MultiCentre
The Analytical Stage

www.uhvdesign.com
Configurable analytical stages offering up to 5 axes of motion and options for sample biasing, heating to 1200°C and cooling to <20K (typically 15K). MultiCentres can be configured to accept most common surface analysis sample holders including pucks, flags and ESCA stubs.

The MultiCentre and associated accessories provide a complete solution for sample manipulation and transfer. Typical applications include analytical instrumentation for surface analysis equipment and synchrotron end stations.

The MultiCentre range includes the XL-T Series which provides compact single bellows stages and the XL-R series which utilises dual bellows with dual-point support to provide increased stability, precision and range.

Each series offers a full range of options including motorisation, resistive or e-beam heating, temperature measurement, sample biasing/current measurement and LN$_2$ and LHe cooling options. MultiCentres are unique in their ability to provide continuous azimuthal rotation and temperature measurement even when cooling with LN$_2$ and when heating to 1200°C.

### MULTICENTRE KEY ADVANTAGES

- Compact and high stability, high precision stages
- Modular stage design allows functionality to be configured to suit application
- Innovative sample stage with ultra compact swept volume and unique range of additional stage options
- Heating to 1200°C & cooling to <20K (typically 15K, with LN$_2$ precooling to reduce LHe consumption and costs)
- Unique ability to provide continuous azimuthal rotation and LN$_2$ cooling
- Flag, puck and ESCA sample compatible stages

### XL-T Series

Compact stages

### XL-R Series

High stability, precision stages
Future-proofed modular design

The innovative MultiCentre range can be configured to match your application requirements. Should your requirements change in the future, the MultiCentre can be upgraded to include additional functionality.

For example, the unique uncluttered stage design provides space to include additional sample parking stages.

This ability to add additional functionality when required provides an economic route to future proofing your purchase, ensuring that the MultiCentre will remain at the forefront of surface science applications.

Continuous azimuthal rotation (LN$_2$ only - not LHe)

Polar rotation

LN$_2$ cooling module

Service collar (power, bias, thermocouple and LN$_2$)

Z translation of the sample

Heating, LN$_2$ and LHe Cooling

Electrically isolated sample stage (~30mm swept radius)

Configured for use with flag, ESCA or puck samples
Configure to suit your application

Choose 4-axis for polar rotation only, and 5-axis if azimuthal rotation is also required. In addition, heating and cooling can also be specified. If sample heating is required, resistive heating to 900°C and e-beam heating to 1200°C options are available. If sample cooling is required, LN2 cooling to <-150°C (123K) and LHe to -258°C (<20K (typically 15K)) options can be included.

Page 10 outlines further stage options and a range of sample transfer techniques and products.
Cooling Options

**LN$_2$ Cooling to <-165°C (108K)**
Innovative LN$_2$ cooling module provides sample cooling typically down to <-165°C (108K) with continuous azimuthal rotation and temperature measurement.
The LN$_2$ circuit is routed through the hollow shaft with the coils inside the service collar to minimise the swept volume of the stage head.

**LHe Cooling to -258°C (<20K, typically 15K)**
Based on UHV Design's own continuous flow cryostat, cryogenic temperatures below -258°C (<20K (typically 15K)) can be achieved in less than one hour.

Example Configurations

**4-Axis Heat & LN$_2$ cooling**
Heating to 1200°C with cooling to <-165°C (108K)

**5-Axis Heat & LN$_2$ cooling**
Heating to 1200°C with cooling to <-165°C (108K)

**5-Axis Heat & LHe cooling**
Heating to 600°C with cooling to -258°C (<20K (typically 15K))
The XL-T series is an entry level single bellows compact stage, offering a full range of functions. Based on the proven design of the TETRAXE XYZT manipulator, its rugged construction and smaller platform is ideal for surface science chambers where space is at a premium.

The large 65mm internal diameter bellows bore allows for all services, including LN$_2$ cooling coils, to be routed at the top of the stage resulting in a very uncluttered, compact design at the sample stage, significantly reducing the swept radius.

A unique feature is the continuous azimuthal rotation even when cooling with LN$_2$. This is achieved via a proprietary design which not only acts as a bearing for rotation, but provides electrical isolation of the sample.

Any or all axes of motion can be motorised (including Polar and Azimuthal rotation).

Contact us for details of suitable controllers.

