Linear Shift Mechanisms (LSMs) provide linear motion along the port axis (Z). Typical applications include the positioning of beamline filters, adjustment of sputter sources and deposition stages through to production style applications.

UHV Design has the largest range of LSMs in the world, ranging from CF35 to CF150 flanges, up to 1m stroke, tilt & X alignment versions with manual, pneumatic and motorisation options, all available with a range of position encoders. Bakeable to 250°C, the range is supplied on CF flanges and provides true UHV performance.

The bellows-sealed LSMs provide smooth, precise motion via a kinematically-designed external leadscrew driven mechanism, complete with anti-rotation and anti-deflection systems.

This design ensures smooth and precise motion along the Z axis. The range has a high load capability ensured through its rigid construction. Ball screw driven versions are available for fast acting, high duty cycle, high load, production applications.

The bellows are manufactured from 316L stainless steel as standard and offer a minimum design life of 10,000 cycles. Customised units are available offering a design life of up to 3 million cycles.

In addition to the standard range of LSMs we offer customised LSMs which are application-specific for use on synchrotrons, and in critical production applications.

**LSM KEY ADVANTAGES**

- 2x flange parallelism of conventional designs
- 2x load-carrying capability of conventional designs
- Smooth kinematic motion
- 10,000 cycle lifetime guarantee (3 million cycle option)
- Demountable bellows assembly
- Reliable and rigid construction
- Bakeable to 250°C
LSM Actuation options

The LSM range is available with a variety of manual, pneumatic and motorised actuation methods.

**Manual actuation**

<table>
<thead>
<tr>
<th>Code</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Manual</td>
<td>A manual handwheel provides the most basic method of actuation.</td>
</tr>
<tr>
<td>GH</td>
<td>Manual with geared-handwheel</td>
<td>Large bore LSMs are fitted with a 5:1 geared handwheel to provide sufficient mechanical advantage to overcome the additional thrust due to vacuum.</td>
</tr>
</tbody>
</table>

**Pneumatic actuation**

<table>
<thead>
<tr>
<th>Code</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Pneumatic</td>
<td>Pneumatic actuators provide a simple solution to automated operation. Standard design is for 2 position actuation. 3 position versions available upon request.</td>
</tr>
</tbody>
</table>

**Motorised actuation**

<table>
<thead>
<tr>
<th>Code</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>DC motorised</td>
<td>A 12 or 24V DC motor provides the motion and is mounted to the side of the LSM. Special in-line versions are available upon request.</td>
</tr>
<tr>
<td>SS</td>
<td>Stepper motor driven</td>
<td>A stepper motor provides the motion and is mounted to the side of the LSM. Special in-line versions are available upon request.</td>
</tr>
<tr>
<td>UP</td>
<td>Wiring upgrade</td>
<td>When purchasing an LSM for use with a UHV Design controller (please see section 13), an additional integration upgrade is available. The upgrade includes a bakeable socket connector, mounted to the frame, to which the limit switches are pre-wired. In the case of stepper motor-driven products, an extra home switch is also provided. The motor lead terminates with a connector compatible with UHV Design’s controllers.</td>
</tr>
</tbody>
</table>


**Position Readout/Feedback**

<table>
<thead>
<tr>
<th>Code</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>Engraved shaft</td>
<td>LSMs can be fitted with a shaft engraved with a scale with 1mm increments for visual positioning.</td>
</tr>
<tr>
<td>DLA</td>
<td>Digital linear scale</td>
<td>Digital scale displays are fitted to LSMs via a kinematic mount ensuring precise and repeatable location, which is critical for accurate repositioning after bakeout. The scale features large, easy to read characters that can be switched between metric and imperial units. The readout has a resolution of 10 microns (0.01mm). Users can set the Origin at any position of its stroke, from which it will provide a plus/minus scale in the units selected. The Origin is retained in its memory until reset by the user, even when switched off. A second temporary Zero facility is offered to enable one-off measurements to take place, which resets to the ‘Origin’ setting when turned off.</td>
</tr>
<tr>
<td>EN</td>
<td>Magnetic encoder</td>
<td>Contactless high-speed linear magnetic encoder with 10 micron resolution.</td>
</tr>
</tbody>
</table>

**Synchrotron Specification**

UHV Design supplies LSMs to synchrotron facilities around the world for a range of applications including the positioning and manipulation of beam line diagnostics and mirrors. Synchrotron specific LSMs are tolerant of low level radiation, comply with low electrical noise requirements and are supplied with wiring protocols, motors and controllers to match the facility’s specifications.

