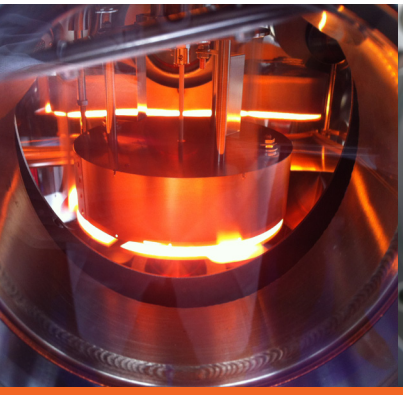
UHV Design

UHV MOTION AND HEATING



DEPOSITION STAGES

ANALYTICAL STAGES

SAMPLE TRANSFER

COMPONENTS

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UHV Design

UHV Motion and Heating Specialists

UHV Design leads the field in high-technology motion, manipulation and heating product solutions for the vacuum industry.

Unrivalled in-house resources

Every stage of the production process is controlled in-house, from design to manufacture, assembly, testing and after-sales support to ensure that rigorous standards are always met.

Exceptional scientific and engineering capability

Our highly-qualified, dedicated team provides:

- detailed understanding of process, applications and techniques
- the ability to model magnetic devices, stress and thermal dynamics
- state-of-the-art designs through best engineering practices
- rapid, competitive customisation to meet individual requirements

Outstanding Customer Support

UHV Design guarantees the highest level of customer support both before and after ordering.

UHV Design's custom-built UK manufacturing facility.

DEPOSITION STAGES | ANALYTICAL STAGES | SAMPLE TRANSFER | COMPONENTS

Contents

Section 01

01

ROTARY DRIVES

UHV Design

Magnetic Rotary Drives

The production-proven MagiDrive range of rotary feedthroughs enables rotation to be transferred into a vacuum system using a stiff high flux magnetic coupling. With no bellows, fluids or dynamic seals, the MagiDrive range offers reliable and leak-tight UHV operation.

MagiDrive concept

Using the latest magnetic materials technology, a large number of high flux magnetic fields interlock inner and outer rotating assemblies through a solid stainless steel enclosure. The enclosure or vacuum envelope is manufactured from one piece ensuring vacuum integrity. The high density of interlocking fields ensures exceptionally high torsional rigidity.

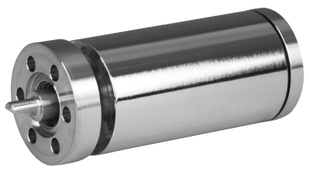
MagiDrives used in excess of their torque rating simply release their magnetic grip and lock back onto the next magentic pole. This protects the drive and whatever it is driving from incurring any damage, thereby avoiding expensive maintenance. MagiDrives offer high precision rotation with zero angular backlash under low load and acceleration. All drives are fitted with magnetic shielding.

MagiDrives are available in a range of CF flange sizes and include hollow variants to enable stacking of drives to provide three independent axes of rotation or to enable services, such as heating, to be fed through. MagiDrives can be actuated manually, pneumatically or motorised using stepper or DC motors. MagiDrives are available in both Solid and Hollow configurations.

KEY ADVANTAGES

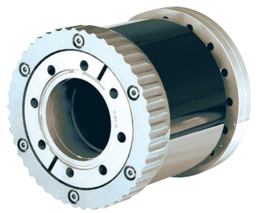
- Magnetically-coupled, fail safe design
- Single piece vacuum enclosure ensures leak-free performance
- Magnetic shielding permits use in magnetically-sensitive environments
- No bellows, organics or sliding seals
- Bakeable to 250ºC (including magnets)
- High torque to size ratio
- Zero backlash under low load and acceleration
- Hollow variants allow stacking of concentric drives

01



Solid MagiDrive Series

The solid shaft series provides a range of standard shaft options as detailed in the product configuration options. Customised shafts are available upon request. For longer shafts, where concentricity and stability of the rotating shaft is critical, UHV Design offer a range of extended bearing housings to support the shaft along its axis of rotation. Details are available upon request.



Hollow MagiDrive Series

The four largest MagiDrives are available in a hollow configuration, terminating with a non-rotating CF flange at the rear. This allows services to be passed through the drive or alternatively, an additional MagiDrive to be mounted to the rear, providing a secondary axes of rotation. Up to four independent axes of rotation can be provided by combining the MD16, MD35H, MD64H and MD100H MagiDrives. This stacking capability is typically used to provide simple solutions to sophisticated manipulation requirements.

MagiDrive Selection Table

		Standard Torque	Medium Torque	High Torque	Ultra-High Torque
MagiDrive	**Mounting Flange**	**0.04-2.0 Nm**	**2.1-4.5 Nm**	**4.6-10.0 Nm**	**11-40 Nm**
MD10	CF10, (1" OD CF)	✓ (page 8)			
MD16/MD19/MD16A	CF16, (1.33" OD CF)	✓ (page 10)			
MD20/MD21	CF35, (2.75" OD CF)	✓ (page 12)			
MD25			✓ (page 14)		
MD35/MD35H			✓ (page 16/22)		
MD35LB				✓ (page 24)	
MD64/MD64H	CF64, (4.5" OD CF)			✓ (page 18/26)	
MD64LB				✓ (page 28)	
MD64LBM					✓ (page 28)
MD100H	CF100, (6" OD CF)				✓ (page 30)
MD150H	CF150, (8" OD CF)				✓ (page 32)

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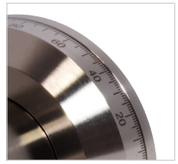
MAGIDRIVE Actuation options

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

Manual actuation

Code	Item	Description
T	Standard drive	The standard manual drive.
F	Friction control	An adjustable external friction system enables the drive to hold its position when the desired position is reached. Resistance to turn is adjusted by tightening/ loosening a single screw located at the rear of the drive. Ideal for shutter applications.
B	Brake	A thumbscrew brake facility enables the drive to be locked in any position.
CB	Calibrated thimble with brake	Calibrated thimble with 1° increments and thumbscrew brake facility.
D	Dual shaft	MagiDrives can be supplied with both input and output shafts. This allows the customer to retrofit their own motorisation option or to fit a position encoder.
P	Timing pulley	A pulley is mounted on the end of the drive allowing users to install their own motor assembly.



Calibrated thimble

Brake

Dual shaft

Timing pulley

Pneumatic actuation

Code	Item	Description
RA	Rotary actuator	Pneumatically actuated MagiDrives are fitted with an adjustable rotary actuator providing from 30-170° sweep. Flow controllers enable input and exhaust to be throttled to control speed.
RAI	Rotary actuator with visual position indicators and reed switches for position feedback	As above but fitted with two reed switches to provide position feedback for system interlock facilities. This option also includes LEDs allowing the user to see the position of the shutter in open or closed states.

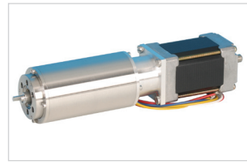
Pneumatic actuation

Motorised actuation

Motorised MagiDrives can be driven with DC or stepper motors, and are available with a selection of motor and gearbox combinations to cover a wide range of load, speed and positioning requirements (see page 33).

Motors can be mounted either to the side or in-line with the drive (as shown below), to suit the space available. Motors are easily removed for bakeout and have pre-set mounting brackets to ensure the correct re-alignment and belt tension is maintained when the motor is replaced.

Code	Item	Description
Stepper Motors		
IS	In-line stepper motor	A co-axially mounted stepper motor providing minimum lateral footprint.
SS	Side-mounted stepper motor	A stepper motor mounted to the side of the drive.
DC Motors		
ID	In-line DC motors	A co-axially mounted DC motor providing minimum lateral foot-print.
SD	Side-mounted DC motor	A DC motor mounted to the side of the drive.



In-line motor

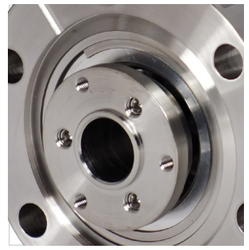
Side-mounted motor

Additional options for motorised MagiDrives

Code	Item	Description
S	Home Sensor	Single optical sensor for home positioning whilst allowing continuous rotation
L	Limit Switches	End of travel switch limiters
E	Rotary Encoder	Rotary positional data

Shaft Options

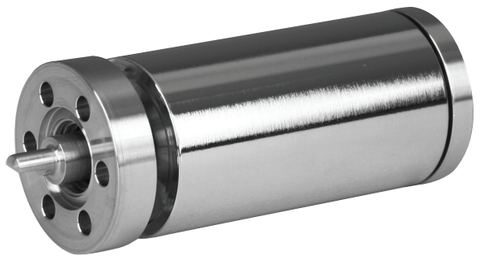
Code	Item	Description
X000	Stub shaft or spigot	Stub shaft - short stub shaft for end users to connect to. Spigot flange - spigot flanges to provide a rigid coupling to the driven load, whilst ensuring drive and shaft concentricity.
X030	30mm shaft	30 mm long stub shaft with a machined flat to aid connection (MD16). 30 mm long hollow tube shaft (MD35LB).
D	Dual shaft	Drive is provided with both input and output shafts.



Spigot Flange

CF10, 1" OD Flange

Solid MagiDrive Series



MD10 Series

This miniature drive is made possible through the use of the CF10 micro flange, which has an outside diameter of just 25.4mm. The body diameter is no bigger than the flange 1" OD, which makes the MD10 ideal for rotating small instrumentation loads, in applications where space is at a premium.

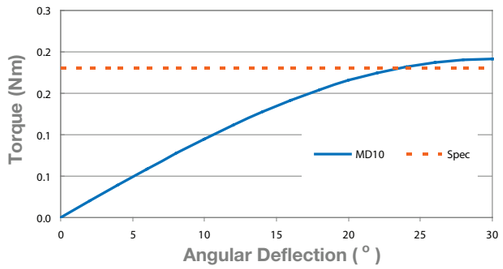
MD10 KEY ADVANTAGES

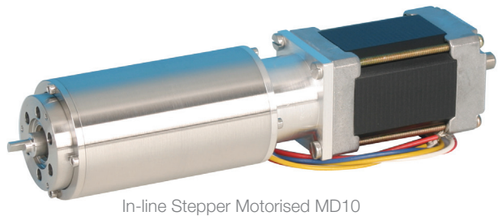
- **Magnetically-coupled fail-safe design**
- **Smallest UHV drive on market**
- **High torque / size ratio**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

Specification Table

MAGIDRIVE BODY	MD10
System mounting flange	CF10 25.4mm (1") OD CF
Construction	Machined from one piece 316L
Shaft style	Solid
Break-away torque	0.18Nm (0.13 lbf ft)
Max. no load spin speed (standard bearings)	200 rpm
Maximum shaft axial thrust	20N (4.5 lbf ft)
Maximum bakeout temp	250°C

Torsional Stiffness





In-line Stepper Motorised MD10

Pneumatically actuated MD10 with custom shaft

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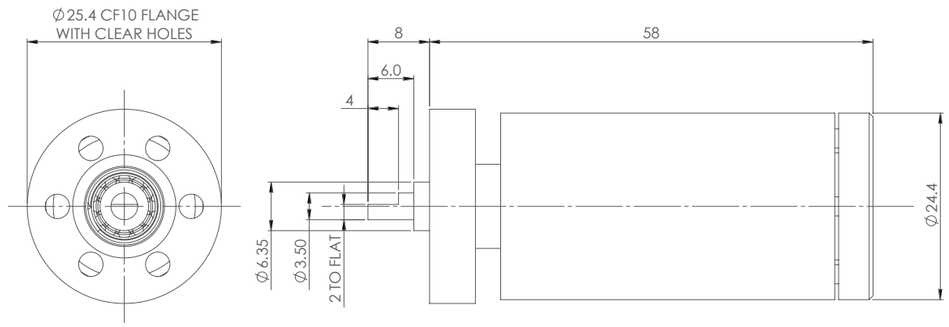
Base Drive Dimensions (mm)

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



MD10 Part Code Generator

MagiDrive Size		+		Actuation Options		+	Gearing	+	Shaft Options		+	Bearing	
MD10	MD10								Standard	X000		Standard bearing	Z
			Manual	Standard thimble	T								
				Standard thimble + friction control	TF								
				Calibrated thimble + friction control	CB								
			Motorisation	Timing pulley	P								
				Dual shaft	D								
				In-line stepper motor	IS		1,2,3,4						
				In-line DC motor	ID		1,2,3,4						
			Pneumatic	Pneumatic actuator	RA								
				RA + position feedback	RAI								

For more information on gearing options for motorised MagiDrives please see page 33

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

For more information on actuation options see page 6

Example Configured Part Number:

MD10TX000Z

= **MD10**, standard thimble **T**, standard shaft **X000** and standard bearings **Z**

CF16, 1.33" OD Flange

Solid MagiDrive Series

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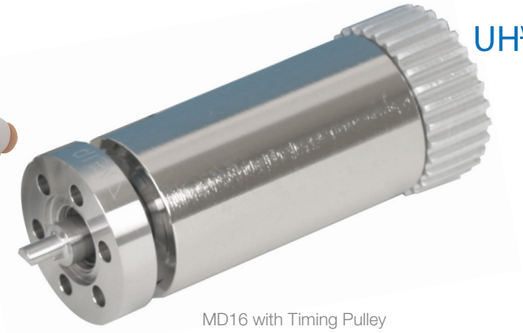
Pneumatically actuated MD16



MD16 with Timing Pulley

MD16/MD19/MD16A Series

The MD16 is the 'work horse' of the MagiDrive series. This standard drive provides sufficient torque for the majority of miniature feedthrough requirements. The MD19 variant maintains the same dimensions but provides increased levels of torque (0.56Nm). The MD16A provides the highest torque on the market for a CF16 flange (1.8Nm) and is ideal for shutter applications.

MD16 & MD19 KEY ADVANTAGES

- **Magnetically-coupled fail-safe design**
- **High torque / size ratio**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

Base Drive Dimensions (mm)

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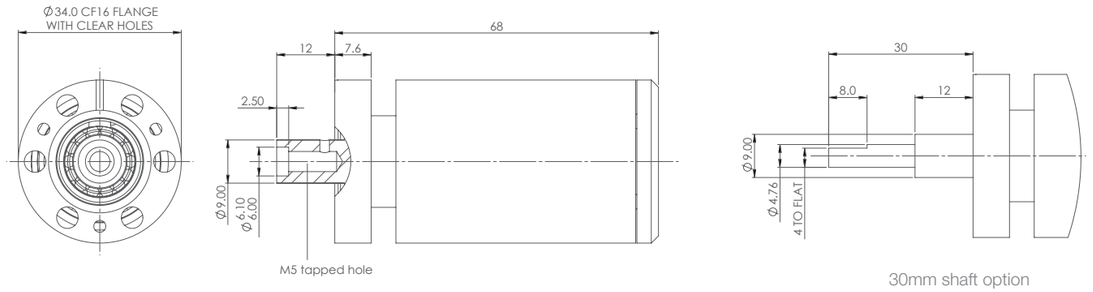


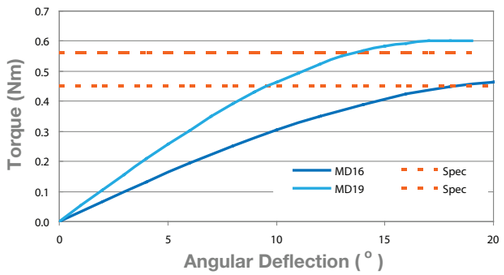
30mm shaft option

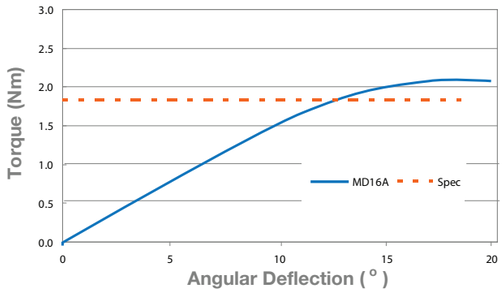
Specification Table

MAGIDRIVE BODY	MD16	MD19	MD16A
System mounting flange	CF16 34mm (1.33") OD CF		
Construction	Machined from one piece 316L		
Shaft style	Solid		
Break-away torque	0.45 Nm (0.33 lbf ft)	0.56 Nm (0.41 lbf ft)	1.8 Nm (1.33 lbf ft)
Maximum no load spin speed (standard bearings)	1000 rpm		
Maximum shaft axial thrust	20 N (4.5 lbf)		
Maximum bakeout temp	250°C		

MD16 with optical sensor

Torsional Stiffness





MD16/MD19/MD16A Part Code Generator

MagiDrive Size	
MD16 (0.45 Nm)	MD16
MD19 (0.56 Nm)	MD19
MD16A (1.8 Nm)	MD16A

+

	Actuation Options		Gearing
Manual	Standard thimble	T	
	Standard thimble + friction control	TF	
	Calibrated thimble + friction control	CB	
Motorisation	Timing pulley	P	
	Dual shaft	D	
	In-line stepper motor only	IS	1,2,3,4
	+ home sensor	ISS	1,2,3,4
	+ rotary encoder	ISE	1,2,3,4
	+ rotary encoder + home sensor	ISES	1,2,3,4
	In-line DC motor	ID	1,2,3,4
	In-line SMART motor only	ISM	1,2,3,4
	+ home sensor	ISMS	1,2,3,4
Pneumatic	Pneumatic actuator only	RA	
	+ position feedback	RAI	

+

Shaft Options	
Standard	X000
30mm shaft	X030

+

Bearing	
Standard bearing	Z
Ceramic bearing	CE

For more information on gearing options for motorised MagiDrives please see page 33

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

For more information on actuation options see page 6

Example Configured Part Number:

MD16PX000CE

= **MD16** timing pulley **P**, standard shaft **X000** and ceramic bearings **CE**

Should your requirements fall outside our standard specifications then please contact us at:

CF35, 2.75" OD Flange

Solid MagiDrive Series

MD20/MD21 Series

The MD20 provides sufficient torque for the majority of miniature feedthrough applications requiring a CF38 flange. The MD21 variant supplies higher torque with the same dimensions.

MD20 & MD21 KEY ADVANTAGES

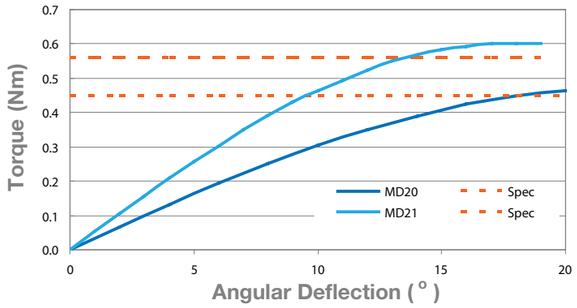
- **Magnetically-coupled fail-safe design**
- **High torque / size ratio**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

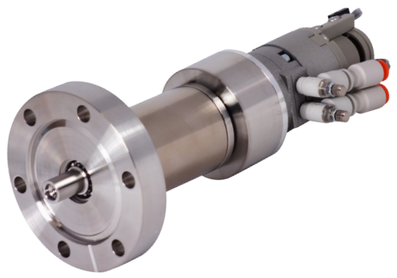
Specification Table

MAGIDRIVE BODY	MD20	MD21
System mounting flange	CF35 70mm (2.75") OD CF	
Construction	Machined from one piece 316L	
Shaft style	Solid	
Break-away torque	0.45 Nm (0.33 lbf ft)	0.56 Nm (0.41 lbf ft)
Maximum no load spin speed (standard bearings)	1000 rpm	
Maximum shaft axial thrust	20 N (4.5 lbf)	
Maximum bakeout temp	250°C	

MD20 with calibrated thimble

Torsional Stiffness





Pneumatically actuated MD20

Base Drive Dimensions (mm)

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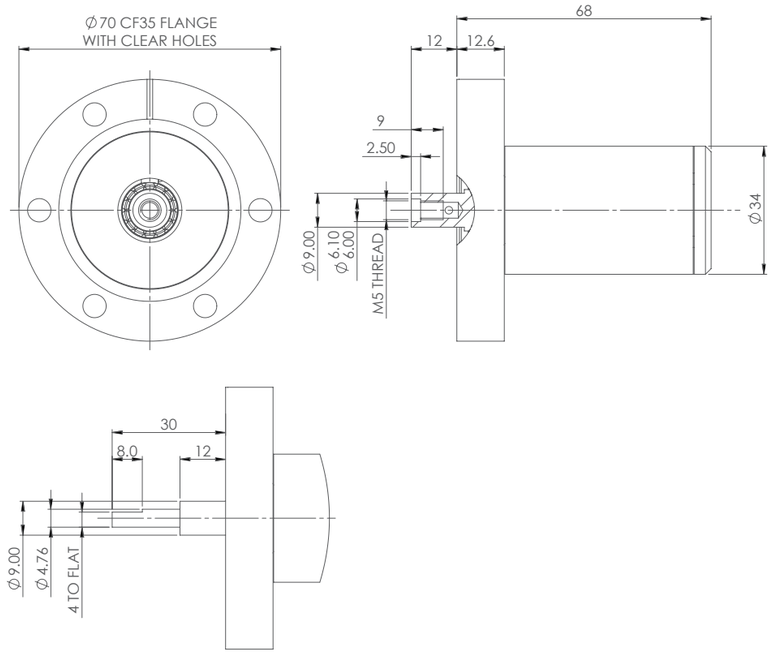

MD20/MD21 Part Code Generator

MagiDrive Size		+	Actuation Options		+	Gearing	+	Shaft Options		+	Bearing	
MD20 (0.45Nm)	MD20		Manual	Standard thimble	T			Standard	X000		Standard bearing	Z
MD21 (0.56Nm)	MD21		Manual	Standard thimble + friction control	TF			30mm shaft	X030		Ceramic bearing	CE
			Manual	Calibrated thimble + friction control	CB							
			Motorisation	Timing pulley	P							
			Motorisation	Dual shaft	D							
			Motorisation	In-line stepper motor only	IS	1,2,3,4						
			Motorisation	+ home sensor	ISS	1,2,3,4						
			Motorisation	+ rotary encoder	ISE	1,2,3,4						
			Motorisation	+ rotary encoder + home sensor	ISES	1,2,3,4						
			Motorisation	In-line DC motor	ID	1,2,3,4						
			Motorisation	In-line SMART motor only	ISM	1,2,3,4						
			Motorisation	+ home sensor	ISMS	1,2,3,4						
			Pneumatic	Pneumatic actuator only	RA							
			Pneumatic	+ position feedback	RAI							

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:

MD20DX000Z

= **MD20** dual shaft **D**, standard length **X000** and standard bearings **Z**

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CF35, 2.75" OD Flange

Solid MagiDrive Series

MD25 Series

The MD25 provides a medium torque solution available on a CF35 flange. Available with manual, pneumatic and motorisation actuation options.

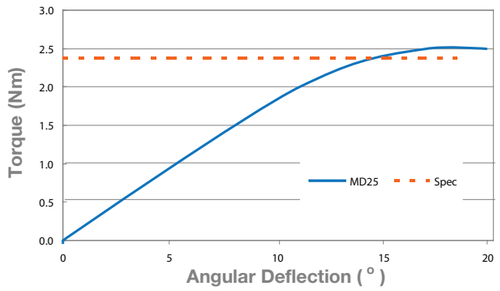
MD25 KEY ADVANTAGES

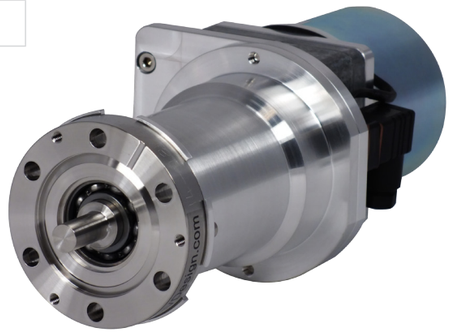
- **Magnetically-coupled fail-safe design**
- **High torque / size ratio**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

Specification Table

MAGIDRIVE BODY	MD25
System mounting flange	CF35 70mm (2.75") OD CF
Construction	Machined from one piece 316L
Shaft style	Solid
Break-away torque	2.4 Nm (1.77 lbf ft)
Max. no load spin speed (standard bearings)	750 rpm
Maximum shaft axial thrust	142N (32 lbf)
Maximum bakeout temp	250°C

Torsional Stiffness





MD25 with in-line motorisation

Base Drive Dimensions (mm)

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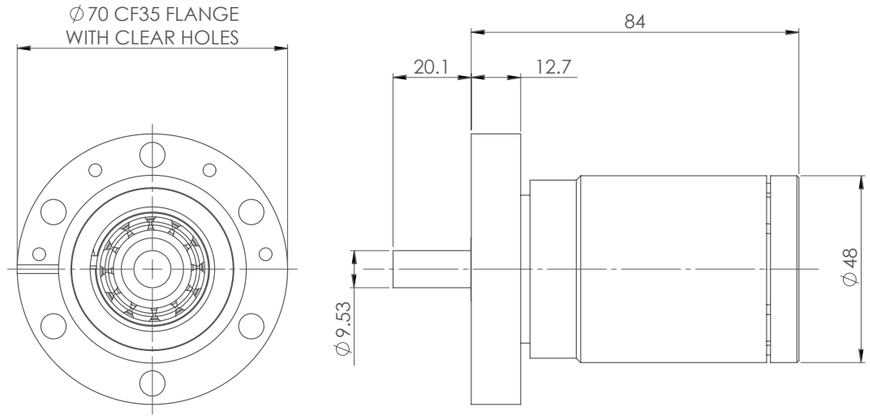


MD25 Part Code Generator

MagiDrive Size		+	Actuation Options		+	Gearing	+	Shaft Options		+	Bearing	
MD25	MD25							Standard	X000		Standard bearing	Z
											Ceramic bearing	CE
			Manual	Standard thimble	T							
				Calibrated thimble + brake screw	CB							
				Timing pulley	P							
				Dual shaft	D							
			Motorisation	In-line stepper motor only	IS	1,2,3,4						
				+ home sensor	ISS	1,2,3,4						
				+ rotary encoder	ISE	1,2,3,4						
				+ rotary encoder + home sensor	ISES	1,2,3,4						
				Side-mounted stepper motor only	SS	1,2,3,4						
				+ home sensor	SSS	1,2,3,4						
				+ limit switches	SSL	1,2,3,4						
				+ home + limit switches	SSSL	1,2,3,4						
				+ encoder	SSE	1,2,3,4						
				+ encoder + home sensor	SSES	1,2,3,4						
				+ encoder + limit switches	SSEL	1,2,3,4						
				+ encoder + home + limit switches	SSESL	1,2,3,4						
				In-line DC motor	ID	1,2,3,4						
				Side-mounted DC motor	SD	1,2,3,4						
				Side-mounted SMART motor only	SM	1,2,3,4						
				+ home sensor	SMS	1,2,3,4						
				+ limit switches	SML	1,2,3,4						
				+ home + limit switches	SMSL	1,2,3,4						
			Pneumatic	Pneumatic actuator only	RA							
				+ position feedback	RAI							

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:

MD25PX000CE

= **MD25** timing pulley **P**, standard shaft **X000** and ceramic bearings **CE**

CF35, 2.75" OD Flange

Solid MagiDrive Series

MD35 Series

The MD35 MagiDrive provides high torque rotation on a 70mm OD (2¾" OD CF) flange. The drive is ideally suited to applications such as the rotation of samples and small platens, where stability is key. The MD35 is also available in a hollow configuration (see page 22). For higher torque requirements on this flange size see MD35LB Series (6Nm) on page 24.

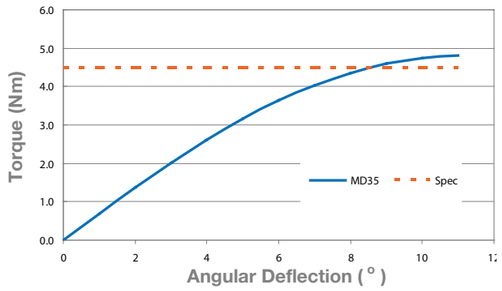
MD35 KEY ADVANTAGES

- **Magnetically-coupled fail-safe design**
- **No bellows or dynamic seals**
- **High torque rotation (4.5Nm)**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

Specification Table

MAGIDRIVE BODY	MD35
System mounting flange	CF35 70mm (2.75") OD CF
Construction	Machined from one piece 316L
Shaft style	Spigot flange
Break-away torque	4.5 Nm (3.32 lbf ft)
Maximum no load spin speed (standard bearings)	500 rpm
Maximum shaft axial thrust	142 N (32 lbf)
Maximum bakeout temp	250°C

Torsional Stiffness



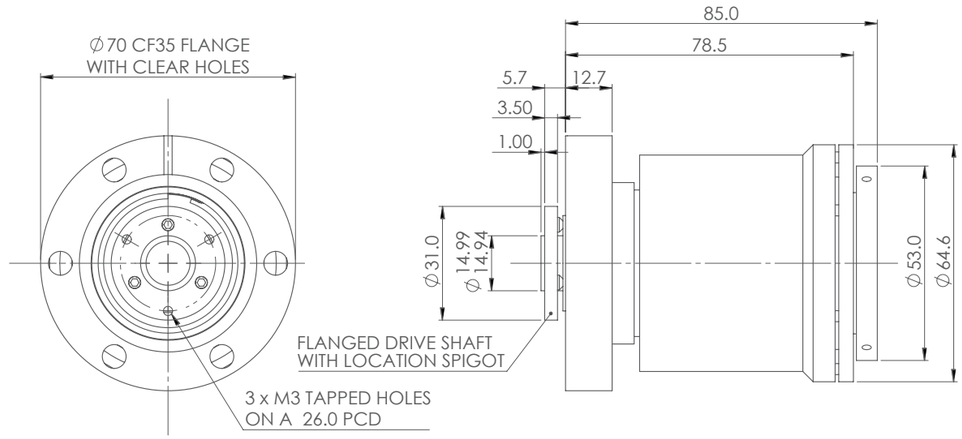
Pneumatically actuated MD35

In-line motorised MD35

UHV Design

Base Drive Dimensions (mm)

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



MD35 Part Code Generator

	MagiDrive Size			Actuation Options			Gearing		Shaft Options			Bearing	
	MD35	MD35	+		Standard thimble	T		+	Standard	X000	+	Standard bearing	Z
				Manual	Calibrated thimble + brake screw	CB						Ceramic bearing	CE
					Timing pulley	P							
					Dual shaft	D							
				Motorisation	In-line stepper motor only	IS	1,2,3,4						
					+ home sensor	ISS	1,2,3,4						
					+ rotary encoder	ISE	1,2,3,4						
					+ rotary encoder + home sensor	ISES	1,2,3,4						
					Side-mounted stepper motor only	SS	1,2,3,4						
					+ home sensor	SSS	1,2,3,4						
					+ limit switches	SSL	1,2,3,4						
					+ home + limit switches	SSSL	1,2,3,4						
					+ encoder	SSE	1,2,3,4						
					+ encoder + home sensor	SSES	1,2,3,4						
					+ encoder + limit switches	SSEL	1,2,3,4						
					+ encoder + home + limit switches	SSESL	1,2,3,4						
					In-line DC motor	ID	1,2,3,4						
					Side-mounted DC motor	SD	1,2,3,4						
					Side-mounted SMART motor only	SM	1,2,3,4						
					+ home sensor	SMS	1,2,3,4						
					+ limit switches	SML	1,2,3,4						
					+ home + limit switches	SMSL	1,2,3,4						
				Pneumatic	Pneumatic actuator only	RA							
					+ position feedback	RAI							

For more information on gearing options for motorised MagiDrives please see page 33

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

For more information on actuation options see page 6

Example Configured Part Number:

MD35ID3X000Z

= **MD35** in-line DC motor **ID**, gearbox option **3***, standard shaft **X000** and standard bearings **Z**

CF64, 4.5" OD Flange

Solid MagiDrive Series

MD64 Series

The MD64 MagiDrive provides high torque rotation through a high stiffness coupling. This drive would be ideally suited to robot type or platen rotation applications. The MD64 is also available in a hollow configuration (see page 26). For higher torque applications (up to 40Nm) see MD64LBM & MD100H on pages 28 and 30.

