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RVC2
User Manual

RVC2 User Manual SP103009.106
April 2013

MKS Instruments UK Ltd.
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Declaration of Conformity
RVC2 (LM105)

Declaration:

MKS Instruments UK Ltd. hereby declares that the RVC2 (LM105) product complies with the EMC and LVD directives and the following standards:

2004/108/EEC ELECTROMAGNETIC COMPATIBILITY DIRECTIVE

The item detailed above has been tested in accordance with:

EN 61326-1:2006 - Electrical equipment for measurement, control & laboratory use

2006/95/EC LOW VOLTAGE DIRECTIVE

The item detailed above has been tested in accordance with:

EN61010-1:2010 (3rd Edition) Safety requirements for electrical equipment for measurement, control & laboratory use

The technical documentation required to demonstrate the product meets with the requirements of the directives is available for inspection by the relevant authorities.

I hereby declare that the RVC2 (LM105) product meets with the requirements of the above referenced European Standards and complies with the referenced European Directives.

Signed:

Stephen Drysdale
General Manager
22 March 2013

CE 13

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Diversion or transfer contrary to U.S. law is prohibited.

1. RVC2 Introduction

In many applications, the residual gas analyzer is required to monitor gases in vacuum systems which are run at higher pressures than those in which the quadrupole analyzer can operate. This is often the case in vacuum process systems such as sputter chambers, vapor deposition and other thin film deposition processes. In these circumstances, the quadrupole analyzer is housed in its own vacuum chamber pumped by a small, independent pumping system. Gas from the main process chamber is introduced to the quadrupole via a suitable inlet. This system is often referred to as a High Pressure Adapter (HPA).

The Remote Vacuum Controller, or RVC, is designed to control the HPA's pumping and inlet system either automatically or manually, from the RGA control unit. It is designed to give protection to the process chamber by preventing accidental exposure to harmful conditions. The controller also protects the quadrupole by interlocking the filament and multiplier operation with the pump down, baking and venting of the system.

The RVC2 is specifically designed to operate in systems using Microvision Plus / IP RGA's and the Process Eye software package (version 5 or greater). The RVC2 cannot be used in Microvision, Satellite or VacCheck based systems, nor can it be used with RGA for Windows.

This manual covers the hardware aspects of the RVC2, details of the accompanying software and hardware features can be found in the Process Eye and Microvision Plus / IP manuals.

2. Typical Installation

A variety of High Pressure Adapter configurations are required to meet the needs of various applications and the RVC2 has a degree of flexibility allowing it to be configured for many types of systems. Primarily it will be used to operate with systems using one or two inlet valves used in PVD systems. Below is a general description of a typical installation:

The quadrupole analyzer is housed in a small chamber which is evacuated by a turbo molecular pump backed by a 24v dry diaphragm pump. The RVC2 is designed to operate with a Pfeiffer turbo but some other types may be used, your local MKS Spectra facility can advise you on this. The power supply for these two pumps, and hence whether they are on or off, is controlled by the RVC2. The speed of the turbo pump is monitored by the RVC2 via a signal taken from the turbo pump controller.

The HPA has to have some method of introducing gas into the quadrupole chamber. This is achieved by fitting one or two valves. The number and type of valve is governed by the application and the pressure regimes to be monitored. Generally the valves are electro-pneumatic operated by compressed air at approximately 60psi. The compressed air is controlled by a 24V DC solenoid valve, which is opened and closed by an output from the RVC2.

The high conductance valve (Valve 1) is used to expose the quadrupole to the process chamber without any pressure reduction, this would only be opened when the process chamber is at a pressure of $1x10^{-2}$ Torr for instruments fitted with a PVD ion source or less and is used when leak checking and baselining. For an RGA fitted with an open ion source the pressure limit is $1x10^{-4}$ Torr.

A bypass line can be added to the high conductance valve, which would incorporate a fixed molecular leak. This bypass line connects the inlet side of the high conductance valve to the outlet side. A fixed leak is built into the shut off valve's fitting. The fixed leak is chosen to suit the pressure regime to be sampled, which is usually in the range of 1 to $2x10^{-2}$ Torr.