Contact us to request our Synchrotron brochure or to discuss your requirements.
Standard Linear Shift Mechanism

LSM Series

Production-proven linear motion along the port axis (Z) for sample positioning and production applications.

Comprehensive series offering true UHV performance with a vast range of flange sizes, strokes, actuation and encoder options.

Overview

The LSM is the most comprehensive series in the range, offering the largest number of flange, stroke and actuation options. All flanges within the series are supplied with tapped bolt holes as standard. Special variants with clear holes on the mounting flange can be provided for most sizes, these are labelled HLSM in the partcodes and specification tables.

Actuation methods

The series can be actuated via a manual handwheel, pneumatic cylinder, DC motor or stepper motor. Each LSM can also be fitted with a digital linear scale, offering visual position indication with 10 micron resolution.

Motorised LSMS are fitted with bakeable limit and home switches, pre-wired to a single bakeable connector mounted on the frame (‘UP’ option must be selected). LSMS are compatible with UHV Design’s SADC and stepper motor controller range, details of which can be found in Section 13.

Specification Table

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Flange information</th>
<th>Bolt holes</th>
<th>Clear Bore (mm)</th>
<th>Maximum Bakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flange code</td>
<td>Flange size</td>
<td>Travelling flange</td>
<td>Mounting flange</td>
</tr>
<tr>
<td>LSM</td>
<td>38</td>
<td>CF38 70mm (0.75&quot;) OD CF</td>
<td>M6 Tapped*</td>
<td>M8 Tapped*</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>CF64 114mm (4.5&quot;) OD CF</td>
<td>M8 Tapped</td>
<td>M8 Tapped*</td>
</tr>
<tr>
<td>HLSM</td>
<td>100</td>
<td>CF100 152mm (6&quot;) OD CF</td>
<td>M8 Tapped</td>
<td>Clear holes</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>CF150 203mm (8&quot;) OD CF</td>
<td>M8 Tapped</td>
<td></td>
</tr>
</tbody>
</table>

* Clear bolt holes on mounting flange available (HLSM option).

LSM KEY ADVANTAGES

- 2x flange parallelism compared with conventional designs
- 2x load-carrying capability compared with conventional units
- Smooth kinematic motion
- 10,000 cycle lifetime guarantee
- Demountable bellows assembly
- Bakeable to 250°C

LSM Series Part Code Generator

Example Configured Part Number:
LSM38-200-SS-DLA

= LSM, CF38 flange 38, 200mm stroke ZD, side-mounted stepper motor SS, and digital linear scale DLA

For details of ‘plug & play’ motor controllers please see section 13

Example LSM Dimensions

For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com

Dimension drawings for the complete range can be downloaded from www.uhvdesign.com

For details of ‘plug & play’ motor controllers please see section 13

LSM Series

Standard Linear Shift
Mechanism

Linear Motion and Alignment

Should your requirements fall outside our standard specifications then please contact us at:
www.uhvdesign.com  +44 (0)1323 811188  sales@uhvdesign.com
Long Travel Linear Shift Mechanism

HLSML Series

The HLSML provides strokes of up to 1000mm (39”) with high precision motion maintained throughout the stroke. The HLSML is also chosen for shorter strokes where ultimate stability is required.

HLSML KEY ADVANTAGES
- Up to 1m stroke
- Smooth kinematic motion
- Reliable and rigid construction
- ‘Plug and play’ production solutions
- True UHV performance
- Bakeable to 250°C
- Demountable bellows

Overview
The HLSML series of long travel Linear Shift Mechanisms, incorporates an upgraded structure with rear spine and large bore shafts and supports. The rigid structure maintains precise motion and unrivalled stability with strokes up to 1m.
High duty cycle production HLSMLs are available providing reliable, smooth and rigid motion with long operational life. Production ready HLSMLs can be supplied with pre-wired switches and connectors for ‘plug & play’ operation.

Actuation methods
The series can be actuated via a manual handwheel, DC motor or stepper motor.
Motorised HLSMLs are fitted with bakeable limit and home switches, pre-wired to a single, bakeable connector mounted on the frame. HLSMLs are compatible with UHV Design’s SADC and Stepper motor controller range.
Each HLSML can be supplied with a digital linear scale, offering visual position indication with 10 micron resolution.