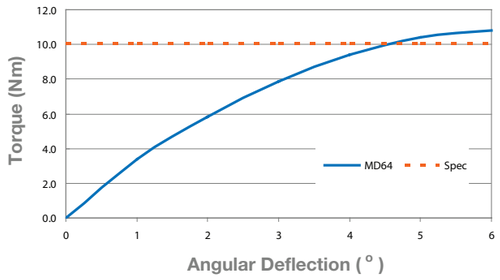
MD64 KEY ADVANTAGES

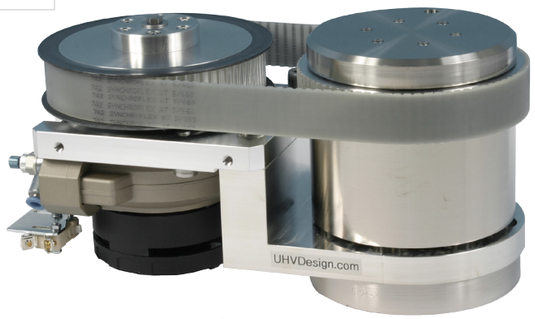
- **Magnetically-coupled fail-safe design**
- **High torque**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

Specification Table

MAGIDRIVE BODY	MD64
System mounting flange	CF64 114mm (4.5") OD CF
Construction	Machined from one piece 316L
Shaft style	Spigot flange
Break-away torque	10 Nm (7.38 lbf ft)
Maximum no load spin speed (standard bearings)	500 rpm
Maximum shaft axial thrust	415 N (93 lbf)
Maximum Bakeout Temp	250°C

Torsional Stiffness





Pneumatically actuated MD64

Base Drive Dimensions (mm)

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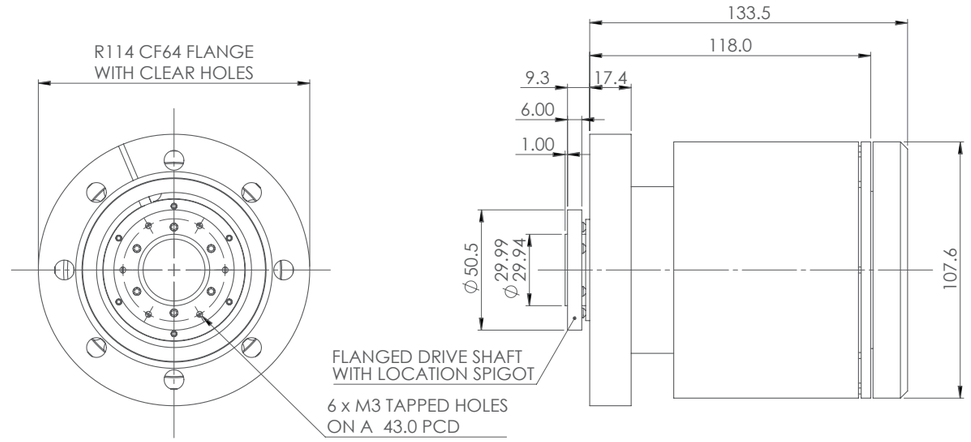


MD64 Part Code Generator

MagiDrive Size		Actuation Options			Gearing	Shaft Options		Bearing	
MD64	MD64	Manual	Standard thimble	T		Standard	X000	Standard bearing	Z
			Calibrated thimble + brake screw	CB				Ceramic bearing	CE
			Timing pulley	P					
			Dual shaft	D					
		Motorisation	In-line stepper motor only	IS	1,2,3,4				
			+ home sensor	ISS	1,2,3,4				
			+ rotary encoder	ISE	1,2,3,4				
			+ rotary encoder + home sensor	ISES	1,2,3,4				
			Side-mounted stepper motor only	SS	1,2,3,4				
			+ home sensor	SSS	1,2,3,4				
			+ limit switches	SSL	1,2,3,4				
			+ home + limit switches	SSSL	1,2,3,4				
			+ encoder	SSE	1,2,3,4				
			+ encoder + home sensor	SSES	1,2,3,4				
			+ encoder + limit switches	SSEL	1,2,3,4				
			+ encoder + home + limit switches	SSESL	1,2,3,4				
			In-line DC motor	ID	1,2,3,4				
			Side-mounted DC motor	SD	1,2,3,4				
			Side-mounted SMART motor only	SM	1,2,3,4				
			+ home sensor	SMS	1,2,3,4				
			+ limit switches	SML	1,2,3,4				
			+ home + limit switches	SMSL	1,2,3,4				
		Pneumatic	Pneumatic actuator only	RA					
			+ position feedback	RAI					

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:

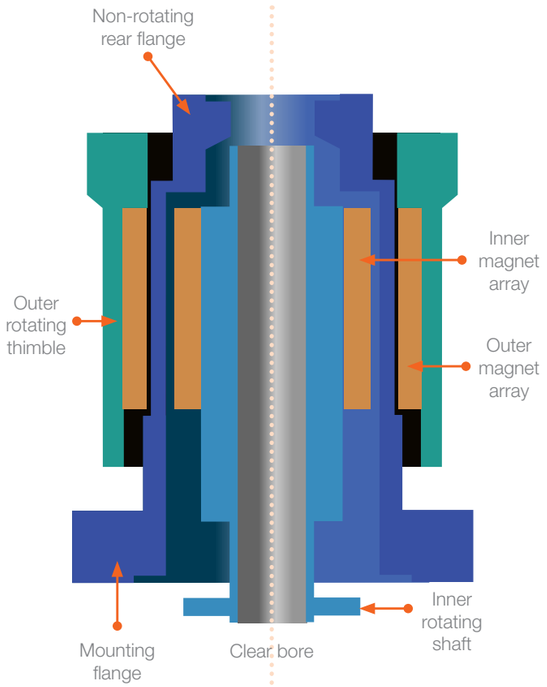
MD64ID3X000Z

= **MD64** in-line DC motor **ID**, gearbox option **3***, standard shaft **X000** and standard bearings **Z**

Hollow Magnetic Rotary Drives

The four largest MagiDrives are available in a hollow configuration, terminating with a non-rotating CF flange at the rear. This allows services to be passed through the drive or alternatively, an additional MagiDrive to be mounted to the rear, providing a secondary axis of rotation. Up to five independent axes of rotation can be provided by combining the MD16, MD35H, MD64H, MD100H and MD150H MagiDrives.

This stacking capability is typically used to provide simple solutions to sophisticated manipulation requirements.



HOLLOW MAGIDRIVE KEY ADVANTAGES

» Allows services to pass through the centre, i.e. power feedthroughs, thermocouples, cooling tubes etc.

» Co-axial combinations of drives, providing up to five axes of independent rotation for sophisticated manipulation requirements

» All MagiDrives are:

- Failsafe – with excess torque a MagiDrive will simply release and lock back onto the next pole avoiding possible costly damage, maintenance and downtime
- Bakeable to 250°C

» MagiDrives benefit from:

- A single piece vacuum enclosure* guaranteeing vacuum integrity
- No bellows, organics or sliding seals
- True UHV performance
- High torque
- Zero backlash under low load and acceleration
- Magnetic shielding permitting use in magnetically-sensitive environments

*Excluding MD100H & MD150H

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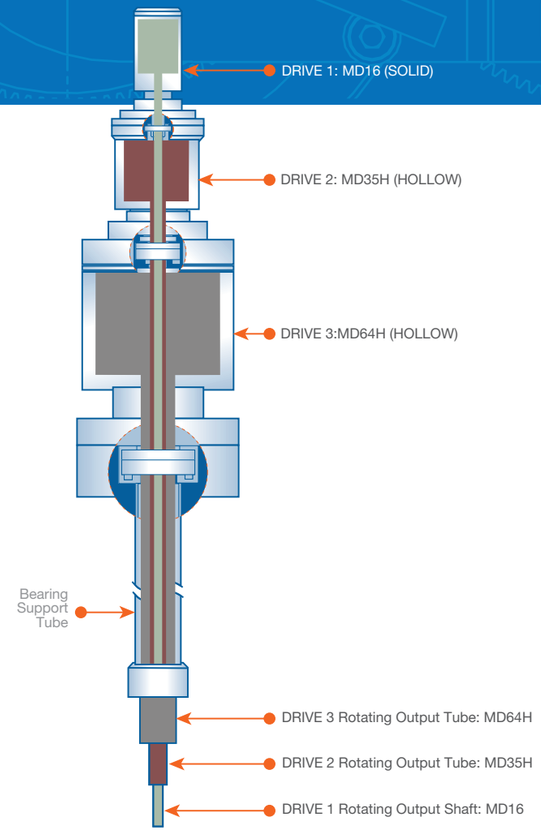
Schematic of stacked hollow range illustrating three concentric rotations.



Practical application of hollow MagiDrives on the EC-R Epicentre deposition stage.

Selecting your Hollow MagiDrive

DRIVE	MD35H	MD35LB	MD64H	MD64LB	MD64LBM	MD100H	MD150H
Mounting flange (OD) CF	CF35 2.75"		CF64 4.5"			CF100 6.0"	CF150 8.0"
Rear flange (OD) CF	CF16 1.33"	CF35 2.75"		CF64 4.5"			CF100 6.0"
Clear bore	12mm	27mm	26mm	48.5mm		65mm	100mm
Break-away Torque Nm (lbf ft)	4.5 (3.3)	6.0 (4.4)	10.0 (7.4)	8 (5.9)	40 (29.5)		
Page Number	22	24	26	28	28	30	32

CF35, 2.75" OD Flange

Hollow MagiDrive Series

MD35H Series

MD35H is a medium torque, medium stiffness rotary drive. Configured with a hollow body, the MD35H has a fixed rear flange enabling a component to pass through the centre, such as a heater module, a feedthrough, a second MagiDrive rotary feedthrough or a cold lance.

MD35H KEY ADVANTAGES

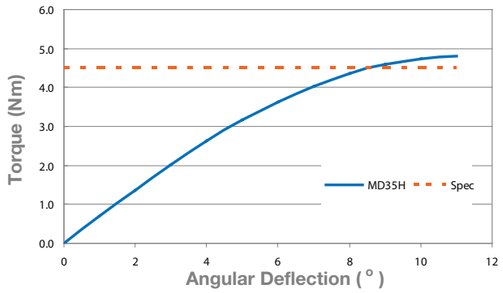
- 12mm clear bore
- Magnetically-coupled fail-safe design
- Medium torque
- No bellows or dynamic seals
- Bakeable to 250°C
- Zero backlash under low load
- True UHV performance

Specification Table

MAGIDRIVE BODY	MD35H
System mounting flange	CF35 70mm (2.75") OD CF
Fixed rear flange	CF16 34mm (1.33") OD CF
Construction	Machined from one piece 316L
Clear bore diameter	12mm
Shaft style	Spigot flange
Break-away torque	4.5 Nm (3.32 lbf ft)
Maximum no load spin speed (standard bearings)	500 rpm
Maximum shaft axial thrust	142 N (32 lbf)
Maximum bakeout temp	250°C

MD35H with timing pulley option

Torsional Stiffness



MD35H with side-mounted stepper motor

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Base Drive Dimensions (mm)

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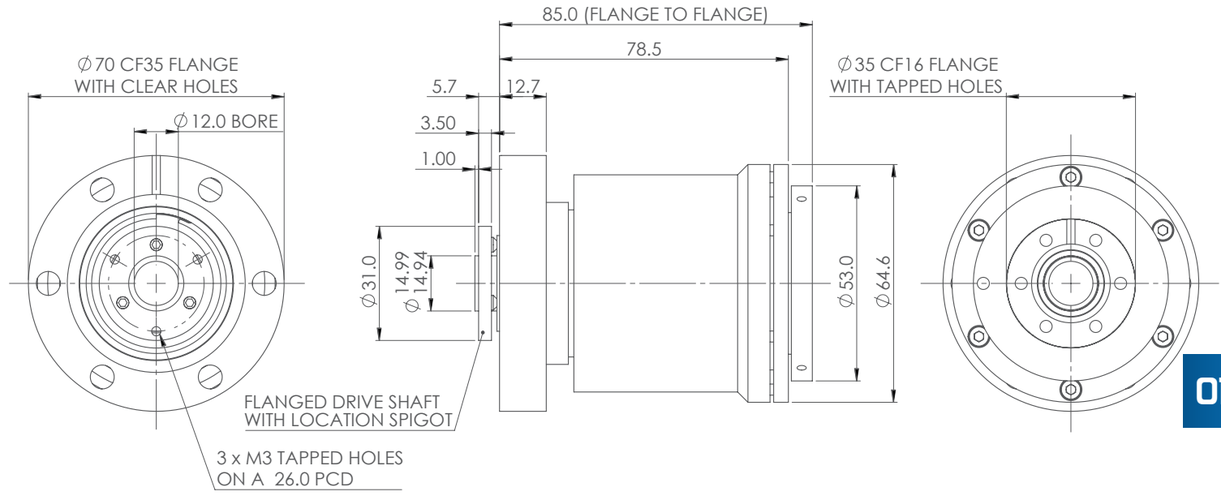


MD35H Part Code Generator

MagiDrive Size		+		Actuation Options		+	Gearing*	+	Shaft Options		+	Bearing	
MD35H	MD35H								Standard	X000		Standard bearing	Z
												Ceramic bearing	CE
			Manual	Standard thimble	T								
				Calibrated thimble + brake screw	CB								
				Timing pulley	P								
			Motorised	Side-mounted stepper motor only	SS		1,2,3,4						
				+ home sensor	SSS		1,2,3,4						
				+ limit switches	SSL		1,2,3,4						
				+ home + limit switches	SSSL		1,2,3,4						
				+ encoder	SSE		1,2,3,4						
				+ encoder + home sensor	SSES		1,2,3,4						
				+ encoder + limit switches	SSEL		1,2,3,4						
				+ encoder + home + limit switches	SSESL		1,2,3,4						
				Side-mounted DC motor	SD		1,2,3,4						
				Side-mounted SMART motor only	SM		1,2,3,4						
				+ home sensor	SMS		1,2,3,4						
				+ limit switches	SML		1,2,3,4						
				+ home + limit switches	SMSL		1,2,3,4						
			Pneumatic	Side-mounted pneumatic actuator only	RA								
				+ position feedback	RAI								

For more information on gearing options for motorised MagiDrives please see page 33

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

For more information on actuation options see page 6

Example Configured Part Number:

MD35HSSE2X000Z

= **MD35H** Side-mounted stepper motor with encoder **SSE**, gearbox option **2***, standard shaft **X000** and standard bearings **Z**

CF35, 2.75" OD Flange

Hollow MagiDrive Series

MD35LB Series

MD35LB is a medium/high torque, medium stiffness rotary drive. The MD35LB is provided with calibrated thimble, brake and timing pulley as standard. An adjustable rear flange enables rotation of position prior to fixing. The large 27mm clear bore allows a component to pass through the centre, such as a heater module, a feedthrough or a cold lance.

MD35LB KEY ADVANTAGES

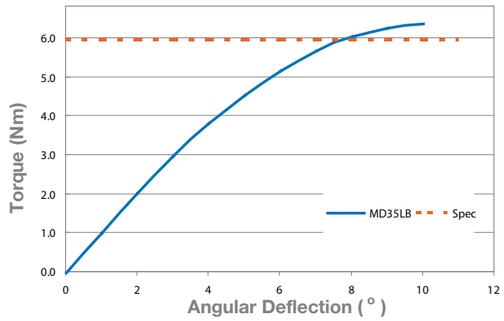
- » 27mm clear bore
- » Magnetically-coupled fail-safe design
- » Medium/high torque
- » No bellows or dynamic seals
- » Bakeable to 250°C
- » Zero backlash under low load
- » True UHV performance

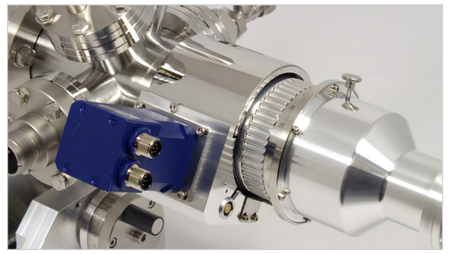
Specification Table

MAGIDRIVE BODY	MD35LB
System mounting flange	CF35 70mm (2.75") OD CF
Fixed rear flange	CF35 70mm (2.75") OD CF
Construction	Machined from one piece 316L
Clear bore diameter	27mm
Shaft style	Tube
Break-away torque	6 Nm (4.43 lbf ft)
Maximum no load spin speed (standard bearings)	500 rpm
Maximum shaft axial thrust	145 N (32.5 lbf)
Maximum bakeout temp	250°C

MD35LBCBP 27mm clear bore

Torsional Stiffness





MD35LBCBP as part of a manipulator

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Base Drive Dimensions (mm)

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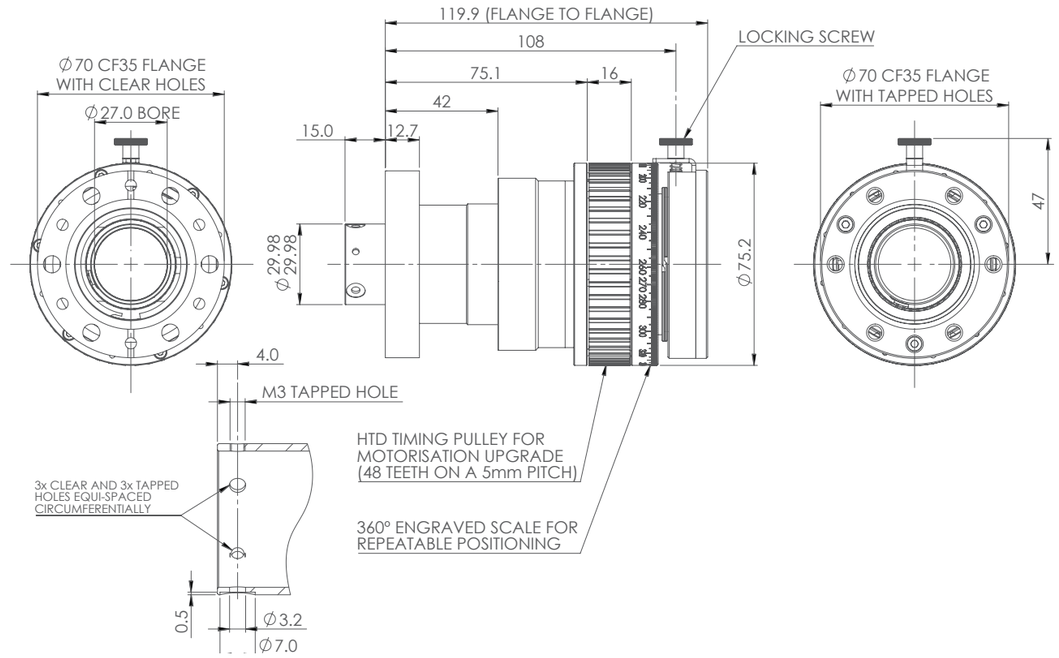


MD35LB Part Code Generator

Magidrive Size	
MD35LB	MD35LBCBP

+

	Actuation Options (optional)	
Manual	Supplied with timing pulley, brake and calibrated thimble as standard	
Motorised	Side-mounted stepper motor only	SS
Motorised	+ home sensor	SSS
Motorised	+ limit switches	SSL
Motorised	+ home + limit switches	SSSL
Motorised	+ encoder	SSE
Motorised	+ encoder + home sensor	SSES
Motorised	+ encoder + limit switches	SSEL
Motorised	Side-mounted DC motor	SD
Motorised	Side-mounted SMART motor only	SM
Motorised	+ home sensor	SMS
Motorised	+ limit switches	SML
Motorised	+ home + limit switches	SMSL
Pneumatic	Side-mounted pneumatic actuator only	RA
Pneumatic	+ position feedback	RAI

+

Gearing
1,2,3,4,5

+

Shaft Options	
Standard	X000
30mm shaft	X030

+

Bearing (select one)	
Standard bearing	Z
Ceramic bearing	CE

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:

MD35LBCBPX000CE

= **MD35LBCBP**, standard shaft **X000** and ceramic bearings **CE**

CF64, 4.5" OD Flange

Hollow MagiDrive Series

MD64H Series

The MD64H MagiDrive provides high torque rotation through a high stiffness coupling. This drive is ideally suited to platen rotation or robot type applications. The MD64H has an adjustable rear flange enabling rotation of position prior to fixing. The hollow bore allows a component to pass through the centre such as a heater module, or a second MagiDrive rotary feedthrough shaft.

MD64H KEY ADVANTAGES

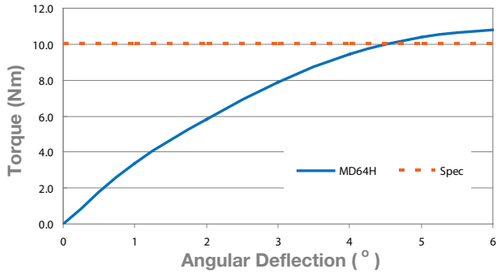
- » 26mm clear bore
- » Magnetically-coupled fail-safe design
- » High torque / stability
- » No bellows or dynamic seals
- » Bakeable to 250°C
- » Zero backlash under low load
- » True UHV performance

Specification Table

MAGIDRIVE BODY	MD64H
System mounting flange	CF64 114mm (4.5") OD CF
Fixed rear flange	CF38 70mm (2.75") OD CF
Construction	Machined from one piece 316L
Clear bore diameter	26mm
Shaft style	Spigot flange
Break-away torque	10 Nm (7.38 lbf ft)
Maximum no load spin speed (standard bearings)	500 rpm
Maximum shaft axial thrust	415 N (93 lbf)
Maximum bakeout temp	250°C

MD64H with timing pulley

Torsional Stiffness



MD64H with side-mounted stepper motor

Base Drive Dimensions (mm)

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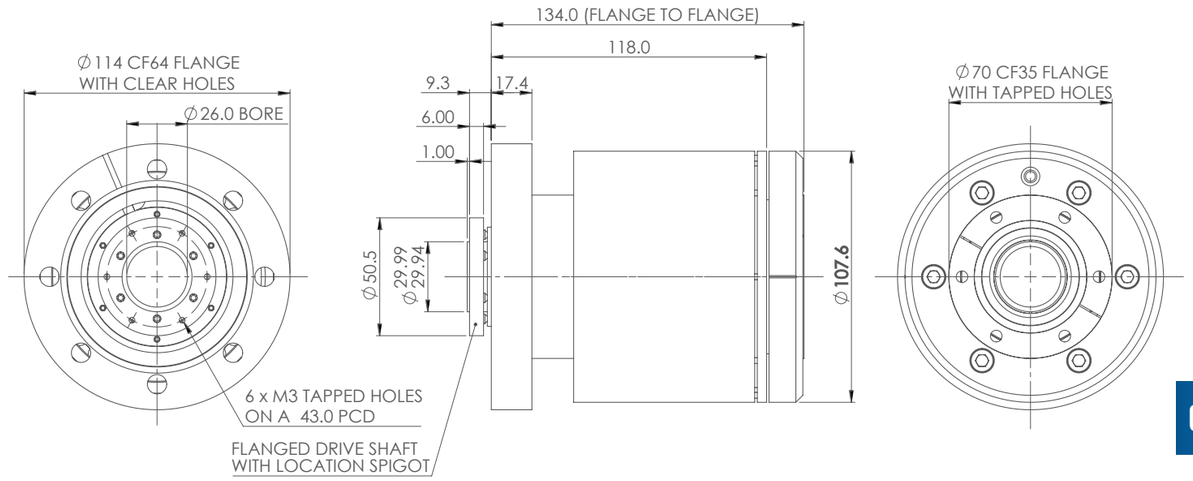


MD64H Part Code Generator

MagiDrive Size		+	Actuation Options		+	Gearing*	+	Shaft Options		+	Bearing	
MD64H	MD64H							Standard	X000		Standard bearing	Z
											Ceramic bearing	CE

	Actuation Options		Gearing*
Manual	Standard thimble	T	
Manual	Calibrated thimble + brake screw	CB	
Manual	Timing pulley	P	
Motorised	Side-mounted stepper motor only	SS	1,2,3,4
Motorised	+ home sensor	SSS	1,2,3,4
Motorised	+ limit switches	SSL	1,2,3,4
Motorised	+ home + limit switches	SSSL	1,2,3,4
Motorised	+ encoder	SSE	1,2,3,4
Motorised	+ encoder + home sensor	SSES	1,2,3,4
Motorised	+ encoder + limit switches	SSEL	1,2,3,4
Motorised	+ encoder + home + limit switches	SSESL	1,2,3,4
Motorised	Side-mounted DC motor	SD	1,2,3,4
Motorised	Side-mounted SMART motor only	SM	1,2,3,4
Motorised	+ home sensor	SMS	1,2,3,4
Motorised	+ limit switches	SML	1,2,3,4
Motorised	+ home + limit switches	SMSL	1,2,3,4
Pneumatic	Side-mounted pneumatic actuator only	RA	
Pneumatic	+ position feedback	RAI	

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:
MD64HTX000Z
= **MD64H** standard thimble **T**, standard shaft **X000** and standard bearings **Z**

CF64, 4.5" OD Flange

Hollow MagiDrive Series

MD64LB(M) Series

The MD64LB & MD64LBM MagiDrives provides high (8 Nm) or ultra-high (40 Nm) torque rotation through a high stiffness coupling with a large 48.5mm clear bore. This drive is ideally suited to platen rotation or robot type applications. The MD64LBM supplies higher torque with the same dimensions.

MD64LB(M) KEY ADVANTAGES

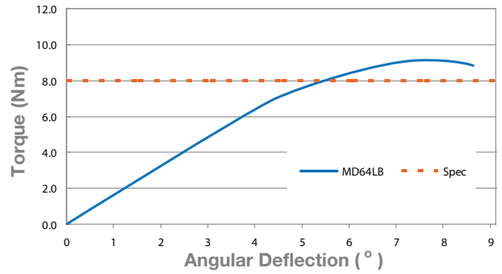
- **48.5mm clear bore**
- **High torque / stability**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

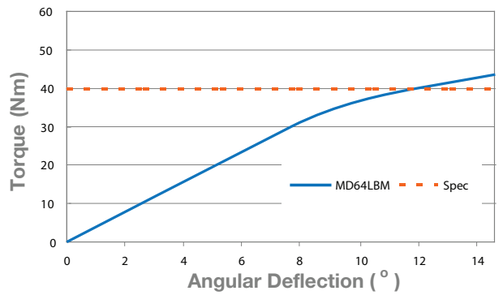
Specification Table

MAGIDRIVE BODY	MD64LB	MD64LBM
System mounting flange	CF64 114mm (4.5") OD CF	
Fixed rear flange	CF64 114mm (4.5") OD CF	
Construction	Machined from one piece 316L	
Clear bore diameter	48.5mm	
Shaft style	Tube with spigot flange	
Clear bore	48.5mm	
Break-away torque	8 Nm (5.90 lbf ft)	40 Nm (29.50 lbf ft)
Maximum no load spin speed	500 rpm	
Maximum shaft axial thrust	415 N (93 lbf)	
Maximum bakeout temp	250°C	

MD64LB with side-mounted stepper motor

Torsional Stiffness





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Base Drive Dimensions (mm)

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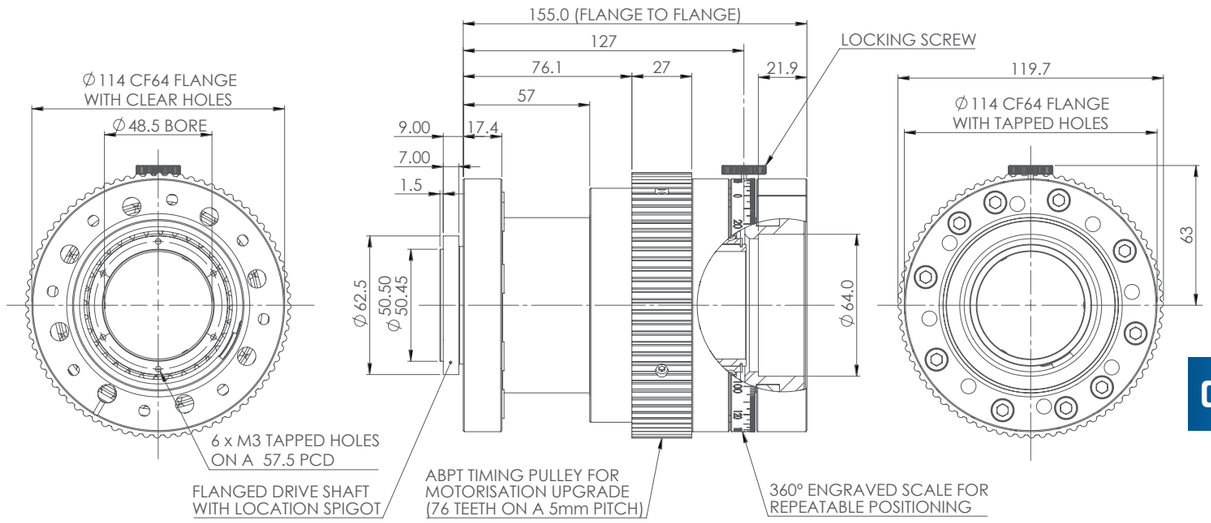


MD64LB(M) Part Code Generator

MagiDrive Size	
MD64LB	MD64LBCB
MD64LBM	MD64LBMCB

+

	Actuation Options (optional)		Gearing
Manual	Supplied with timing pulley, brake and calibrated thimble as standard		
Motorised	Side-mounted stepper motor only	SS	1,2,3,4
	+ home sensor	SSS	1,2,3,4
	+ limit switches	SSL	1,2,3,4
	+ home + limit switches	SSSL	1,2,3,4
	+ encoder	SSE	1,2,3,4
	+ encoder + home sensor	SSES	1,2,3,4
	+ encoder + limit switches	SSEL	1,2,3,4
	+ encoder + home + limit switches	SSESL	1,2,3,4
	Side-mounted DC motor	SD	1,2,3,4
	Side-mounted SMART motor only	SM	1,2,3,4
	+ home sensor	SMS	1,2,3,4
	+ limit switches	SML	1,2,3,4
	+ home + limit switches	SMSL	1,2,3,4
Pneumatic	Side-mounted pneumatic actuator only	RA	
	+ position feedback	RAI	

For more information on actuation options see page 6

+ Gearing

For more information on gearing options for motorised MagiDrives please see page 33

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

+ Shaft Options

Standard	X000

+ Bearing (select one)

Standard bearing	Z
Ceramic bearing	CE

Example Configured Part Number:

MD64LBMSS4X000CE

= **MD64LBMCB** high torque version with calibrated thimble and brake, side-mounted stepper motor **SS** with gear option **4**, standard shaft **X000** and ceramic bearings **CE**

CF100, 6" OD Flange

Hollow MagiDrive Series

MD100H Series

The MD100H is selected for demanding high torque and stiffness applications where a large bore is required, such as indexing robots or providing substrate rotation. The MD100H has a 65mm clear bore which enables a component to pass through the centre such as a heater module, cooling tubes or a second MagiDrive rotary feedthrough.

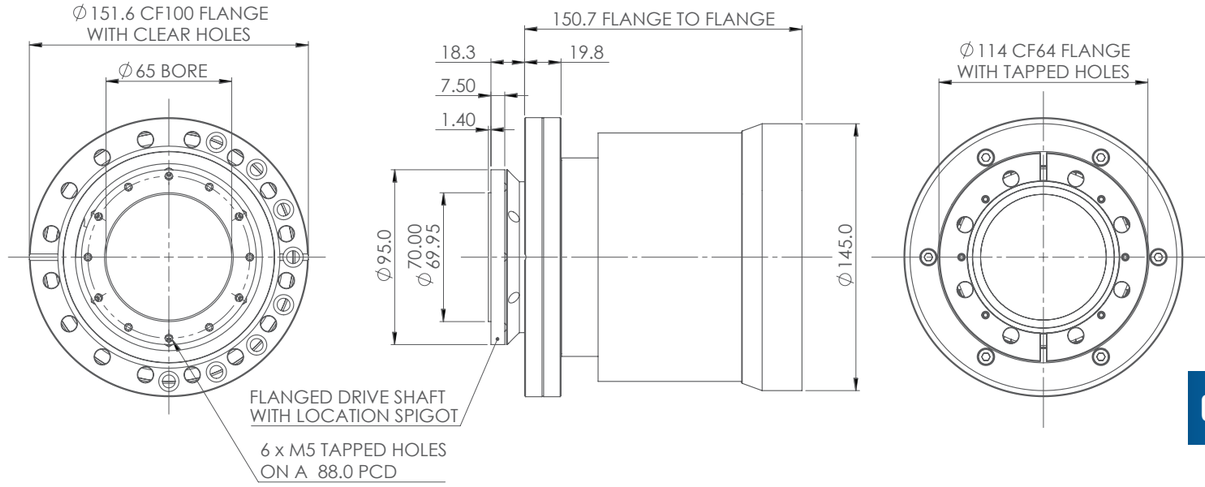
MD100H KEY ADVANTAGES

- » 65mm clear bore
- » Powerful, stiff coupling
- » No bellows or dynamic seals
- » Bakeable to 250°C
- » Zero backlash under low load
- » True UHV performance

UHV Design

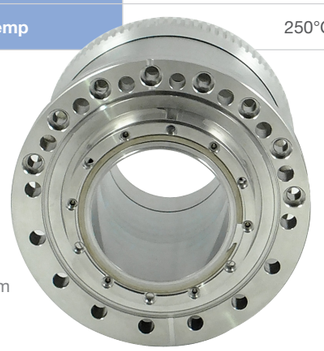
Base Drive Dimensions (mm)

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



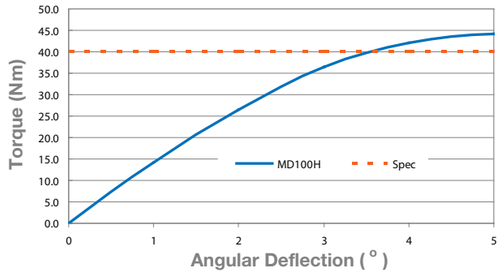
Specification Table

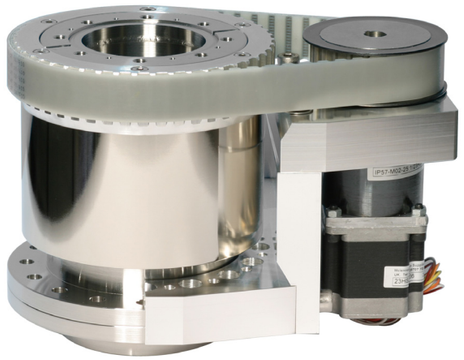
MAGIDRIVE BODY	MD100H
System mounting flange	CF100 152mm (6") OD CF
Fixed rear flange	CF64 114mm (4.5") OD CF
Construction	Fabrication
Clear bore diameter	65mm
Shaft style	Spigot flange
Break-away torque	40 Nm (29.50 lbf ft)
Maximum no load spin speed	200 rpm
Maximum shaft axial thrust	415 N (93 lbf)
Maximum bakeout temp	250°C



MD100H 65mm clear bore

Torsional Stiffness





MD100H with side-mounted stepper motor

MD100H Part Code Generator

MagiDrive Size		+	Actuation Options		+	Gearing	+	Shaft Options		+	Bearing	
MD100H	MD100H							Standard	X000		Standard bearing	Z
			Manual	Standard thimble	T						Ceramic bearing	CE
			Motorised	Timing pulley	P							
				Side-mounted stepper motor only	SS	1,2,3,4						
				+ home sensor	SSS	1,2,3,4						
				+ encoder	SSE	1,2,3,4						
				+ encoder + home sensor	SSES	1,2,3,4						
				Side-mounted DC motor	SD	1,2,3,4						
				Side-mounted SMART motor only	SM	1,2,3,4						
				+ home sensor	SMS	1,2,3,4						
				+ limit switches	SML	1,2,3,4						
				+ home + limit switches	SMSL	1,2,3,4						

For more information on actuation options see page 6

For more information on gearing options for motorised MagiDrives please see page 33

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

Example Configured Part Number:

MD100HTX000Z

= **MD100H** standard thimble **T**, standard shaft **X000** and standard bearings **Z**

Should your requirements fall outside our standard specifications then please contact us at:

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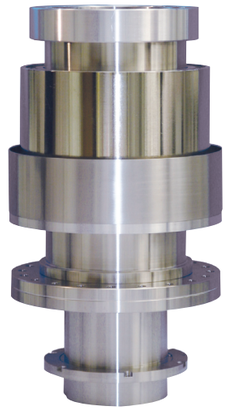
CF150, 8" OD Flange

Hollow MagiDrive Series

MD150H Series

(CF150, 8"OD) Hollow



The MD150H is selected for demanding high torque and stiffness applications, such as indexing robots or rotating large loads. The MD150H has the largest clear bore in the range (100mm). This enables a component to pass through the centre such as UHV Design's cold lance or a second MagiDrive rotary feedthrough.

