RESONANCE LTD

Optical Solutions & Technologies

VM200

Operating Manual

REV 1.1

9/29/2014

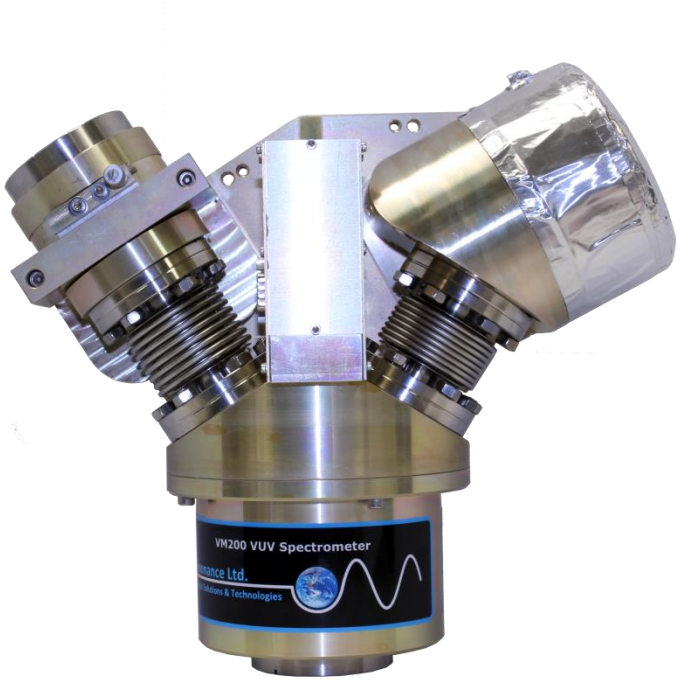

Table of Contents

Table of Figures

System Overview

The Resonance Ltd. monochromator/spectrometer is designed for laboratory applications yet is rugged enough for field use. The system is hermetically sealed and can be used in the vacuum ultraviolet region (wavelengths below 190 nm) with a nitrogen or helium purge, or by connecting to a vacuum system either through the slits or through a 2.75" Conflat® style flange on its base. The compact size of the unit results in a small internal volume (only 2 liters), allowing for a rapid pumping time.

A single grating is used to maximize throughput in the vacuum ultraviolet region and to minimize scattered light. The standard grating is a 45mm square f/4.2 concave holographic grating with an aluminum/MgF2 overcoat. The reflective properties of this or any grating can be severely damaged by mechanical contact with any solid, liquid or vapor. **Never blow on the surface of the grating or onto the slit openings.**

