using a KF16 centring O ring and clamp.

2.3.4. Heater jacket fitting

The Vision 1000-P is supplied with the heater jacket fitted. There is no need to remove the heater jacket during the installation and testing procedure. The heater jacket enables the quadrupole chamber to be baked which should be done before you start to acquire good data.

Note that the heater jacket is designed to be a tight fit.

Lay the heater jacket on a flat surface with the orange side uppermost and the power cable towards you. It is the orange side which will be in contact with the vacuum chamber, the grey side will be visible when it is in place. Note the circular cut out in the heater jacket which will fit around the RGA vacuum chamber just above the flange connecting to the turbo pump. Notice that the distance from the circular cut out to each edge (the edges without the press studs) is not the same. The shorter side goes towards the inlet to the main vacuum chamber, the longer side towards the analyser feedthrough.

Wrap the heater jacket around the RGA vacuum chamber and press together the six press studs to hold it in place.

2.3.5. Microvision Plus installation

Rotate the locking ring on the RF/analyser connector so that the slot lines up with the keyway on the connector tube. Hold the Microvision Plus unit so that the keyway lines up with the locating key on the analyser flange.

Gently slide the Microvision Plus unit on to the analyser. TAKE GREAT CARE the pins on the vacuum feedthrough are easily damaged. DO NOT force the Microvision Plus unit on to the analyser.

When all of the pins are engaged, push the Microvision Plus firmly onto the analyser to ensure electrical continuity. The last 3mm (1/8") is important. When correctly fitted the front face of the RF/analyser connector should butt up against the analyser flange.

Finally, rotate the locking ring to lock the Microvision Plus in place. You will not be able to do this if the Microvision Plus is not pushed fully onto the analyser.

2.4. Electrical installation

WARNING

The electrical installation must be carried out by qualified personnel in accordance with local standards and regulations.

The electrical installation should be carried out after the vacuum system installation. Please follow the next sections, in sequence.

2.4.1. Electrical specification

Power Consumption: 100 - 120Vac or 220 - 240Vac 50/60Hz, (typically) 1KVA.

There are two fuses on the rear panel of the Remote Vacuum Controller, please refer to the RVC manual for further details.

There are two fuses on the rear panel of the turbo pump controller, please refer to the turbo pump controller manual for further details.

Only use IEC or UL approved Mains fuses are used to protect this equipment.

Safety Class I
Installation Category II
Pollution Category II

WARNING

The Yellow/Green Earth Core of the Power Cord must be connected to the Power Source Protective Earth Terminal.

2.4.2. Equipment rack

The Remote Vacuum Controller (RVC1A) and the turbo pump controller are fitted into a 19 inch sub-rack. The sub-rack should be fitted into a 19 inch equipment rack using four M6 screws, plastic cup washers and cage nuts.

2.4.3. Interconnecting cables

All the cables which run between the equipment rack and the RGA vacuum chamber are fitted into plastic trunking which provides a good degree of protection. The trunking complete with cables will be supplied completely disconnected. All the cables have been marked at both ends with cable tags and identification letters. All the connectors have been chosen to minimise

the risk of making a wrong connection. The table below gives cable functions and the identification letter.

Ident. Letter	Cable Function
A	Backing Pump Power
B	Microvision Plus Digital I/O
C	Process valve Solenoid Power
D	Heater Jacket Power
E	Microvision Plus Power
F	Microvision Plus RS485
G	Turbo Pump Vent Valve
H	Turbo Pump Cooling Fan
J	Turbo Pump Power
K[1]	Turbo Pump Speed Signal
L[2]	Process Tool Signal (Gate Valve Systems)
L[3]	Customer Interface Cable (Angle Valve Systems only)
L[5]	Analogue Data Input Cable
M[4]	Process Tool Signal (Angle Valve Systems only)
M[6]	Internal Vision 1000-P
N[7]	Customer Process Toll Connection

1 Cable K does not run in the trunking.

2 Cable L on systems fitted with a gate valve is used to connect to the process tool to provide the Vision 1000-P with a Pressure OK signal.

3 Cable L on systems fitted with an angle valve is run in the trunking and provides a Customer Interface.

4 Cable M is only fitted on systems incorporating an angle valve and is used to connect to the process tool to provide the Vision 1000-P with a Pressure OK signal.

5 On WO13564 Gate Valve systems cable L is used as the signal cable to connect to the Analogue Input card in the PC

6 On WO13564 Gate Valve systems cable M is used as an internal Vision 1000-P signal cable.

7 On WO13564 Gate Valve systems cable N is used to connect to the process tool to provide the Vision 1000-P with a Pressure OK signal and analogue data from the tool.