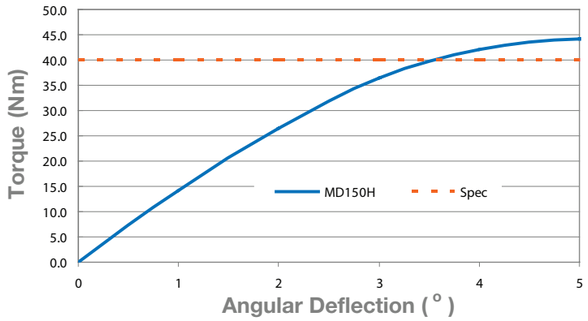
MD150H KEY ADVANTAGES

- » Hollow drive
- » 100mm clear bore
- » Powerful, stiff coupling
- » No bellows or dynamic seals
- » Bakeable to 250°C
- » Zero backlash under low load
- » True UHV performance

Specification Table

MAGIDRIVE BODY	MD150H
System mounting flange	CF150 203mm (8") OD CF
Fixed rear flange	CF100 152mm (6") OD CF
Construction	Fabrication
Clear bore diameter	100mm
Shaft style	Spigot flange
Break-away torque	40 Nm (29.50 lbf ft)
Maximum no load spin speed	200 rpm
Maximum shaft axial thrust	415 N (93 lbf)
Maximum bakeout temp	250°C

Torsional Stiffness



MD150H Part Codes

Contact us for information on MD150H configuration and part numbering.

Should your requirements fall outside our standard specifications then please contact us at:

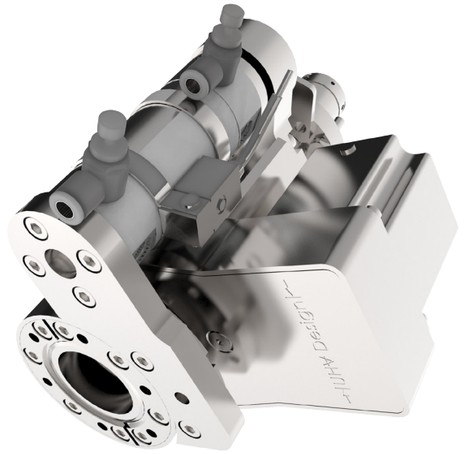
UHV Design

MAGIDRIVE Motorisation Details

Gearbox Options

		MAXIMUM OUTPUT TORQUE Nm FOR GEAR OPTION:					MAXIMUM OUTPUT SPIN SPEED RPM FOR GEAR OPTION:				
DRIVE	MOTOR TYPE	1	2	3	4	5	1	2	3	4	5
MD10	In-Line DC motor (ID)	0.18	0.18	0.18	0.18	-	230	135	70	42	-
	In-Line stepper motor (IS)	0.07	0.18	0.18	0.18	-	200	23	16	8	-
MD16, MD16A, MD19, MD20, MD21	In-Line DC motor (ID)	0.21	0.3	0.3	0.45	-	230	135	70	42	-
	In-Line stepper motor (IS)	0.11	0.45	0.45	0.45	-	1000	300	150	60	-
MD25	Side-mounted DC motor (SD)	0.6	1.4	2.4	2.4	-	307	123	61	31	-
	In-Line DC motor (ID)	0.4	1.0	2.4	2.4	-	460	184	92	46	-
	Side-mounted stepper motor (SS)	1.5	0.9	2.0	2.4	-	667	200	80	40	-
	In-Line stepper motor (IS)	1.0	1.5	2.4	2.4	-	750	120	60	30	-
MD35 MD35H* *side-mounted options only	Side-mounted DC motor (SD)	0.8	2.0	3.9	4.5	-	230	92	46	23	-
	In-Line DC motor (ID)	0.4	1.0	2.0	3.9	-	460	184	92	46	-
	Side-mounted stepper motor (SS)	2.0	1.2	2.7	4.5	-	500	150	60	30	-
	In-Line stepper motor (IS)	1.0	1.5	2.7	4.5	-	500	120	60	30	-
MD35LBCBP	Side-mounted DC motor (SD)	0.4	1.7	6	6	6	500	104	28	17	23
	Side-mounted stepper motor (SS)	0.8	3.7	6	6	6	500	150	75	30	23
MD64 MD64H* *side-mounted options only	Side-mounted DC motor (SD)	1.7	4.3	7.9	10	-	245	98	49	25	-
	In-Line DC motor (ID)	0.9	1.8	4.2	8.4	-	440	220	88	44	-
	Side-mounted stepper motor (SS)	3.5	6.9	10	10	-	150	75	30	15	-
	In-Line stepper motor (IS)	4.6	3.7	8.4	10	-	300	150	60	30	-
MD64LBCB (MD64LBMCB)	Side-mounted DC motor (SD)	1.7	4.3	7.9	10	-	245	98	49	25	-
	Side-mounted stepper motor (SS)	3.7	7.3	8 (16.8)	8 (33.6)	-	150	75	30	15	-
MD100H	Side-mounted DC motor (SD)	1.8	4.6	8.4	16.8	-	230	92	46	23	-
	Side-mounted stepper motor (SS)	3.7	7.3	16.8	33.6	-	150	75	30	15	-
MD150H	Contact us for details.										

For detailed technical information including gearing ratios please contact us



Linear & Rotary Drive

MagiLift

Magnetically-coupled rotation and axial motion in a single, compact device. An example application would be the rotatation of a substrate cradle with the lift and lower motion used to faciliate sample transfer. Hollow drive technology allows services to be passed through to a substrate heating module.

MAGILIFT KEY ADVANTAGES

- **Magnetically-coupled fail-safe design**
- **Rotation up to 60 rpm and 25mm axial motion in a single, compact device**
- **27.8mm bore to allow services to be passed through**

The MLR35 is a magnetically-coupled combined hollow rotary and linear motion device, which enables a central hollow shaft to be rotated in UHV at up to 60 rpm and moved axially by up to 25mm. As such this manipulator is ideal for applications where, for example, a substrate may need to be rotated in front of a source or heater to achieve uniformity whilst being able to move the substrate axially to facilitate sample hand off.

The MRL35 is magnetically-coupled (i.e. free from bellows, sliding seals, Ferro seals etc) ensuring trouble-free operation and eliminating the risk of leaks in service. The very high torque and axial thrust provided by our highly optimised magnetic couplings ensure precision and surety of motion.

The large hollow bore provides ample space through which services can be passed to deliver power, cooling, electrical connections etc. A range of motorisation options is available for the rotary motion, and the linear motion can be actuated either manually or pneumatically. The linear actuator can have fitted limit switches, and the rotary motion has built in an option for a hall sensor triggered by an internal magnet such that an unambiguous rotational home signal is provided.

Being mounted from a standard CF38, the device is very compact and the rotatable CF38 rear flange provides for greater flexibility when mounting additional devices to the rear of the drive in spatially constrained situations, as the device can be mounted in any angular orientation.

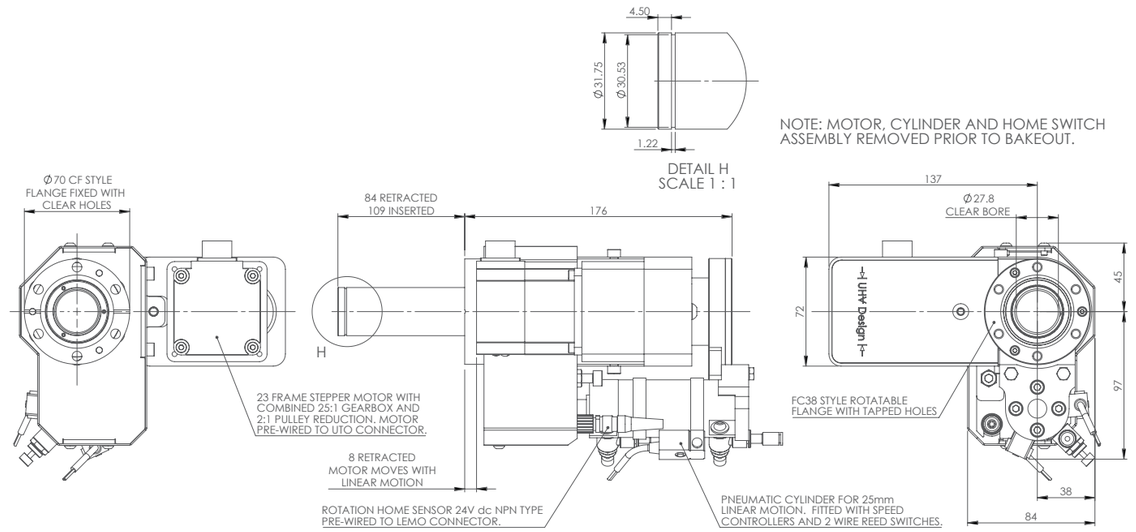
Specification Table

MAGILIFT	
System mounting flange size	CF38 70mm (2.75") OD CF metric clear holes straddled
Rear flange size	CF38 70mm (2.75") OD CF metric tapped rotatable
Clear bore	27.8mm
Break-away Torque	9 Nm (6.6 lbf ft)
Linear coupling	140 N (31.3 lbf)
Lift motion range	0-25mm
Rotation speed range	60 rpm maximum
Max bakeout temperature	250 °C with motor/pneumatic cylinder/ home sensor removed

Should your requirements fall outside our standard specifications then please contact us at:

Base Drive Dimensions (mm)

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



MagiLift Part Code Generator

MagiLift		+ Lift Actuation Options		+ Rotation Actuation Options		+ Home Sensor	
MagiLift	MLR35	Pneumatic actuator (standard)	P	Stepper motor	SS	No home sensor	
		Manual	H	SMART motor	SM	Home sensor included	S

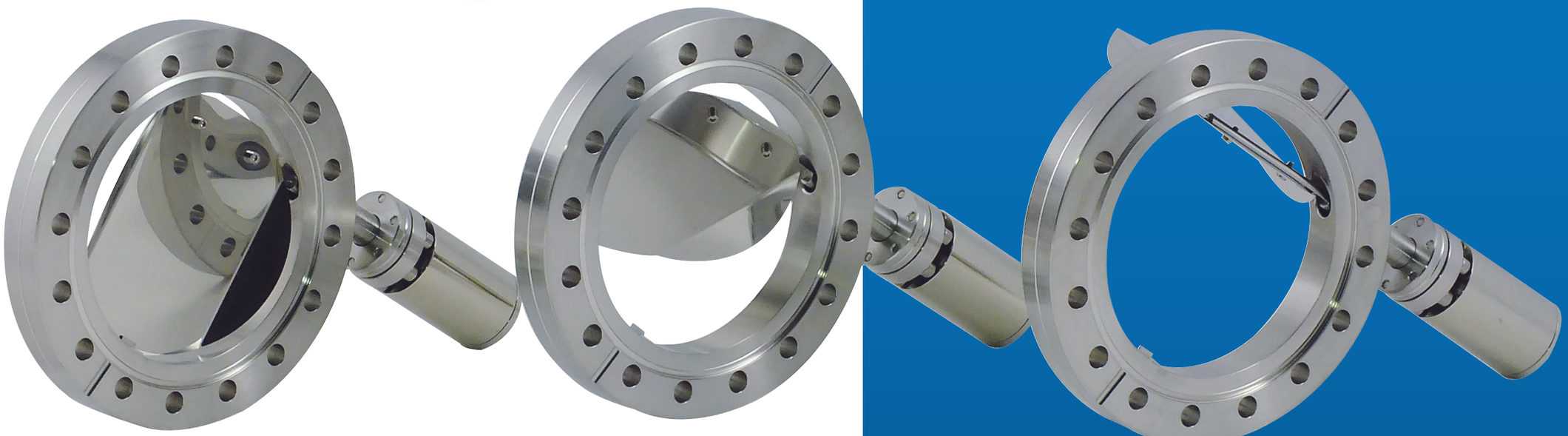
For more information on gearing options for motorised MagiDrives please see page 33

For details of 'plug & play' motor controllers see section 13

Example Configured Part Number:

MLR35-P-SS-S

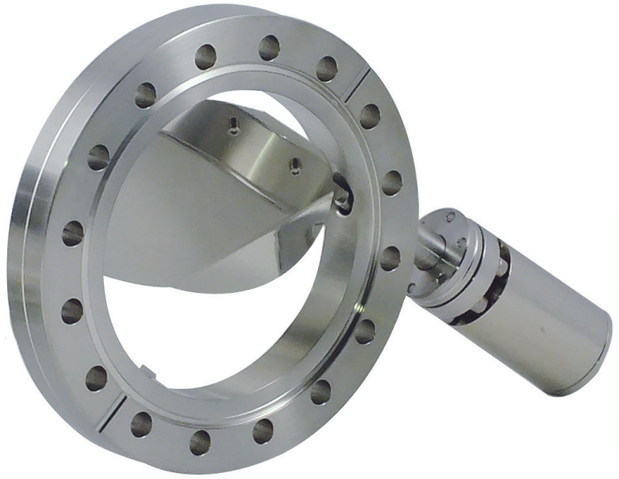
= **MagiLift**, pneumatic lift actuation **P,** stepper motor rotation **SS** and home sensor **S**



Section 02

02

SHUTTERS



Viewport Shutters

Designed to protect system windows during processes such as vacuum deposition.

Utilising the magnetically-coupled MagiDrive rotary feedthroughs (see section 1) for shutter actuation, the range can be actuated manually or pneumatically where remote control is required.

VPS KEY ADVANTAGES

- » Available on CF38 to CF150 flanges
- » Manual or pneumatic actuation
- » Fully bakeable to 250°C
- » Friction control system
- » 100% full closure option
- » Position switch option

Manual Actuation

Manually actuated viewport shutters are fitted with an external friction control system, ensuring the blade remains in the desired position without the need for position locks.

Pneumatic Actuation

Viewport shutters can also be fitted with a pneumatically actuated MagiDrive for remote operation from a control panel or switch or interlocked to the vacuum process, such that activating a deposition source, for example, would automatically close the viewport shutter. For critical applications, an optional feedback-switch assembly can be fitted to the drive to confirm to the process controller that the shutter is in the closed position.

100% Full Closure Option

The full closure option provides maximum protection against the coating of viewports. Ideally suited to applications such as MBE where viewports cannot easily be cleaned or replaced.

Specification Table

VIEW PORT SHUTTER SPECIFICATION	VPS38	VPS64	VPS100	VPS150
System mounting flange size (with clear holes)	CF38 (2¾" OD CF)	CF64 (4½" OD CF)	CF100 (6" OD CF)	CF150 (8" OD CF)
Blade aperture coverage (Standard)	88.4%	90.6%	84.0%	87.0%
Blade aperture coverage (Full Closure option)	100%	100%	100%	100%
Bakeout temperature	250°C with pneumatic cylinder removed			
Pneumatic option - cylinder sweep	set at 90 degrees (adjustable 30-170°)			
Pneumatic option - cylinder switch	5-24V 2 wire reed switch			
Pneumatic option - max rotation speed	0.5 seconds per 90°	0.5 seconds per 90°	1 second per 90°	1 second per 90°

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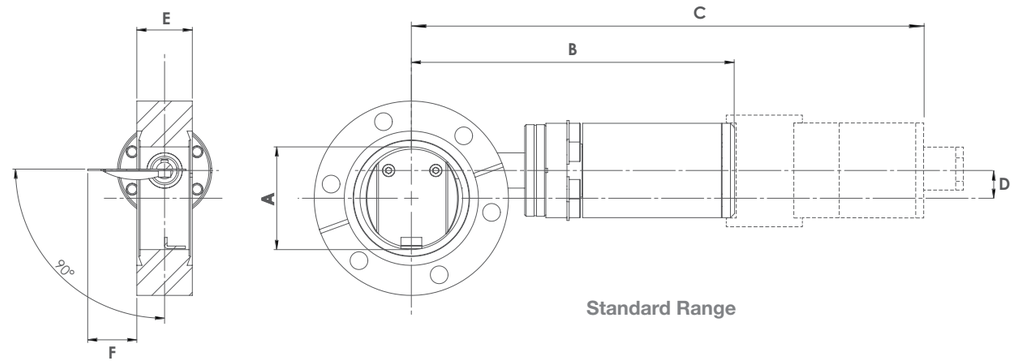
Standard option

100% Full Closure option with pneumatic actuation

Example Dimensions (mm)

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



Standard Range

Dimensions (mm)	A	B (Manual)	C (Pneumatic)	D	E	F
VPS38	37.0	116.0	180.2	10.0	20.0	17.7
VPS38FC	31.0	116.0	180.2	10.0	20.0	16.8
VPS64	63.5	135.0	199.2	19.5	17.4	41.8
VPS64FC	58.0	135.0	199.2	19.5	17.4	40.8
VPS100	101.9	158.0	222.0	35.5	19.8	74.7
VPS100FC	96.0	158.0	222.0	35.5	19.8	73.1
VPS150	152.4	173.0	236.7	52.5	22.4	115.6
VPS150FC	152.4	173.0	236.7	52.5	22.4	113.3

Viewport Shutter Part Code Generator

Viewport Shutter	
Standard viewport shutter	VPS
Full closure version	VPSFC

+

Flange Size	
CF38	38
CF64	64
CF100	100
CF150	150

+

Actuation Options (optional)	
Pneumatic actuator	RA
Pneumatic actuator + position feedback switches	RAI

Example Part Number: **VPS38**
= **VPS** CF38 flange **38**

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Source Shutters

MD16 with pneumatic actuator

MD16 shutter with shaft & blade

MD35 with pneumatic actuator

Robust, high-duty cycle flux-switching solutions for applications such as sputter sources, ion guns or viewport shutters. Available in 7 different sizes to match torque requirements for a range of applications.

KEY ADVANTAGES

- **Adjustable sweep (30° - 170°)**
- **Magnetically-coupled fail-safe design**
- **No bellows or dynamic seals**
- **Bakeable to 250°C**
- **Zero backlash under low load**
- **True UHV performance**

UHV Design's high quality rotary source shutters are becoming an industry-standard for flux-switching solutions. The pneumatic actuation provides a robust high-duty solution for shutter applications such as sputter sources, ion guns or viewport shutters.

Range

Based on the MagiDrive magnetically-coupled rotary feed through series (see section 1), the range includes seven different sizes to match the torque requirements for an array of applications. Each drive is fitted with an external pneumatic actuator providing adjustable sweep between 30°-170° and flow control valves are also supplied to adjust the speed of actuation.

Actuation Details

A solenoid-operated spool valve switches compressed gas between the actuator ports. Energising the solenoid will sweep the shutter through the required angle; de-energising the solenoid returns the shutter to its start position. Actuators can also be fitted with Auto Switch actuators complete with reed switches for system feedback and visual position indicators.

Shafts and Shutter Blades

Source shutters can be supplied with standard MagiDrive shaft options but customised shafts and shutter blades are available upon request. Extended bearing housings can be provided for longer shafts. Please contact Sales for further information.

Specification Table

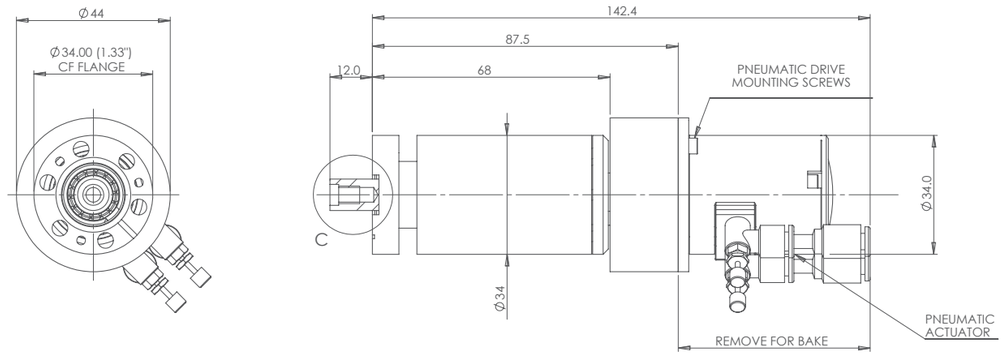
MAGIDRIVE	MD10	MD16	MD16A	MD20	MD25	MD35	MD64
Mounting flange	CF10 (1" OD CF)	CF16 (1.33" OD CF)		CF38 (2.75" OD CF)			CF64 (4.5" OD CF)
Sweep	30°-170° (adjustable)						
Magnetic break-away torque	0.18 Nm (0.13 lbf ft)	0.45 Nm (0.33 lbf ft)	1.8 Nm (1.33 lbf ft)	0.45 Nm (0.33 lbf ft)	2.5 Nm (1.84 lbf ft)	4.5 Nm (3.32 lbf ft)	10 Nm (7.38 lbf ft)
Torsional stiffness	0.01Nm/degree	0.033Nm/degree	0.16Nm/degree	0.033Nm/degree	0.214Nm/degree	0.655Nm/degree	2.9Nm/degree
Maximum air input pressure	6.8 bar (98 PSI)						
Flow control port size	4mm OD pipe						

Should your requirements fall outside our standard specifications then please contact us at:

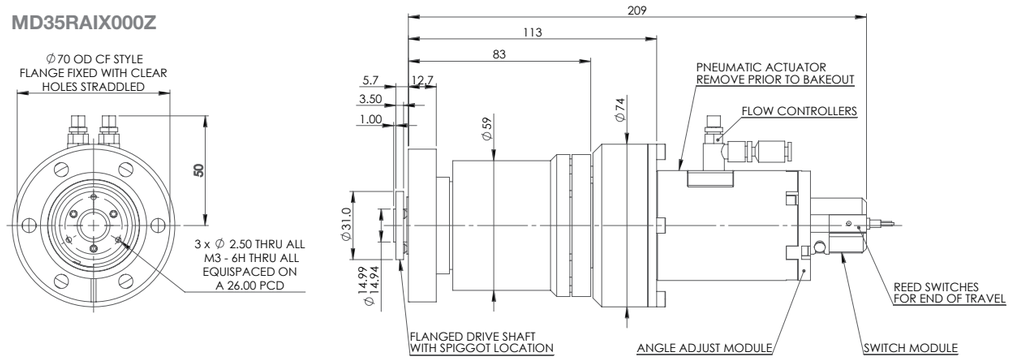
Example Dimensions (mm)

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

MD16RAX000Z



MD35RAIX000Z



Source Shutter Part Code Generator

Magidrive Size		+	Actuation Options		+	Shaft Options		+	Bearing	
MD10	MD10		Pneumatic	Pneumatic actuator	RA	Standard	X000		Standard bearing	Z
MD16	MD16			Pneumatic actuator + position feedback	RAI	30mm shaft*	X030		Ceramic bearing	CE
MD16A	MD16A									
MD20	MD20									
MD25	MD25									
MD35	MD35									
MD64	MD64									

*MD16 & MD20 variants only

Example Configured Part Number:

MD10RAX000Z

= **MD10**, pneumatic actuation **RA**, standard shaft **X000** and standard bearings **Z**

Section 03

03

PUSH PULL DEVICES

Magnetically-coupled Push Pulls

High duty, high torque, linear & linear/rotary motion

For high duty process applications the magnetically-coupled Push Pull (MPP) devices are ideally suited with high torque, high axial stiffness and zero thrust due to vacuum.

The magnetically-coupled Push Pull range provides linear and linear/rotary motion solutions with up to 300mm (12") stroke. Strong magnetic coupling eliminates the use of bellows and dynamic seals which are vulnerable to failure, providing a robust long life design.

The MPP range is ideally suited to high duty cycle applications such as production lines where uptime is critical.

The range provides smooth motion in both directions with zero thrust due to vacuum unlike bellows-sealed devices. Ranges provide linear motion (with free rotation of the shaft), guided linear motion (no rotation of the shaft) and linear and rotary motion (shaft rotation controlled by the thimble). Manual actuation is provided as standard with motorised and pneumatic options available. Pneumatic actuation is ideal for high duty, two position applications such as source or beam shutters.

MPPRL Series

Linear & rotary motion

Page 46

MPPL Series

Guided linear motion

Page 48

MPP Series

Unguided linear motion

Page 50

UHV Design

Linear Bellows Drives

High precision, multi-position, linear only motion

For applications where precise multi-positioning is required, our Linear Bellows Drives provide exceptional resolution (2 times better than conventional units), a guaranteed minimum lifetime of 10,000 cycles and the ability to easily motorise in the field.

The Linear Bellows Drives (LBDs) are a range of cost-effective UHV bellows-sealed devices that provide smooth and precise linear motion solutions for low load applications with 0.01mm linear resolution. They are available on a 34mm (1.33") OD CF flange as standard or 70mm (2.75") OD CF flange option with a range of strokes up to 150mm. They are ideal for simple linear motion applications through to precise positioning such as required for beamline diagnostics.

The LBD is manufactured and assembled to high tolerances using quality materials throughout, including 316L bellows, which offer a guaranteed minimum lifetime of 10,000 cycles.

A simple user-friendly retrospective motor upgrade is available, which includes home and limit switches for positional accuracy that can easily be removed for bake-out. The Linear Bellows Drive range offers four interchangable actuation methods; simple push pull rod, micrometer style actuation, high precision motorisation and pneumatic.

LBD-R Series

Simple push pull rod

Page 52

LBD-H Series

Precise, micrometer scale

Page 52

LBD-IS Series

High precision motorisation

Page 52

LBD-P Series

Pneumatic Actuation

Page 52

Linear & Rotary Motion

MPPRL Series

Magnetically-coupled Push Pull devices providing rotary and linear motion solutions for low load applications in both high and ultra-high vacuum. Provided on a CF16 flange as standard with a choice of stroke lengths from 50mm to 300mm.

MPPRL KEY ADVANTAGES

- **Linear and continuous rotary motion**
- **High power-to-size ratio**
- **No bellows - smooth operation**
- **No thrust due to vacuum**
- **Over 90 N (20 lbf) linear thrust**
- **Torque in excess of 0.4 Nm (0.29 lbf ft)**
- **Entire unit bakeable to 250°C**

The MPPRL provides linear and continuous rotary motion of the vacuum shaft. The range provides a simple and intrinsically safe alternative to bellows-sealed push pull systems and is ideal for high duty cycle/performance critical applications such as synchrotrons and MBE systems where downtime is not acceptable. Linear strokes between 50mm and 300mm are offered as standard, with special strokes available upon request.

Utilising UHV Design's magnetic coupling technology, the Magnetic Push Pull removes the need for edge-welded bellows 'stacks', incorporated within traditional push pull designs. Their elimination maximises vacuum integrity, providing a robust, cost-effective solution.

Unlike a bellows-sealed device, the MPPRL offers the additional advantage of not being subject to thrust due to vacuum, resulting in smooth free-moving, user-friendly operation.

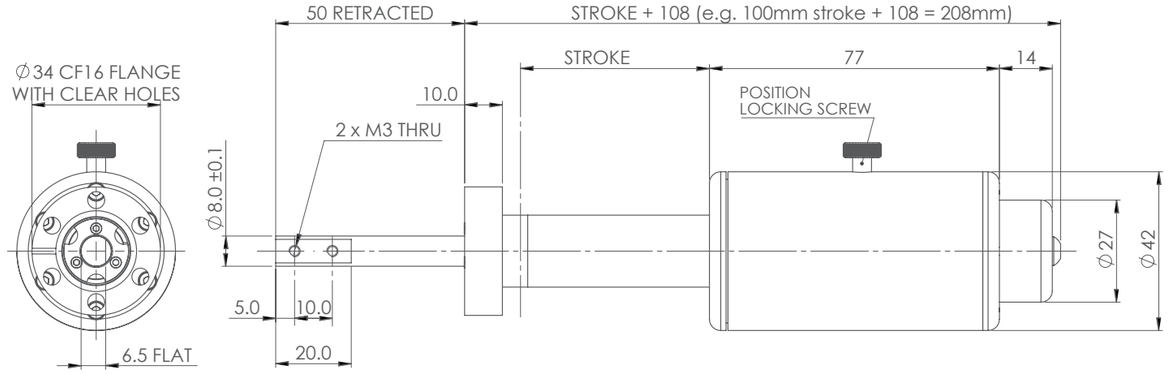
The CF16 flange version of the MPPRL is typically available from stock. CF35 flange versions are available at additional cost.

Should your requirements fall outside our standard specifications then please contact us at:

UHV Design

Example Dimensions (mm)

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



MPPRL Part Code Generator

Push Pull		+	CF Flange Size (select one)		+	Axial Stroke (select one)		+	Manual Actuation	
Rotary & Linear	MPPRL		CF16 34mm (1.33" OD CF) - Standard	16		50mm stroke	50		Manual	H
			CF35 70mm (2.75" OD CF) - Option	35		100mm stroke	100			
						150mm stroke	150			
						200mm stroke	200			
						250mm stroke	250			
						300mm stroke	300			

Example Part Number:

MPPRL16-50-H

= **MPPRL** CF16 flange **16**, 50mm stroke **50**, manual actuation **H**

Guided Linear Motion

MPPL Series

Magnetically-coupled Push Pull devices providing linear guided motion solutions for low load applications in high vacuum and ultra-high vacuum provided on CF16 flange as standard with strokes from 50mm to 300mm. Manual, pneumatic and motorised actuation options with additional switches to prevent over-travel and aid system interlocks are available.

MPPL KEY ADVANTAGES

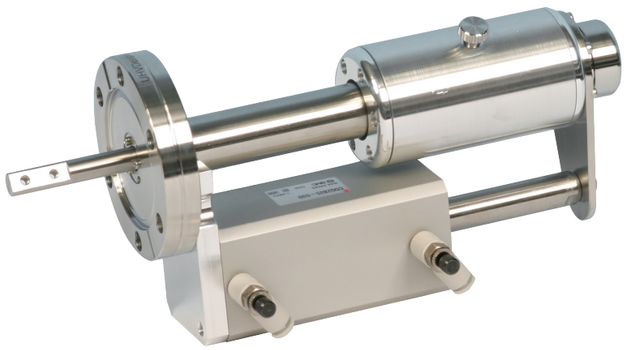
- **Internally-guided linear motion**
- **Guaranteed rotation-free motion**
- **No bellows - smooth operation**
- **No thrust due to vacuum**
- **Over 90 N (20 lbf) linear thrust**
- **Entire unit bakeable to 250°C**

The MPPL provides internally-guided linear motion of the vacuum shaft, guaranteeing rotation-free motion. Furthermore, the high axial thrust coupling produces no torque and so external rotation of the thimble does not apply a rotational force internally, ensuring smooth motion.

The range can be actuated manually, pneumatically or motorised with DC or stepper motors. Additionally, switches can be provided to prevent over-travel and to aid system interlocks.

The MPPL provides a simple and intrinsically safe alternative to bellows push pull systems. Utilising UHV Design's magnetic coupling technology the Magnetic Push Pull removes the need for edge-welded bellows stacks, incorporated within traditional push pull designs. Their elimination maximises vacuum integrity, providing a robust, cost-effective solution. Also, unlike a bellows-sealed device, the MPPL is not subject to the thrust due to vacuum, resulting in smooth, free-moving operation.

The CF16 flange versions of the MPPL are typically available from stock. CF35 flange versions are available at additional cost.