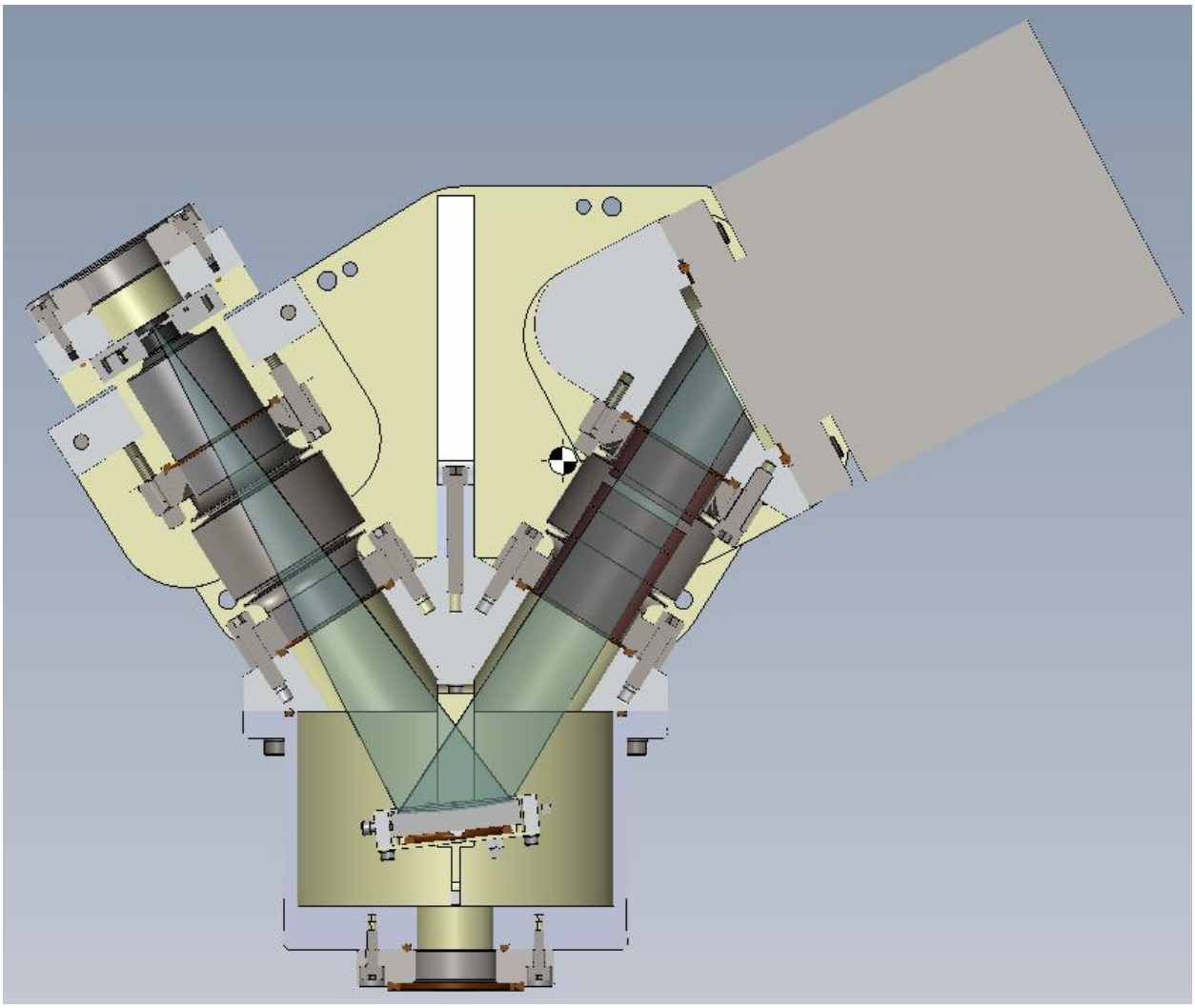

Figure 1: Cutaway view of VM200

Packing List

Below is a list of all the components shipped with the VM200. If you find any of these items to be missing, please contact Resonance Ltd. to arrange to have it delivered.

Item	Quantity
VM200 Monochromator	1
Motor Drive Controller Box	1
5 VDC Power Supply (100 to 240 VAC)	1
DP-9 Cable (for Motor Drive Controller)	1
USB Cable (for Motor Drive Controller)	1
2 ¾" Viton Gasket	1
2 ¾" Copper Gasket	1
Spare Viton O-rings	1 package
Hardware kit	1 package
Manual draft	1
*Software available for download from Resonance FTP site (particulars provided by email)	

Setup

The VM200 spectrometer can be fixed in any orientation, however it should be suitably supported by its optical plane, a VUV light source can be fixed via the custom CF using M6 bolts. If purged operation is desired, an adaptor flange can be used to allow purge gas to enter the spectrometer through the flange at the bottom of the spectrometer and exit the entrance slit. Vacuum or purged operation is necessary only when observing wavelengths less than 190 nm. Keep in mind that the VUV properties can be easily damaged by organic contaminants therefore use only oil-free purge gas.

For mounting to a purge system, light source, or detector a custom CF flange has been supplied (see Figure 1). Similarly a custom flange has been supplied for mounting of the customer supplied detector.

Operating in Monochromator Mode

1. Plug the motor cable into the motor drive controller box.

Figure 2: Motor Drive Controller Box

2. Plug in the driver box power supply.
3. Plug in the USB cable.
4. Plug in the 9 pin serial cable.

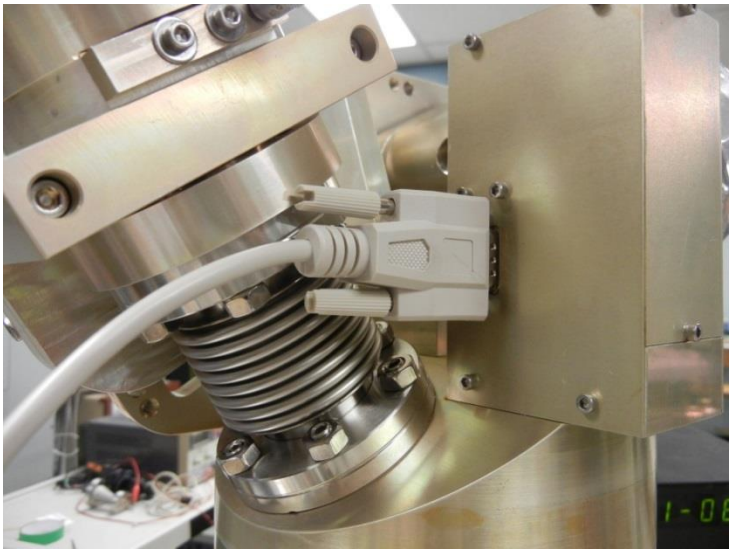

Figure 3: Motor drive Connection

Operating in Monochromator Mode (continued)