The Remote Vacuum Controller has three operating modes; Automatic, Manual and Maintenance. The Maintenance Mode is entered by switching the INTERLOCKS key switch on the front panel of the RVC2 to the OFF position. In this mode, none of the interlocks are active, therefore there is no protection offered for either the process chamber or the quadrupole analyzer. Under normal circumstances, this mode should not be used. The key switch should be switched to the ON position and the key should be removed.

To operate in the Manual and Automatic modes, two interlock signals are required (one signal in systems using one valve). These should come from independent total pressure gauges monitoring the process chamber or from the process control system.

The first interlock signal is the LoVAC Ok signal and this would be set for the highest pressure that the inlet system has been designed to operate. With the most common inlet configuration, the high conductance inlet with single by-pass, when the LoVAC Ok signal goes true the by-pass valve may be opened but the high conductance valve remains closed. The second interlock signal is HiVAC Ok, when this condition is true the high conductance valve may be opened.

In the Manual operating mode, the inlet valves are opened by a user accessible control, providing the interlocks are all true, the valve can be opened. In the Automatic mode the appropriate valve will be opened as soon as the interlock conditions are true without any user intervention.

That concludes the brief introduction to the Remote Vacuum Controller a more detailed description of the various features can be found in later sections.

3. Safety

To ensure the equipment is safe to use and will perform correctly the following procedures must be followed. Do not use this equipment in a manner not specified by MKS Instruments.

Installation

1) The installation procedures given in this operating manual must be followed.
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 vacuum system on which the RVC2 is mounted must be earthed.

Operation

1) The equipment is not authorised for use as a critical component in a life support or safety critical systems 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.

Maintenance

1) Maintenance functions must only be carried out by competent persons.
2) During the warranty period, faulty equipment must be returned to MKS Instruments 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.
4) Equipment enclosures embody certain special fastening and bonding devices that affect EMC and safety performance. These must be correctly re-fitted after servicing.

3.1 Hazard Warning Labels

Warning!
Danger of an electric shock.

Warning!
Danger of personal injury or damage to the unit. Refer to manual for instruction

Warning!
Hot surface.

PE (Protective Earth)
All equipment external to the RVC must be earthed at this point.

4. Specifications

4.1 Mechanical

Euro rack, plug in unit to DIN 41494 Part 5. Size 3U x 42HP

Dimensions:

Front panel height:	128.4mm
Width:	212 mm
Depth:	372mm including 80mm for connector clearance at the rear of the unit.
Weight:	3.5 Kg

4.2 Electrical

Power input: 100 - 240VAC 50 - 60Hz. 2.5Amps

*** SAFETY ***
REPLACEMENT FUSES MUST BE OF THE SAME TYPE AND RATING

Fuse Type:	220-240V. 5mm x 20mm High Breaking Capacity (HBC) manufactured in accordance with IEC127.
Mains Inlet:	T2.5A
System 3:	T8A
Turbo Pump:	T5A
Backing Pump:	T3.15A

Installation category (overvoltage category) II to EN61010
Insulation Class I to EN61010

4.3 Environmental Conditions

For indoor use only
Enclosure IP20 to EN60529

Altitude:	Up to 2000 m
Temperature range:	5°C to 40°C
Relative Humidity:	80% up to 31°C decreasing linearly to 50% at 40°C operating and storage
Mains supply voltage:	Fluctuations not to exceed ± 10% of nominal voltage
Pollution Degree:	2
Installation category:	II

Ventilation:
The openings in the top and bottom panels must not be obstructed.
Do not exceed the maximum ambient operating temperature.

4.4 Manufacturer Information

This equipment is manufactured by:

MKS Instruments UK Ltd. – Spectra Products
3 – 4 Cowley Way
Crewe
Cheshire
CW1 6AG
United Kingdom

Tel: +44 (0)1270 250150

4.5 Support Information

You can obtain UK support for this product from the following location:

MKS Instruments UK Ltd. – Spectra Products
3 – 4 Cowley Way
Crewe
Cheshire
CW1 6AG
United Kingdom
Tel: +44 (0)1270 250150

In the USA:

MKS Instruments, Spectra™ Products
70 Rio Robles Drive
San Jose
CA 95134
Toll Free: 800-428-9401
Tel: 408-750-0300

Or to find a local agent, please visit:

http://www.mksinst.com/service/servicehome.aspx

5. RVC2 Technical Features

The following sections describe some of the facilities provided by the RVC2, how they operate and when they should be used.