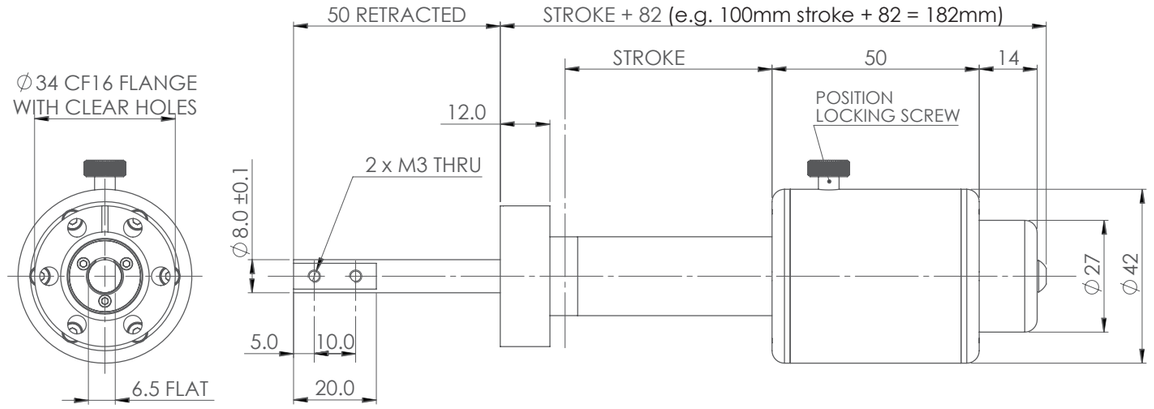
Special side-mounted pneumatically actuated MPPL

UHV Design

Standard In-line pneumatically actuated MPPL

Example Dimensions (mm)

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



MPPL Part Code Generator

Push Pull		+	CF Flange Size (select one)		+	Axial Stroke (select one)		+	Manual Actuation	
Linear Only	MPPL		CF16 34mm (1.33" OD CF) - Standard	16		50mm stroke	50		Manual actuation	H
			CF35 70mm (2.75" OD CF) - Option	35		100mm stroke	100		In-line pneumatic actuator	P
						150mm stroke	150		P + reed switches	PR
						200mm stroke	200		In-line stepper motor+ pre-wired switches	IS
						250mm stroke	250			
						300mm stroke	300			

Example Part Number:
MPPL16-100-H
= **MPPL** CF16 flange **16**, 100mm stroke **100**, manual actuation **H**

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Unguided Linear Motion

MPP Series

Unguided linear motion solutions for low load applications in high/ultra-high vacuum. The vacuum shaft is free to rotate, avoiding possible conflict with an internal chamber mechanism. Available in CF16 and CF35 flanges and six stroke lengths from 50mm to 300mm. Manual, pneumatic and motorised actuation options with additional switches to prevent over-travel.

MPP KEY ADVANTAGES

- **Unguided linear motion of the vacuum shaft**
- **Vacuum shaft free to rotate**
- **High power-to-size ratio**
- **No bellows - smooth operation**
- **No thrust due to vacuum**
- **Over 90 N (20 lbf) linear thrust**
- **Entire unit bakeable to 250°C**

MPPs provide linear motion of an unguided vacuum shaft (free to rotate). This is used to manipulate slides or pivot arms where a guided system may conflict with the mechanism. Please note that although the vacuum shaft is free to rotate, the MPP does not provide rotation.

The range can be actuated manually, pneumatically or motorised with DC or stepper motors. Additionally, switches can be provided to prevent over-travel and to aid system interlocks.

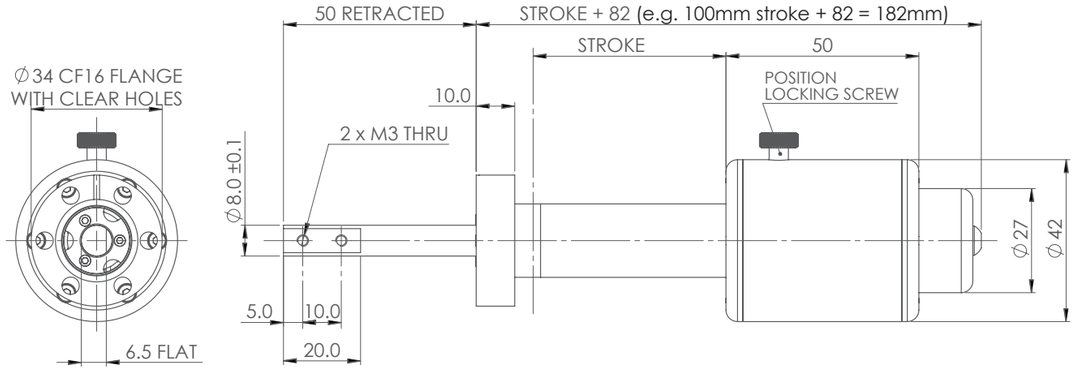
The MPP range provides a simple and intrinsically safe alternative to bellows push pull systems. Utilising UHV Design's magnetic coupling technology, the Magnetic Push Pull removes the need for edge-welded bellows stacks, incorporated within traditional push pull designs. Their elimination maximises vacuum integrity, providing a robust, cost-effective solution. Also, unlike a bellows-sealed device, the MPP is not subject to the thrust due to vacuum, resulting in smooth, free-moving operation.

The CF16 flange versions of the MPPL are typically available from stock. CF35 flange versions are available at an additional cost.

Should your requirements fall outside our standard specifications then please contact us at:

Example Dimensions (mm)

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



MPP Part Code Generator

Push Pull		+	CF Flange Size (select one)		+	Axial Stroke (select one)		+	Manual Actuation	
Linear + free rotation	MPP		CF16 34mm (1.33" OD) - Standard	16		50mm stroke	50		Manual actuation	H
			CF35 70mm (2.75" OD) - Option	35		100mm stroke	100		In-line pneumatic actuator	P
						150mm stroke	150		P + reed switches	PR
						200mm stroke	200		In-line stepper motor+ pre-wired switches	IS
						250mm stroke	250			
						300mm stroke	300			

Example Part Number:

MPP16-100-H

= **MPPL** CF16 flange **16**, 100mm stroke **100**, manual actuation **H**

Linear Bellows Drive

Linear Bellows Drive with micrometer scale

Linear Bellows Drive with Pull rod actuation

Motorised Linear Bellows Drive

Bellows-sealed, precise lead-screw driven linear motion solutions for low load applications in ultra-high vacuum. Available in CF16 and CF35 flange sizes with stroke length options from 25mm to 150mm.

Manual or stepper motor actuation options.

LBD KEY ADVANTAGES

- **316L high-quality bellows**
- **10,000 cycle guarantee**
- **Simple to motorise retrospectively**
- **High resolution performance: 10 micron manual, 1 micron motorised**
- **25N (5.6 lbf) axial thrust**
- **Bakeable to 250°C with motor removed**

The Linear Bellows Drives (LBDs) are a range of ultra-high vacuum compatible, bellows-sealed devices that provide smooth and reliable linear motion solutions for low load applications.

The CF16 flange versions of the LBD are typically available from stock, and are ideal for simple linear motion applications through to precise positioning such as beamline diagnostics.

CF35 flange versions are available at an additional cost.

The LBD is manufactured and assembled to high tolerances using quality materials throughout, including 316L bellows, which offer a guaranteed minimum lifetime of 10,000 cycles.

LBDs utilise a common drive body actuated by four interchangable mechanisms; pull rod, micrometer style actuation, pneumatic actuation and stepper motorisation.

The driving mechanism, which incorporates a precision cut lead-screw that is supported internally via a ceramic linear bush for greater rigidity, can either be manually actuated via a micrometer scale or stepper motor driven, both of which offer a factor twice the resolution of conventional units. Actuation via a simple pull rod and is also available.

As actuation mechanisms are interchangeable a user-friendly retrospective motor upgrade is possible at any time (see below). This upgrade includes pre-wired home and limit switches for positional accuracy that can easily be removed for bake-out.

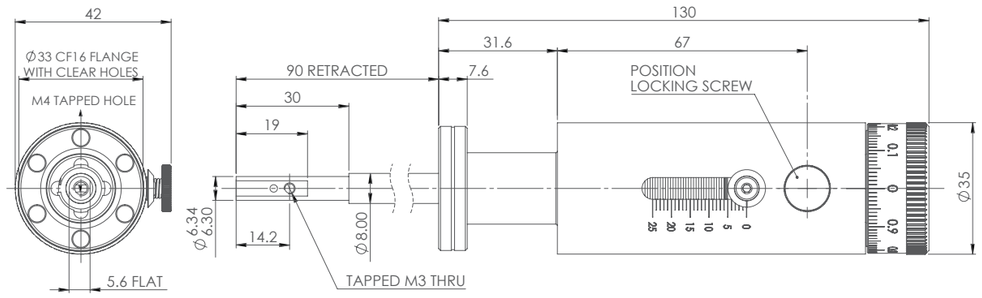
Specification Table

LINEAR BELLOWS DRIVE	
Mounting flange	CF16 (1.33" OD CF)
Calibrated drive resolution	10 microns
Motorised drive resolution	1 micron
Maximum cantilevered load	0.5 Nm
Maximum axial load	25 N (5.6 lbf)
Lateral float of shaft in retracted position	0.3mm max

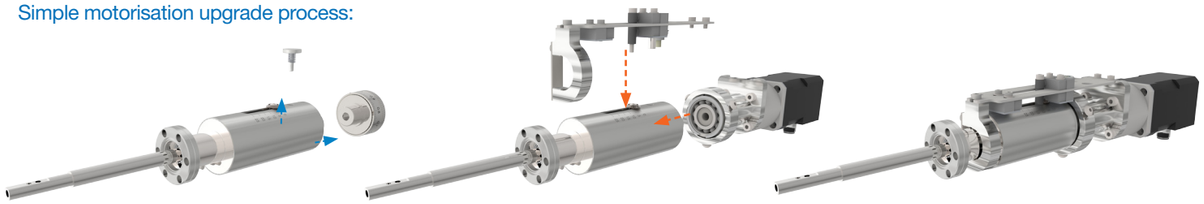
Base Drive Dimensions (mm)

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

LBD16-25-H



Simple motorisation upgrade process:



1. Thimble and brake screw removed

2. Install simple two-piece motorisation kit

3. Motorised LBD is ready to use

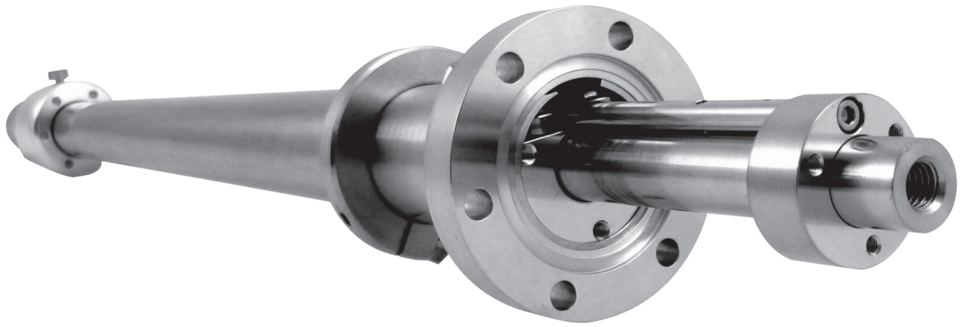
LBD Part Code Generator

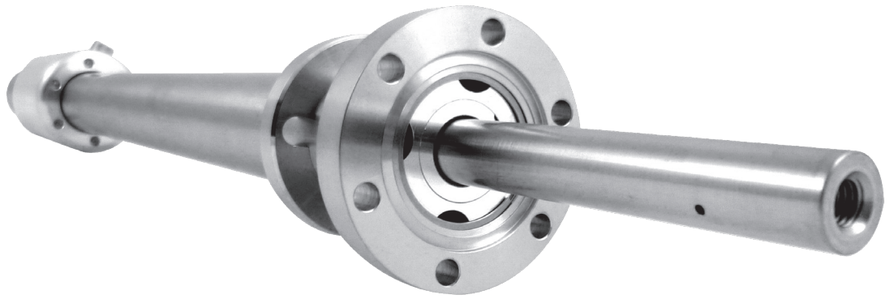
Linear Bellows Drive		+	CF Flange Size (select one)		+	Axial Stroke (select one)		+	Actuation	
Linear Bellows Drive	LBD		CF16 34mm (1.33" OD) - Standard	16		25mm stroke	25		Micrometer scale	H
			CF35 70mm (2.75" OD) - Option	35		50mm stroke	50		Pull rod assembly with brake	R
						100mm stroke	100		In-line stepper motor+ pre-wired switches	IS
						150mm stroke	150		Pneumatic	PR

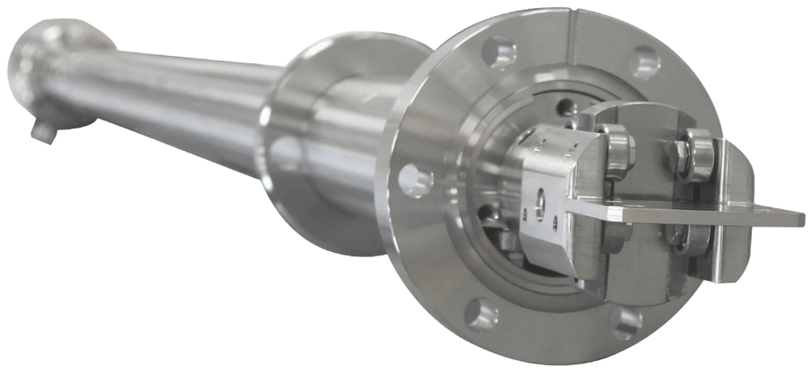
Example Part Number:

LBD16-50-R

= **LBD** CF16 flange **16**, 50mm stroke **50**, pull rod actuation **R**



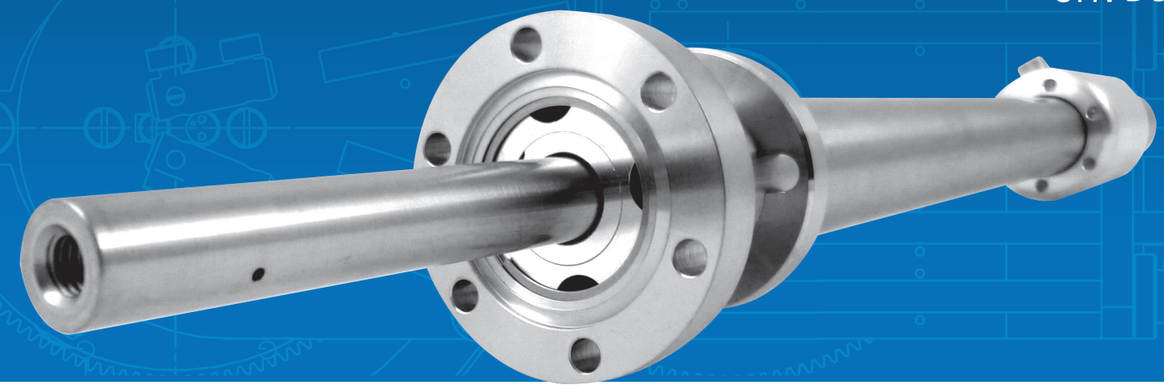




04

SAMPLE TRANSFER ARMS

UHV Design



Sample Transfer Arms

PowerProbe sample transfer arms enable secure transfer of samples within UHV. This is a consequence of their unrivalled magnetic coupling strength. In addition to linear and linear/rotary probes, this extensive range includes the Elevating PowerProbe and the Dual-Axis PowerProbe designed to transfer specific industry-standard sample holders using a variety of actuation methods.

Exceptional performance

PowerProbes have unrivalled thrust performance. The standard linear coupling has a break-away force of 180 N (40 lbf), in comparison to the 26-50 N of conventional units available on the market. A high power option is also available with an unrivalled 310 N (69 lbf). Figure 1 illustrates the axial stiffness of the coupling under load, demonstrating that the standard probe deflects <1mm for a 98 N (22 lbf) load.

In terms of rotation, the rotary transmission is essentially based upon the MD35 MagiDrive delivering 4 Nm (3 lbf ft) break-away torque. This is four times the level offered by more conventional units. The unique rotary coupling retains the renowned angular rigidity of the MagiDrive series (see Figure 2). Figure 3 shows the vertical deflection at the end of a horizontally-mounted PowerProbe transfer arm as a function of extended length, and with an applied weight/load of 10 N on the end of the probe. The relationship between load and deflection is approximately linear for typical transfer loads.

The crucial aspect of these performance characteristics is not necessarily the load-carrying capacity, but the stiffness of the coupling. The probes are, therefore, ideal for sample transfer applications.

All PowerProbes are fully bakeable to 250°C and do not require dismantling, unlike some conventional units available. The probes are suitable for use between atmospheric pressure and ultra-high vacuum.

Figure 1: Axial Stiffness

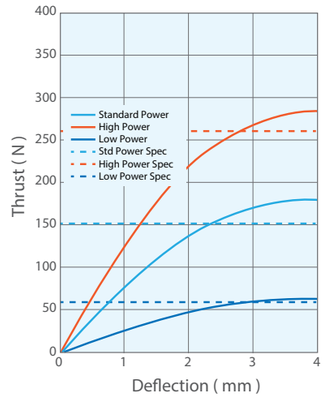


Figure 2: Torsional Stiffness

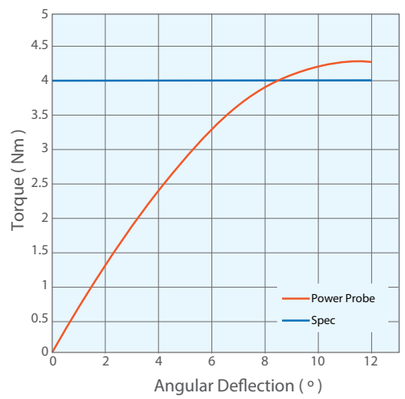
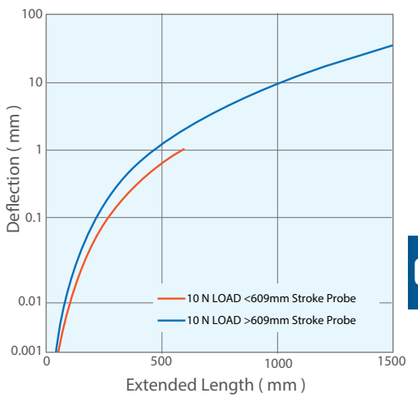
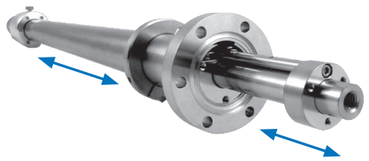


Figure 3: Probe Deflection v Applied Load



LPP: Linear Power Probe



The Linear PowerProbe should be selected where only linear motion is required and twisting or turning of the sample would be undesirable.

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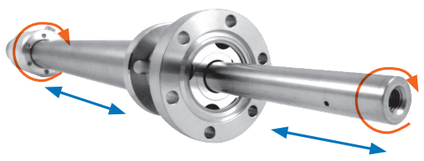
PP: Linear & Rotary Power Probe



The PowerProbe provides both linear and rotary motion of the sample, via a single actuator.

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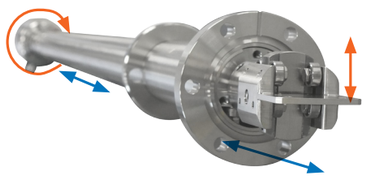
EPP: Elevating Power Probe



The Elevating PowerProbe incorporates an internally-guided linear motion, with the ability to elevate its end-effector throughout its stroke, providing 12.7mm of lift (with 25mm and 50mm options) in the Y axis for sample hand-off.

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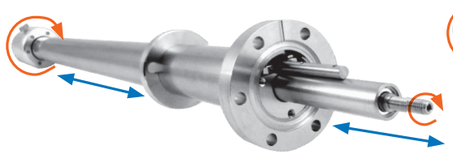
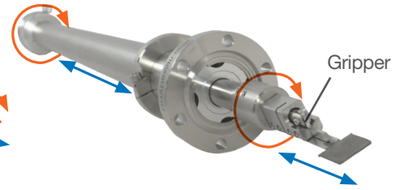
DAPP: Dual Axis Power Probe



For system designers our Dual Axis Power Probe provides an outer tubular shaft with linear only motion and an inner shaft with independent rotary motion. Ideal for grippers, elevators and other manipulators.

Page 64

TAPP: Triple Axis Power Probe



The Triple Axis PowerProbe provides linear and rotary motion with a unique sample gripping mechanism, allowing samples to be locked on/off of the probe.

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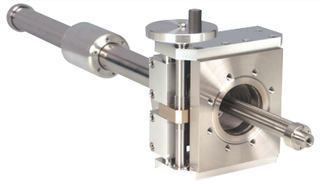
Power Probe & Y-shift



By combining a Y-shift with any of the standard PowerProbes, an additional lift and lower motion is achieved for durable production-proven sample transfer.

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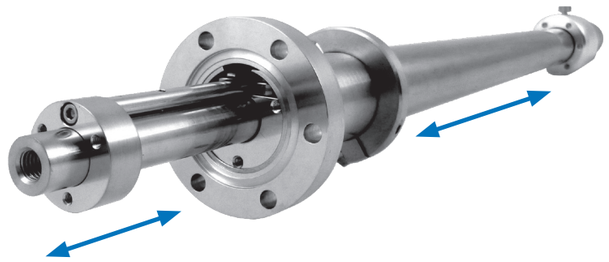


Linear Motion Only

Linear PowerProbe

(LPP Series)

High performance magnetically-coupled linear devices, designed for sample transfer where only linear motion is required and rotation is undesirable.

Available in standard stroke lengths from 304mm to 1524mm with motorisation options. The LPP is bakeable to 250°C without removing any components.

LPP KEY ADVANTAGES

- **Internal anti-rotation system ensures straight in-line motion**
- **No need for conventional external linear guide bars**
- **10x the thrust of conventional probes**
- **Unrivalled axial coupling strength**
- **Exceptional axial stiffness**
- **Zero backlash under low load**

The Linear PowerProbe should be selected where only linear motion is required and twisting or turning of the sample would be undesirable.

An anti-rotation system is fitted internally ensuring straight, in-line motion, despite any rotation of the external drive thimble. This removes the need for the unwieldy and bulky external linear guide bars used by other manufacturers and guarantees no rotation during the stroke.

Furthermore the external drive carriage has only a linear magnetic coupling (no rotary magnetic coupling) meaning no torque is applied to the shaft when rotating the thimble. Fewer parts also means that this linear only version of the PowerProbe is a lower cost than the rotary and linear versions.

A retracted switch option is available which provides indication when the probe is fully retracted. This signal can be interlocked to prevent, for example, the premature closing of a gate valve before the PowerProbe has fully retracted.

Specification Table

LINEAR POWERPROBE	STANDARD	
Mounting flange size	CF38 70mm (2.75") OD CF	CF64 114mm (4.5") OD CF
Linear axial coupling break-away force	180 N (40.5 lbf) standard with 90N (20 lbf) & 310N (69.7 lbf) versions available on request.	
Sample weight / load capacity	Maximum recommended internal load-carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 20 Nm (15 lbf ft).	
Maximum recommended internally applied load when vertically installed	This is a function of the load acceleration. In a static case the load may approach the coupling linear break-away force, however, it would be wise to apply a sensible safety factor.	
Pressure range	Atmosphere to $5x10^{-11}$ mbar	
Bakeout temperature	PowerProbes are bakeable to 250°C without the removal of any components (except for motors).	
Position locking	Thumbscrew (manual only)	
Axial & Torsional Stiffness	Refer to graphs on page 57	

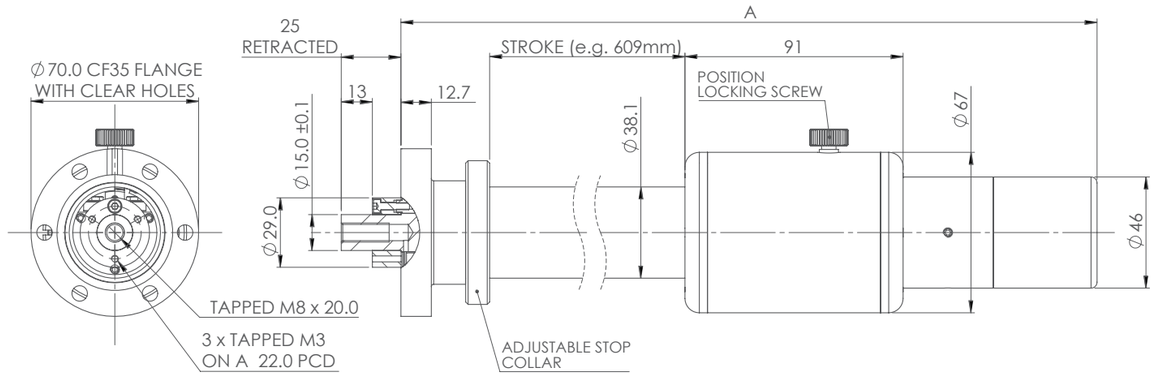
Should your requirements fall outside our standard specifications then please contact us at:

UHV Design

Motorised LPP

Base Probe Dimensions

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



Stroke (mm)	304	457	609	914	1219	1524
A	514	692	870	1225	1530	1845

LPP Part Code Generator

Linear PowerProbe	
Linear Only	LPP

+

Flange Size (select one)	
CF35 (Standard)	35
CF64* (Option)	64*

*only available with 1524mm stroke option

+

Axial Stroke (select one)	
304mm (12")	304
457mm (18")	457
609mm (24")	609
914mm (36")	914
1219mm (48")	1219
1524mm* (60")	1524*

*only available on CF64 flange

+

	Actuation Options (select one)	
Manual	Manual Thimble	H
Manual	Manual Thimble with retracted switch	HR
Motor	Stepper motor + switches	SS

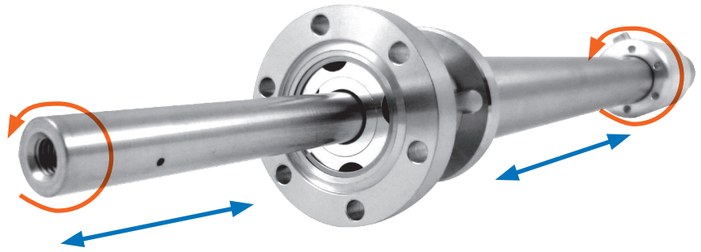
Example Part Number:

LPP35-457-HR

= **LPP** CF35 flange **35**, 457mm stroke **457**, manual thimble with retracted switch **HR**

UHV Design

Linear & Rotary
PowerProbe
(PP Series)



High performance magnetically-coupled combined linear/rotary devices, designed for sample transfer. Both linear and rotary motion of the sample achieved via a single actuator with stroke length from 304mm to 1524mm.

PP KEY ADVANTAGES

- **Unrivalled axial coupling strength**
- **10x thrust and 4x torque compared to conventional devices**
- **Exceptional axial stiffness**
- **Zero backlash under low load**
- **Bakeable to 250ºC without removing any components**

The PowerProbe provides both linear and rotary motion of the sample, via a single actuator.

The PowerProbe's powerful magnetic coupling technology provides performance far in advance of conventional probes on the market avoiding magnetic hysteresis and de-coupling issues suffered by traditional designs.

The high torque characteristics are achieved by utilising MagiDrive rotary coupling technology. Combined with a high thrust linear coupling, this ensures optimum drive performance on both axes. Therefore, actuation of the thimble in either axis will result in the precise transmission of this motion to the sample.

The PowerProbe can be fitted with a bakeable limit switch for the retracted position, aiding system interlocks.

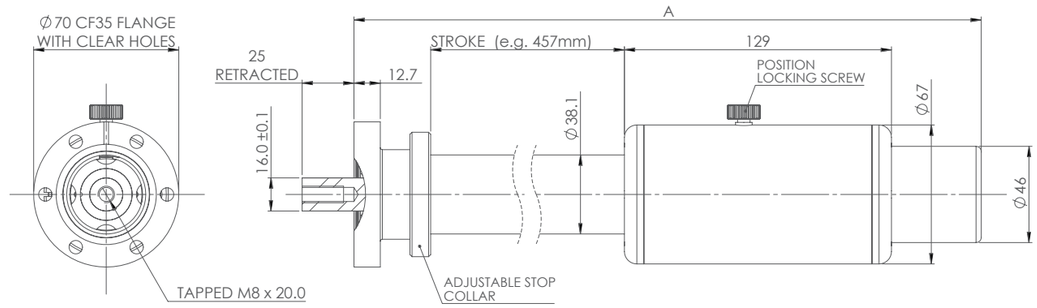
Specification Table

POWER PROBE	STANDARD	
Mounting flange size	CF38 70mm (2.75") OD CF	CF64 114mm (4.5") OD CF
Linear axial coupling break-away force	180 N (40.5 lbf) standard with 90N (20 lbf) & 310N (69.7 lbf) versions available on request.	
Rotary coupling break-away torque	4 Nm (2.95 lbf ft)	
Sample weight / load capacity	Maximum recommended internal load-carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 20 Nm (15 lbf ft).	
Maximum recommended internally applied load when vertically installed	This is a function of the load acceleration. In a static case the load may approach the coupling break-away force, however, it would be wise to apply a sensible safety factor.	
Bakeout temperature	PowerProbes are bakeable to 250°C without the removal of any components (except for motors).	
Position locking	Thumbscrew (manual only)	
Axial & Torsional Stiffness	Refer to graphs on page 57	

Base Probe Dimensions

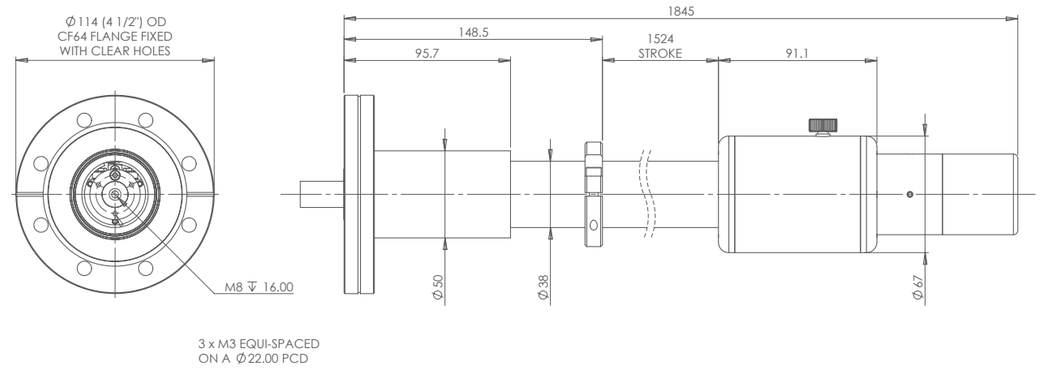
For the complete range of 2D drawings & 3D models contact us or visit www.uhvdesign.com

CF34 versions



Stroke (mm)	304	457	609	914	1219	1524
A	515	692	870	1225	1530	1845

CF64 version



PP Part Code Generator

PowerProbe	
Linear & Rotary	PP

+

Flange Size (select one)	
CF35	35
CF64*	64*

*only available with 1524mm stroke option

+

Axial Stroke (select one)	
304mm (12")	304
457mm (18")	457
609mm (24")	609
914mm (36")	914
1219mm (48")	1219
1524mm* (60")	1524*

*only available on CF64 flange

+

Actuation Options (select one)		
Manual	Manual Thimble	H
	Manual Thimble with retracted switch	HR

Example Part Number:

PP35-609-HR

= **PP** CF35 flange **35**, 609mm stroke **609**, manual thimble with retracted switch **HR**

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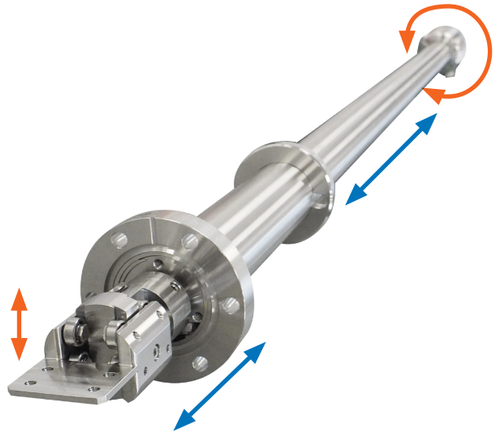

Linear & Elevation

Elevating PowerProbe

(EPP Series)

Complete sampling-handling system providing linear motion and up to 50mm of lift in the Y-axis for sample hand-off. Stroke lengths from 304mm to 1219mm and motorisation options available.

EPP KEY ADVANTAGES

- **Up to 50mm of lift in the Y-axis**
- **Unrivalled axial coupling strength**
- **10x the thrust of conventional probes**
- **Exceptional axial stiffness**
- **Zero backlash under low load**
- **Bakeable to 250°C without removing any components**

The Elevating PowerProbe transforms conventional approaches to sample transfer. In addition to its internally-guided linear motion, the probe has the ability to elevate its end-effector throughout its stroke, providing 12.7mm of lift as standard (with 25mm and 50mm options) in the Y axis for sample hand-off.

This PowerProbe variant greatly simplifies sample transfer techniques, providing a single device to provide both linear motion for sample introduction and the lift/lower motion to collect or hand-off the sample.

With a range of industry-standard effectors, the Elevating PowerProbe provides a complete sample-handling system in its own right removing the need for secondary motion tools. This reduces cost and simplifies the transfer process.