The following table details the start and finishing point for each cable. Cables running in the trunking start at the equipment rack and finish at the main vacuum chamber.

Ident. Letter	**Start Equipment Rack**	**Finish RGA Vacuum Chamber**
A	RVC1A skt C	Backing Pump
B	RVC1A plg 4	Microvision Plus Digital I/O
C	RVC1A skt 1	Process valve Solenoid
D	RVC1A Heater	Heater Jacket
E	RVC1A Microvision plus power	Microvision Plus Power
F	PC485 Card	Microvision Plus RS422/485
G	Turbo Controller X1	Turbo Pump Vent Valve
H	Turbo Controller X2	Turbo Pump Cooling Fan
J	Turbo Controller X5	Turbo Pump
K	Turbo Controller X5	RVC1A J5
L[1]	RVC1A J5	Process Tool Controller
L[2]	RVC1A J5	Customer Interface
L[4]	25 way D-Type	Control PC
M[3]	RVC1A J5	Process Tool Controller
M[5]	RVC1A Skt 1	25 way D-Type
N[6]	RVC1A Plg 5	Process Tool

1 Cable L does not run in the trunking on systems fitted with a gate valve.

2 Cable L does run in the trunking on systems fitted with an angle valve.

3 Cable M is only fitted on systems incorporating and angle valve.

4 On WO13564 Gate Valve systems cable L is used as the signal cable to connect to the Analogue Input card in the PC

5 On WO13564 Gate Valve systems cable M is used as an internal Vision 1000-P signal cable.

6 On WO13564 Gate Valve systems cable N is used to connect to the process tool to provide the Vision 1000-P with a Pressure OK signal and analogue data from the tool.

The following table details the connectors used at each end of each cable.

Ident. Letter	Start, Equipment Rack	Finish, RGA Vacuum Chamber
A	Circular 4 pin Plug	IEC Socket
B	25 pin D-Type Socket	25 pin D-Type Plug
C	15 pin D-Type Plug	3 pin Solenoid Valve Connector
C[1]	15 pin D-Type Plug	3 pin Din Connector
D	Circular 4 pin Plug	Circular 4 pin Socket
E	15 pin D-Type Plug	15 pin D-Type Socket
F	9 pin D-type Socket	15 pin D-Type Plug
G	Circular 3 pin Plug	3 pin Vent Valve Connector
H	Circular 7 pin Plug	Circular 7 pin Socket
J	Pfeiffer Custom Connector	Circular 8 pin Socket
K	2 pin QM connector	2 pin QM connector
L[1]	26 pin High Density D Plug	no connector fitted
L[2]	26 pin High Density D Plug	9 pin D-Type socket
L[4]	25 pin D Plug	26 pin High Density D Plug
M[3]	26 pin High Density D Plug	no connector fitted
M[5]	15 pin D-Type Plug	25 pin D Plug
N[6]	25 pin D Socket	25 pin D Plug

[1] On systems fitted with an angle valve the connector to the solenoid valve is a 3 pin Din socket.

[2] On systems fitted with an angle valve cable L is used to provide a customer interface.

[3] Cable M is only fitted on systems fitted with an angle valve. It is used to provide a Pressure OK signal to the Vision 1000-P from the process tool.

[4] On WO13564 Gate Valve systems cable L is used as the signal cable to connect to the Analogue Input card in the PC

[5] On WO13564 Gate Valve systems cable M is used as an internal Vision 1000-P signal cable.

[6] On WO13564 Gate Valve systems cable N is used to connect to the process tool to provide the Vision 1000-P with a Pressure OK signal and analogue data from the tool.

2.4.4. Connecting the cables

The first task is to identify which end of the cable trunking goes to the equipment rack and which to the main vacuum chamber. The easiest way to do this is to locate cable J the turbo pump cable. At the RGA vacuum chamber end it has a circular connector at the equipment rack end it has a large rectangular connector.

Run the trunking between the equipment rack and the main vacuum chamber. Secure the trunking to the bracket fitted to the turbo pump. The trunking connector includes a lock nut, slacken this and slide the connector into the large cut out in the bracket then tighten the lock nut.

Make the various connections to the main vacuum chamber. There are a total of nine connections to make involving cables A to J.

Make the various connections at the equipment rack. There a total of eight connections to make involving cables A to E, G, H and J.