5. Start the VM200 Program.

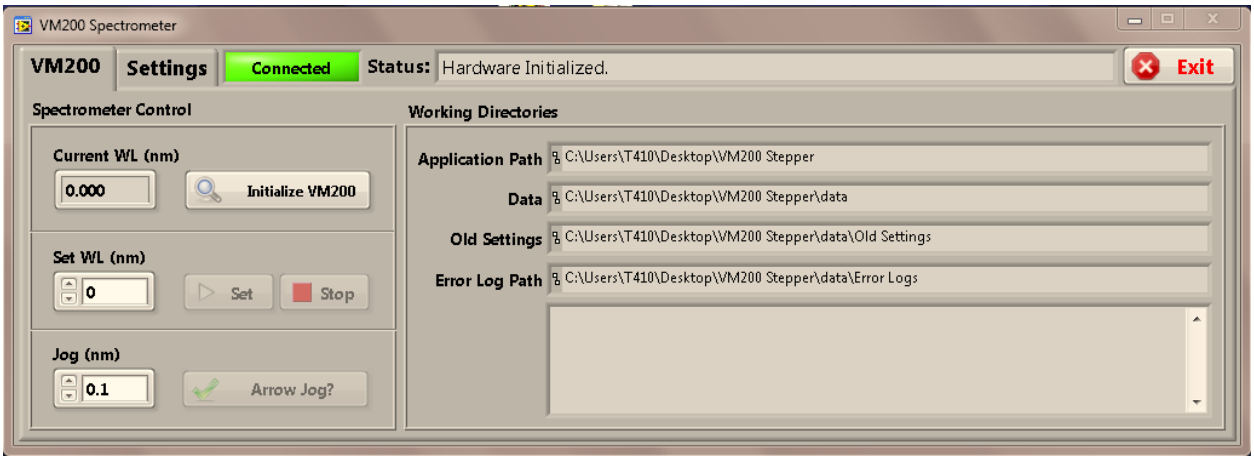

Figure 4: VM200 stepper control Screen

6. Make sure the 'Stepper' indicator light turns green

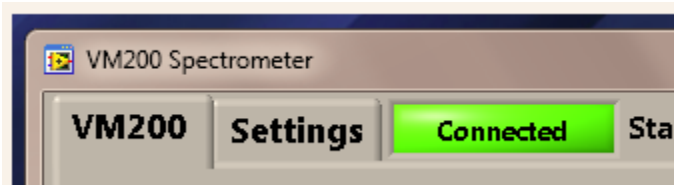

Figure 5: Stepper Button

7. Click on the 'Zero' button

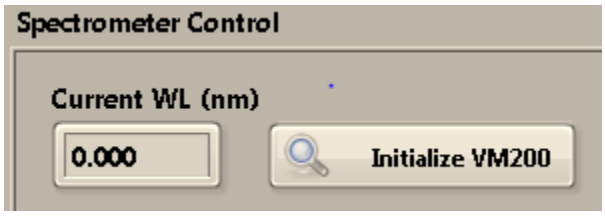

Figure 6: Zero Button

You are now ready to obtain spectra

Operating in Spectrometer Mode

THIS FEATURE IS NOT INCLUDED IN THIS INSTRUMENT
CUSTOMER TO SUPPLY INTERFACE

Mounting and Operating with a Lamp

A custom CF flange has been provided for mounting a customer supplied lamp. NOTE: if high vacuum is unattainable, check that the gasket is fully compressed and has not been pinched.

Calibration

It is possible that occasionally the wavelength scale may need recalibration. To do this, 3 known wavelengths are required, ideally with two of them near the far ends of the wavelength scale.

Focusing

This VM200 has to be refocused, as the shipped grating has to be replaced and the CCD used at the factory for testing is not supplied with the unit. This can be done using the customer supplied detector.

Monochromator Mode

1. Select a light source with a known sharp line and connect it to the monochromator
2. Set the slits to as narrow as possible while still obtaining a decent signal
3. Scan across the line.
4. On the exit side arm, slightly loosen the two screws holding the locking plate that holds the arm on the optical plane.