Specification Table

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Flange Information</th>
<th>Bolt holes</th>
<th>Clear Bore (mm)</th>
<th>Maximum Bakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLSML</td>
<td>Flange Code</td>
<td>Flange Size</td>
<td>Traveling Flange</td>
<td>Mounting Flange</td>
</tr>
<tr>
<td>38</td>
<td>CF38 70mm (2.75”) OD CF</td>
<td>M6 Tapped</td>
<td>Clear holes</td>
<td>38</td>
</tr>
<tr>
<td>64</td>
<td>CF64 114mm (4.5”) OD CF</td>
<td>M8 Tapped</td>
<td>Clear holes</td>
<td>65</td>
</tr>
</tbody>
</table>

Example HLSML Dimensions

For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com

Example Configured Part Number:
HLSML64-800-H = HLSML, CF64 flange, 64, 800mm stroke 800, with manual actuation H

For details of ‘plug & play’ motor controllers please see section 13

Dimension drawings for the complete range can be downloaded from www.uhvdesign.com
A compact solution to linear motion along the port axis (Z). The CLSM series provides the shortest available flange-to-flange dimension, without compromising on performance or reliability.

Overview

The CLSM compact series offers the shortest flange-to-flange dimension in the range. As such, the series is offered with limited flange and stroke options.

Actuation methods

The series can be actuated via a manual handwheel, pneumatic cylinder, DC motor or Stepper motor. Each CLSM can be supplied with a digital linear scale, offering visual position indication with 10 micron resolution.

Example CLSM Dimensions

For the complete range of 20 drawings & 3D models contact us or visit www.uhvdesign.com

CLSM Series Part Code Generator

For details of ‘plug & play’ motor controllers please see section 13

Dimension drawings for the complete range can be downloaded from www.uhvdesign.com
Linear Shift Mechanism With Tilt
LSMT Series

Smooth kinematic linear motion along the port axis (Z) with the additional facility to tilt the travelling flange so it serves as an integrated port aligner. This makes the LSMT ideal for applications where precise alignment with a fixed point is essential.

Overview
The LSMT is based on the standard LSM series with the additional facility to tilt the moving flange by +/- 2° for final alignment, acting as an integrated port aligner. Typically used on beamlines to align diagnostics or for ion/sputter source alignment. Adjustment is actuated via four threaded support shafts. All flanges in the series are supplied with tapped bolt holes on the base flange as standard.

Actuation methods
The series can be actuated with a manual handwheel, pneumatic cylinder, DC motor or stepper motor.

Specifi cation Table

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Flange information</th>
<th>Bolt holes</th>
<th>Travelling flange tilt</th>
<th>Clear Bore (mm)</th>
<th>Maximum Bakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSMT</td>
<td>CF38 70mm (2.75&quot;) OD CF</td>
<td>M6 Tapped</td>
<td>+/-2°</td>
<td>38</td>
<td>250°C</td>
</tr>
<tr>
<td></td>
<td>CF64 114mm (4.5&quot;) OD CF</td>
<td>M8 Tapped</td>
<td>+/-2°</td>
<td>65</td>
<td>250°C</td>
</tr>
</tbody>
</table>

LSMT KEY ADVANTAGES
- Up to 150mm stroke
- +/- 2° tilt for final alignment
- Adjustment via 4 threaded support shafts
- Smooth kinematic motion
- Bakeable to 250°C
- Demountable bellows assembly

Example LSMT Dimensions
For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com

Example Configured Part Number:
LSMT38-100-P = LSMT, CF38 flange 38, 100mm stroke 100 with pneumatic actuation P

For details of plug & play motor controllers please see section 13
Linear Shift Mechanism With X Travel

**LSMX Series**

Linear motion along the port axis (Z) with the additional facility to adjust the travelling flange laterally (X axis) to facilitate alignment. The travelling flange angle remains constant throughout actuation.

**Overview**

The LSMX is based on the standard LSM series. Where the LSMX version differs is that, in addition to the Z motion, the user has the option to adjust the X motion of the moving flange by up to +/-5mm via a manual thumb wheel. The thumb wheel can be moved to the opposite side if required.

This is useful if the user needs the flexibility to make lateral alignment adjustments to the linear shift without altering the travelling flange angle. A typical application would be the alignment of a sample holder with a sample transfer arm within the system.

**LSMX KEY ADVANTAGES**

- +/- 5mm lateral (X axis) motion
- Smooth kinematic alignment
- Reliable and rigid construction
- True UHV performance
- Bakeable to 250°C
- Demountable bellows assembly

**Specification Table**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Flange code</th>
<th>Flange size</th>
<th>Bolt holes</th>
<th>Travelling flange offset (X motion)</th>
<th>Clear Bore (mm)</th>
<th>Maximum Bakeout</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSMX</td>
<td>CF38</td>
<td>70mm (2.75&quot;) OD CF</td>
<td>M6 Tapped</td>
<td>+/-5mm</td>
<td>38</td>
<td>250°C</td>
</tr>
<tr>
<td></td>
<td>CF64</td>
<td>114mm (4.5&quot;) OD CF</td>
<td>M8 Tapped</td>
<td>+/-5mm</td>
<td>65</td>
<td>250°C</td>
</tr>
</tbody>
</table>

**Example LSMX Dimensions**

For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com

**LSMX Series Part Code Generator**

Example Configured Part Number:
LSMX38-150-SS-EN
= LSMX, CF38 flange 38, 150mm stroke 150 with side-mounted stepper motor SS and linear encoder EN

For details of ‘plug & play’ motor controllers please see section 13
Production-Proven Linear Shift Mechanisms

Linear Shift Mechanisms for production environments

In addition to the main ranges of Linear Shift Mechanisms (LSMs), variants designed specifically to work in demanding high duty cycle production environments are available.

Application specific design

With the world’s largest range of LSMs at their disposal, UHV Design’s in-house design team can customise any of the standard designs to specifically match production requirements.

Customised designs can accommodate the required flange size, stroke, bore size, duty cycle and space envelope. In addition, any required sensors, motors and encoders can be incorporated and pre-wired for plug and play operation.

All production LSMs benefit from:

- Ultra-stiff construction for minimal deflection
- High cantilevered load capacity
- Ball screw drive mechanism with recirculating linear slides
- Bellows with greater than 3 million cycles guaranteed

Manufactured and assembled for use in ultra clean applications

UHV Design’s in-house manufacturing facility enables us to cost-effectively and rapidly produce highly tolerated, high quality components.

Components are cleaned prior to assembly in an ISO 7 Class 10,000 clean room.
Port Aligner Range

Enables the distance and angular relationship between two flanges to be adjusted, where a fixed flange supports three equi-spaced threaded shafts, and in parallel, a travelling flange has adjustable floating mounts. A typical application would be the final alignment of sample transfer arms.

Overview

The Port Aligner range enables the distance and angular relationship between two flanges to be adjusted. The range consists of five series, which can be supplied with either tapped or clear bolt holes on the flanges. Each range provides +/-5 mm axial length adjustment, with +/-3° angular tilt.

Essentially, this is a simple device that once adjusted, provides a stable platform. The design consists of two approximately parallel flanges, one of which remains fixed, whilst the position of the second may be adjusted with respect to the first.

Specification Table

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PA35-H</th>
<th>PA35-T</th>
<th>PA64-H</th>
<th>PA64-T</th>
<th>PA100-H</th>
<th>PA100-T</th>
<th>PA150-H</th>
<th>PA150-T</th>
<th>PA200-H</th>
<th>PA200-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange size</td>
<td>CF38</td>
<td>CF64</td>
<td>CF100</td>
<td>CF150</td>
<td>CF100</td>
<td>CF150</td>
<td>CF100</td>
<td>CF150</td>
<td>CF200</td>
<td>CF200</td>
</tr>
<tr>
<td>Flange bolt hole type</td>
<td>Clear M6</td>
<td>Tapped M6</td>
<td>Clear M8</td>
<td>Tapped M8</td>
<td>Clear M8</td>
<td>Tapped M8</td>
<td>Clear M8</td>
<td>Tapped M8</td>
<td>Clear M8</td>
<td>Tapped M8</td>
</tr>
<tr>
<td>Axial length adjustment</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
<td>+/- 5mm</td>
</tr>
<tr>
<td>Tilt</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
<td>+/- 3°</td>
</tr>
<tr>
<td>Bellows clear bore</td>
<td>38mm</td>
<td>65mm</td>
<td>102mm</td>
<td>127mm</td>
<td>127 - 200mm (made to order)</td>
<td>127 - 200mm (made to order)</td>
<td>127 - 200mm (made to order)</td>
<td>127 - 200mm (made to order)</td>
<td>127 - 200mm (made to order)</td>
<td>127 - 200mm (made to order)</td>
</tr>
<tr>
<td>Bakeout temperature</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
<td>250°C</td>
</tr>
</tbody>
</table>

PA Key Advantages

» Any-orientation mounting
» +/- 5mm axial adjustment
» +/- 3° angular tilt
» High quality flexible 316L bellows accommodates motion, whilst maintaining ultra-high vacuum
» Bakeable to 250°C

Example Configured Part Number:

PA64-H = PA, CF64 flange 64, clear holes on flanges

Example Dimensions

For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com