2.4.5. Connecting to the process tool

There is one connection to be made between the Vision 1000-P system and the process tool.

Vision 1000-P systems fitted with a gate valve the connection is Cable L.
Vision 1000-P systems fitted with an angle valve the connection is Cable M.
On WO13564 Vision 1000-P systems the connection is cable N.

This is a control signal which must come from the process tool to indicate that the pressure is low enough to open the process valve on the Vision 1000-P. The precise value will depend on the configuration of the Vision 1000-P inlet, please refer to the shipment report for the maximum process pressure. The Vision 1000-P has been configured to connect to a no-volts relay contact, when the contact is closed the pressure is OK. Other types of signal such as TTL can be accommodated, please refer the RVC1A manual for details.

On Vision 1000-P systems fitted with an angle valve there is an additional cable to provide a customer interface. This is Cable L. The cable is run in the trunking and is terminated in a 9 way D-Type socket at the RGA vacuum

chamber end. At the equipment rack end the cable connects directly to the RVC1A. The following table details the cable connections.

Colour	RVC1A J5	9 way D-Type Socket
Red	Pin 1	Pin 1
Blue	Pin 2	Pin 2
Green	Pin 3	Pin 3
Yellow	Pin 4	Pin 4
White	Pin 5	Pin 5
Black	Pin 6	Pin 6
Brown	Pin 7	Pin 7
Violet	Pin 8	Pin 8

The RVC1A manual gives details of the J5 connector and the pin functions.

2.4.6. Mains power

There is a single mains power connection to the Vision 1000-P which is made to the RVC1A. Connect the mains power cable to a suitable single phase supply:

100/120 Volts AC 50/60 Hz 16 Amps
220/240 Volts AC 50/60 Hz 13 Amps

LINE	BROWN
NEUTRAL	BLUE
EARTH	GREEN/YELLOW

2.4.7. Computer connection

Vision 1000-P systems are used in conjunction with one of the MKS Spectra Windows based software programs run on a PC. If a PC has been supplied as part of the system the software will have been installed onto the hard drive and will have been fully tested as part of the complete Vision 1000-P system.

There is one serial communications cable to connect to the Vision 1000-P. Connect cable F to the appropriate comm. port on the PC. You may need to use a Comms. cable to act as an extension cable, this will depend on the location of the PC.

If you are using RS232 you would normally connect to comm. port 2 on the PC the Spectra operating software (RGA for Windows or Process Eye) manual will give further details of Comms. port connections. The documentation which came with the PC will identify the Comms. ports.

If you are using RS485 a suitable card needs to be fitted and you should consult the documentation which comes with it. If the PC has been supplied by us the RS485 card will have been fitted, configured and tested. The connector will be labelled on the rear panel.

The PC and monitor will need their own mains power supply this is not provided by the Vision 1000-P system.

If you are supplying your own PC install the software, either RGA for Windows and/or RGA Process, by following the instructions in the relevant manual.

You are now ready to power up the system. Please read the next section of this manual before you do.

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Section 3.
Operation

3.1. Overview

This section gives an overview of the Vision 1000-P system operation.

The system hardware (Microvision Plus) senses the presence of the vacuum system controller (RVC1A) and sets up an application program as an icon in the main program. The vacuum system must be started up using this application program before the RGA filament can be turned on. Although, the pumps may be switched on from the RVC1A .
The operation of the vacuum system controller is fully described in the Remote Vacuum Controller manual.

The pumps are switched on from the Remote Vacuum Controller window or from the RVC1A and the sequence of events is as follows :

The turbo and backing pumps will start, and the turbo will accelerate.

When the turbo reaches 95% of full speed the RVC1A indicates Pump up to Speed.

At this point the RGA filament may be switched on and the background spectra in the RGA chamber may be observed.

In order to be able to open the process valve, the Pressure OK signal from the process system must be true. The Pressure OK signal must be configured to give the true state when the process pressure is below the maximum pressure given in shipment report.

The process valve is opened either manually or automatically from the RVC software, refer to the RVC1A manual. Once the valve is opened monitoring of the process chamber may begin.

CAUTION

Check the complete installation thoroughly before proceeding.

3.2. Start up

Set the turbo pump controller On / Off switch to the On position. Control of the turbo pump is achieved by the RVC1A controlling the mains power to the turbo controller. The turbo pump controller On/Off switch should be left in the On position.