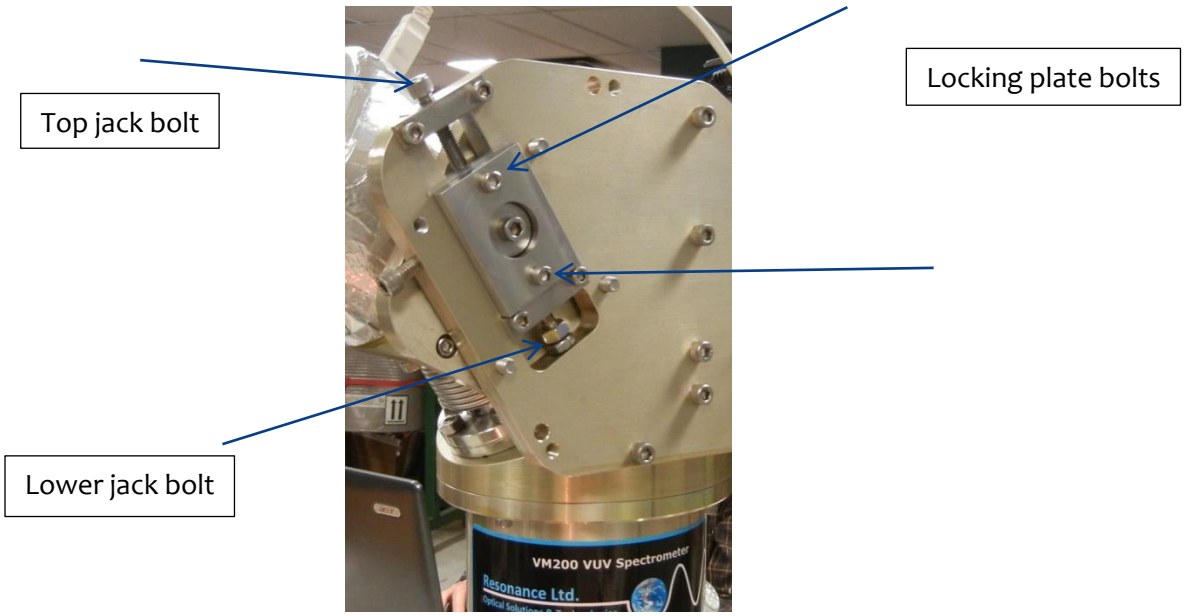

Figure 7: Exit arm focusing

5. It is expected that the focus position will be further out than that set at the factory, therefore back off the top jack bolt and tighten the lower jack bolt until your signal reaches its highest level.
6. Take a spectral scan of the selected line
7. Note whether or not the line has become any narrower and the signal has increased.

Focusing (continued)

8. If it appears that the signal has come out of focus, drive the arm in the opposite direction a set amount and take another scan

9. Continue to repeat step 8 until you have scanned past the focal point and the line begins to broaden and have a lower peak signal.

10. Drive the arm in smaller increments in the opposite direction and scanning at each interval until again you have just passed the focal position.

11. Repeat step 10, with smaller adjustment changes each time you change directions, until you are finally confident to have settled at the focal point.

12. Retighten the locking plate bolts to ensure the focus is held.

Grating Replacement Procedure

1. Place spectrometer on its optical plane.
2. Remove the 8 bolts holding the cylinder to the main body exposing the grating assembly.

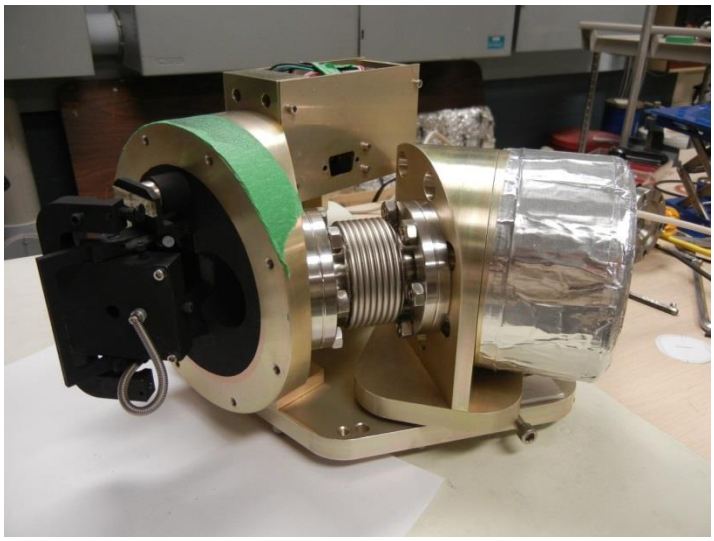

Figure 8: Optical Plane

3. Remove the 4 bolts holding the rear cover plate and spring on the grating bucket. Use care when removing the last bolt as the spring tension will want to rotate the rear cover.