### XL-T KEY ADVANTAGES
- Single bellows 3, 4 or 5 axes
- +/- 12.5mm X and Y motion
- 50-300mm Z motion
- Puck, Flag or ESCA sample handling
- E-beam heating, LN$_2$ cooling plus biasing options
- Continuous azimuthal rotation & LN$_2$ cooling

### XL-T Series
**Single bellows, compact analytical stages**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Puck-Style</th>
<th>Flag-Style</th>
<th>ESCA Stub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting flange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-Y travel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z travel</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Polar rotation</td>
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<td></td>
</tr>
<tr>
<td>Azimuthal rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum sample size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistive heating*</td>
<td>&gt; 900°C</td>
<td>&gt; 900°C</td>
<td>&gt; 900°C</td>
</tr>
<tr>
<td>e-beam heating*</td>
<td>&gt; 1100°C</td>
<td>&gt; 1200°C</td>
<td>N/A</td>
</tr>
<tr>
<td>LN$_2$ cooling*</td>
<td>&lt; -165°C (108K) typically achieved</td>
<td>&lt; -140°C</td>
<td></td>
</tr>
<tr>
<td>Sample current measurement</td>
<td>Isolation &gt; +/- 1000V Resistance &gt; 500MOhm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: all heating and cooling specifications are based on standard molybdenum sample holders.
Innovative uncluttered stage

The XL-T uses the large 65mm internal diameter bellows bore to route all services, including LN$_2$ cooling coils, at the top of the stage resulting in a very uncluttered, compact design at the sample stage. This significantly reduces the swept radius and eliminates the cycling stress on the cooling system whilst freeing up space for sources and detectors on multitechnique chambers.

Traditional stage designs (as shown on the right) require the services to be coiled around the shaft. This increases the swept radius of the stage, provides potential snagging areas and, after multiple cycles, the cooling pipes fatigue to the point of failure.
The XL-R series is a truly modular dual bellows stage. Incorporating dual-point shaft support with Z travel up to 1,000mm the XL-R series provides the ultimate in precision and stability.

With the addition of an integrated dual-point support, the XL-R series offers greatly increased stability, making it an ideal choice for surface analytical and synchrotron end-station applications where long travel and stability are essential.

All stage modules use proven kinematic designs that eliminate thermal stressing problems, such that even after repeated bakeout at 250°C, smooth operation is assured.

Any or all axes of motion can be motorised (including polar and azimuthal rotation).

Contact us for details of suitable controllers.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Puck-Style</th>
<th>Flag-Style</th>
<th>ESCA Stub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting flange</td>
<td>CF100 152mm (6&quot;) OD CF / CF150 203mm (8&quot;) OD CF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-Y travel</td>
<td>+/- 19mm or +/- 40mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z travel</td>
<td>100, 200, 300, 400, 600, 800 and 1000mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polar rotation</td>
<td>+/- 180° (+/- 100° with LHe option) with 0.02° angular reproducibility (stepper motorised)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Azimuthal rotation</td>
<td>Continuous with LN₂ cooling (+/- 100° with LHe cooling)</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Maximum sample size</td>
<td>25mm diameter</td>
<td>15mm x 18mm</td>
<td>14mm diameter</td>
</tr>
<tr>
<td>Resistive heating*</td>
<td>&gt; 900°C</td>
<td>&gt; 900°C (600°C with LHe option)</td>
<td>&gt; 900°C</td>
</tr>
<tr>
<td>e-beam heating*</td>
<td>&gt; 1100°C</td>
<td>&gt; 1200°C (Not available with LHe option)</td>
<td>N/A</td>
</tr>
<tr>
<td>LN₂ cooling*</td>
<td>&lt; -165°C (108K) typically achieved</td>
<td></td>
<td>&lt; -140°C</td>
</tr>
<tr>
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<td>Not available</td>
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MultiCentre

The Analytical Stage

XL-T/XL-R 5-Axis Stage - Resistive e-Beam Sample Heating

XL-T/XL-R 5-Axis Stage - LN₂ Sample Cooling

CryoCentre 5-Axis Stage - Combined LN₂/LHe Sample Cooling
Compatible sample handling throughout all experimental modules is essential to maintain full system integration. UHV Design offers a range of industry-standard transfer solutions which includes Flag-style, Puck-style and ESCA Stub options, all three of which can be fitted to either Wobblesticks or PowerProbes.

### Puck-Style

Puck-style gripper available with Wobblestick or PowerProbe.

### Flag-Style

Flag-style gripper available with Wobblestick or PowerProbe. For Wobblestick sample transfer there is an option to include a toggle switch (b) (see opposite) on the stage to raise and lower the thermocouple before and after sample transfer.

### ESCA Stub

ESCA stub gripper only available on Wobblestick (Section 5).
Additional Stage Options

In addition to the small swept volume and generally uncluttered design, the flat area of the platform adjacent to the sample plate itself can be utilised for additional modules if required. Some examples of our innovative parking stages are shown below.

Single flag-style parking position for 5-axis stage

5-axis flag-style heat / cool stage with the following additional features:

(a) Single flag-style sample parking position which can loaded from either side by a wobble stick, is electrically floating for biasing and sample current measurement, and can be cooled

(b) Toggle mechanism which can be operated by a wobble stick to disengage the thermocouple from the back of the sample plate. Normally this functionality is accomplished by the forks on the magnetic transfer arm which engage in the end of the manipulator and disengage the thermocouple in the process

Two level parking positions for 4-axis stage

4-axis flag-style heat / cool stage showing a custom parking position for the conditioning of flag mounted STM tips (d)

Additional Stage Shielding for Deposition Applications

Additional stage head shielding (e) to minimise coating of key components during deposition. Note: not suitable for CVD style applications. Please contact us to discuss any deposition application.