Set the Vacuum Controller Interlocks key switch to ON and the power switch to On (I)

On your PC, boot the MKS Spectra operating software (RGA for Windows or the Process Eye). The software will detect that the RVC1A is fitted and the Remote Vacuum Controller window will be displayed. This window will show a simplified schematic of the Vision 1000-P vacuum system. To start the Vision 1000-P click on the Main Pumps symbol on the left of the vacuum system schematic. The symbol will change from red to yellow indicating the pump starting up. More information about the RVC operating software can be found in the RVC1A manual.

The Vision 1000-P may be started from the RVC1A. This is useful if the PC is disconnected or the Spectra software is not running. To start the system from the RVC1A press the PUMPS switch on the front panel.

As soon as the Vision 1000-P is started the backing pump will start and the turbo pump will be powered up. The turbo pump will start to come up to speed and the controller should indicate this.

The turbo pump controller will indicate when the pump is up to speed and the Main Pumps symbol in the RVC window will change from yellow to green.

As soon as the turbo pump is up to speed you may switch the RGA filament on but we recommend you wait for 5 minutes after the pump has come up to speed before switching a filament on.

Switch the RGA filament on (the RVC1A manual will describe how to do this) and look at the RGA chamber background spectrum. If you are using RGA for Windows use the bar chart mode, if you are using Process Eye run the Bar Chart recipe, refer to the appropriate manual for further help.

The pressure is likely to be quite high but should be falling. If the pressure is very high switch the filament off and wait a little while for the pressure to fall.

Now, check that the process valve is work. Ensure that there is a good vacuum in the process and that the vacuum interlock is connected and operating properly. The pressure is the process chamber must be below the maximum operating pressure, refer to the shipment report.

With the Remote Vacuum Controller in the manual mode open the process valve. The process valve (either a gate valve or angle valve) will open and you will be able to see a spectrum of the process chamber.

Once you have established that the process valve is working correctly close the valve.

3.3. Leak checking

At this point you will have assembled the system, checked that it is working and you that you can see a background spectrum. The next thing to do is to leak check the Vision 1000-P.

The vacuum system used in the Vision 1000-P was fully leak checked as part of the assembly and test procedure before it left the factory. You need to leak check in case any leaks have occurred due to shipping damage and to check the one seal you have made between the Vision 1000-P and the process chamber.

Ensure that the process valve is closed.

To leak check you will need a cylinder of helium fitted with a regulator and a length of flexible hose to spray helium around the Vision 1000-P. You can use another gas, Argon is often used on vacuum systems, and any grade of helium will do (balloon gas is quite adequate).

Turn RGA for Windows to the Leak Check mode or run the Leak Check recipe in Process Eye, check that the probe gas is set to mass 4 (Helium) or the appropriate mass if you are using another gas, set the range to E-10 and disable autoranging (refer to the RGA for Windows or Process Eye manual if you need help).

As the Vision 1000-P uses a Microvision Plus there will be no audio tone so you will have to position the monitor so that you can see the screen while you are leak checking. You can connect an external speaker or head phones, please consult the Microvision Plus manual for details of the audio output.

Starting at the top of the Vision 1000-P vacuum system slowly and carefully spray helium over the entire system paying particular attention to the vacuum seals. Watch the monitor or listen to the audio tone for a signal indicating a leak.

If you do find a leak shut the system down (see section **3.4. System shut down**), fix the leak and start again.

Once the RGA vacuum chamber is leak tight check the part of the Vision 1000-P between the process valve and the process chamber.

Open the process valve and spray helium over the valve, the seal to the process chamber and the connecting pipe work.

If you do find a leak shut the system down (see section **3.4. System shut down**), fix the leak and start again. Remember you may need to break the seal between the Vision 1000-P and the process chamber in which case you will also have to shut down the process chamber.

3.3.1. Baking

Before you can start to use the system properly, you will need to run it for sufficient time to allow the back-ground in the RGA vacuum chamber 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 $1x10^{-5}$ mBar. We recommend baking the RGA vacuum chamber to a temperature of $150^{O}C$ (the heater jacket supplied is self-regulating) for at least 24 hours. Optimum bake out is achieved by having the inlet valve open with the process chamber at the normal operating pressure of very clean, dry, inert gas. The quadrupole should be running with the filament on but must be using the faraday detector. Do not use the multiplier detector during baking.

CAUTION

The Electron Multiplier (SEM) MUST NOT be operated at temperatures above $50^{o}C$.

With dual (faraday and electron multiplier) detector instruments serious damage will be caused to the electron multiplier if it is operated at temperatures above $50^{0}C$.

No damage is caused to the multiplier by high temperatures provided it is not switched on.