5.1 Turbo Pump at Speed

The turbo pump at speed signal is used as a basic method of determining whether the vacuum is good enough to allow the quadrupole analyzer to be operated, in particular whether it is safe to switch on a filament.

95% of the turbo pump's full speed is taken to be up to speed. At this level, it can be assumed to the vacuum is good enough to switch on a filament without the risk of burning it out. From experience this has proved to be a highly reliable method of monitoring the basic vacuum conditions. Certainly if there is a large air leak, the backing pump has not started, the turbo pump has stalled or there is some obstruction in the backing line, the turbo pump will not reach 95% full speed.

5.2 Bakeout Heater

The main chamber heater has two operating modes; "warm" (70DegC) and "bake" (180DegC). The temperature and baking cycles are controlled by the RVC2.
Depending on the system type, a smaller heater jacket may be fitted to the inlet. This heater has only the "warm" mode and runs constantly at 70DegC, even when the main chamber is in "bake" mode.

5.3 Cool Down

This is a preset time period which allows the vacuum system time to cool down before using the RGA following a bake out. During this Cool Down period, the multiplier will also be unavailable.

5.4 Interlocks

The RVC2 requires two external interlock signals which will come from independent total pressure gauges, pressure switches or the process control system.

5.5 Alarm Output

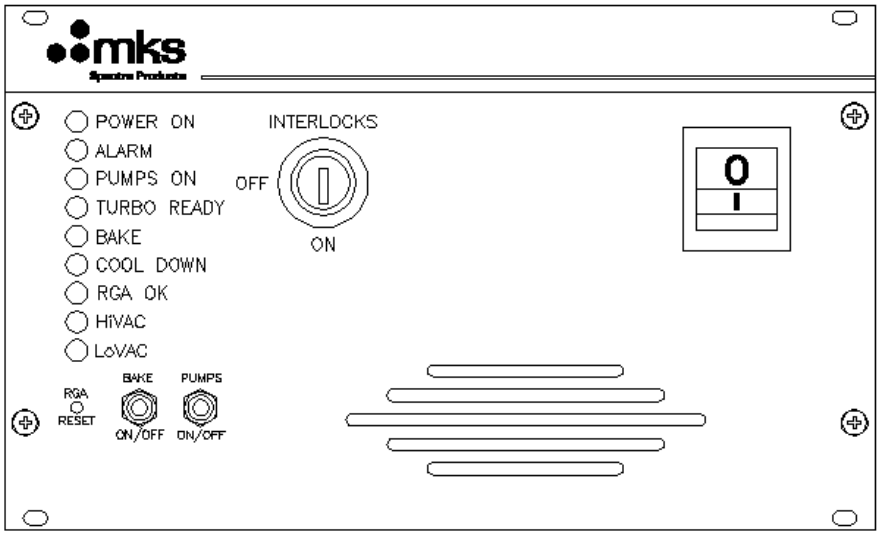
The Alarm Output is used to "interlock" the process to the RGA system. It is available as a Form-C relay contact and as an open collector output.

5.6 Pump Down

Pump down is an automatic cycle controlled by the Microvision Plus or internal logic in the RVC2.

6. Hardware Interface

6.1 Front Panel Indicators



POWER ON	Green LED is lit when mains power is applied to the RVC2
ALARM	Red LED is lit when the RVC2 receives an alarm signal from the Microvision or process control
PUMPS ON	Green LED is lit when the pumping system is active
TURBO READY	Green LED is lit when the turbo molecular pump has reached full speed
BAKE	Amber LED is lit when the full heaters are active
COOL DOWN	Amber LED is lit when the RVC2 is in the Cool Down mode
RGA OK	Green LED is lit when the RGA is operating correctly with a filament on
HiVAC	Green LED is lit when the HiVAC signal is true
LoVAC	Green LED is lit when the LoVAC signal is true

6.2 Front Panel Switches

POWER	Switches power to the RVC2 on and off (1=ON / 0=OFF)
RGA RESET	Recessed push-button switch which should not be used unless instructed
BAKE ON/OFF	Momentary push-button switch which cycles the full heaters
PUMPS ON/OFF	Momentary push-button switch which cycles the pumping system power
INTERLOCKS ON/OFF	2-position key-switch used to enable or disable the interlocks