Specification table

ELEVATING POWERPROBE	STANDARD
Mounting flange	CF38 70mm (2.75") OD or CF64 114mm (4.5") OD
Elevating (lift/lower) motion	12.7mm (0.5"), 25.4mm (1.0") or 50mm (2.0")
Linear coupling break-away force	180 N (40.5 lbf) standard with 90N (20 lbf) & 310N (69.7 lbf) versions available on request.
Sample weight / load capacity	Maximum recommended internal load-carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 20 Nm (15 lbf ft) and 1.5 Nm (1.1 lbf ft) on elevating plate.
Pressure range	Atmosphere to $5x10^{-11}$ mbar
Bakeout temperature	PowerProbes are bakeable to 250°C without the removal of any components (except for motors).
Position locking	Thumbscrew (manual only)
Axial & Torsional Stiffness	Refer to graphs on page 57

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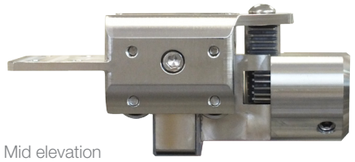
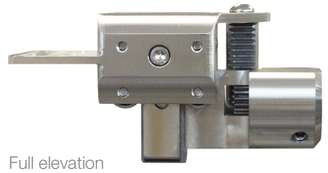
Start position



Mid elevation

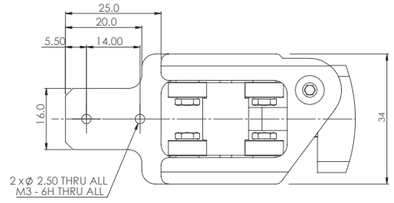


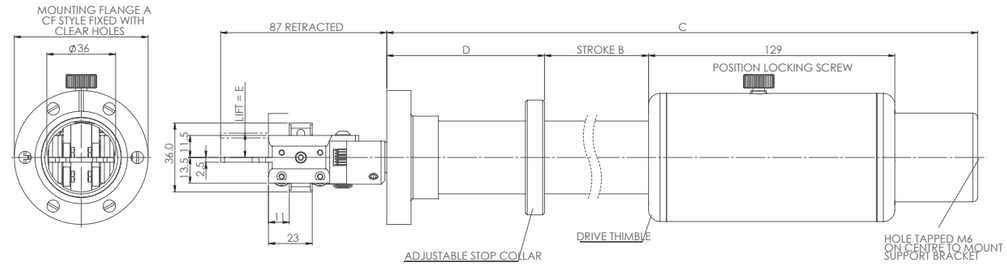
Full elevation

Rotating the EPP thimble actuates up to 50mm of lift/lower

Base Probe Dimensions

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





A	B	C	D	E
CF38 70mm (2.75") OD	304	559	83	12.7
CF38 70mm (2.75") OD	457	717	88	12.7
CF38 70mm (2.75") OD	609	870	89	12.7
CF38 70mm (2.75") OD	914	1290	203	12.7
CF38 70mm (2.75") OD	1219	1594	203	12.7
CF64 114mm (4.5") OD	609	870	89	25.4
CF64 114mm (4.5") OD	914	1290	203	25.4
CF64 114mm (4.5") OD	1219	1594	203	25.4

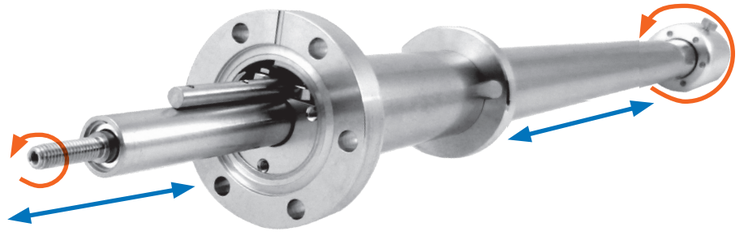
EPP Part Code Generator

Elevating PowerProbe		+	Flange Size (select one)		+	Axial Stroke (select one)		+	Actuation Options (select one)			+	Elevation Option	
Elevating	EPP		CF35 (standard)	35		304mm (12")	304		Manual	Manual Thimble	H		12.7mm	
			CF64 (option)	64		457mm (18")	457			Manual Thimble with retracted switch	HR		25mm	25
						609mm (24")	609		Motor	Stepper motor + switches	SS		50mm	50
						914mm (36")	914							
						1219mm (48")	1219							

Example Part Number:

EPP64-609-H-25

= **EPP** CF64 flange **64**, 609mm stroke **609**, manual thimble **H,** 25mm elevation option **25**



Linear With Rotatable Inner Shaft

Dual Axis PowerProbe

(DAPP Series)

High performance magnetically-coupled devices designed for sample transfer with outer shaft linear motion and independent rotary motion of inner shaft. Ideal for systems where a secondary motion is required to actuate an end-effector mechanism. Range includes end-effectors to transfer industry-standard flag and puck sample holders.

DAPP KEY ADVANTAGES

- **Independent linear & rotary motion**
- **Unrivalled axial coupling strength**
- **10x thrust and 4x torque compared to conventional devices**
- **Exceptional axial stiffness**
- **Zero backlash under low load**
- **Bakeable to 250°C without removing any components**

The Dual Axis PowerProbe (DAPP) has two concentric output shafts providing independent axes of motion. The outer tubular shaft has linear only motion provided by the linear PowerProbe magnetic coupling. The inner shaft has independent rotary motion provided by the PowerProbe rotary magnetic coupling. The DAPP has a single driving thimble allowing simultaneous actuation of both the linear and rotary axes.

This PowerProbe variant is ideally suited to system designers who wish to employ a secondary motion to actuate an end-effector mechanism, such as a sample locking system, for example.

The Dual Axis PowerProbe benefits from our powerful magnetic coupling technology providing robust, reliable performance. Additionally, the internal linear guidance system, prevents rotation of the main shaft, thus removing the need for conventional external guide bars, providing an elegant and compact solution to sample transfer.

Standard End-effectors

Two standard end-effectors are offered to grip and safely transfer industry-standard surface analysis flag and puck sample holders.

Specification Table

DUAL AXIS POWERPROBE	STANDARD
Mounting flange	CF35 70mm (2.75") OD
Linear coupling break-away force	180 N (40.5 lbf) standard with 90N (20 lbf) & 310N (69.7 lbf) versions available on request.
Rotary coupling break-away torque (second shaft)	4 Nm (2.95 lbf ft)
Sample weight / load capacity	Maximum recommended internal load-carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 20 Nm (15 lbf ft).
Pressure range	Atmosphere to $5x10^{-11}$ mbar
Bakeout temperature	PowerProbes are bakeable to 250°C without the removal of any components (except for motors).
Position locking	Thumbscrew (manual only)
Axial & Torsional Stiffness	Refer to graphs on page 57

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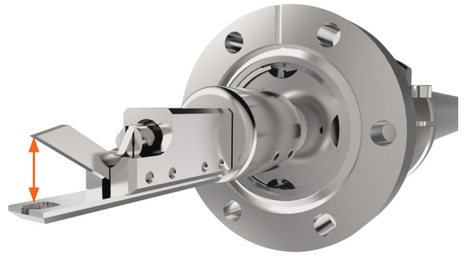
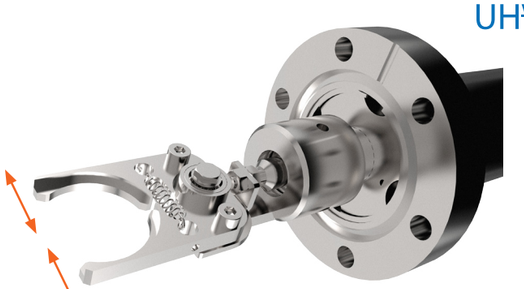
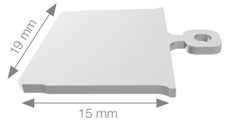
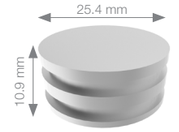


Flag Gripper Option



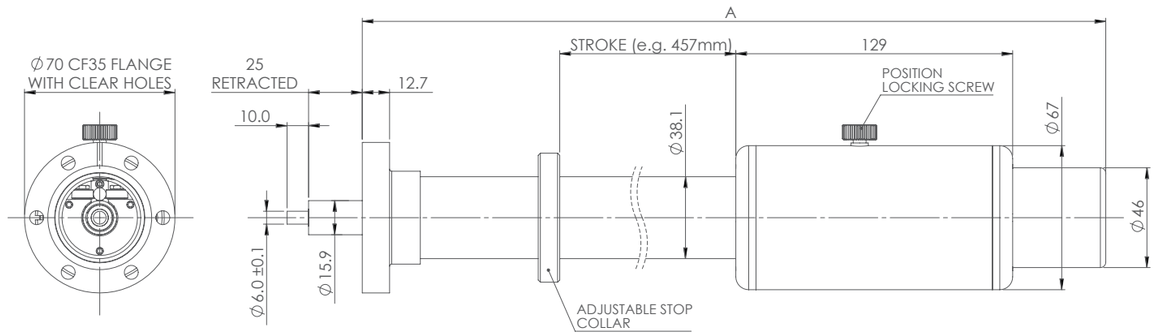
Puck Gripper Option





Base Probe Dimensions

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



Stroke (mm)	304	457	609	914	1219
A	515	692	870	1225	1530

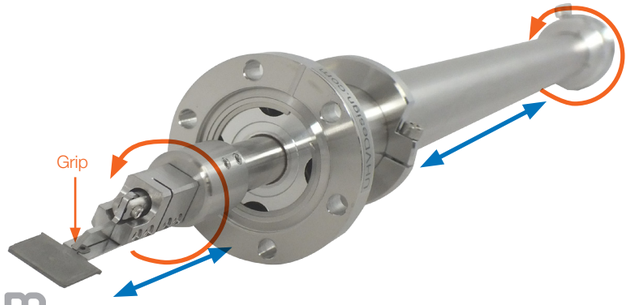
DAPP Part Code Generator

Power Probe		+	Flange Size		+	Axial Stroke (select one)		+	Actuation Options (select one)		+	End-effector (optional)	
Dual Axis	DAPP		CF35	35		304mm (12")	304		Manual	Manual Thimble	H	None	
						457mm (18")	457			Manual Thimble with retracted switch	HR	Flag	F
						609mm (24")	609					Puck	P
						914mm (36")	914						
						1219mm (48")	1219						

Example Part Number:

DAPP35-457-HR-F

= **DAPP** CF35 flange **35**, 457mm stroke **457**, manual thimble with retracted switch **HR** and flag end-effector **F**



Rotary Inner Shaft with Trigger Mechanism

Triple Axis PowerProbe

(TAPP Series)

Magnetically-coupled triple axis transfer arm, providing linear and rotary motion with a unique sample gripping mechanism allowing samples to be locked onto and off the probe. Linear and rotary motion of the sample is achieved via a single actuator with stroke length from 304mm to 1219mm. Unique lock/unlock mechanism then activates an independent shaft to provide gripper activation.

TAPP KEY ADVANTAGES

- **Independent linear & rotary motion with unique sample gripping system**
- **End-effectors for flag & puck systems**
- **Unrivalled axial coupling strength**
- **10x thrust and 4x torque compared to conventional devices**
- **Exceptional axial stiffness**
- **Zero backlash under low load**

The Triple Axis PowerProbe (TAPP) has two concentric output shafts providing two independent axes of motion. Linear and rotary motion of the outer shaft is provided through a high power magnetic coupling, driven by the thimble.

Compared with conventional devices the Triple Axis Power Probe provides more than 10 times the thrust and 4 times the torque with exceptional axial stiffness.

Unique Lock/unlock mechanism

In addition to linear and rotary motion the thimble incorporates a unique secondary linear motion that can be used to lock/unlock samples held by a gripping end-effector.

This PowerProbe variant is ideally suited to system designers who need linear and rotary motion with an independent end-effector mechanism. When ordered with an end-effector the Triple Axis Power Probe provides the ultimate in secure sample transfer.

Standard End-effectors

Two standard end-effectors are offered to grip and safely transfer industry-standard surface analysis flag and puck sample holders.

Specification Table

TRIPLE AXIS POWERPROBE	STANDARD
Mounting flange	CF38 70mm (2.75") OD
Linear coupling break-away force	180 N (40.5 lbf) standard with 90N (20 lbf) & 310N (69.7 lbf) versions available on request.
Rotary coupling break-away torque	4 Nm (2.95 lbf ft)
Sample weight / load capacity	Maximum recommended internal load-carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 20 Nm (15 lbf ft).
Pressure range	Atmosphere to $5x10^{-11}$ mbar
Bakeout temperature	PowerProbes are bakeable to 250°C without the removal of any components (except for motors).
Position locking	Thumbscrew (manual only)
Axial & Torsional Stiffness	Refer to graphs on page 57

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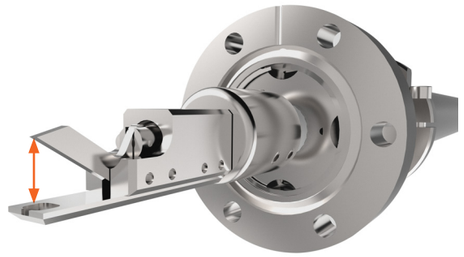
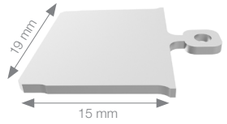
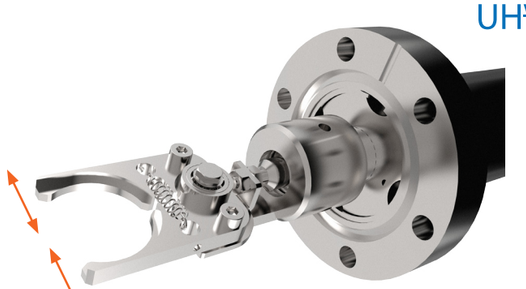
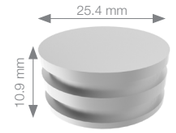


Flag Gripper Option



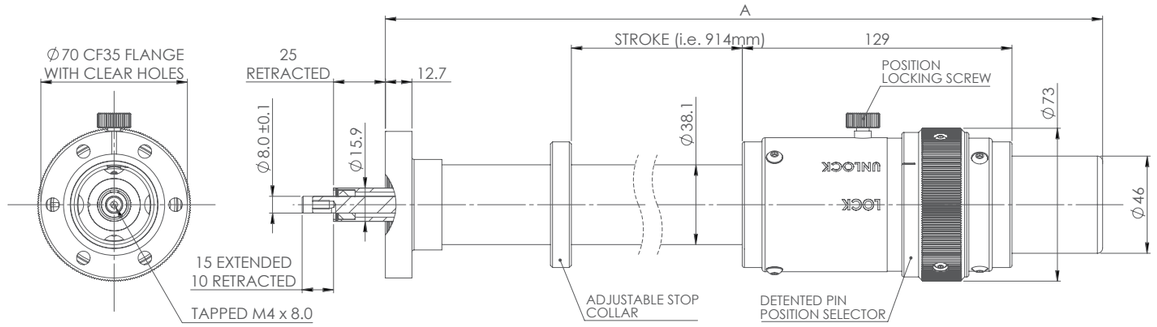


Puck Gripper Option



Base Probe Dimensions

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



Stroke (mm)	304	457	609	914	1219
A	515	692	870	1225	1530

TAPP Part Code Generator

Power Probe		+	Flange Size		+	Axial Stroke (select one)		+	Actuation Options (select one)			+	End-effector (optional)	
Triple Axis	TAPP		CF35	35		304mm (12")	304		Manual	Manual Thimble	H		None	
						457mm (18")	457			Manual Thimble with retracted switch	HR		Flag	F
						609mm (24")	609						Puck	P
						914mm (36")	914							
						1219mm (48")	1219							

Example Part Number:

TAPP35-457-HR-F

= **DAP** CF35 flange **35**, 457mm stroke **457**, manual thimble with retracted switch **HR,** flag end-effector **F**

Sample Hand-off System

Y Shift with PowerProbe

Combines the linear/rotary motion of the PowerProbe with the ability to lift and lower a sample by +/-7.5mm or +/-31mm to enable transfer.

Available in CF64 & CF100 mounting flange options with manual or motorised actuation. Customised transfer forks available - contact us for more details.

Y SHIFT KEY ADVANTAGES

- **Suitable for automated systems**
- **Lift/Lower transfer motion**
- **Kinematic design provides smooth & precise lift/lower of samples**
- **High load-carrying capability**
- **Customised transfer forks available**

The combination of Y Shift and PowerProbe has been used for many years in production applications. The system combines the linear/rotary motion of the Sample Transfer Tool range with the ability to lift and lower the whole transfer tool and therefore the sample to enable hand-off (transfer).

The Y Shift consists of a bellows assembly with a flange at each end. One flange is fixed to the chamber, the other moving flange is used to mount the transfer arm. The Y Shift mechanism then precisely manipulates the transfer arm up and down along the Y axis and therefore the sample.

Use of the Y Shift and PowerProbe combination is ideal for transferring samples between multiple chambers (e.g. load lock, preparation chamber, process chamber) where differing transfer heights can be accommodated, or the transfer of samples on/off sample cassettes. The robust Y Shift mechanism is ideal for high duty cycle, medium load, multiple position sample transfer applications.

Customised transfer forks are available on request.

Specifications

Y-Shift Type		
Travelling Flange	**Mounting Flange**	**Y motion (lift/lower)**
CF38	**CF64**	+/- 7.5 mm
CF64	**CF64**	
CF38	**CF100**	+/- 31mm
CF64	**CF100**	

Motorised Y-shift

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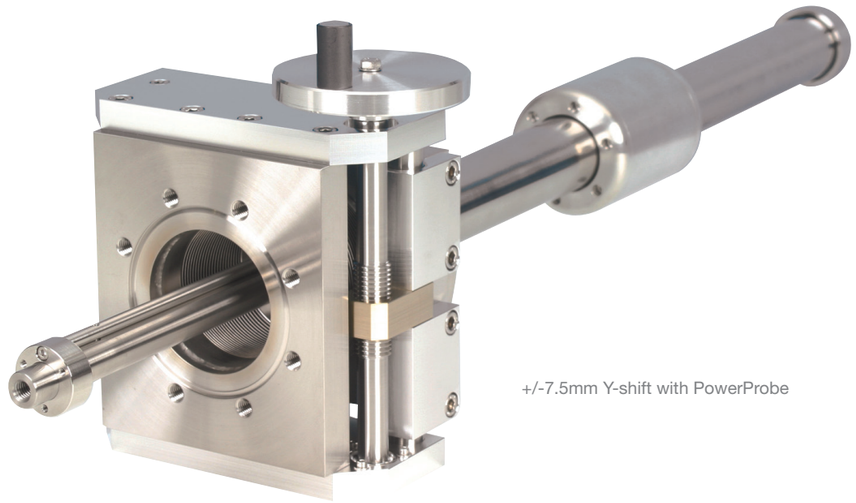
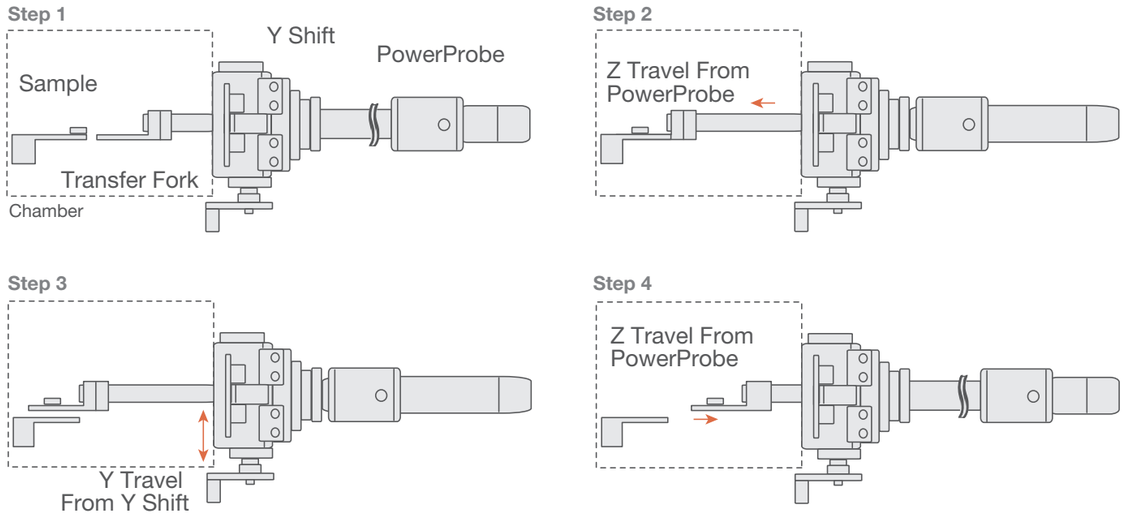


+/-7.5mm Y-shift with PowerProbe

Application example



Sample Hand-off Part Code Generator

Y Shift		+	Fixed Flange (select one)		+	Travelling Flange (select one)		+	Actuation Options (select one)		+	Power Probe Part Number (see pages 58 - 67)
Y Shift	LDM		CF64	64		CF38	38		Manual Thimble	H		
			CF100	100		CF64	64		In-line stepper motor with switches	IS		

Example:

LDM64-64-H-PP35-457-HR

= **LDM** CF64 fixed flange **64**, CF64 travelling flange **64**, manual thimble **H fitted** with Power Probe **PP** with CF35 flange **35,** 457mm axial stroke **457** and manual thimble with retracted switch **HR**

Section 05

05

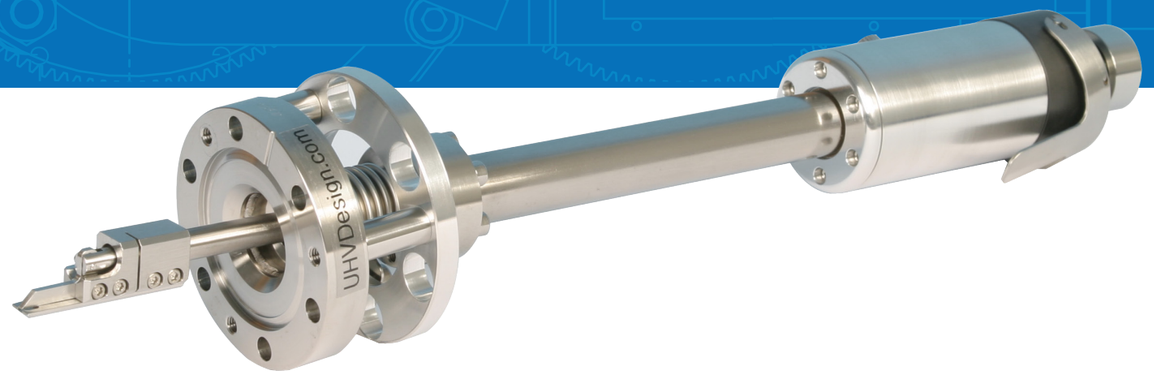
WOBBLE STICKS

UHV Design

Wobble Sticks

The UHV Design Wobble Stick is a modular concept. The basic WSL series provides lateral and tilt movement through a robust hydroformed bellows adaptor and linear push/pull motion through a magnetic coupling. The WSLR series also provides continuous rotation, giving four axes of movement. The WSLRT provides linear, rotary, lateral and tilt plus a fifth axis for gripping sample holders.

The Wobble Sticks benefit from UHV Design's high power magnetic coupling technology. The coupling eliminates the need for long egde-welded bellows stacks, typically employed with conventional wobble stick designs. This reduces the risk of leaks, particularly for deposition applications such as MBE where particulates or deposition between bellows convolutions can reduce lifetimes or cause immediate failure. Also, unlike a bellows-sealed device, the wobble stick is not subject to the thrust due to vacuum, resulting in smooth, free-moving operation. Each range is offered with optional standard sample transfer forks to transport industry-standard sample holders such as flags, pucks & stubs with the WSLRT offering the ultimate solution.



Linear & Tilt

WSL Range

Page 74

Linear, Rotary & Tilt

WSLR Range

Page 76

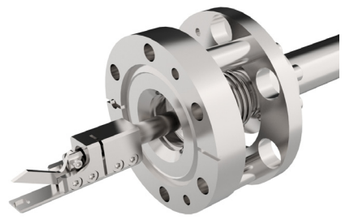
Linear, Rotary & Tilt with trigger mechanism

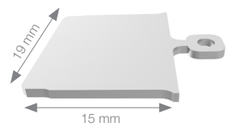
WSLRT Range

Page 78

End-effector Options

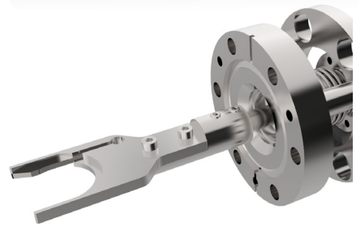
Flag Gripper

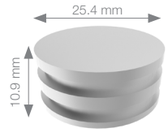




Option on WSLRT

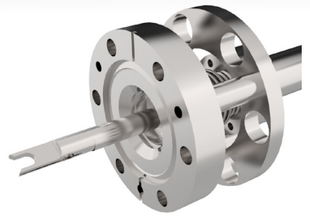
Puck Gripper

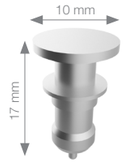




Option on WSLR & WSLRT

ESCA Stub Gripper





Option on WSLR & WSLRT

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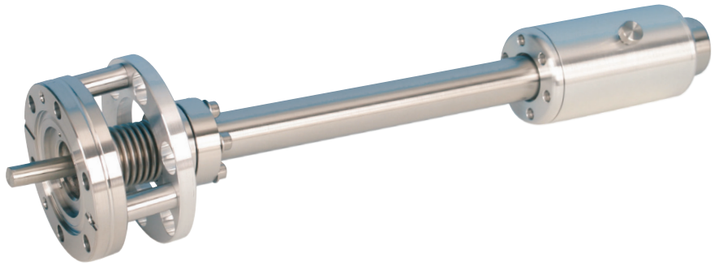


WSL

(Linear & Tilt Movement)

Magnetically-coupled wobble stick with a choice of 150mm or 250mm internally-guided linear stroke providing smooth, free-running operation with no thrust due to vacuum.

Robust hydroformed bellows provide +/-22° tilt.

WSL KEY ADVANTAGES

- **No vulnerable linear bellows**
- **No thrust due to vacuum, smooth reliable operation**
- **+/- 22° tilt**
- **150mm or 250mm linear stroke**
- **Bakeable to 250°C without removing any components**

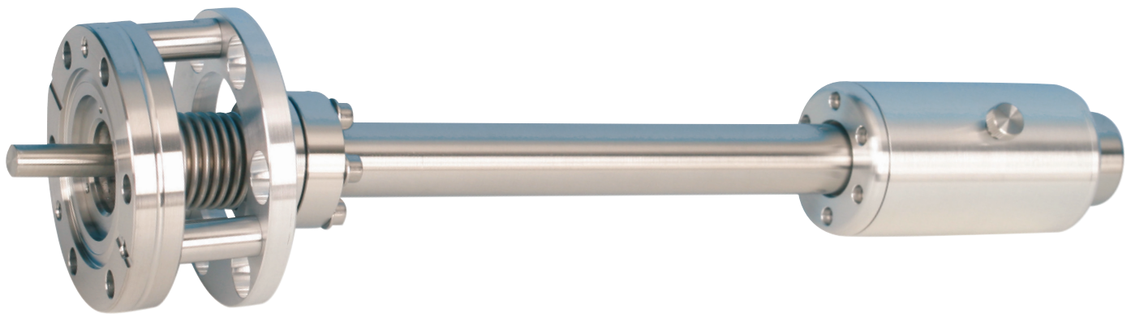
The WSL series provides internally-guided linear motion of the vacuum shaft, guaranteeing rotation-free motion. The high axial thrust coupling produces no torque and so rotation of the thimble does not apply a rotational force internally, ensuring smooth motion. In addition to the linear motion the WSL series provides +/-22° tilt.

Magnetic coupling technology eliminates the need for edge-welded bellows. This reduces the risk of leaks and in doing so, improves the reliability of the system for sensitive applications.

Unlike conventional bellows-sealed wobble sticks there is no resistance to linear motion due to vacuum thrust.

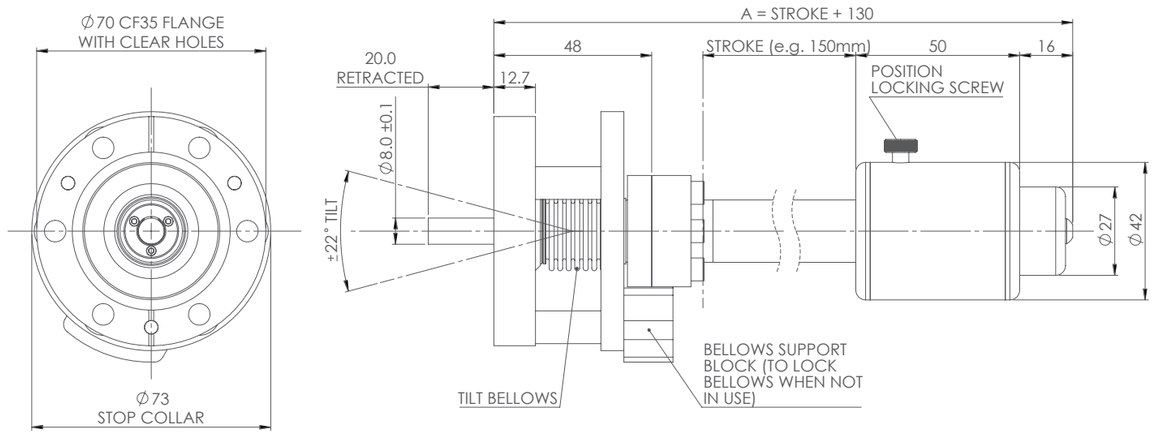
Specification Table

WSL Series	
Linear travel	150mm or 250mm
Linear break-away force	95 N (21.4 lbf)
Tilt	+/-22°
Suggested sample mass	260g
Maximum bakeout temperature	250°C
System mounting flange	CF35 (2.75") OD CF



Example Dimensions

For comprehensive 2D drawings & 3D models contact us or visit www.uhvdesign.com



WSL Part Code Generator

Wobble Stick		+	Linear Stroke (select one)		+	Actuation	
Linear & tilt	WSL		150mm	150		Manual	H
			250mm	250			

Example Part Number:
WSL-250-H
= **WSL with 250mm linear stroke**

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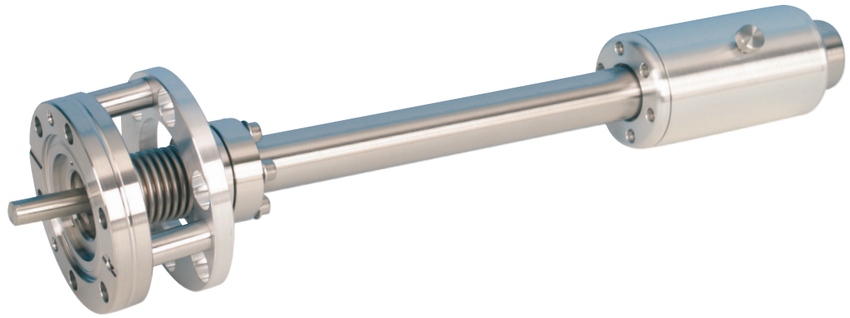


WSLR

(Linear, Rotary & Tilt movement)

Magnetically-coupled wobble stick with a choice of 150mm or 250mm smooth free-running linear stroke and continuous rotation. Robust hydroformed bellows provide +/-22° tilt.

Choice of industry-standard puck and ESCA stub end-effectors.

WSLR KEY ADVANTAGES

- » No vulnerable linear bellows
- » Linear and continuous rotatry motion
- » No thrust due to vacuum, smooth reliable operation
- » +/- 22° tilt
- » 150mm or 250mm linear stroke
- » Bakeable to 250°C without removing any components

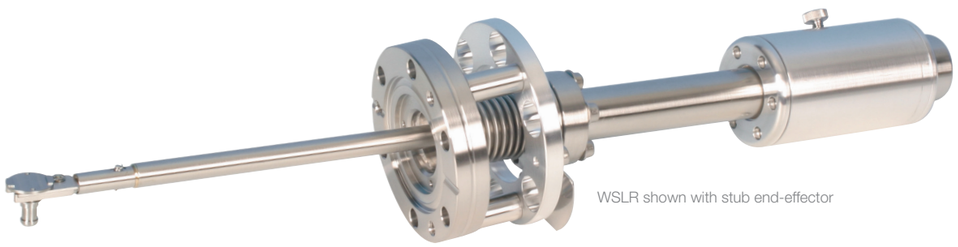
The WSLR series provides lateral and tilt movement through a robust hydroformed bellows adaptor along with linear and continuous rotary motion through a magnetic coupling. The WSLR also provides continuous rotation giving four axes of movement.

Magnetic coupling technology eliminates the need for edge-welded bellows. This reduces the risk of leaks and in doing so, improves the reliability of the system for sensitive applications. Unlike conventional bellows-sealed wobble sticks there is no resistance due to vacuum thrust.

The WSLR is available with puck and ESCA stub end-effectors (see Gripper options in the Part Code Generator).