The only remedy when a multiplier has been damaged due to being operated at higher temperatures is to replace it.

THIS IS AN EXPENSIVE REPAIR.

The total pressure should gradually start to rise and you should bake the system at least until that pressure starts to drop.

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 you switch the system off it will vent to atmosphere introducing water vapour and you will have to bake again.

3.4. System shut down

It is important to follow the procedure outlined below to shut down and switch off the Vision 1000-P system.

1. Switch off the RGA filament and wait for 15 minutes for the filament to cool down.

2. Switch off the pumps from the Remote Vacuum Controller window or by pressing the PUMPS switch on the RVC1A.

3. Switch off the Microvision Plus.

4. Disconnect the Vision 1000-P from the mains power.

Section 4.
Maintenance

Generally, Vision 1000-P systems require very little maintenance with the frequency of routine maintenance being dependant on the application. The operating pressure, amount and type of gases being pumped will have an effect on the system.

In general, it is a good idea to schedule maintenance of the Vision 1000-P, including preventative measures, such as renewing filaments, to coincide with planned maintenance of the process system.

4.1. Operating pressure

The Vision 1000-P system has a special PVD ion source. The optimum operating pressure of this source is $2x10^{-3}$ to $5x10^{-3}$ mbar, but may be used at pressures up to $1x10^{-2}$ mbar. As the ion source pressure increases above the optimum, the peak heights become significantly non-linear - that is, they do not rise as much as the pressure.
Monitoring processes at pressures higher than $1x10^{-2}$ mbar requires inlet pressure reduction.

In this system, pressure reduction is accomplished by incorporating a flow restricting orifice in the interface coupling flange between the ion source and the inlet isolation valve. This extends the maximum process monitoring pressure directly in proportion to the pressure reduction. Please refer to the shipment report for the type of pressure reduction, if any, fitted to your system.

For example if the pressure reduction flange installed in the system is 5x, the optimum pressure range will be extended from $2x10^{-3}$ to $5x10^{-3}$ mbar up to $1x10^{-2}$ to $2.5x10^{-2}$ mbar.

4.1.1. Removing the inlet flange

The inlet flange is the double-sided flange fitted between the quadrupole

chamber and the process valve. Fitted to one side of the flange is the ceramic socket with mates with the gas inlet tube on the PVD ion source. The inlet flange may include and orifice and orifice holder or a hole of a specific size. The exact arrangement will depend on the process pressure being monitored, please refer to the shipment report. You may need to replace the orifice if it were to become blocked or fit a new flange if a different process is to be monitored.

To remove the inlet flange on systems fitted with a gate valve:

1. Shut down the Vision 1000-P system by following the instructions in section **3.4. System shut down**, remove the heater jacket and the Microvision Plus.

2. Un-do the six M6 nuts holding the short nipple to the quadrupole chamber.

3. Remove the quadrupole housing complete with the turbo pump leaving the elbow, gate valve and short nipple connected to the process chamber.

4. Slide the double sided flange off the six M6 studs fitted to the quadrupole chamber.

To remove the inlet flange on systems fitted with an angle valve:

1. Shut down the Vision 1000-P system by following the instructions in section **3.4. System shut down**, remove the heater jacket and the Microvision Plus.

2. Un-do the six M6 nuts holding the angle valve to the quadrupole chamber.

3. Remove the quadrupole housing complete with the turbo pump leaving the elbows and angle valve connected to the process chamber.

4. Slide the double sided flange off the six M6 studs fitted to the quadrupole chamber.

4.1.2. Refitting the inlet flange

To re-fit the double sided inlet flange simply follow the removal procedure in reverse. Take care to ensure the ceramic socket mates correctly with the gas inlet tube on the PVD source. Remember that when you tighten the M6 nuts you will be making two vacuum seals.

Once the Vision 1000-P system is re-assembled it must be leak checked before re-fitting the heater jacket.

4.1.3. Replacing the orifice

You may wish to remove the ceramic socket from the flange at this point. Before doing this note how the socket is free to slide around against the flange within the limits of the securing ring. When you come to re-fit the ceramic socket you will have to tighten the screws sufficiently to allow the same movement with a similar force. Carefully unscrew and remove the three M2 slotted screws and their springs and lift away the ceramic socket and metal securing ring.

1. Remove the screw which is in the centre of the double sided flange (this holds the orifice in place). Now remove the orifice disc.