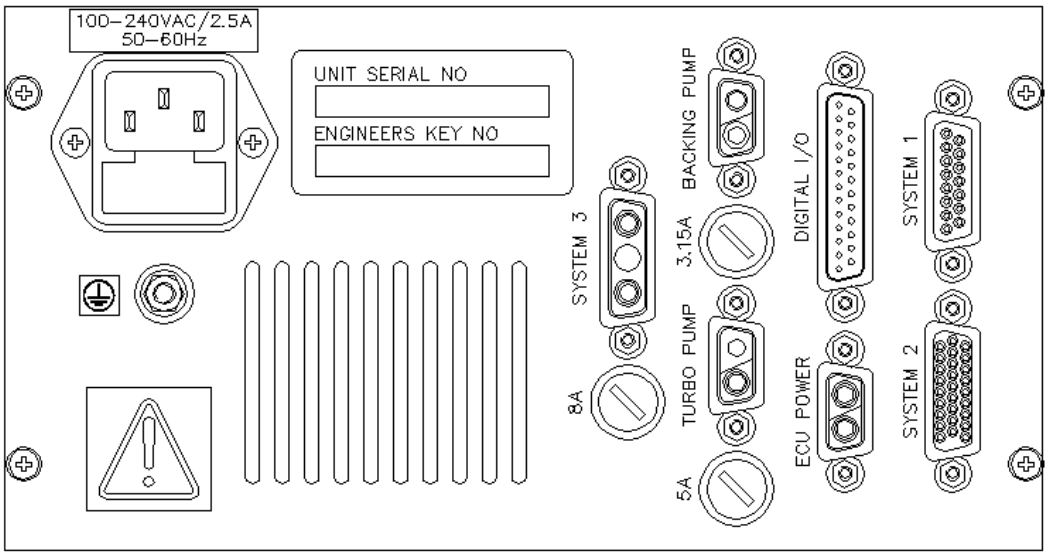
6.3 Rear Panel Connections

The rear panel is where all the connections to the RVC2 are made. It is also the location of the three fuses that protect the Heater, Turbo and Backing Pump supplies.

Normally the RVC2 forms part of an overall system where the rear panel connections, interlocks and controls may already be catered for. Refer to the user manual applicable to your system for hook-up and connectivity information.

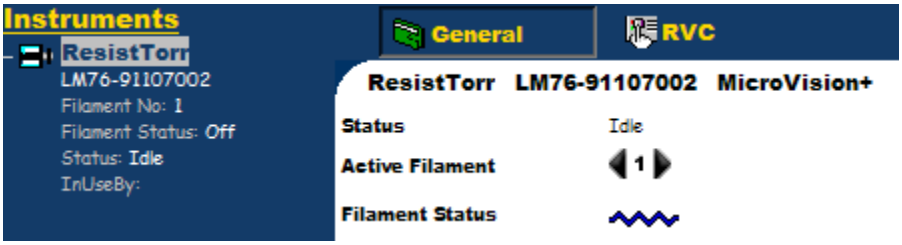
The pin-out and function information is provided for applications where the customer wishes to use the RVC2 as a stand-alone vacuum controller.

Details on these connectors can be found in Section 8.2

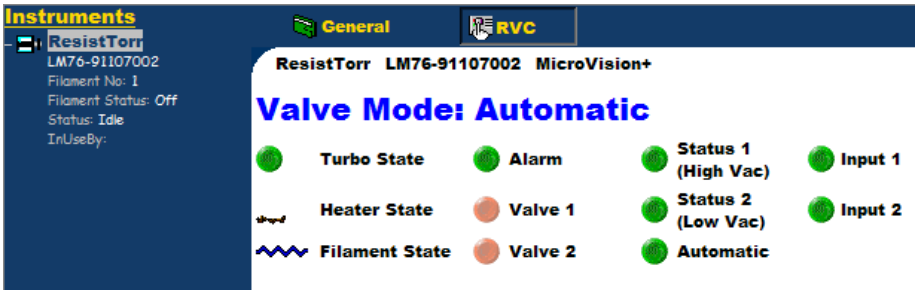


7. Software Operation

On a correctly configured control unit, the Process Eye software automatically detects the RVC2 and adds an "RVC" tab to the main view as shown below.



Clicking on this tab displays the current status of the RVC2 and associated hardware.



Most of the on-screen indicators are duplicated and mimic those on the front panel with the exception of INPUT1, INPUT2 and VALVE MODE which are displayed here only.

Depending on the Valve Mode selected, some of the on-screen indicators also act as controls, hovering over the control will change your mouse pointer if the indicator is in an interactive state.

7.1 On-screen Indicators

The colour of the on-screen indicators change to reflect changes in state:
Green – ON, TRUE or OPEN
Red – OFF, CLOSED or FALSE
Amber – INTERMIDIATE

7.1.1 Turbo State

OFF 

Accelerating 

ON 

Clicking the indicator cycles the pumps ON and OFF

7.1.2 Heater State

OFF

ON 

Cool Down 

Clicking the indicator cycles the heaters ON and OFF

7.1.3 Filament State

OFF 

FAIL / TRIP 

ON 

Clicking the indicator cycles the filaments ON and OFF

7.1.4 Valve 1 & Valve 2

While in Automatic Mode, V1 and V2 are grayed out and act as indicators of the valve's state only. Green = Open, Red = Closed.

In Manual Mode these act as controls for each of the valves

7.2 On-screen Controls

The following describes all of the controls available with the Remote Vacuum Controller. Note that not all of these will be available in each particular configuration.

7.2.1 Turbo State

This control is available in all the RVC operation modes. It controls the power to the turbo pump and backing pump used in the RGA vacuum system.
When the pumping system is switched off the symbol will be shown in red. To switch the pumps on, click on the symbol. The symbol will change to amber indicating that the turbo pump is on, but not up to speed. When the turbo comes up to speed the symbol will change to green. The filaments cannot be turned on before the pump is on and up to speed.

NOTE:
Once the pumping system is switched on a timer starts. If the turbo pump has not reached full speed within 8 minutes, the pumping system will be switched off to protect the turbo. Check the backing pressure of the external pump is adequate and that there are no leaks present in the system or pump bellows.

7.2.2 Filament State

Clicking on the symbol once the pumping system is up to speed will turn on the filaments, indicated by the symbol changing from blue to red. Clicking the symbol again will switch off the filaments.

7.2.3 Valve 1 (Low Pressure Sampling)

In Automatic Mode, Valve1 will open when the interlock conditions are satisfied, the symbol will change to reflect the status of the valve, Green=Open, Red=Closed.

In Manual Mode, Valve1 will be unavailable until the following interlock conditions are satisfied:
Pumps on and at speed
Filament On
Pressure OK (HiVAC and LoVAC OK)
The valve may then be opened or closed by clicking on the symbol. The symbol will change to reflect the status of the valve, Green=Open, Red=Closed.

7.2.4 Valve 2 (High Pressure Sampling)

In Automatic Mode, Valve2 will open when the interlock conditions are satisfied, unless a variable by-pass valve is also fitted, the symbol will change to reflect the status of the valve, Green=Open, Red=Closed.

In Manual Mode, Valve2 will be unavailable until the following interlock conditions are met:
Pumps on and at speed
Filament On
Pressure OK (LoVAC OK)
The valve may then be opened or closed by clicking on the symbol. The symbol will change to reflect the status of the valve, Green=Open, Red=Closed.

7.2.5 Heater State

Switches the heater state between normal running @ 70DegC and bake 180DegC

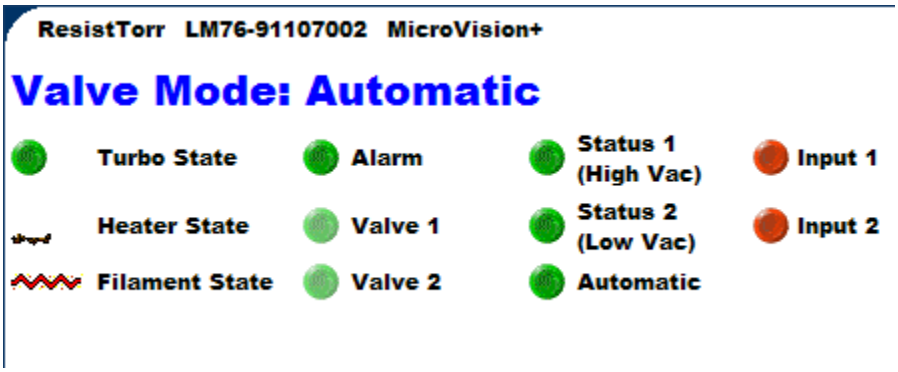
7.3 Operating Modes

There are three operating modes which are described below.

7.3.1 Automatic Mode

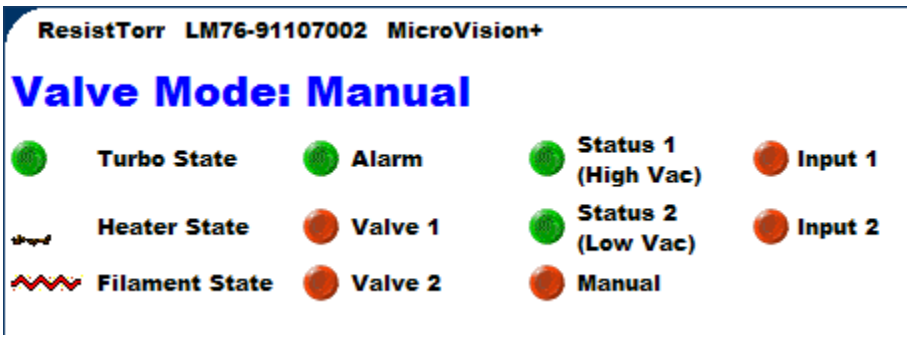
In Automatic Mode the inlet valve or valves will open when all the interlock conditions are satisfied without any user intervention.
If, once a valve is open one or more of the interlock conditions changes, the valve will be closed but will re-open as soon as the interlock condition is satisfied.

This is the recommended operating mode as the RGA and process chambers are protected by the interlocks.



7.3.2 Manual Mode

In Manual Mode all the inlet valves will remain closed until the user opens a valve using the on-screen control. The valve will only open if all the interlock conditions are satisfied.
If the interlock conditions are not met, the valve will remain closed. If, once the valve is open one or more of the interlock conditions changes the valve will be closed and will not re-open until the interlock condition is satisfied and the user opens the valve using the on-screen control.



7.3.3 Maintenance Mode

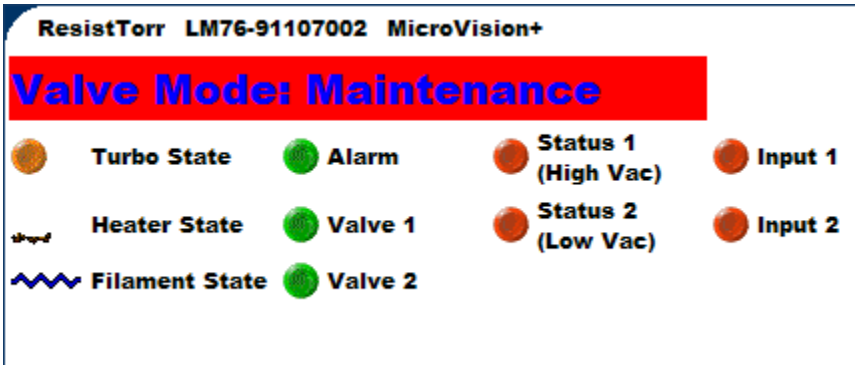
CAUTION

Maintenance Mode should only be used by skilled personnel who are familiar with the system.

Do not switch to Maintenance Mode while operating in the Automatic Mode as all valves will open.

In Maintenance Mode all the safety interlocks are disabled. The valves may be opened the filaments and multiplier may be switched on regardless of the state of the system. Damage to the filaments and multiplier may occur. There is the risk that the process chamber is exposed to atmosphere.

This mode should not normally be used and if it is, it should only be used by competent vacuum engineers.
Do not switch to Maintenance Mode while in Automatic Mode. Under this condition, the valves to the process chamber will open as soon as the RVC is switched to Maintenance Mode.



Maintenance Mode can be activated only by turning the key switch on the front of the RV2C to the **INTERLOCKS OFF** position.
The RVC2 should be placed in Manual Mode **before** Maintenance Mode is selected.

When in the maintenance mode the mode bar will be red and the legend will read MAINTENANCE MODE.

It is recommended that the key-switch is left at the INTERLOCKS ON position and the key removed for safety.

8. Installation and Interfacing

The RVC2 is typically supplied as an integral part of a factory assembled and tested system, this section should provide useful background information. The main purpose of this section of the manual is to provide purchasers who wish to integrate the unit into an existing or self-assembled vacuum system, with the necessary technical information.

WARNING

The installation of this product must be carried out by skilled technical personnel who possess an in depth knowledge of vacuum engineering, electrical engineering and the safety standards relating to both fields. All procedures and wiring methods marked * safety * in the Installation and Interfacing sections must be complied with.

The RVC2 MUST be mounted in an equipment sub-rack, such that only the front panel is accessible by an operator. The enclosure surrounding the sub-rack must have adequate rigidity and resistance against the spread of fire, within the meaning of EN61010-1:2002, parts 8 and 9.

MKS Instruments will not be liable for any damage or injury due to failure to comply with the requirements of both the above statements.

8.1 Interlocks

If you intend to make use of the process safety features and automatic control that the RVC2 offers, then three additional interlocks signals are required in addition to the internal interlocks.
The HiVac and LoVAC signals will typically be from an independent total pressure gauge, pressure switches or the process control system.
A "turbo at speed" signal is also required, check the pump's owners manual for details.

The table below summaries the interlock conditions used in the Manual and Automatic Modes. The required state is only reached when all the conditions are satisfied.

Required State	Conditions
Filament On	Main Pumps On and up to speed No filament trips *
By-Pass Valve Open	Main Pumps On and up to speed Filament On LoVAC OK
High Conductance Valve Open	Main Pumps On and up to speed Filament On LoVAC OK HiVAC OK

* Filament trips include X-Trip, P-Trip and T-Trip, refer to your RGA user manual for information on these conditions.

8.1.1 LoVAC OK

The LoVAC OK signal will typically be provided by an independent total pressure gauge monitoring the process chamber, a total pressure switch or the process control system.
The LoVAC level will be the normal maximum process operating pressure which will determine the size of the leak or setting of the metering valve in the by-pass.
Once the pressure falls below the Low Vacuum level the LoVAC OK signal is set true, the LoVAC icon in the Remote Vacuum Controller window changes color from red to green and Valve 2 (High Pressure) may be opened providing the other interlock conditions are satisfied.

8.1.2 HiVAC OK

The HiVAC OK signal will typically be provided by an independent total pressure gauge monitoring the process chamber, a total pressure switch or the process control system.
In systems using two inlet valves the HiVAC OK level will control the opening of the high conductance valve (Valve 1) and is usually set to the maximum operating pressure for the high conductance inlet.
Once the pressure drops below the High Vacuum level the HiVAC OK signal is set true, the HiVAC OK icon in the Remote Vacuum Controller window will change color from red to green and the high conductance valve may be opened providing the other interlock conditions are satisfied.

In systems which use one inlet valve, this valve is controlled by the HiVAC OK signal. Once the pressure drops below the HiVAC OK level the HiVAC OK signal is set true, the HiVAC OK icon in the Remote Vacuum Controller window will change color to green from red and the sampling valve may be opened providing the other interlock conditions are satisfied.
Cont….

The setting for the HiVAC OK level will depend on the inlet configuration and the ion source type.
Note: When HiVAC is OK the LoVAC signal must also be OK. The HiVAC level is set to the maximum operating pressure for the higher conductance inlet (Valve1). Once the pressure drops below the HiVAC level, the HiVAC OK signal is set true and the high conductance valve may now be opened, providing the other interlock conditions are satisfied.

Interfacing of the Hi and Lo VAC signals is described in Section 8.4.
They are designed to accept a variety of types of signal such as no volts relay contact, open collector TTL drive and TTL totem pole drive.

8.1.3 Turbo at Speed

All turbo pump controllers offer a "turbo ready" or "turbo at speed" signal when the pump is >95% of full speed.

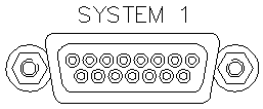
8.1.4 Internal

The other interlocks are internal to the complete RGA systems.
Before either the high conductance valve (Valve1) or the by-pass valve (Valve2) can be opened, one of the RGA's filaments must be on and the emission must be correct.

8.2 Connectors

8.2.1 System 1

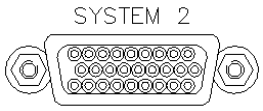
15-way D-Type socket



Pin	Function	Notes
1	Valve 1 Open	open collector drive
2	Valve 2 Open	open collector drive
3	Alarm On	open collector drive
4	Pumps On	open collector drive
5	Bake On	open collector drive
6	Alarm Relay	relay contacts "Form C"
7	Quad OK	open collector drive
8	Spare	
9	24V DC valve 1	current limited
10	24V DC valve 2	current limited
11	24V DC	current limited
12	24V DC	current limited
13	24 V DC	current limited
14	Alarm Relay	normally open contact
15	Alarm Relay	normally closed contact

8.2.2 System 2

26-way High Density D-Type socket

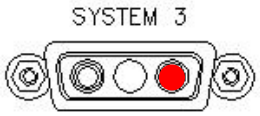


Pin	Function	Notes
1	Vcc (+5V)	1K ohm impedance
2	HiVAC Ok	opto-isolator anode
3	HiVAC Ok	opto-isolator cathode
4	Ground (0V)	
5	Vcc (+5V)	1K ohm impedance
6	LoVAC Ok	opto-isolator anode
7	LoVAC Ok	opto-isolator cathode
8	Ground (0V)	
9	H1	multiplier temp protect
10	Turbo Ready	opto-isolator anode
11	Vcc (+5V)	1K ohm impedance
12	Vac Restart	opto-isolator anode
13	Vac Restart	opto-isolator cathode
14	Ground (0V)	
15	Vcc (+5V)	47 ohm impedance
16	Ground (0V)	
17	24 V DC	current limited
18	Ground (0V)	current limited
19	Vcc (+5V)	1K ohm impedance
20	GPDI #1	opto-isolator anode
21	GPDI #1	opto-isolator cathode
22	Ground (0V)	
23	Vcc (+5V)	1K ohm impedance
24	GPDI #2	opto-isolator anode
25	GPDI #2	opto-isolator cathode
26	Ground (0V)	

8.2.3 System 3

3-pin D-type

Pin-A1 Female +24VDC
Pin-A2 Open
Pin-A3 Female 0V



8.2.4 Turbo Pump

2-pin D-type

Pin-A2 Female +24VDC
Pin-A1 Male 0V

8.2.5 Backing Pump

2-pin D-type

Pin-A2 Male +24VDC
Pin-A1 Female 0V

8.2.6 ECU Power

2-pin D-type

Pin-A2 Female +24VDC
Pin-A1 Female 0V

8.3 Connecting Vacuum Pumps

If direct energisation is not possible, for instance because of distance to pumps or because 120V or 240V pumps are used, it is possible to energize slave relays using the switched 24VDC outputs "Turbo Pump" and "Backing Pump".

The relay coils should be rated at 24VDC and the current consumption of each relay must not exceed 6A. The relay solenoids should be wired to a suitable 2-way D-type plug to mate with the rear panel sockets Turbo Pump and Backing Pump. These can be purchased separately.

Note that although the unit is fitted with inductive clamping diodes, it is good practice to fit these at the solenoid.

If connecting 24VDC pumps to the RVC2, the maximum load must not exceed 550W.

SAFETY
THE RELAY INSULATION CREEPAGE DISTANCES, CONTACTS RATINGS AND MAINS CIRCUITS WIRING MUST COMPLY WITH LOCAL REGULATIONS WITH RESPECT TO THE VOLTAGES AND CURRENTS HANDLED

8.4 Interfacing the Hi and LoVAC Gauges

In order that the RVC2 can determine whether it is safe to grant a request to open the inlet valves V1 and V2, it must know whether vacuum conditions in the users system are safe.
It is possible to hard wire both of these to the safe condition, BUT IT IS NOT RECOMMENDED.

The LoVAC indication might come from a Pirani or Penning gauge with the trip point set at a pressure for which the by-pass (Valve 2) has been configured.
The HiVAC indication might come from a Penning or Ion gauge with the trip point set at a pressure for which the higher conductance path (valve 1) has been configured.

Both Hi and Lo vacuum trip interfaces are identical and can operate either from a TTL drive signal or from an uncommitted relay contact. Correct use of these interfaces should ensure that if the gauge is turned off, a fail indication will be set up.

Three possible methods of interfacing are shown below and apply to both the HiVAC and LoVAC trips. The connections are all made to the 26-way High Density D-type connector System 2.