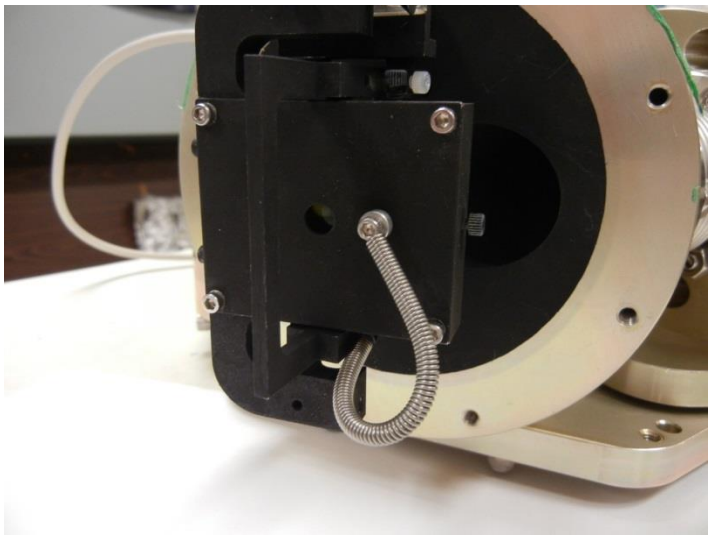

Figure 9: Grating Bucket

Grating Replacement Procedure (continued)

4. Remove the Viton O-ring used as a compliant spacer to hold grating in place.

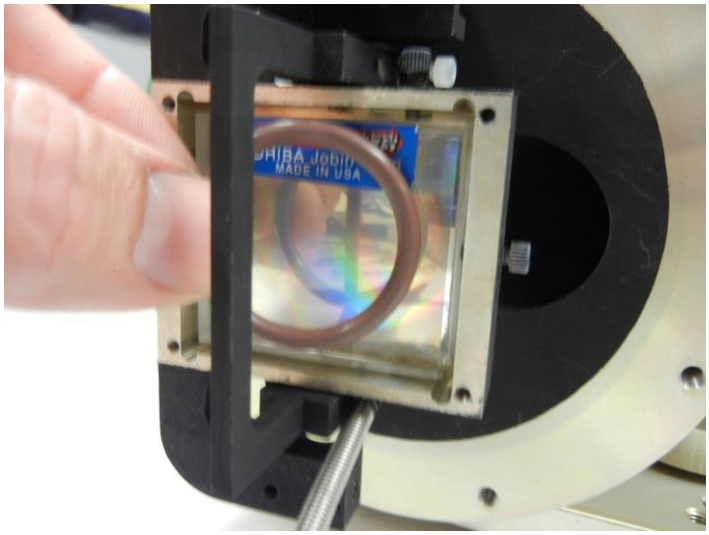

Figure 10: Viton O-ring

5. Loosen the 2 nylon screws holding the grating in the bucket.

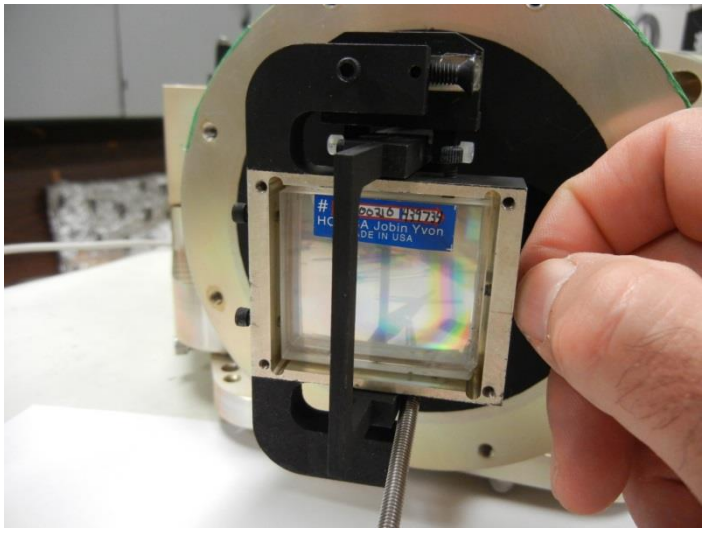

Figure 11: Fixing Grating

Grating Replacement Procedure (continued)

6. Using a thin metal blade (i.e. feeler gauge) wiggle the grating out far enough to hold it from the edges and remove.

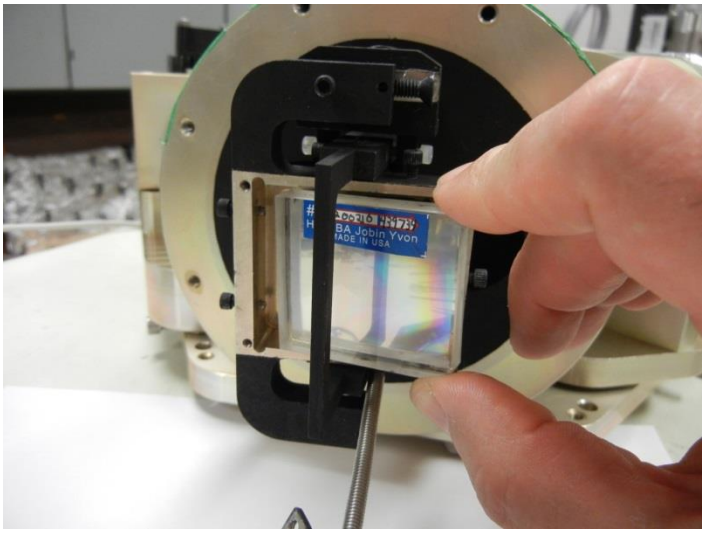

Figure 12: Grating Removal

7. Replacement is the opposite of removal.

8. Once the new grating is in place and the nylon screws have been hand tightened, ensure the O-ring is in place, hold the cover and rotate 4 times counter clockwise to pre load the spring and slide the cover into place.

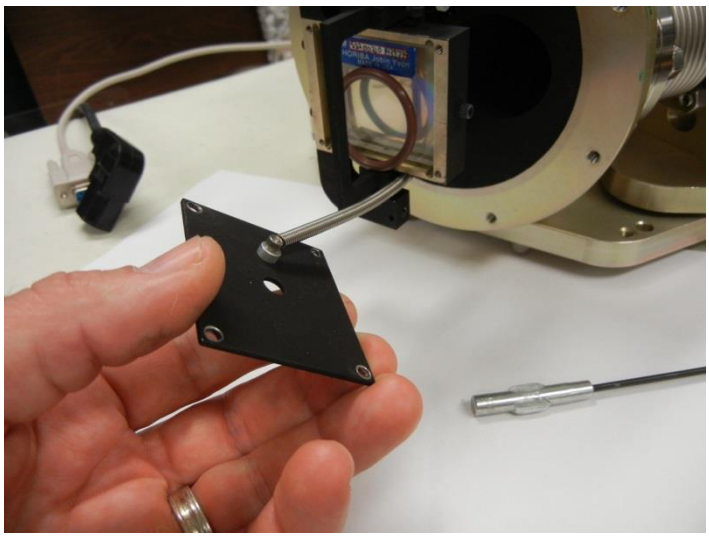

Figure 13: Spring Preload

Grating Replacement Procedure (continued)

9. The grating is centered In the bucket (as viewed left to right) but off center top to bottom, 1.36 mm at top and 0.96 mm at bottom. The bucket has also been adjusted in the yoke to compensate for machining tolerances of the various components and it is currently off set to the side opposite the wavelength selection screw mechanism. 0.78 mm by screw -top and 0.55 mm at bottom.

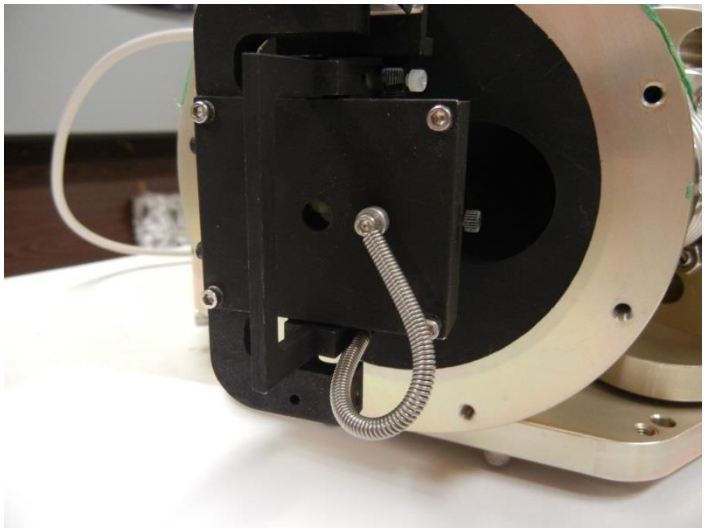

Figure 14: Grating spacing

Detector Replacement Procedure

The customer is to supply the detector, this detector is fixed to the angled mounting block with the supplied screws. The angled block must be removed to allow the addition of the mounting bolts. To access this area the exit bellows must be removed from the spectrometer and the bellows then removed from the angled block. See step by step process below.

1. Remove all 6 nuts on the studs on the side of the spectrometer. A standard allen key must be cut back to allow access to the inner nuts. Using the allen key back–off the studs into the spectrometer body to the point where the nuts can be removed.