2. Fit the new orifice disc and replace the screw. Just tighten the screw sufficiently to hold the disc in place do not over tighten it as this may distort the disc. It does need to be tight enough to make a seal if gas can leak around the orifice disc this will effectively give you a larger sized orifice than you want.

If you removed a ceramic socket (PVD source systems) refit it by replacing the socket together with its securing ring and re-fitting the three M2 screws and springs. Tighten these screws equally so that equal pressure is applied around the circumference of the ceramic socket by the securing ring. The screws should be tightened sufficiently so that the ceramic socket it just able to slide against the flange. The screw heads should be at least 1mm below the level of the top of the ceramic socket.

4.2. Vision 1000-P electronics

The RGA control unit (Microvision Plus) supplied as part of your Vision 1000-P system is designed specifically to operate with a PVD ion source. No damage will be caused to the analyser or the electronics if a replacement standard RGA control unit is fitted but the performance will be dramatically reduced. This is of particularly relevance to customers who operate more than one Spectra RGA.

4.3. Vacuum pumps

4.3.1. Diaphragm pump maintenance

Unlike rotary pumps diaphragm pumps are free from routine maintenance. You may need to clean or replace valves and diaphragms in the pump from time to time. Please consult the pump manual.

4.3.2. Turbo pump maintenance

The bearings in the turbo pump may need to be lubricated from time to time, although, most modern turbo pumps have sealed bearings and require no maintenance. Consult the turbo pump manual supplied with your system for further details.

4.4. Mass spec maintenance

The only routine maintenance required by the quadrupole is to change the filaments. The filaments will wear out in time and changing filaments is fully described in the Microvision Plus manual. Also, the ion source may need to be cleaned which would be done as part of the filament replacement procedure, again this is fully described in the Microvision Plus manual.

CAUTION

The quadrupole analyser is a delicate instrument which is easily damaged and can be expensive to repair. The safest place for the analyser is in its vacuum chamber, so leave the analyser where it is until you have everything ready.

4.4.1. Removing the analyser

Before you can change the filaments or clean the ion source the quadrupole analyser must be removed from the vacuum chamber. Before removing the analyser check that you have all the parts and tools ready for the maintenance work. Also, have ready something to stand the analyser on, a small vice is useful for this.

The process valve fitted between the RGA chamber and the process chamber will allow the RGA chamber to be vented to atmosphere without affecting the process chamber. We would recommend venting the RGA chamber when the process chamber is not being run, just in case there is an unexpected accident.

To remove and replace the analyser you will need:

One pair of 10mm spanners
One CF40 copper gasket

1. Shut down the Vision 1000-P system as described in section **3.4. System shut down** of this manual.
2. Make a note of the orientation of the analyser with respect to the vacuum chamber. This is most easily done by making a mark on the vacuum chamber in line with the locking pip on the analyser's feedthrough housing.
3. Remove the six M6 bolts.
4. 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.

4.4.2. Re-fitting the analyser

1. Note the gas inlet tube on the top of the analyser 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. When properly mated the analyser flange should be flush with that of the vacuum chamber. If the two flanges are not parallel, the gas inlet tube is not in 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. Re-fit the Microvision Plus.

Appendix 1
Analogue / digital card

The PC supplied as part of the Vision 1000-P system has been fitted with an Analogic DAS-12/50 PC card. Full details of the card can be found in its manual. The card has been configured to provide the system with 8 differential analogue inputs and one digital input. The cable details are given below.

Analogue cable.
The cable consists of a 26 way high density D-Type socket connected to the DAS-12/50 card with a 25 way D-Type socket at the other end connected to an adapter. The adapter provides screw terminals for the user to connect to.

Channel	**26 way H.D. D-Type Plug**	**25 way D-Type Plug**	**Terminal Connector**
1	1	1	1
1	10	14	14
2	2	2	2
2	11	15	15
3	3	3	3
3	12	16	16
4	4	4	4
4	13	17	17
5	5	5	5
5	14	18	18
6	6	6	6
6	15	19	19
7	20	7	7
7	19	20	20
8	22	8	8
8	21	21	21

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Appendix 2
Health and safety clearance form

1. This form must be used when returning analysers and other equipment for service.

2. A completed copy of this form should be faxed or sent by post to ensure that we have this information before we receive the equipment.

   A further copy should be handed to the carrier with the equipment.

3. Failure to complete the form or comply with the procedure will lead to delays in servicing the equipment.

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RETURNS FORM

1. This form must be completed when returning equipment for service or repair.

2. Please complete the form and fax or send by first class post to the appropriate 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 returns 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.:

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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.: