### Specifications

<table>
<thead>
<tr>
<th></th>
<th>STM (UHV 300/700)</th>
<th>Beam Deflection AFM (UHV 350/750)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution (X,Y)</td>
<td>0.5A</td>
<td>0.5A</td>
</tr>
<tr>
<td>Resolution (Z)</td>
<td>0.05A</td>
<td>0.1A</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scan Range (X,Y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (130V)</td>
<td>5μm</td>
<td>2.5μm</td>
</tr>
<tr>
<td>High (215V)</td>
<td>6μm</td>
<td>4.1μm</td>
</tr>
<tr>
<td>Offset Range (X,Y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (130V)</td>
<td>Up to 5μm</td>
<td>2.5μm</td>
</tr>
<tr>
<td>High (215V)</td>
<td>Up to 8μm</td>
<td>4.1μm</td>
</tr>
<tr>
<td>Z Range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (130V)</td>
<td>0.65μm</td>
<td>0.43μm</td>
</tr>
<tr>
<td>High (215V)</td>
<td>1.04μm</td>
<td>0.74μm</td>
</tr>
<tr>
<td>Offset Range (Z)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (130V)</td>
<td>0.73μm</td>
<td>0.73μm</td>
</tr>
<tr>
<td>High (215V)</td>
<td>1.2μm</td>
<td>1.2μm</td>
</tr>
<tr>
<td><strong>Scanner</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resonant Frequency</td>
<td>Structure &gt; 5 kHz</td>
<td>Structure &gt; 1.7 kHz</td>
</tr>
<tr>
<td><strong>Bakeout Temp</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STM</td>
<td>150°C</td>
<td></td>
</tr>
<tr>
<td>Beam Deflection AFM</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Environmental Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor Space:</td>
<td>12&quot; wide x 12' deep or more</td>
<td></td>
</tr>
<tr>
<td>Entrance:</td>
<td>36° wide x 72&quot; high minimum</td>
<td></td>
</tr>
<tr>
<td>Room Temperature:</td>
<td>15° - 25°C held within ±1°C</td>
<td></td>
</tr>
<tr>
<td>Floor Vibration:</td>
<td>≤ 1 μm at 2 Hz</td>
<td>≤ 3 μm at 10 Hz</td>
</tr>
<tr>
<td>Acoustic Vibration:</td>
<td>≤ 45 dB</td>
<td></td>
</tr>
</tbody>
</table>

**Other**
- Tunnelling Current (STM): <1 pA (IVP-300) to 100 nA (IVP-200)
- Tunnelling Current (AFM): <5 pA (IVP-300) to 100 nA (IVP-200)
- Bias Voltage: 0 — ±10 V
- Vacuum Range: <2 x 10^-10 Torr

**NOTE:** Temperatures measured directly on sample.

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**UHV Ambient and Variable Temperature STM and AFM Systems**

**Models:**
- UHV 300 and UHV 700 STM
- UHV 350 and UHV 750 AFM/STM
- UHV 3000/7000 STM and UHV 3500/7500 AFM/STM Complete Systems

Integrated SPM/Surface Analysis Systems

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**RHK Technology Inc.**
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www.rhk-tech.com
About RHK
Since 1987, RHK Technology has designed, manufactured and marketed high performance SPM products. Our continuous improvements to meet the demanding requirements of the research community has earned us a reputation for providing quality high performance products.

RHK’s UHV Product Line: Modularity and High Performance “Beetle™” Design

Modular UHV Products
Based on over a decade of design experience, our UHV line offers unparalleled flexibility and modularity.

Our scan heads, sample flanges, temperature options, and chambers are designed with modularity in mind. This means you can easily upgrade your system, add functionality, or integrate your SPM with existing or new surface analysis instrumentation.

UHV 300 Series
External air leg vibration isolation
1. UHV 300 STM
2. UHV 350 Beam Deflection AFM/STM

UHV 700 Series
Internal spring suspension vibration isolation with eddy current dampening
1. UHV 700 STM
2. UHV 750 Beam Deflection AFM/STM

UHV 3000 Series
Complete Turn-key UHV SPM Systems
1. UHV 3000/7000 STM
2. UHV 3500/7500 Beam Deflection AFM/STM

Combination Surface Analysis Systems
1. RHK SPM System
2. SPECS AES, XPS, UPS, LEED
3. Sample Preparation, Deposition, MBE

The Beetle™ RHK scan heads provide researchers with the ideal SPM scanner design for research. Low noise and high resolution are key benefits to every RHK SPM. Each scan head is based on the “Johnny Walker” Beetle™ design, the most mechanically and thermally stable of the many SPM designs.

Inherent Mechanical Stability
The compact geometry results in a small mechanical loop for first order drift compensation is accomplished through the symmetric design of the Beetle scanner.

The Beetle’s small mechanical loop ensures mechanical stability.
RHK’s unique modular design provides the ultimate flexibility with a built-in upgrade path. Scan heads, Sample stages, VT options and sample holders are all designed to be easily replaced or upgraded to meet your changing research requirements. You can configure a system to meet your needs today with an upgrade path for future research needs. As a result, we provide a research platform with ease of use, performance and a combination of capabilities unmatched in any commercial UHV SPM instrument.

RHK offers two scan head designs: An STM with superior low current imaging performance and an AFM/STM with beam deflection feedback. Both of the scan head designs are modular assemblies mounted on standard ConFlat® flanges and are easily customer interchangeable in all of our systems. This unique modular design provides a straightforward upgrade path regardless of variable temperature or vacuum chamber options.