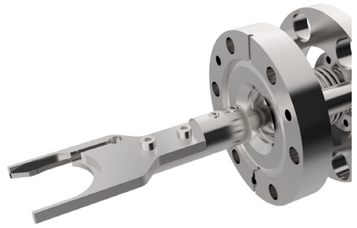
Specification Table

WSLR Series	
Linear travel	150mm or 250mm
Linear break-away force	95 N (21.4 lbf)
Rotation	Continuous
Angular break-away torque	0.45 Nm (0.33 lbf ft)
Tilt	+/-22°
Suggested sample mass	260g
Maximum bakeout temperature	250°C
System mounting flange	CF35 (2.75") OD CF

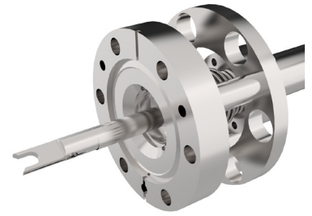


WSLR shown with stub end-effector

UHV Design



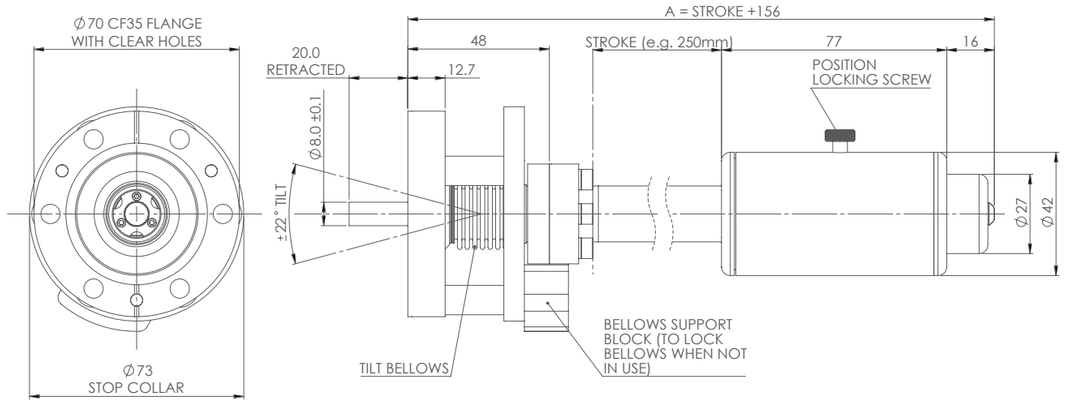
Puck end-effector option



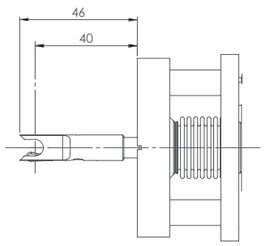
ESCA stub end-effector option

Example Dimensions

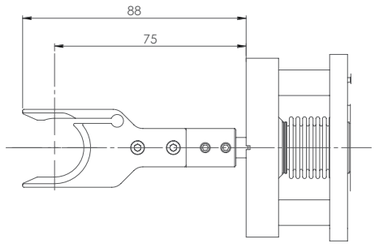
For comprehensive 2D drawings & 3D models contact us or visit www.uhvdesign.com



End-effector options



WSLR FITTED WITH ESCA STUB STYLE GRIPPER

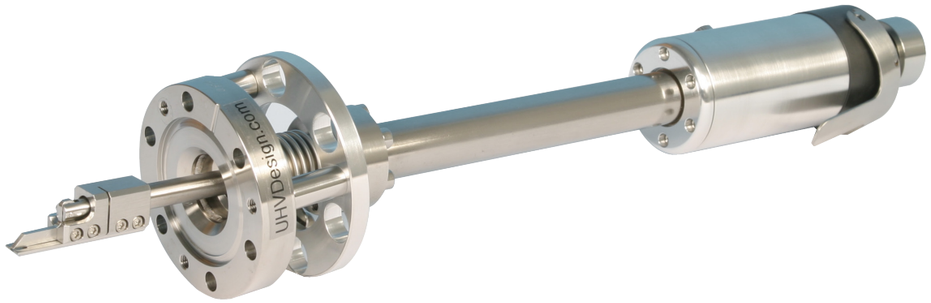


WSLR FITTED WITH PUCK STYLE GRIPPER

WSL Part Code Generator

Wobble Stick		+	End-effector Option		+	Linear Stroke (select one)		+	Actuation	
Linear, Rotary & Tilt	WSLR		None			150mm	150		Manual	H
			Puck	P		250mm	250			
			ESCA Stub	E						

Example Part Number:
WSLRP-250-H
= **WSL with Puck Gripper, 250mm linear stroke**



WSLR

(Linear, Rotary & Tilt Movement with trigger actuation mechanism)

Magnetically-coupled wobble stick with a choice of 150mm or 250mm linear stroke, continuous rotation and +/-22° tilt. Includes trigger actuation mechanism and option for secure sample transfer of flag sample holders. CF35 mounting flange.

WSLR KEY ADVANTAGES

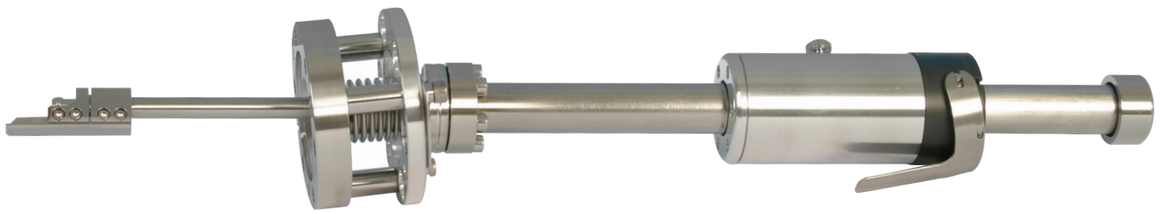
- **No vulnerable linear bellows**
- **Linear and continuous rotary motion**
- **No thrust due to vacuum, smooth reliable operation**
- **+/- 22° tilt**
- **150mm or 250mm linear stroke**
- **Bakeable to 250°C without removing any components**

In addition to providing linear, rotation and tilt motions the WSLRT includes an inner shaft that provides an actuation method for end-effectors with trigger activation.

Magnetic coupling technology eliminates the need for edge-welded bellows. This reduces the risk of leaks and in doing so, improves the reliability of the system for sensitive applications. Unlike conventional bellows-sealed wobble sticks there is no resistance due to vacuum thrust.

Specification Table

WSLRT Series	
Linear travel	150mm or 250mm
Linear break-away force	95 N (21.4 lbf)
Rotation	Continuous
Angular break-away torque	0.45 Nm (0.33 lbf ft)
Tilt	+/-22°
Suggested sample mass	260g
Maximum bakeout temperature	250°C
System mounting flange	CF35 (2.75") OD CF



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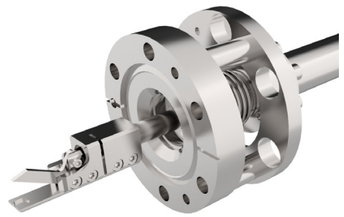
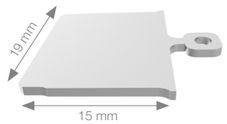


Flag end-effector option



Example Dimensions

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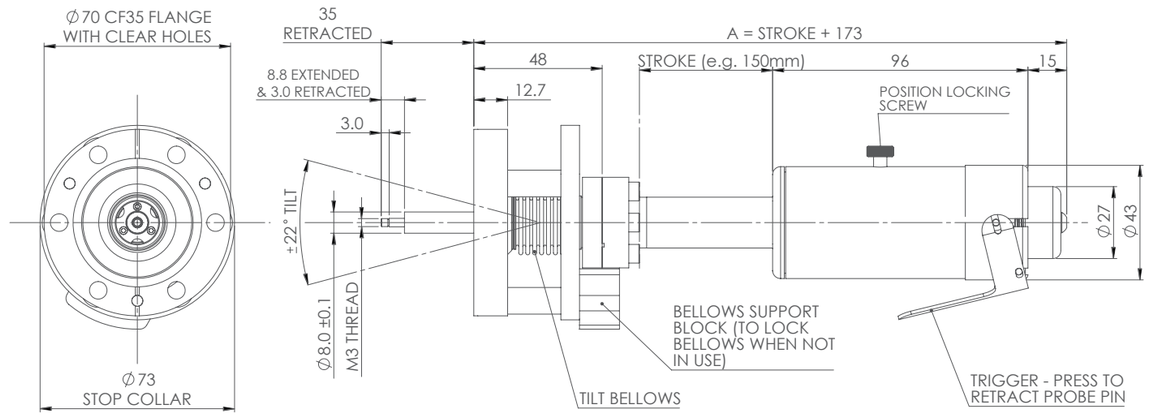
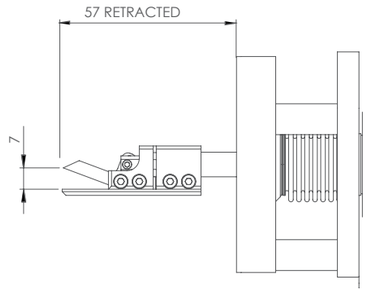


End-effector option



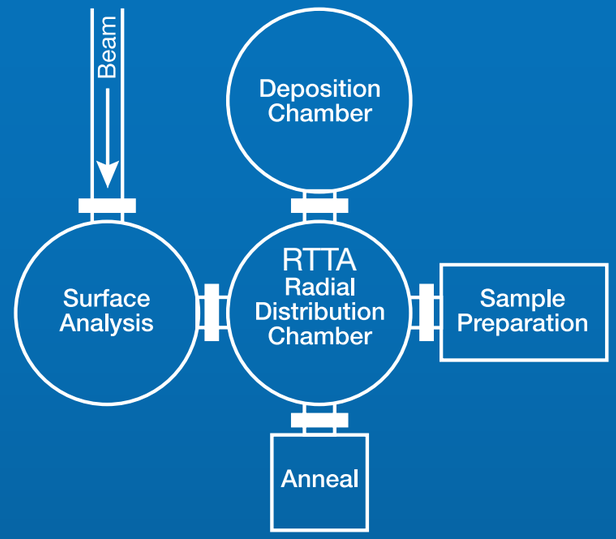
WSLR Part Code Generator

Wobble Stick		+	End-effector		+	Linear Stroke (select one)		+	Actuation	
Linear, Rotary & Tilt	WSLR		None	T		150mm	150		Thimble with trigger	H
			Flag	F		250mm	250			

Example Part Number:
WSLRF-250-H
= **WSL with Flag Gripper, 250mm linear stroke**

06

ROTARY TELESCOPIC TRANSFER ARM



UHV Design

Radial Distribution Chamber Solutions
Rotary Telescopic Transfer Arm

Radial systems require the precise transfer of samples between multiple chambers for preparation and analysis. This is handled from the central radial distribution chamber (as shown on previous page).

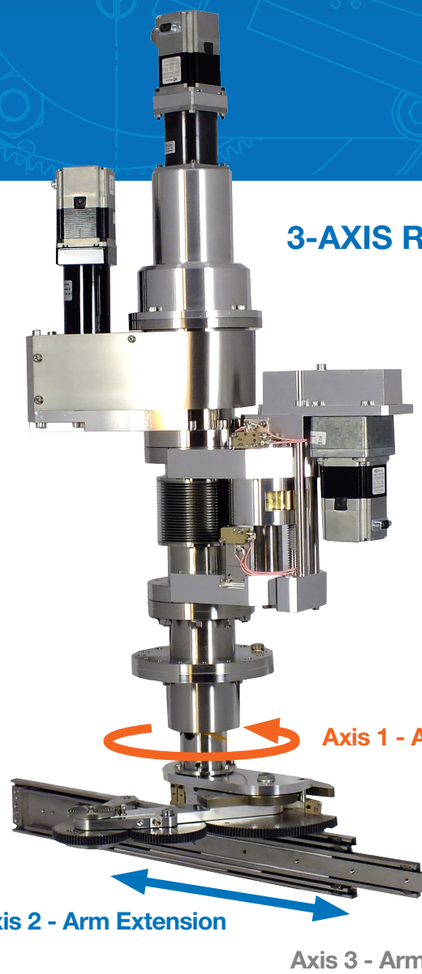
The Radial Telescopic Transfer Arm (RTTA) represents a step-change advance in radial distribution technology offering unrivalled performance over conventional designs at a comparable cost. The RTTA uses a high torque magnetically-coupled MagiDrive (see catalogue Section 1) to provide extremely stiff coupling for radial motion. This radial motion is used to align the transfer arm with the desired chamber port achieving angular reproducibility of <0.2mm. A second MagiDrive is used to drive the innovative telescopic mechanism which provides an arm extension of 760mm (2.5x that of conventional designs) to transport the sample in and out of the desired satellite chamber. The precision slide mechanism achieves linear reproducibility of <0.2mm with <1mm deflection at full extension with a 10N load.

RTTA KEY ADVANTAGES

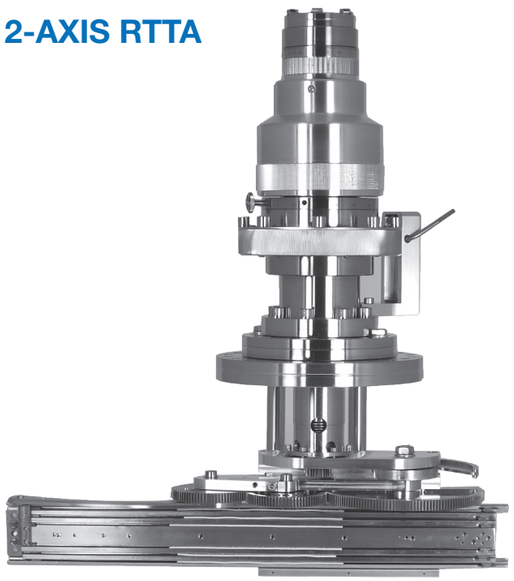
- **2.5x the reach of conventional systems**
- **Typically <1mm deflection at full extension with 10N load**
- **Excellent substrate position reproducibility: <0.2mm laterally & axially**
- **2 and 3-Axis variants**
- **True UHV performance**

The RTTA is available in 2-axis and 3-axis versions. The 2-axis RTTA provides rotation for port alignment and arm extension for sample transfer. The 3-axis RTTA also includes the ability to lift and lower the sample arm for gravity based hand off typically used on our MBE, sputtering and CVD sample manipulators and heating stages.

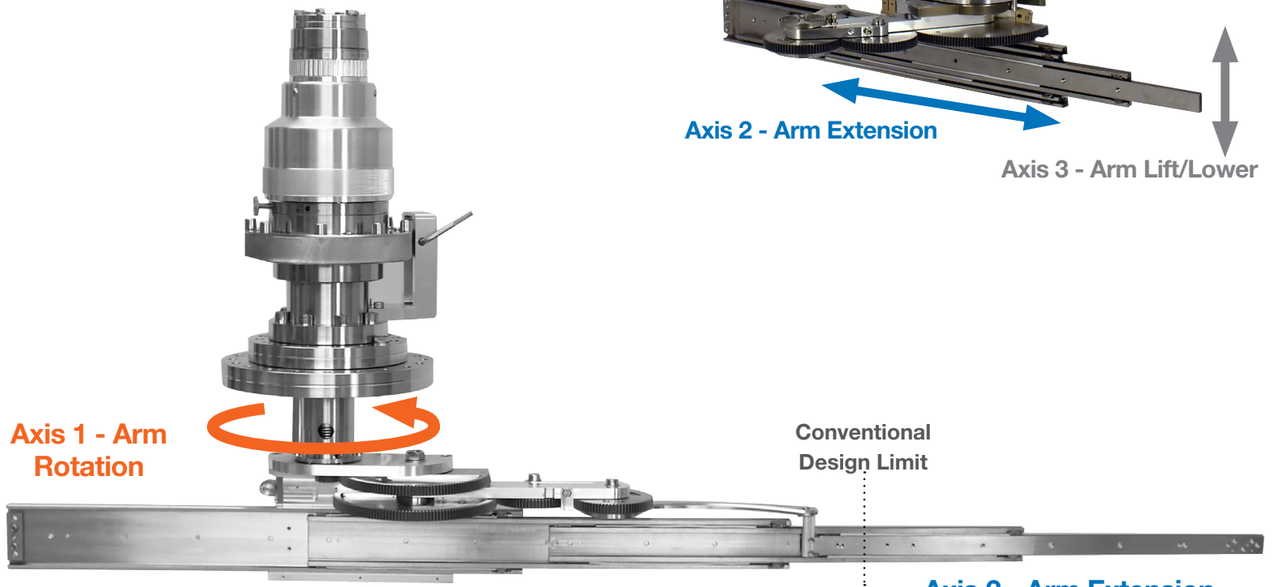
3-AXIS RTTA



2-AXIS RTTA



Retracted position

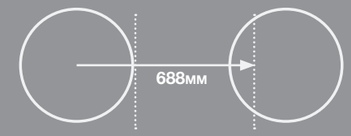


Fully extended

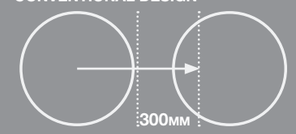
THE RTTA ENABLES YOU TO:

1. Reach further

RTTA

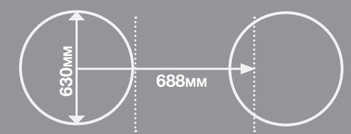


CONVENTIONAL DESIGN

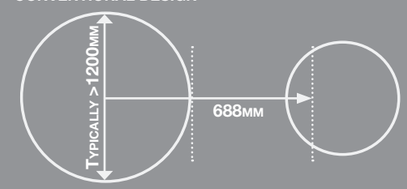


2. Use a smaller chamber for the same stroke

RTTA

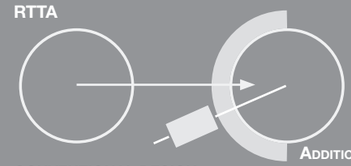


CONVENTIONAL DESIGN



3. Gain access to valuable chamber 'real estate'

RTTA

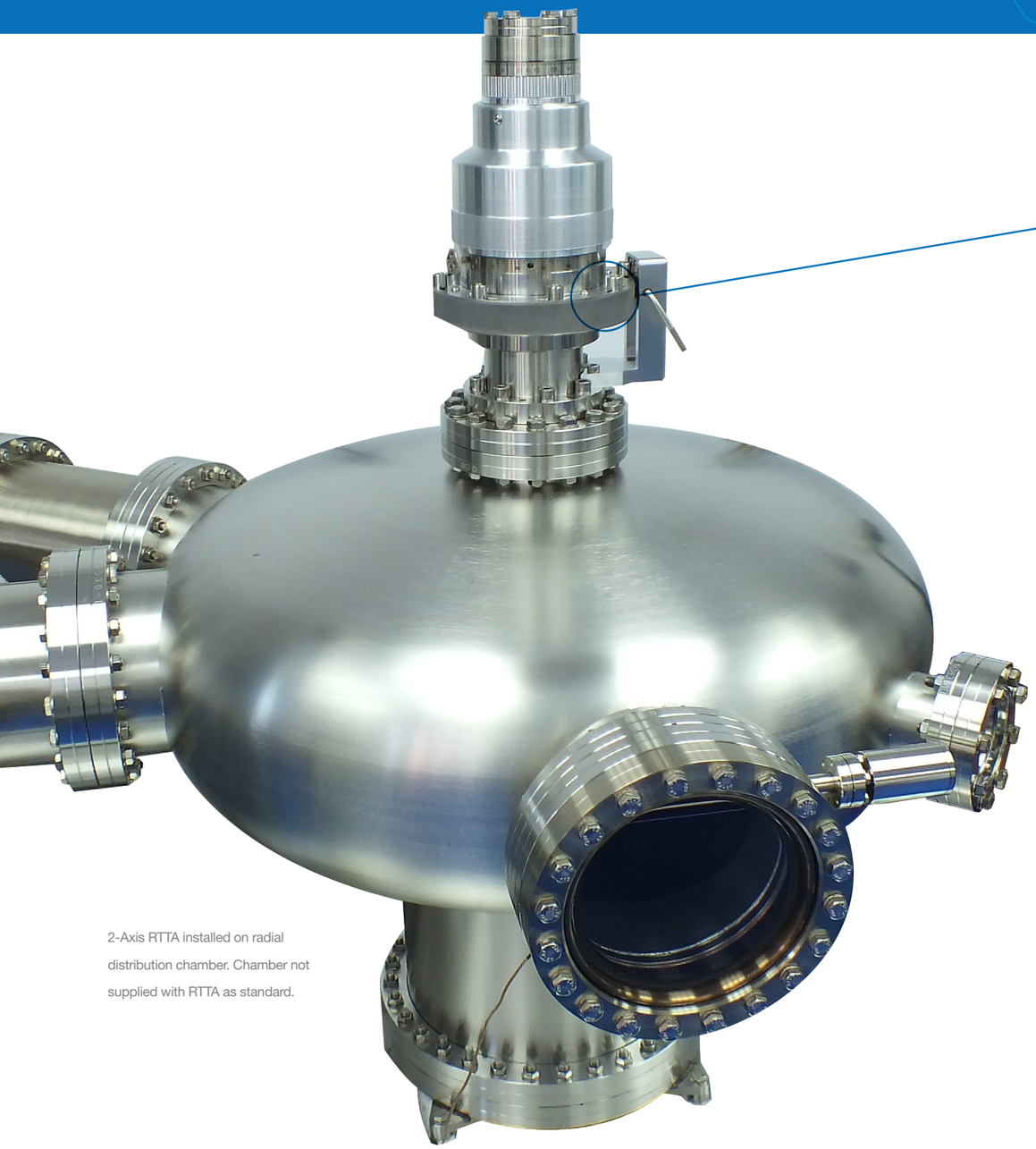


ADDITIONAL SOURCE MAY BE INSTALLED ON THE CHAMBER

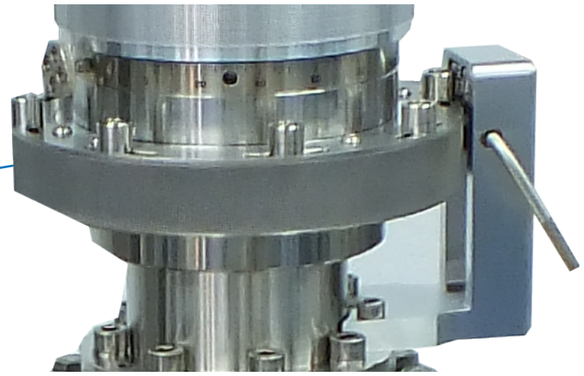
CONVENTIONAL DESIGN

UHV Design

Radial Distribution Chamber Solutions
Rotary Telescopic Transfer Arm



2-Axis RTTA installed on radial distribution chamber. Chamber not supplied with RTTA as standard.



True UHV rotation with no oil, slip rings, bellows or differential pumping

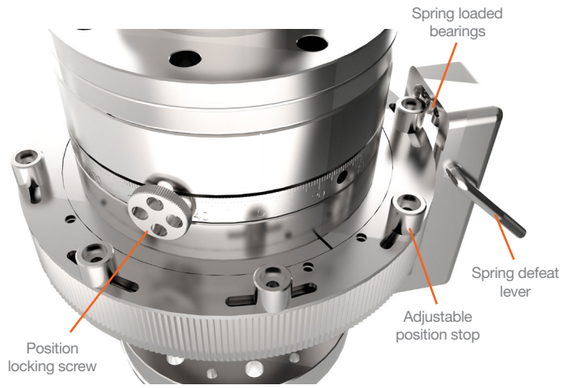
The Radial Telescopic Transfer Arm is actuated by the MD64LB and MD35 magnetically-coupled MagiDrive rotary feedthroughs. They provide true UHV performance, without any bellows, oil, slip rings or differential pumping. The larger MD64LB has a break-away torque of ~40Nm, providing an extremely stiff coupling, ideal for rotating the arm assembly. The smaller MD35 actuates the mechanisms to drive the arm in and out.

User-friendly Manual Arm Alignment

The RTTA is offered in manual or motorised versions.

The manual version of the RTTA is supplied with an innovative, user-friendly system to align the arm with the desired ports.

Fitted to the top of the thimble ring are a number of adjustable position stops. These engage with a pair of spring-loaded bearings that can be withdrawn while the drive is rotated into position then re-engaged to hold the drive firmly in position by using a simple lever. Each stop can be individually aligned with a port axis to define default angular positions which are very reproducible.



Motorised 'Talk Free' Concept

An issue with many radial distribution chambers system designs is the issue of the rotating arm motion causing the arm extension assembly to move (often described as the axis cross-talk). Therefore, rotation of the arm also causes the sample to be driven in and out, losing its position. To overcome this, complex software programming is required to unwind the secondary drive during rotation of the arm. UHV Design recognises this to be an unwanted feature and has, therefore, removed this as an issue through a unique mechanical design used on many other UHV Design manipulators over the years. In brief, this links the rotary motion of the MD64 arm to the motor mounting of the smaller MD35, mechanically unwinding the undesired motion, without the need for complex software.

Should your requirements fall outside our standard specifications then please contact us at:

www.uhvdesign.com +44 (0)1323 811188 sales@uhvdesign.com

2-Axis RTTA

(Rotary & telescopic extension)

The 2-axis RTTA provides 360° rotation and 760mm linear extension within an ultra-compact footprint.

Typically <1mm deflection at full arm extension with 10N load, linear reproducibility of <0.2mm and rotational reproducibility of <0.2mm. Motorisation options available.

RTTA 2-AXIS KEY ADVANTAGES

- **760mm extension**
- **Typically <1mm deflection at full extension under 10N load**
- **Rotational reproducibility <0.2mm**
- **Linear reproducibility <0.2mm**
- **Clean, UHV performance**
- **Competitively priced compared to conventional designs**

The 2-axis RTTA provides a cost-effective solution for radial distribution sample transfer applications providing arm rotation and arm extension.

A high torque magnetically-coupled MagiDrive precisely rotates the transfer arm to align with the desired chamber port. A second MagiDrive is used to drive the innovative telescopic mechanism to provide an arm extension of 760mm to transport the sample in and out of the desired satellite chamber.

The 2-axis RTTA can be motorised using stepper or SMART motors. Alternatively the RTTA can be configured to accept any standard NEMA23 motor.

Specification Table

MODEL	RTTA 2-Axis
Mounting Flange	CF100 152mm (6") OD CF
Min radial port flange size for arm	CF100 152mm (6") OD CF
Min radial port size and clear bore required for assembly installation	CF150 203mm (8") OD CF and 150mm bore
Rotation motion	Unlimited manual and +/-180° motorised
Minimum chamber ID	630mm
Minimum chamber free height	102mm
Arm extension	760mm
Arm extension from port of 630mm ID chamber	688mm*
Arm stiffness at full extension	Typically <1mm deflection for 10N load
Rotational reproducibility	0.2mm at full extension
Bakeout temperature	250°C (with motors removed)

* Contact us for detailed drawings, STEP files and installation guidance.

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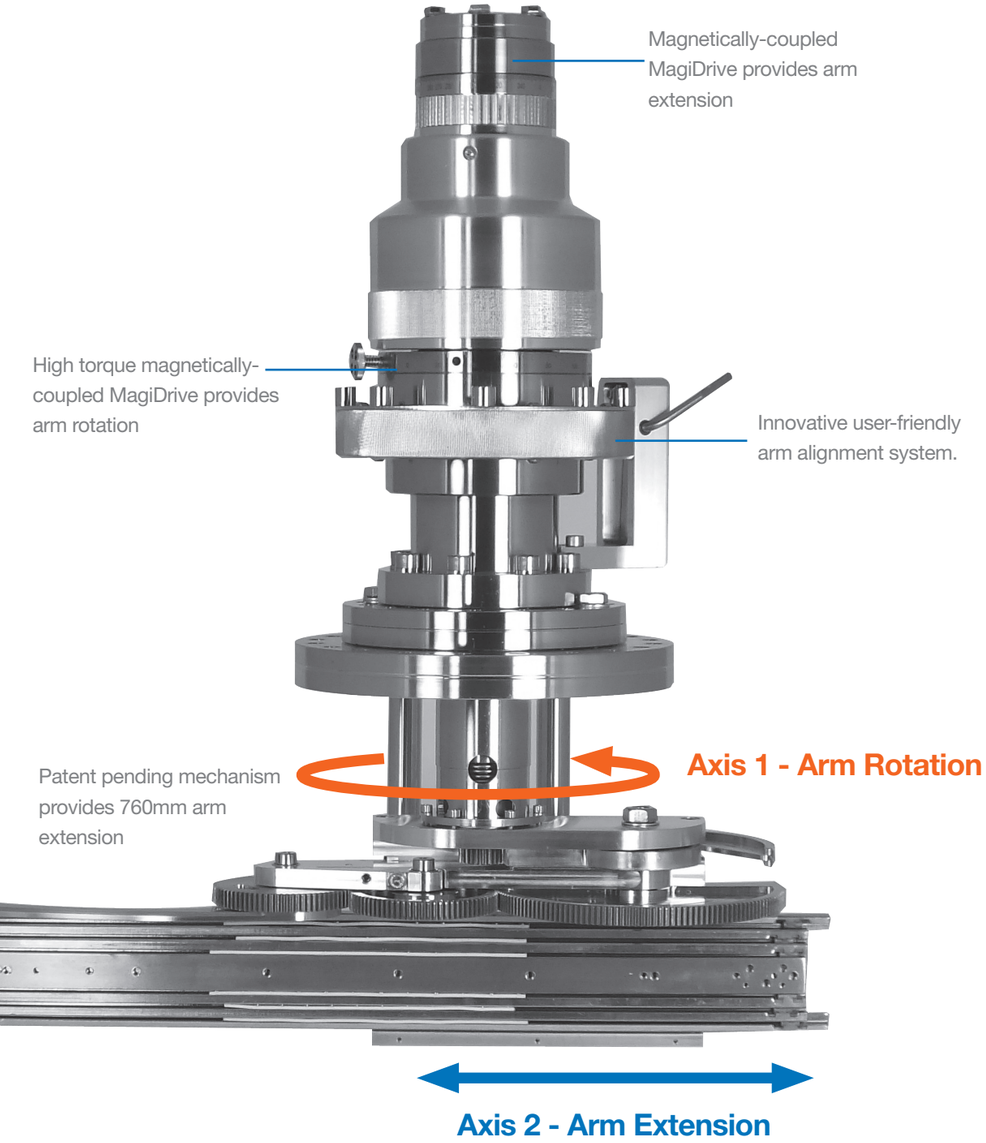


RTTA Part Codes

RTTA	Actuation	Part Number
RTTA 2-AXIS	Manual	RTTA-ZN-RH-EH-760
	Stepper motorised	RTTA-ZN-RS-ES-760
	SMART DC motorised	RTTA-ZN-RSM-ESM-760
	Configured for motorisation (customer to fit own NEMA23 frame motor)	RTTA-ZN-RNM-ENM-760

UHV Design

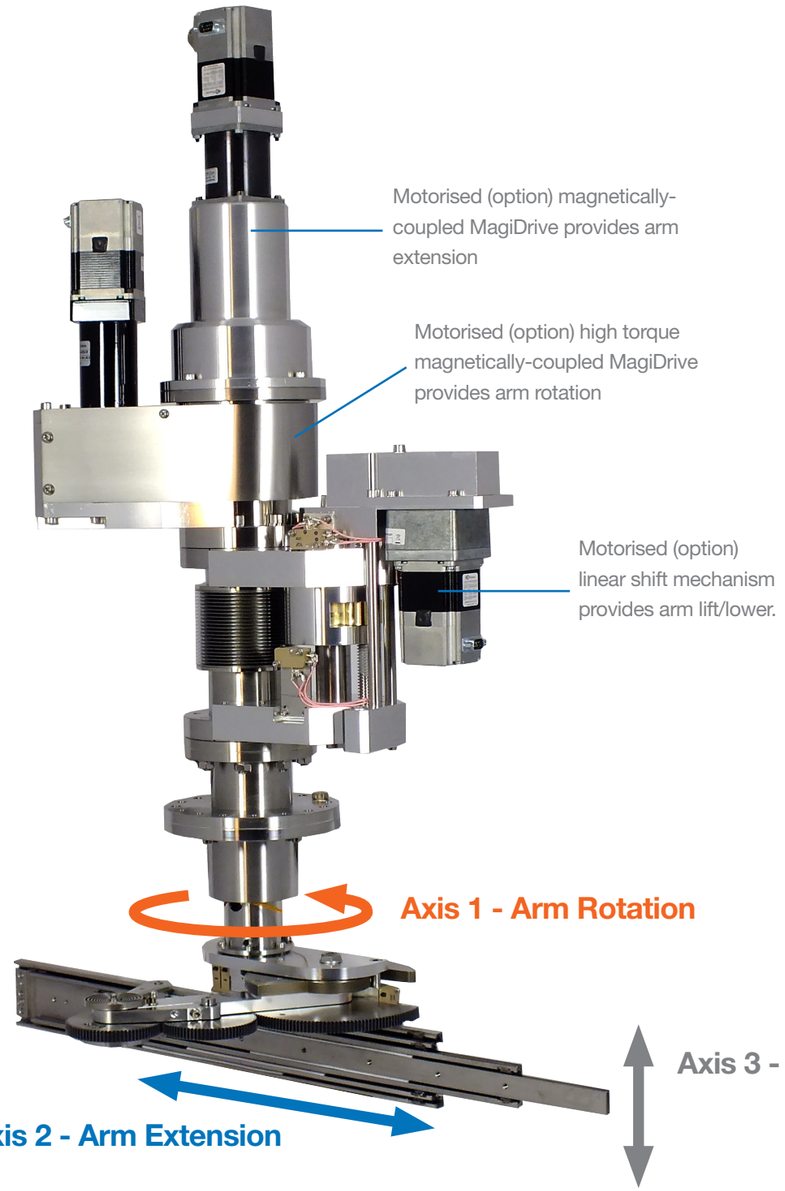
3-Axis RTTA

(Rotary & telescopic extension with lift/lower)

The 3-axis RTTA provides 360° rotation, 760mm linear extension and 50mm Z motion to provide arm lift and lower to aid sample transfer. Typically <1mm deflection at full arm extension with 10N load. Linear reproducibility of <0.2mm and rotational reproducibility of <0.2mm. Motorisation options available.