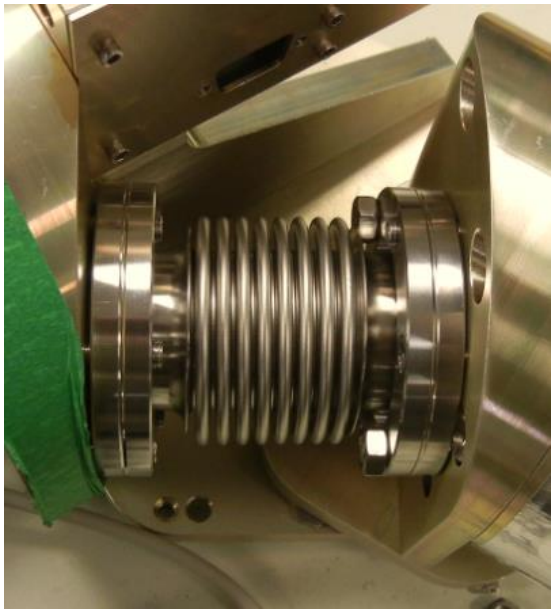

Figure 15: Bellows Removal

2. Loosen the two screws on the locking plate(see figure #5 above) on the backside of the optical plane and remove the end stop. Slide the angled block and the bellows out and remove from the optical plane.

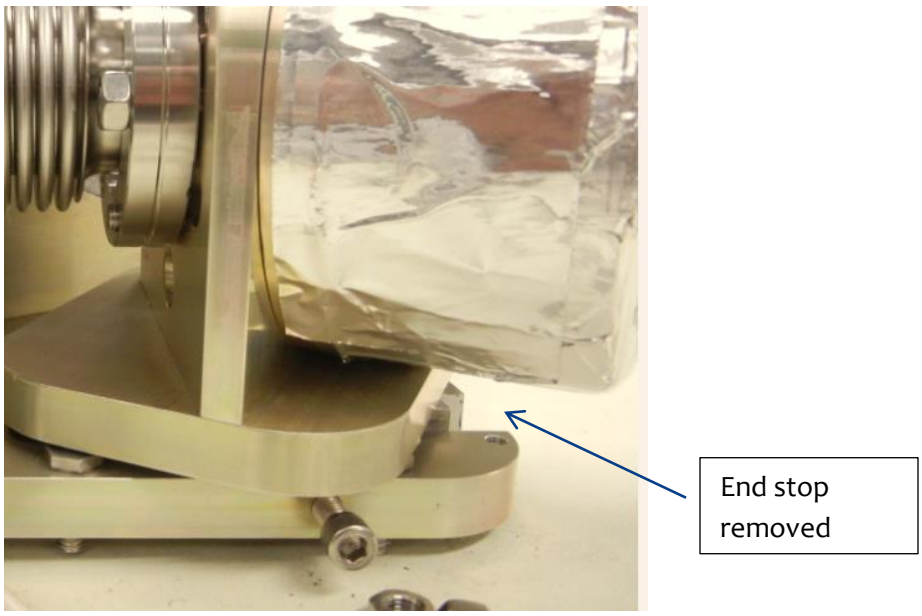

Figure 16: Grating spacing

3. Remove the 6 nuts holding the bellows to the angled block. With the bellows removed access to the bolt holes is now possible.

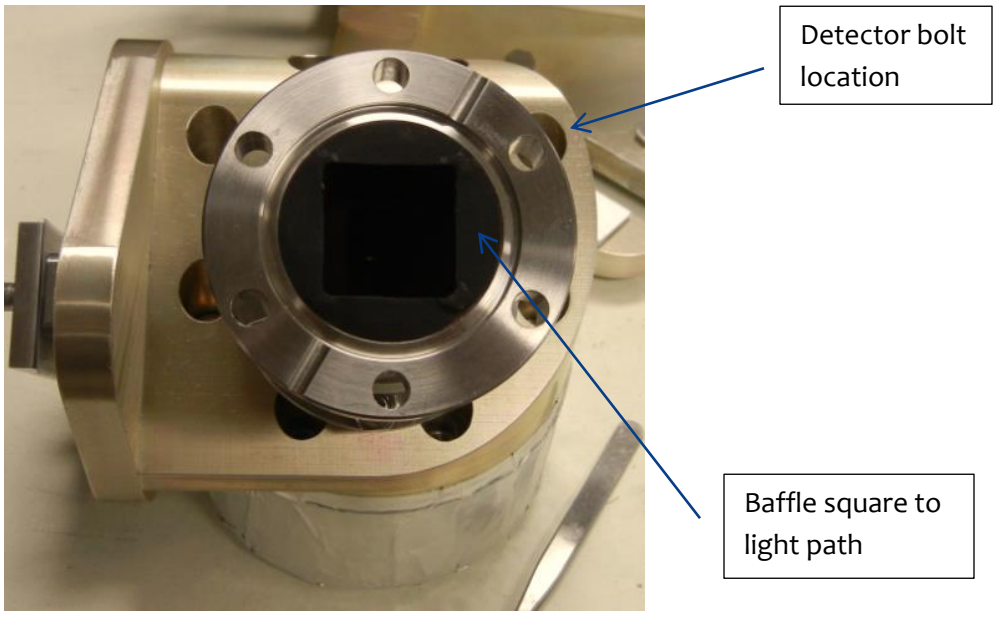

Figure 17: Detector Mounting Bolts

4. When reassembling the bellows, one must ensure the light baffle is square in the bellows. As the bellows has a free end that is allowed to rotate (this end bolted to the angled block) fasten lightly to the angled block and re-insert into the optical plane and line up the six studs on the spectrometer body. At this point tighten up the rotatable flange.

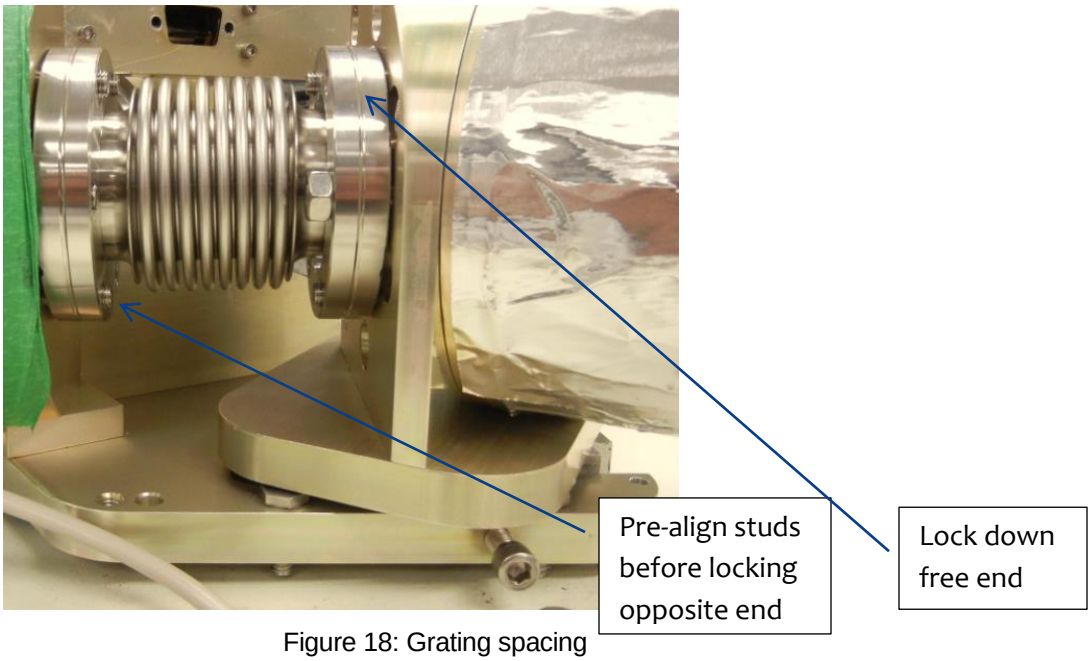

Figure 18: Grating spacing

5. Remove the assembly and complete bolting the flange end to the angled block.
6. Re-insert into optical plane and bolt down the remaining end of the bellows to the spectrometer body.
7. Insert the end stop and snug down the clamping plate. The unit is ready to be focused.

Add-on Options

- Adaptor Flange for Purged Operation
- RF Light Source
- Pumping Station
- CCD Array
- EUV/VUV/UV/Vis Detector

Contact

Resonance Ltd. stands behind every product we sell. We welcome feedback and encourage any of our customers to contact us with questions, or concerns. You may contact us through e-mail, our website, telephone, or fax!

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Appendix

The VM200 monochromator (Vacuum Monochromator 200mm focal length) contains a concave holographic grating with Gold coating. This grating has the following specifications:

Monochromator

Model	VM200
No. of Lines/mm	1200 l/mm
Diameter	40 x 45mm
Coating	Gold
Spectral Range of Operation	<50 – 200nm
Input Focal Length/Output focal Length	200mm/187.9mm
Body Seal Types	Viton O-rings
Body Mating Flanges	2 ¾” Conflat type x 2 (modified)
Ultimate Pressure	<1 x 10^{-6} mbar

Wavelength Drive

Type	10 turn dial/lead screw(stepper drive)
Backlash	0.5nm (vacuum)
Step Size	0.4 – 15 Angstroms
Standard Scanning Speeds	0.4 – 15 nm/sec
Accuracy	± 0.3nm

Appendix

Adjustable Slits

Resonance Ltd. uses ThorLabs Adjustable slits modified to be compatible with vacuum operations.

Slit Height	10 mm
Slit Width Range	0 – 6mm
Blade Parallelism	<25µm
Slit Width Accuracy	± 50 µm