### STM Scan Head
The UHV 300 and 700 series STM systems have been delivering the highest quality low current imaging for over a decade. Flexible operating modes combined with our low noise, high bandwidth control electronics provide the user with an unparalleled performance STM system package. Our patented tip exchange system provides simple tip exchange along with in-situ tip conditioning on VS systems or with the optional tip heating module.

- Low Current Imaging - < 1pA at 5kHz bandwidth
- High Speed Scanning - 3 Frames/second
- Superior thermal and mechanical stability

### AFM/STM Module
The UHV 350 & 750 series AFM/STM systems are based on the traditional laser detection – position sensitive detection (PSD) feedback design. This provides the full range of AFM acquisition modes including; Normal Force, Lateral Force, Non-Contact, Near Contact, Constant Height, CAFM, MFM, simultaneous AFM/STM, and more. The UHV 350 includes standard commercial cantilever mounts and standard STM tip wire mounts with in vacuum storage and in-situ exchange for easy cantilever and/or tip exchange without breaking vacuum. The open exchange holders also provide for in-situ thermal and ion beam tip conditioning.

- Straightforward laser path without mirrors or lenses
- Intuitive orthogonal laser and PSD alignment
- True quantitative friction force measurements

### Beam Deflection AFM/STM Scan Head
The UHV 350 & 750 series AFM/STM systems are based on the traditional laser deflection – position sensitive detection (PSD) feedback design. This provides the full range of AFM acquisition modes including; Normal Force, Lateral Force, Non-Contact, Near Contact, Constant Height, CAFM, MFM, simultaneous AFM/STM, and more. The UHV 350 includes standard commercial cantilever mounts and standard STM tip wire mounts with in vacuum storage and in-situ exchange for easy cantilever and/or tip exchange without breaking vacuum. The open exchange holders also provide for in-situ thermal and ion beam tip conditioning.

- Straightforward laser path without mirrors or lenses
- Intuitive orthogonal laser and PSD alignment
- True quantitative friction force measurements

### UHV SPM Subsystems
For those wanting to integrate an SPM with an existing UHV system or build your own system, we offer the UHV 300 and 700 series in a sub-system package. Both the 300 and 700 series designs are packaged as fully functional SPM system modules, complete with control systems. The subsystem packages are designed for easy integration onto existing vacuum systems or as a basis for your custom stand-alone system design. Our unique through chamber introduction capability allows you to transfer samples in either side or pass completely through the SPM chamber. In addition, the chamber is designed with a large port for the ion pump at the bottom for efficient pumping and numerous blank ports are provided for user additions. Subsystem packages include viewports, blanks, sample and probe holders with internal storage, wobble stick sample transfer and sample introduction load lock with magnetic transfer as shown.

### UHV 300 Series Subsystem
The UHV 300 and 350 subsystem packages take advantage of the inherent stability of the “Beetle” design. The vacuum chamber is designed with multiple ports targeted at the tip/sample interface. In addition to excellent operator view of the sample and internal operation, the system provides full optical access for research techniques which require line of sight access to the sample/interface such as apertureless NSOM. Furthermore, the sample stage is fixed (vibration isolation is external) and the microscope is free of any magnetic field sources providing an ideal research platform for techniques requiring a fixed focal point as in combined SPM/optical experiments, where magnetic field interference is critical or external magnetic fields will be applied.

### UHV 700 Series Subsystem
The UHV 700 and 750 subsystem packages combine the stability of the “Beetle” with an internal spring suspension and eddy current damping system for applications where external air legs are not a practical option. The UHV 700 series system is also designed to provide the user with excellent optical access to the sample and the spring suspension system can be easily locked for sample and tip exchange or non-SPM applications where a fixed sample focal point is required.

### Modular Components = Flexible System Design
RHK offers two sample stage designs with a variety of sample temperature and holder options in response to the growing number of research application requirements. The choice of sample stage is determined by the type of vibration isolation that is chosen. The UHV 300 series instruments utilize a flange mounted sample stage with an internal Vickers isolation and are designed for use with external air leg damping systems. The UHV 700 series instruments also use a flange mounted sample stage which includes an internal spring suspension system with eddy current dampening for integration with systems where air legs are not practical or desirable. The two stages are available in ambient or variable temperature configurations.

**Sample Stage and Variable Temp Modules**

**Sample Stage**

- Ambient
- Variable Temp.

**Sample Holder Selection**

A growing range of sample holder designs are available to address the growing range of applications. As illustrated above, the ambient temperature and sample fracture holders are designed for use on both 300 and 700 series designs while the variable temperature holders for the 700 series use an integral heater design.

**Variable Temperature Imaging and Sample Preparation**

The chart at the right illustrates the wide range of sample heating and cooling temperature range options.

**Full Temperature Range Operation with a Single Sample Holder Design**

You can cool a sample to the minimum temperature, e.g. <25K and heat it to the maximum for the selected heating mode, e.g. 1500K on any of the VT sample holders. Separate holders for heating and cooling are not required. All UHV sample holders allow radiative, e-beam and resistive heating modes.

**Heater options**

- The Tungsten filament provides both radiative and e-beam heating modes while the quartz lamp heater option offers radiative heating in reactive gases and at a wide range of operating pressures.

**True Sample Temperature Measurement**

- Thermocouples in direct contact with the sample.
- No need to rely on indirect temperature measurements of the sample stage.

**Thermal Sample Isolation**

- Sample mounted on sapphire washers, providing minimal thermal transfer to the sample holder during heating yet maximizing thermal transfer during cooling.
- Sample is also electrically isolated for optimal low noise measurement and e-beam heating for sample preparation.

**Research Flexibility & Performance**

- Our unique range of multi-contact sample holder and stage combinations with 10 image acquisition channels provides a nearly unlimited range of operating modes and optimal performance.