RTTA 3-AXIS KEY ADVANTAGES

- **760mm extension**
- **Typically <1mm deflection at full extension under 10N load**
- **Rotational reproducibility <0.2mm**
- **Linear reproducibility <0.2mm**
- **Clean, UHV performance**
- **Competitively priced compared to conventional designs**



The 3-axis RTTA provides a cost-effective radial distribution sample transfer solution for applications that require arm rotation, arm extension and arm lift and lower for sample transfer.

A high torque magnetically-coupled MagiDrive provides arm rotation to align with the desired chamber port. A second MagiDrive is used to drive the innovative telescopic mechanism to provide an arm extension of 760mm to transport the sample in and out of the desired satellite chamber. A linear shift mechanism is used to provide 50mm lift/lower of the sample arm for gravity based sample hand off, typically used on our MBE, sputtering and CVD sample manipulators and heating stages.

The 3-axis RTTA can be fully motorised using stepper or SMART motors. Alternatively the RTTA can be configured to accept any standard NEMA23 frame motor.

Specification Table

MODEL	RTTA 2-Axis
Mounting Flange	CF100 152mm (6") OD CF
Min radial port flange size for arm	CF100 152mm (6") OD CF (Arm lift dependent on radial port ID)
Min radial port size and clear bore required for assembly installation	CF150 203mm (8") OD CF and 150mm bore
Rotation motion	Unlimited manual and +/-180° motorised
Minimum chamber ID	630mm
Minimum chamber free height	152mm
Arm lift motion stroke	50mm (48mm if motorised)
Arm extension	760mm
Arm extension from port of 630mm ID chamber	688mm*
Arm stiffness at full extension	Typically <1mm deflection with 10N load
Rotational reproducibility	0.2mm at full extension
Bakeout temperature	250°C (with motors removed)

* Contact us for detailed drawings, STEP files and installation guidance.

RTTA Part Codes

RTTA	Actuation	Part Number
RTTA 3-AXIS	Manual	RTTA-ZH-RH-EH-760
	Stepper motorised	RTTA-ZS-RS-ES-760
	SMART DC motorised	RTTA-ZSM-RSM-ESM-760
	Configured for motorisation (customer to fit own NEMA23 frame motor)	RTTA-ZNM-RNM-ENM-760

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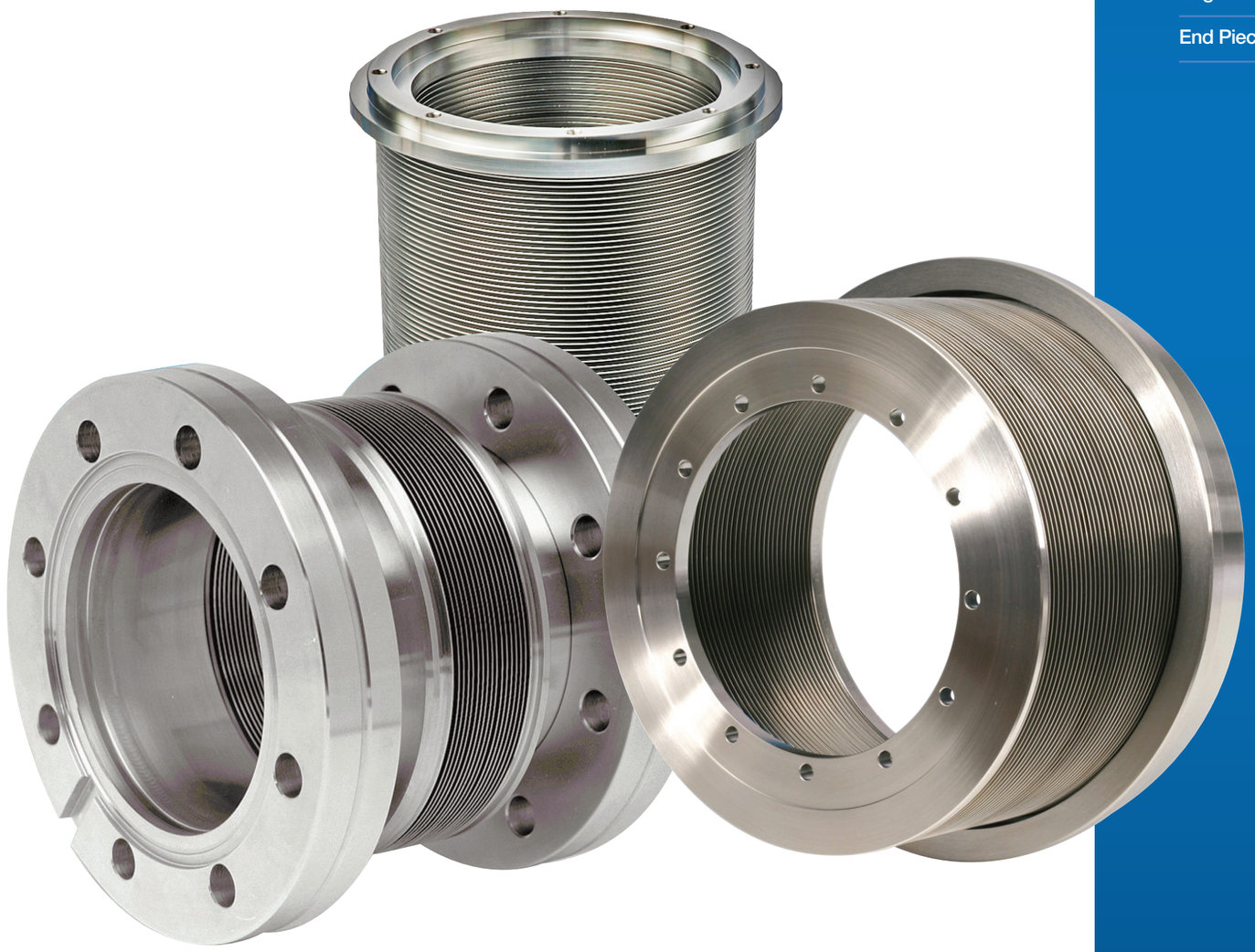

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Section 07

EDGE-WELDED BELLOWS

07

UHV Design

Edge-welded Bellows

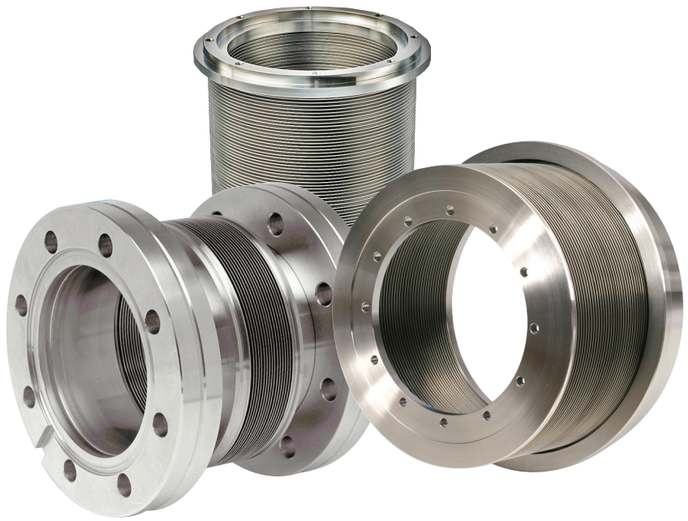
Edge-welded Bellows

UHV Design supply a range of high quality, edge-welded bellows which are fully compatible with UHV environments. Applications are numerous and vary from fundamental vacuum research and instrumentation to equipment used in semiconductor manufacturing and data storage device fabrication.

Bellows can be supplied either against a customer drawing or designed in-house using our 3-D design software, and are available in a range of materials and formats to suit virtually any application. Long stroke bellows can also be provided that are supported or guided to eliminate droop or deflection and possible damage.

Flexible, high-duty designs for:

- Axial motion up to 2m
- Lateral offsets
- Vibration isolation
- Compensation for differential thermal expansion
- Angular alignment



KEY ADVANTAGES

- **Lifetime of 10,000 cycles as standard (within defined mechanical range)**
- **Manufactured from 316L stainless steel as standard**
- **Available in a range of materials and formats**
- **Competitively priced**

Product Options

- Lifetime up to 10 million cycles
- Various formats including ‘race track’ bellows
- Long stroke bellows supported or guided
- A variety of flanges, tube-ends, bellows rings and customised end-pieces to suit every application
- Choice of materials including:
  - 316L Stainless steel
  - AM350
  - Titanium
  - Inconel
  - Hastelloy
- Can be used in challenging environments including:
  - extremes of temperature
  - corrosive chemistries
  - residual magnetic fields

UHV Design’s bellows are competitively priced and are typically available either from stock or within 6-8 weeks for custom designs. Please contact Sales to receive a quotation.

Edge-Welded Bellows 316L Material as standard (please contact sales for alternative materials)

DN	INSIDE DIAMETER (mm) ID	OUTSIDE DIAMETER (mm) OD	COMPRESSED BELLOWS LENGTH (mm) lc	FREE BELLOWS LENGTH (mm) lf	AXIAL STROKE (mm) z	WALL THICKNESS MEMBRANE (mm) t	PROFILE WIDTH (mm) b	EFFECTIVE AREA (mm) EA	SPRING CONSTANT (AXIAL DIRECTION) (mm) SRCz	BENDING ANGLE (mm) Phi	BENDING RADIUS (mm) Rw
	4.8	12.70	0.27	0.53	0.31	0.08	4.00	0.70	80.00	1.62	15.90
	6	13	0.27	0.50	0.28	0.08	3.50	0.80	105.00	1.41	17.50
	8	16	0.27	0.65	0.42	0.08	4.00	1.30	60.00	1.72	17.00
	8.6	16.20	0.20	0.55	0.48	0.05	3.80	1.30	25.00	1.95	14.00
10	9	20	0.35	0.80	0.52	0.08	5.50	1.90	55.00	1.72	21.70
	9	31.50	0.36	1.35	1.03	0.10	11.00	4.30	55.00	2.15	25.30
	13	26	0.32	0.90	0.70	0.08	6.50	3.40	55.00	1.76	23.40
16	16	31.50	0.45	1.20	1.01	0.13	7.75	5.00	95.00	2.09	28.10
	16	35	0.43	1.15	1.18	0.13	9.50	5.90	49.00	2.21	28.70
	18.5	31.50	0.37	0.90	0.74	0.10	6.50	5.30	95.00	1.55	29.50
	19	37	0.40	1.60	1.36	0.13	9.00	6.90	70.00	2.40	28.10
	21	41	0.50	1.85	1.67	0.13	10.00	8.40	75.00	2.66	31.30
	21	49	0.55	2.30	1.84	0.15	14.00	11.30	65.00	2.46	37.30
	21	39	0.43	1.10	1.23	0.13	9.00	7.80	49.00	2.06	31.50
	21.10	34.90	0.35	1.05	0.96	0.10	6.90	6.60	75.00	1.81	28.60
	24	35	0.33	0.70	0.61	0.10	5.50	7.20	82.00	1.15	34.00
	26	41	0.44	1.25	1.23	0.13	7.50	9.40	135.00	1.96	33.40
25	26	46	0.45	1.80	1.67	0.13	10.00	11.10	75.00	2.37	33.90
	31	51	0.50	1.80	1.67	0.13	10.00	14.20	65.00	2.13	38.90
	35	48	0.33	90	0.70	0.10	6.50	14.00	90.00	0.95	43.80
	36	56	0.50	1.80	1.76	0.13	10.00	17.60	65.00	2.05	42.00
	36	72	0.75	2.50	3.01	0.20	18.00	25.80	90.00	2.73	51.70
	38	51	0.40	1.00	0.88	0.10	6.50	16.10	110.00	1.12	45.90
40	39	59	0.50	2.00	1.76	0.13	10.00	19.90	65.00	1.94	44.30
	46	71	0.50	2.30	2.11	0.13	12.50	28.50	60.00	1.94	50.30
	46	62.50	0.50	1.45	1.32	0.13	8.30	24.00	130.00	1.38	52.10
	46	88	0.70	3.30	2.64	0.20	21.00	39.20	96.00	1.95	64.50
50	51	76	0.50	2.40	2.28	0.15	12.50	33.30	85.00	1.96	52.60
	52	62	0.33	0.85	0.52	0.10	5.00	26.10	120.00	0.55	65.10
	52	95	0.75	3.60	2.99	0.20	21.50	46.70	75.00	2.05	68.50
	60	88	0.55	2.70	2.46	0.15	14.00	45.10	80.00	1.82	61.30

All stated values refer to the following operating conditions:
Differential pressure = 1bar
Operating temperature = room temperature
Bakeout temperature = 250°C
Number of cycles = 10,000 cycles

Continued overleaf

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Edge-Welded Bellows 316L Material as standard (please contact sales for alternative materials)

	INSIDE DIAMETER (mm)	OUTSIDE DIAMETER (mm)	COMPRESSED BELLOWS LENGTH (mm)	FREE BELLOWS LENGTH (mm)	AXIAL STROKE (mm)	WALL THICKNESS MEMBRANE (mm)	PROFILE WIDTH (mm)	EFFECTIVE AREA (mm)	SPRING CONSTANT (AXIAL DIRECTION) (mm)	BENDING ANGLE (mm)	BENDING RADIUS (mm)
DN	ID	OD	lc	lf	z	t	b	EA	SRCz	Phi	Rw
63	65	90	0.50	2.40	2.46	0.15	12.50	49.00	95.00	1.78	61.10
	70	94	0.55	2.35	2.33	0.15	12.00	54.70	95.00	1.62	66.50
	75	100	0.60	2.40	2.55	0.15	12.50	62.20	95.00	1.66	70.70
	77.50	120	0.75	3.50	3.16	0.20	21.25	81.20	85.00	1.72	85.00
	80	108	0.55	2.25	2.2	0.15	14.00	71.90	80.00	1.33	77.80
	82	125	0.75	3.70	3.34	0.20	22.00	88.90	80.00	1.74	87.20
	90	120	0.60	2.80	2.46	0.15	15.00	89.50	70.00	1.34	85.70
	90	110	0.50	1.45	1.23	0.15	10.00	80.40	145.00	0.73	94.30
	90.50	135	0.70	4.20	3.69	0.20	22.25	105.10	80.00	1.78	90.00
	92	149	0.85	4.75	4.04	0.25	29.00	122.00	95.00	1.77	102.00
102	102	132	0.60	2.60	2.72	0.15	15.00	110.70	75.00	1.35	91.60
	102.50	150	0.90	4.40	4.04	0.25	23.75	131.40	135.00	1.76	104.40
	110	160	0.80	4.25	2.64	0.20	25.00	150.00	40.00	1.07	122.70
	115	145	0.55	2.50	2.72	0.15	15.00	136.30	75.00	1.22	98.20
	127	157	0.70	2.60	2.81	0.20	15.00	162.30	100.00	1.17	112.80
160	150	185	0.75	2.60	2.99	0.20	17.50	225.70	140.00	1.05	133.30
	156	186	0.75	2.60	2.90	0.20	15.00	234.50	200.00	1.02	135.30
	160	210	2.00	4.20	2.20	0.25	25.00	277.40	200.00	0.68	273.00
	173	203	0.65	2.50	2.81	0.15	15.00	283.10	100.00	0.90	142.70
	180	209	0.65	2.15	2.72	0.15	14.50	302.80	95.00	0.85	148.30
	180	215	0.75	2.80	2.99	0.20	17.50	312.90	148.00	0.91	154.90
200	200	235	0.75	3.00	3.08	0.20	17.50	379.00	160.00	0.85	167.90
	230	265	0.70	2.80	3.08	0.20	17.50	490.00	160.00	0.76	185.50
250	250	285	0.80	3.20	2.81	0.20	17.50	572.00	200.00	0.64	213.80
	280	330	0.90	3.30	3.08	0.20	25.00	745.00	150.00	0.61	249.00
320	300	340	0.80	3.20	3.16	0.20	20.00	818.20	200.00	0.61	245.00
	360	440	2.00	7.50	5.28	0.30	40.00	1286.20	150.00	0.78	366.70
400	400	480	1.45	5.00	3.96	0.40	40.00	1553.60	350.00	0.54	394.70

All stated values refer to the following operating conditions:
Differential pressure = 1bar
Operating temperature = room temperature
Bakeout temperature = 250°C
Number of cycles = 10,000 cycles

Should your requirements fall outside our standard specifications then please contact us at:

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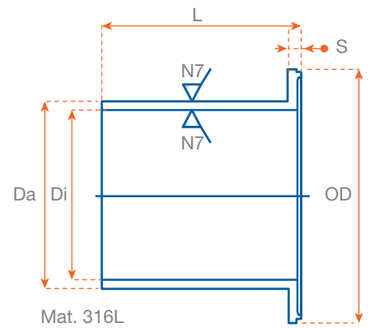
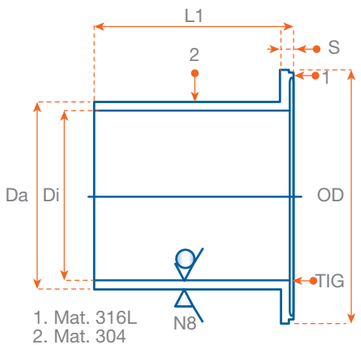
End Pieces

	BELLOWS INSIDE DIAMETER (mm)	BELLOWS OUTSIDE DIAMETER (mm)	INSIDE DIAMETER OF CONNECTING TUBE (mm)	OUTSIDE DIAMETER OF CONNECTING TUBE (mm)	WIDTH OF RING (mm)	LENGTH MAX (mm)	LENGTH MAX (mm)
DN	ID	OD	Di	Da	S	L	L1
	6	13	6.0	8.0	4.0	25.0	<500 mm
10	9	20	10.0	12.0	4.0	25.0	<500 mm
	13	26	16.0	18.0	4.0	32.0	<500 mm
16	16	31.5	16.0	18.0	4.0	32.0	<500 mm
	16	31.5	16.0	18.0	4.0	15.2	<500 mm
	19	37	21.0	25.0	4.0	32.0	<500 mm
	21	41	21.0	25.0	4.0	32.0	<500 mm
	21	49	21.0	25.0	4.0	32.0	<500 mm
25	26	46	31.0	34.0	4.0	40.0	<500 mm
	31	51	31.0	34.0	4.0	40.0	<500 mm
	36	56	38.0	41.3	4.0	50.5	<500 mm
40	39	59	38.0	41.3	4.0	50.5	<500 mm
	39	59	38.0	41.3	4.0	24.2	<500 mm
	46	71	46.0	50.0	4.0	60.0	<500 mm
50	51	76	53.0	57.0	4.0	60.0	<500 mm
63	65	90	66.0	70.0	5.0	25.0	<500 mm
	75	100	72.1	76.1	5.0	20.0	<500 mm
	90	120	90.0	95.0	5.0	20.0	<500 mm
100	102	132	104.0	108.0	5.0	25.0	<500 mm
	127	157	134.5	139.7	5.0	25.0	<500 mm
160	150	185	150.0	156.0	5.0	25.0	<500 mm
	180	215	175.0	179.0	6.0		<500 mm
200	200	235	200.0	206.0	6.0	20.0	<500 mm
250	250	285	250.0	256.0	6.0	20.0	<500 mm
320	300	340	300.0	306.0	6.0	25.0	<500 mm

‘H’ type (single piece)



Tube and ‘R’ type (two piece)



LINEAR MOTION AND ALIGNMENT

Linear Motion and Alignment

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**

Example of long travel LSM

Standard LSM

Up to 350mm

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Long Travel LSM

Up to 1000mm

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Compact LSM

Up to 150mm

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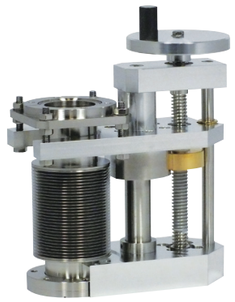
LSM with Tilt



Up to 150mm
+/- 2° tilt

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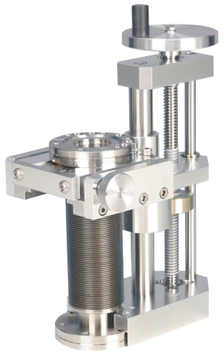
LSM with X motion



Up to 150mm
+/- 5mm lateral (x) motion

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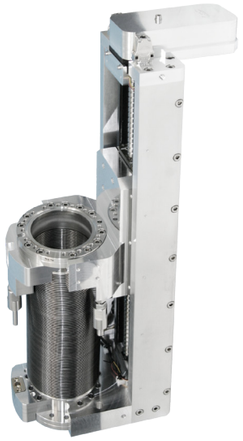
Production LSMs



Production-proven
LSMs

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Port Aligners

+/-5mm linear motion
+/-3° angle adjustment

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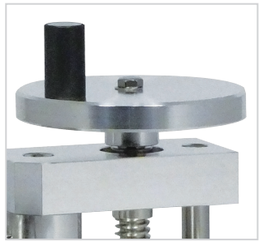
LSM Actuation options

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

Manual actuation

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



Manual handwheel

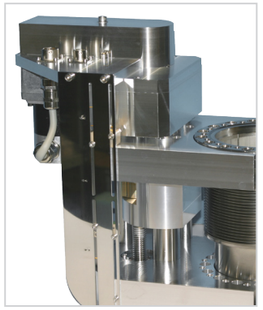
Pneumatic actuation

Code	Item	Description
P	Pneumatic	Pneumatic actuators provide a simple solution to automated operation. Standard design is for 2 position actuation. 3 position versions available upon request.

Pneumatic actuation

Motorised actuation

Code	Item	Description
SD	DC motorised	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.
SS	Stepper motor driven	A stepper motor provides the motion and is mounted to the side of the LSM. Special in-line versions are available upon request.
UP	Wiring upgrade	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.

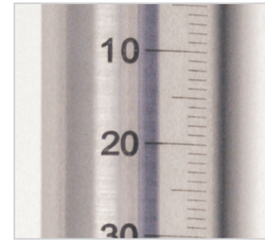


Motorised LSM

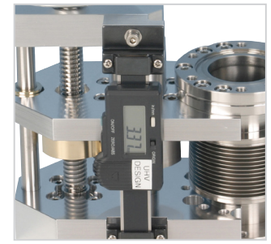
UHV Design

Position Readout/Feedback

Code	Item	Description
ES	Engraved shaft	LSMs can be fitted with a shaft engraved with a scale with 1mm increments for visual positioning.
DLA	Digital linear scale	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 re-set 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.
EN	Magnetic encoder	Contactless high-speed linear magnetic encoder with 10 micron resolution.



Engraved shaft

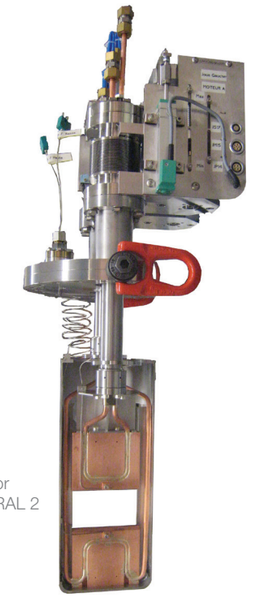


Digital linear scale

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.



Example of customised LSM for beam halo cleaning at the SPIRAL 2 synchrotron.

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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.

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

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.

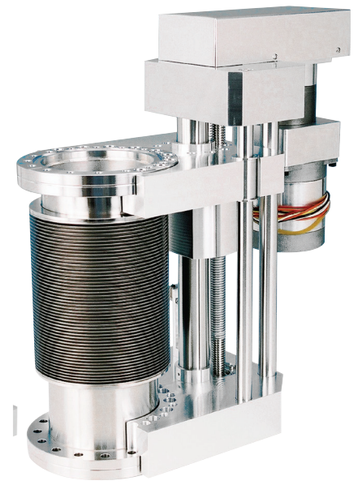
Specification Table

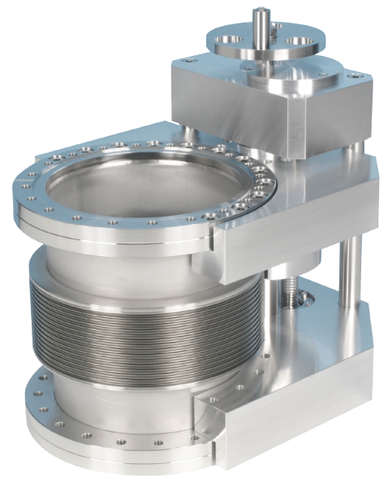
MODEL	Flange information		Bolt holes		Clear Bore (mm)	Maximum Bakeout
	Flange code	Flange size	Travelling flange	Mounting flange		
LSM	38	CF38 70mm (2.75") OD CF	M6 Tapped	M6 Tapped*	38	250°C
	64	CF64 114mm (4.5") OD CF	M8 Tapped	M8 Tapped*	65	
	100	CF100 152mm (6") OD CF	M8 Tapped	Clear holes	102	
	150	CF150 203mm (8") OD CF			149	

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

Should your requirements fall outside our standard specifications then please contact us at:

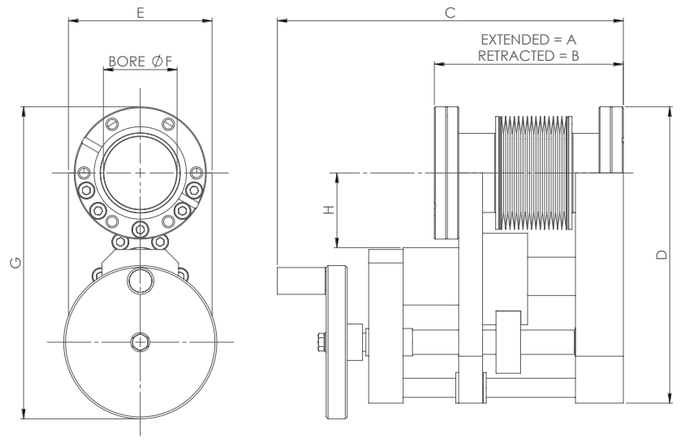
UHV Design





Example LSM Dimensions

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



LSM38	A	B	C	D	E	F	G	H
LSM38-50	131.7	81.7	212.6	154.7	75	38	163	39
LSM38-100	194.5	94.5	275.8	154.7	75	38	163	39
LSM64	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
LSM64-50	135	111	249	203	122.5	65	212.2	64
LSM64-100	211	111	299	203	122.5	65	212.2	64

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

LSM Series Part Code Generator

Series: LSM, HLSM

Flange Size (select one): CF38 (38), CF64 (64), CF38* (38), CF64* (64), CF100 (100), CF150 (150)

*Non-standard option

Stroke (select one): 25mm (25), 50mm (50), 75mm*1 (75), 100mm (100), 150mm (150), 200mm (200), 250mm (250), 300mm (300), 350mm*1 (350)

*1 CF38 flange only

Actuation Options (select one):

Manual	Manual handwheel	H
Motorisation	Side-mounted stepper motor	SS
	Side-mounted 24V DC motor	SD
	Side-mounted DC motor with controller & pre-wired switches	SADC
Pneumatic	In-line-mounted pneumatic actuator	P
	In-line-mounted pneumatic actuator with reed switches	PS

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

Linear Scale (optional): Engraved shaft (ES), Digital Scale (DLA), Linear encoder*2 (EN)

*2 for SS actuation option only

Wiring*3 (optional): Upgrade with switches for connection to controller (UP)

*3 for SS & SD options only

Example Configured Part Number:

LSM38-200-SS-DLA

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

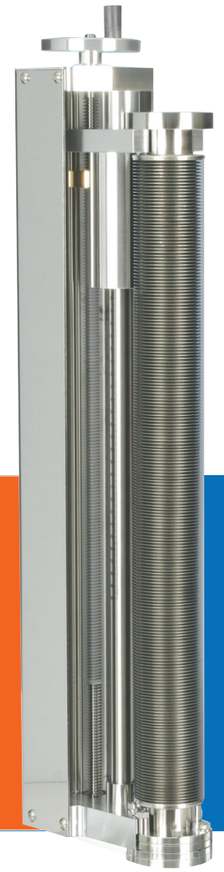
Long Travel Linear Shift Mechanism

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.

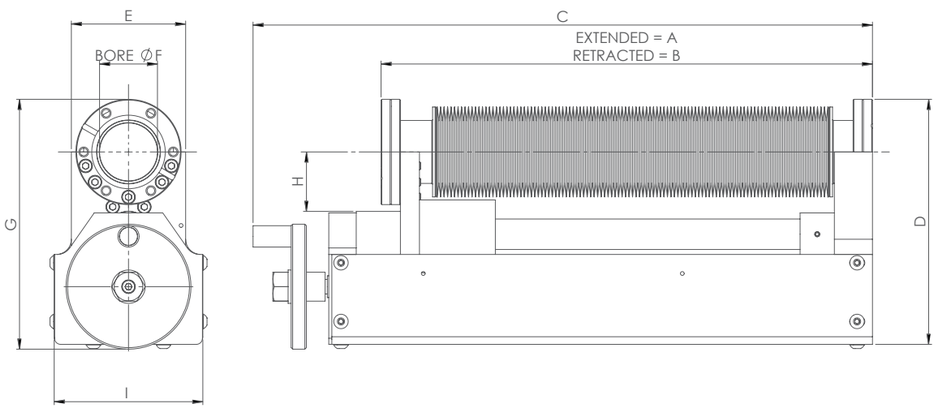
Motorised HLSMLs are fitted with bakeable limit and home switches, pre-wired to a single, bakeable connector mounted on the frame. HLSMLs are compatible with UHV Design's SADC and Stepper motor controller range.

Each HLSML can be supplied with a digital linear scale, offering visual position indication with 10 micron resolution.

Specification Table

MODEL	Flange information		Bolt holes		Clear Bore (mm)	Maximum Bakeout
	Flange Code	Flange Size	Travelling flange	Mounting flange		
HLSML	38	CF38 70mm (2.75") OD CF	M6 Tapped	Clear holes	38	250°C
	64	CF64 114mm (4.5") OD CF	M8 Tapped	Clear holes	65	250°C

Example HLSML Dimensions



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

HLSML38	A	B	C	D	E	F	G	H	I
HLSML38-200	330.3	130.3	415.3	160	75	38	163	39	103
HLSML38-800	11075.5	3075	1205	160	75	38	163	39	103
HLSML64	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
HLSML64-200	325	125	408.2	204	161.4	65	219	64	161.4
HLSML64-800	1073	273	1163	204	123	65	219	64	161.4

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

HLSML Series Part Code Generator

Series	Flange SIze (select one)		Stroke (select one)		Actuation Options (select one)			Linear Scale (optional)	
HLSML	CF38	38	200mm	200	Manual	Manual handwheel	H	Engraved scale	ES
	CF64	64	300mm	300	Motorisation	Side-mounted stepper motor	SS	Digital Scale	DLA
			400mm*1	400		Side-mounted 24V DC motor	SD	Linear encoder*2	EN
			500mm*1	500		Side-mounted DC controller with motor & pre-wired switches	SADC		
			600mm*1	600					
			800mm*1	800					
			1000mm*1	1000*2					

*1 Use of bellows suport tube recommended
*2 CF64 flange only

*2 for SS actuation option only

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

Example Configured Part Number:

HLSML64-800-H

= **HLSML**, CF64 flange **64**, 800mm stroke **800**, and manual actuation **H**

Should your requirements fall outside our standard specifications then please contact us at:

Compact Linear Shift Mechanism
CLSM Series

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.

CLSM KEY ADVANTAGES

- » Compact design
- » Smooth kinematic motion
- » Reliable and rigid construction
- » True UHV performance
- » Bakeable to 250°C
- » Demountable bellows assembly

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

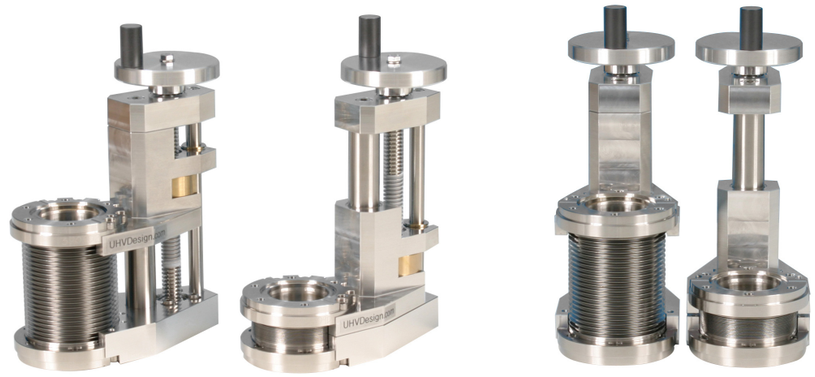
The series can be actuated via a manual handwheel, pneumatic cylinder, DC motor or Stepper motor.

Each CLSM can be supplied with a digital linear scale, offering visual position indication with 10 micron resolution.

Specification Table

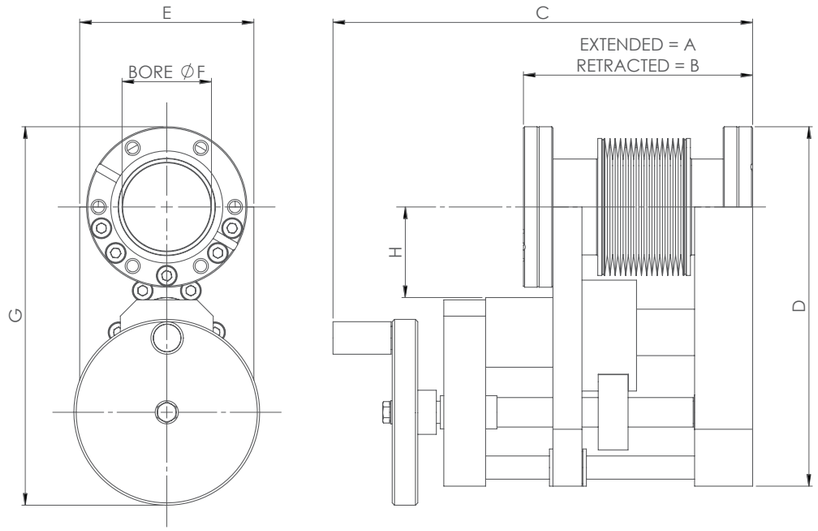
MODEL	Flange information		Bolt holes		Clear Bore (mm)	Maximum Bakeout
	Flange code	Flange size	Travelling flange	Base flange		
CLSM	38	CF38 (2.75" OD)	M6 Tapped	M6 Tapped	38	250°C

UHV Design



Example CLSM Dimensions

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



CLSM38	A	B	C	D	E	F	G	H
CLSM38-25	63	38	173	142	75	38	147.5	39
CLSM38-50	92	42	202	142	75	38	147.5	39
CLSM38-75	125	50	235	142	75	38	147.5	39
CLSM38-100	163	63	273	142	75	38	147.5	39

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

CLSM Series Part Code Generator

Series		Flange Size		Stroke (select one)		Actuation Options (select one)			Linear Scale (optional)		Wiring* (optional)	
CLSM		CF38	38	25mm	25	Manual	Manual handwheel	H	Engraved shaft	ES	Upgrade with switches for connection to controller	UP
				50mm	50	Motorisation	Side-mounted stepper motor	SS	Digital Scale	DLA		
				75mm	75	Motorisation	Side-mounted 24V DC motor	SD				
				100mm	100	Pneumatic	In-line-mounted pneumatic actuator	P				
				150mm	150	Pneumatic	In-line-mounted pneumatic actuator with reed switches	PS				

*for SS & SD options only

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

Example Configured Part Number:
CLSM38-100-P
= **CLSM**, CF38 flange **38**, 100mm stroke **100** with pneumatic actuation **P**

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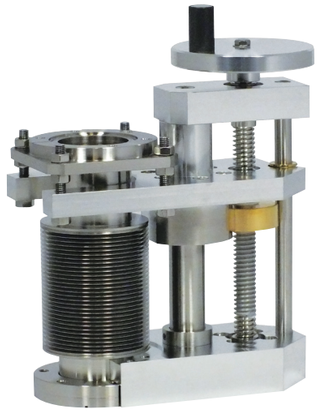


Linear Shift Mechanism With Tilt

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.

LSMT KEY ADVANTAGES

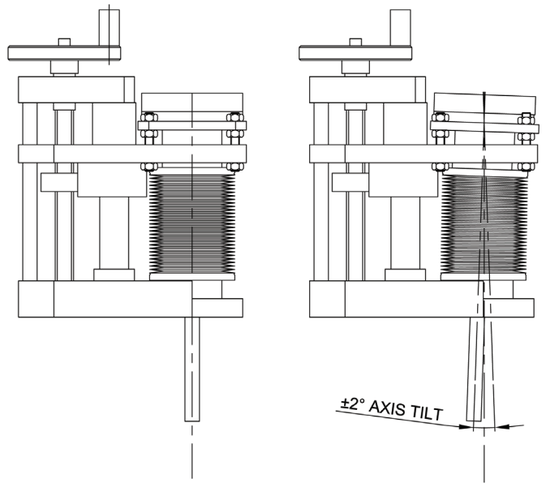
- Up to 150mm stroke
- +/- 2° tilt for final alignment
- Adjustment via 4 threaded support shafts
- Smooth kinematic motion
- Bakeable to 250°C
- Demountable bellows assembly

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 diagnositcs 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.



Specification Table

MODEL	Flange information		Bolt holes	Travelling flange tilt	Clear Bore (mm)	Maximum Bakeout
	Flange code	Flange size				
LSMT	38	CF38 70mm (2.75") OD CF	M6 Tapped	+/-2°	38	250°C
	64	CF64 114mm (4.5") OD CF	M8 Tapped	+/-2°	65	250°C

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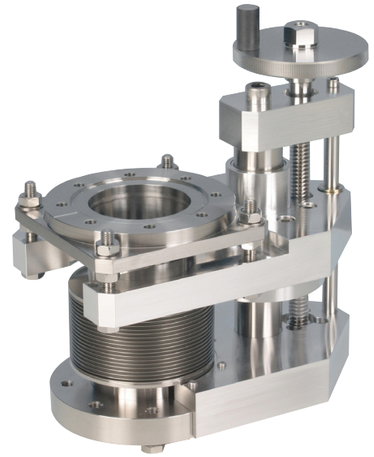
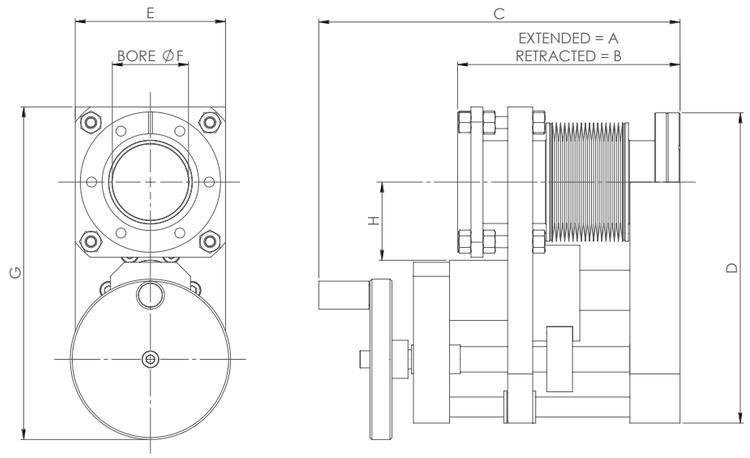


Example LSMT Dimensions

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



LSMT38	A	B	C	D	E	F	G	H
LSMT38-50	142	92	213	155	75	38	165	39
LSMT38-100	199.5	99.5	268	155	75	38	165	39
LSMT38	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
LSMT64-50	180.5	130.5	307	203	122.5	65	213	64
LSMT64-100	230.5	130.5	307	203	122.5	65	213	64

LSMT Series Part Code Generator

Series		Flange SIze		Stroke (select one)		Actuation Options (select one)			Linear Scale (optional)		Wiring* (optional)	
LSMT	+	CF38	38	25mm	25	Manual	Manual handwheel	H	Engraved shaft	ES	Upgrade with switches for connection to controller	UP
		CF64	64	50mm	50	Motorisation	Side-mounted stepper motor	SS	Digital Scale	DLA		
				75mm	75	Motorisation	Side-mounted 24V DC motor	SD				
				100mm	100	Pneumatic	In-line-mounted pneumatic actuator	P				
				150mm	150	Pneumatic	In-line-mounted pneumatic actuator with reed switches	PS				

* for SS & SD options only

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

Example Configured Part Number:

LSMT38-100-P

= **LSMT**, CF38 flange **38**, 100mm stroke **100** with pneumatic actuation **P**

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.

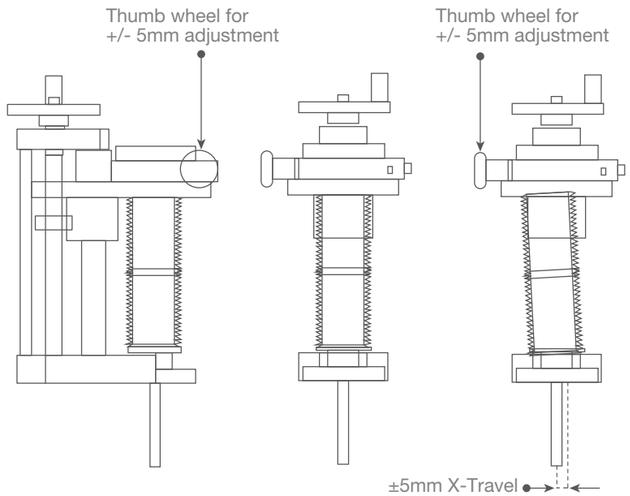
LSMX KEY ADVANTAGES

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

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.

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.



Specification Table

MODEL	Flange information		Bolt holes	Travelling flange offset (X motion)	Clear Bore (mm)	Maximum Bakeout
	Flange code	Flange size				
LSMX	38	CF38 70mm (2.75") OD CF	M6 Tapped	+/-5mm	38	250°C
	64	CF64 114mm (4.5") OD CF	M8 Tapped	+/-5mm	65	250°C

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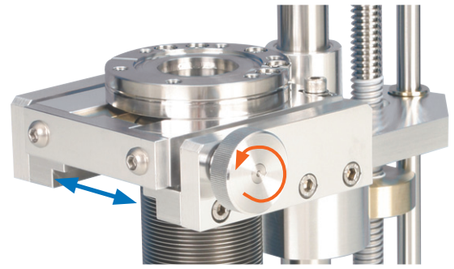
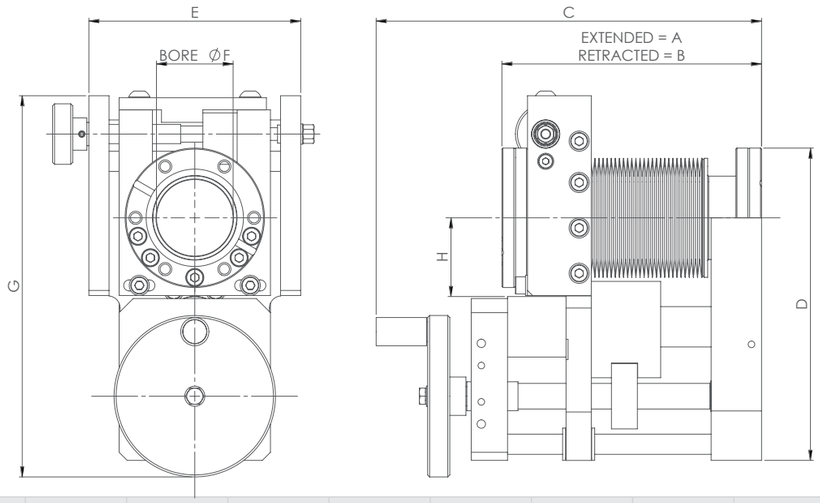


Thumb wheel provides +/-5mm lateral (X axis) movement

Example LSMX Dimensions

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



LSMT38	A	B	C	D	E	F	G	H
LSMX38-50	159.6	109.6	222	155	105	38	189	39
LSMX38-100	235.4	135.4	300	155	105	38	189	39

LSMX Series Part Code Generator

Series	Flange SIze (select one)		Stroke (select one)		Actuation Options (select one)			Linear Scale (optional)		Wiring*2 (optional)	
LSMX	CF38	38	50mm	50	Manual	Manual handwheel	H	Engraved shaft	ES	Upgrade with switches for connection to controller	UP
	CF64	64	100mm	100	Motorisation	Side-mounted stepper motor	SS	Digital Scale	DLA		
			150mm	150	Motorisation	Side-mounted 24V DC motor	SD	Linear encoder*1	EN		
					Motorisation	Side-mounted DC controller with motor & pre-wired switches	SADC				
					Pneumatic	In-line-mounted pneumatic actuator	P				
					Pneumatic	In-line-mounted pneumatic actuator with reed switches	PS				

*1 for SS actuation option only

*2 for SS & SD options only

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

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

UHV Design

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.

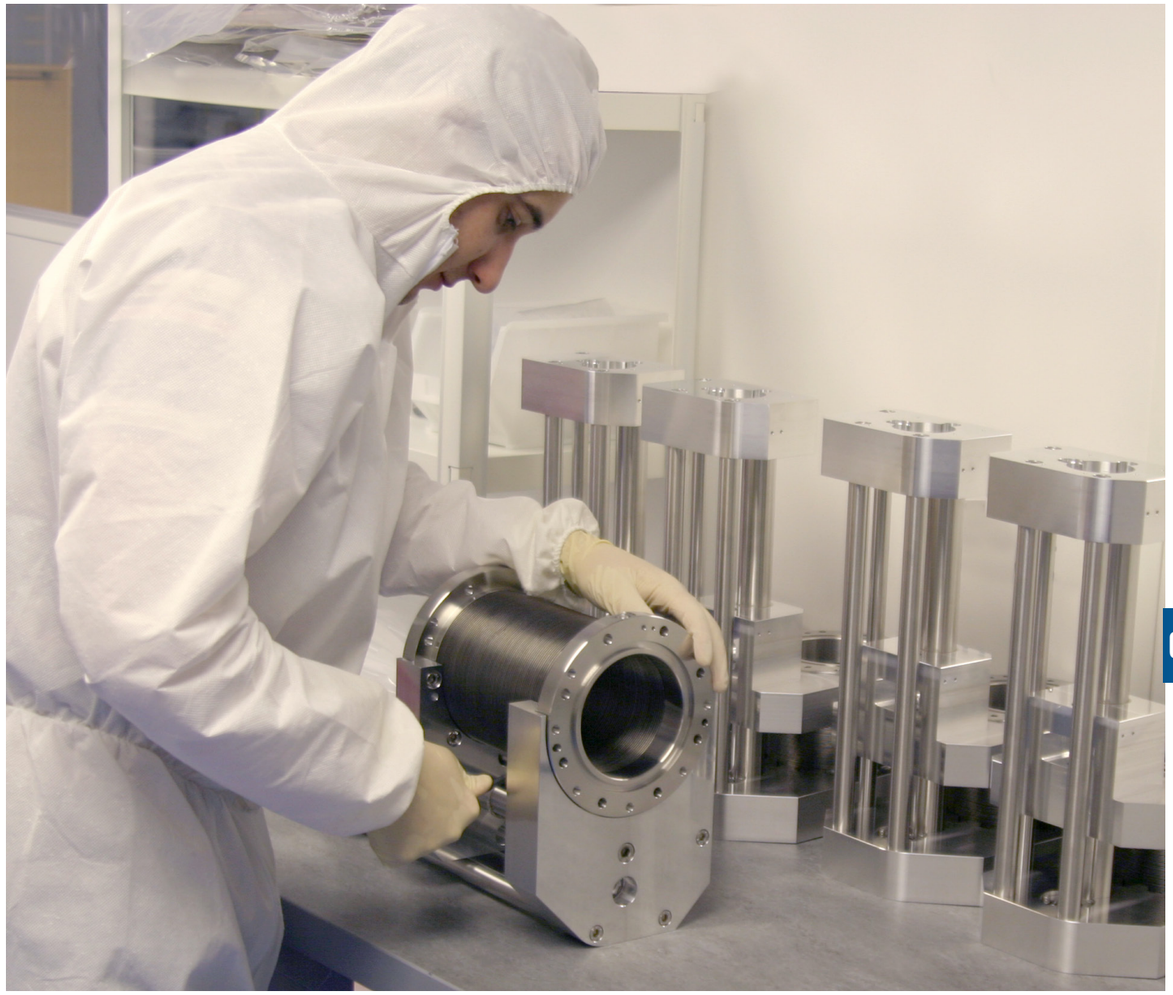
All production LSMs benefit from:

- 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 toleranced, high quality components.

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



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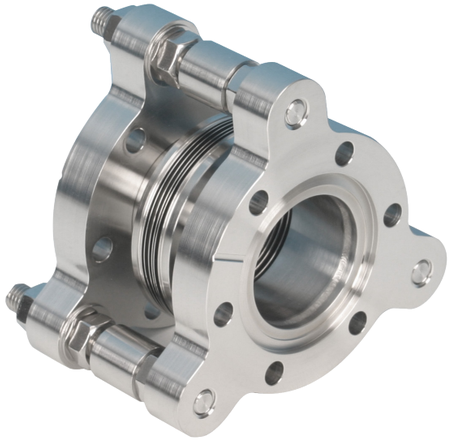

Port Aligner Range

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.

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**

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.

The fixed flange supports three equi-spaced threaded shafts. Alignment of the travelling flange is achieved by adjusting the floating mounts attached to each threaded shaft. The port aligner can be mounted in any-orientation and is bakeable to 250°C.

A high quality, flexible, 316L edge-welded bellows, spans the flanges to accommodate the required motion while ensuring an all-metal vacuum enclosure.

Specification Table

PART NUMBER	PA35-H	PA35-T	PA64-H	PA64-T	PA100-H	PA100-T	PA150-H	PA150-T	PA200-H	PA200-T
Flange size	CF38 70mm (2.75") OD CF		CF64 114mm (4.5") OD CF		CF100 152mm (6") OD CF		CF150 203mm (8") OD CF		CF200 254mm (10") OD CF	
Flange bolt hole type	Clear M6	Tapped M6	Clear M6	Tapped M8	Clear M6	Tapped M8	Clear M6	Tapped M16	Clear M6	Tapped M16
Axial length adjustment	+/- 5mm									
Tilt	+/- 3°									
Bellows clear bore	38mm		65mm		102mm		127mm		127 - 200mm (made to order)	
Bakeout temperature	250°C									

Should your requirements fall outside our standard specifications then please contact us at:

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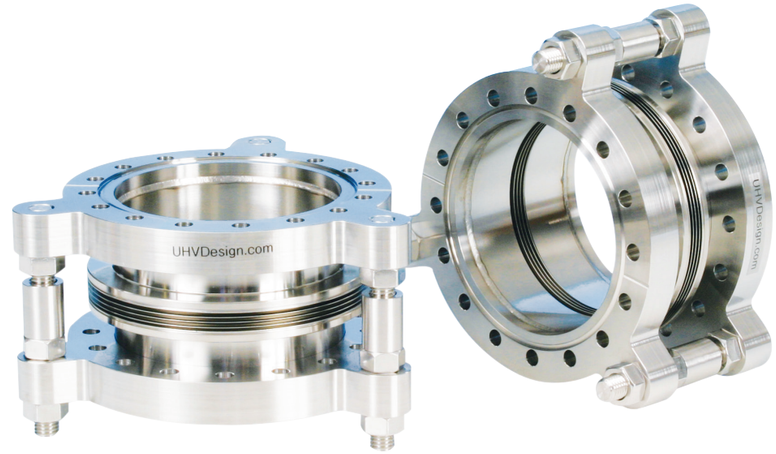
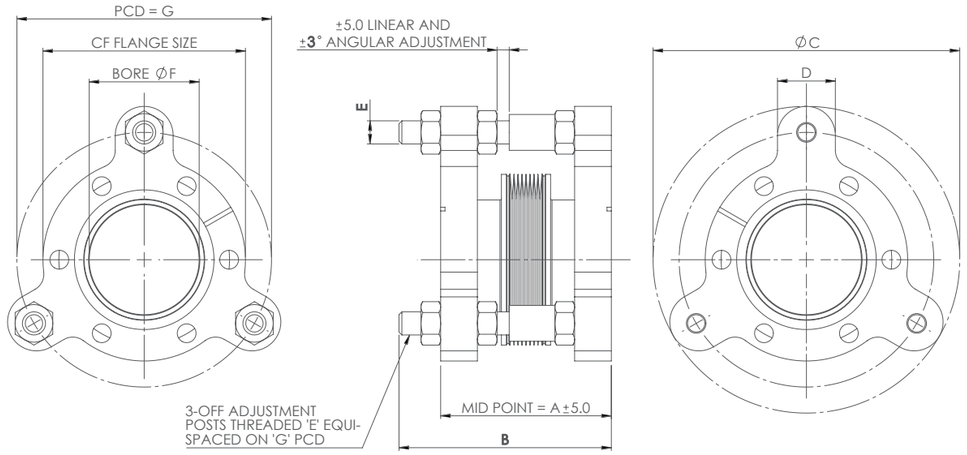


Example Dimensions

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

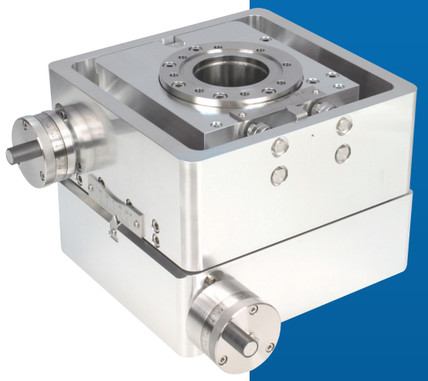


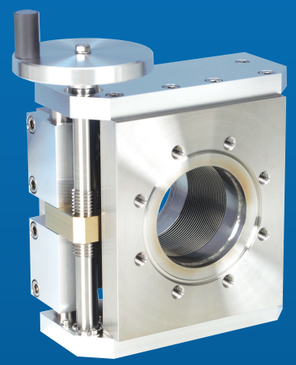
Port Aligner	A	B	C	D	E	F	G
PA35	59	73.4	106	20	M8	38	88
PA64	75	93	166	26	M12	65	140
PA100	90	108	206	26	M12	102	180
PA150	100	125	279.4	45	M16	127	238.4
PA200	100	125	329.4	44	M16	127	290

PA Part Code Generator

Series	+	Flange SIze (select one)		+	Hole Type (select one)	
PA		CF38	38		Clear holes on flanges	H
		CF64	64		Tapped holes on flanges	T
		CF100	100			
		CF150	150			
		CF200	200			

Example Configured Part Number:
PA64-H
= **PA**, CF64 flange **64**, clear holes on flanges **H**





Section 09

Y, XY AND XYZ MOTION

09

UHV Design

Y, XY and XYZ Motion

Introduction

Many vacuum applications such as sample transfer, beamline diagnostic positioning and sample positioning for analysis require precise manipulation along Y, XY or XYZ axes.

UHV Design provides a field-proven range of precise manipulators that can be used in isolation or combined with magnetically-coupled rotary drives (see Section 1) to build sophisticated manipulators with up to six axes of independent motion.

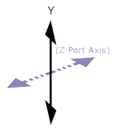
All of our manipulators benefit from kinematic design which ensures smooth, precise motion, high load capability and a minimum bellows design life of 10,000 cycles.

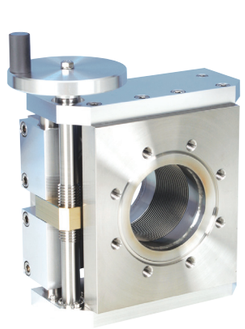
Manipulators can be configured using our modular XYZ and XYZT stages (see pages 126-133). Options include:

- Bellows support tubes
- Service collars
- Rotary drives providing up to 2 additional axes of manipulation

In addition to this modular approach we provide complete sample manipulation solutions which include sample heating, cooling and rotation (see MultiCentre section - page 134).

Y Motion Only





Y-shift Range

Precise, repeatable axial alignment along Y axis.

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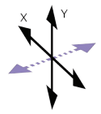
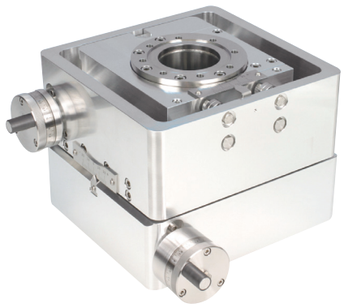
X & Y Motion



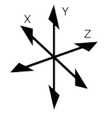


Multibase XY Stage

XY translation with a range of flange sizes, clear bores and actuation methods.

Page122

X, Y and Z motion

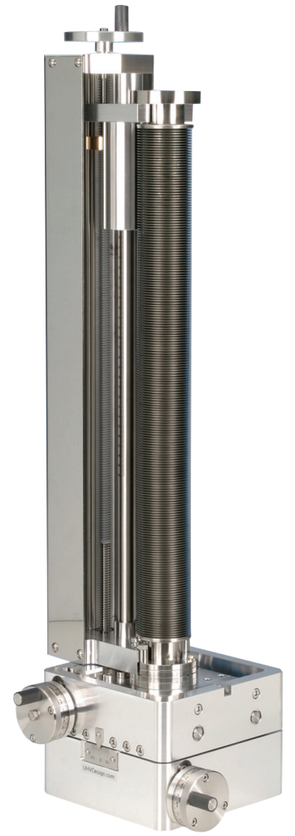


XYZT Stage

Compact stage with +/-12.5mm X&Y translation and up to 250mm Z travel. Integrated +/- 2° tilt for final alignment.

Page 126

Additional axes & configuration options on page 128

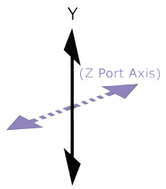


MultiStage XYZ Stage

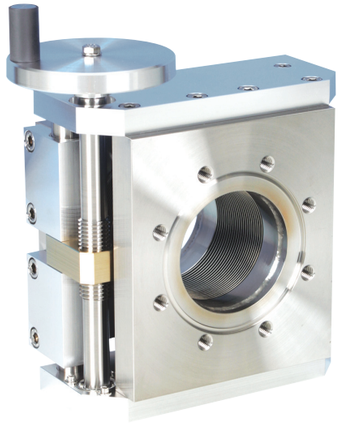
Modular stage with +/- 31mm X & Y translation and up to 1000mm of Z travel.

Page 130

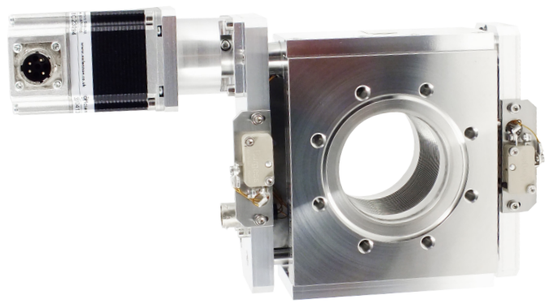
Additional axes & configuration options on page 132

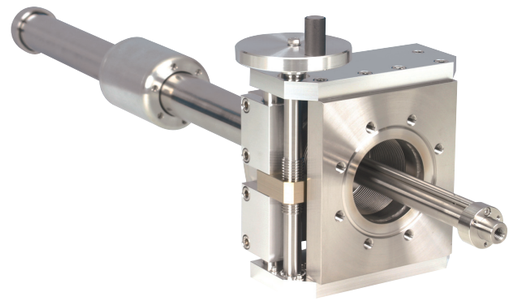


Y-shift Range



UHV Design





Accurate, repeatable alignment on the Y-axis. Typically used to lift and lower sample transfer arms for sample transfer.

Y-SHIFT KEY ADVANTAGES

- Kinematic design provides smooth, precise motion in parallel plane
- Four different fixed/travelling flange combinations
- Any-orientation mounting
- Bellows-sealed all-metal vacuum enclosure

Overview

The Y-Shifts provide accurate, repeatable axial alignment on the Y-axis, and might be used in conjunction with a sample transfer arm, such as a PowerProbe, to effect sample hand-off (see section 4). The robust, production-proven devices offer true UHV performance and are available in two sizes providing +/-7.5mm or +/-31mm Y axis adjustment, with four different fixed/travelling flange combinations.

Suitable for use in both production and R&D applications, the Y-Shifts are supplied with a range of actuation methods including manual hand wheels or stepper motors. Motorised Y-Shifts are supplied with pre-wired bakeable limit switches, terminating with a bakeable, frame-mounted connector. Plug and play motor controllers are available. For more information please see section 13.

Design Concept

The Y-Shift design includes two parallel flanges, one remaining fixed, whilst the other provides the movement. The device works by adjusting the position of the travelling flange in relation to the fixed system mounted flange. The travelling flange position is controlled through an external leadscrew and benefits from an anti-backlash mechanism.

A kinematic guide mechanism ensures smooth and precise motion. Vacuum integrity is ensured through the use of high quality 316L edge-welded bellows which have a minimum design life of 10,000 cycles. The Y-Shift's rigid construction enables large cantilevered loads to be accommodated and allows the units to be mounted in any orientation. Y-Shifts are used for a number of applications, for example in transfer system alignment to adjust a linear probe to achieve sample hand-off (see 'Sample Transfer Section' page 54).

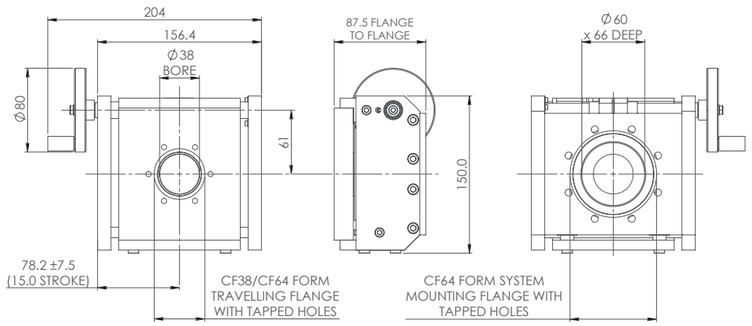
Specification Table

MODEL	LDM64/38	LDM64/64	LDM100/38	LDM100/64
Fixed flange	CF64 114mm (4.5") OD CF		CF100 152mm (6") OD CF	
Travelling flange	CF 38 70mm (2.75") OD CF	CF64 114mm (4.5") OD CF	CF 38 70mm (2.75") OD CF	CF64 114mm (4.5") OD CF
Offset	+/- 7.5mm		+/- 31mm	
Bellows bore	60mm		90mm	
Clear bore	38mm	60mm	38mm	60mm
Flange to flange	87.5mm		182mm	

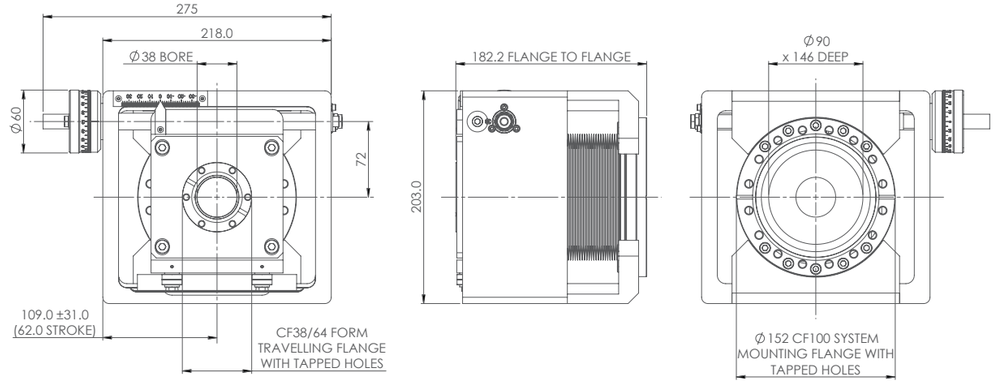
Base Drive Dimensions

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

LDM64-38-H



LDM100-38-H



LDM Series Part Code Generator

Series		Fixed Flange SIze (select one)		Travelling Flange Size (select one)		Actuation Options (select one)		
LDM	+	CF64	64	CF38	38	Manual	Manual handwheel	H
		CF100	100	CF64	64	Motor	In-line stepper motor	IS

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

Example Configured Part Number:

LDM64-64-IS

= **LSM**, CF64 fixed flange **64**, CF64 travelling flange **CF64**, with in-line stepper motor **IS**

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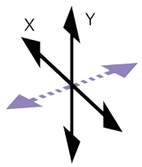
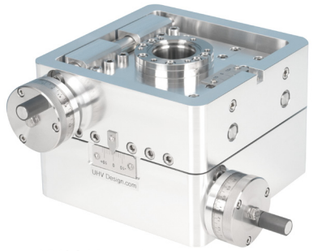
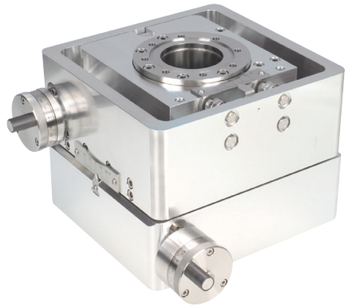




XY14 Manual



XY31 Manual

MultiBase XY Stages

Modular platforms for the manipulation of components in the X and Y planes.

Kinematic design ensures smooth and precise motion.

MULTIBASE KEY ADVANTAGES

- **Any-orientation mounting without additional supports**
- **High precision kinematic drive and guidance system – eliminates need for vulnerable cross-roller slides**
- **Rigid stops limit X/Y travel protecting the bellows**
- **Robust construction for high loads**

The MultiBase XY stage is the first choice for both research and demanding production environments due to its precise motion, true UHV performance and rugged construction which allows mounting in any-orientation.

The MultiBase design includes two parallel flanges. One remains fixed, whilst the other provides the movement. A high quality, supple, edge-welded bellows spans the flanges to accommodate the required motion while ensuring an all-metal vacuum enclosure. The device works by adjusting the position of the travelling flange in relation to the fixed system mounting flange.

Positioning of the travelling flange is controlled through two external lead-screws, each benefiting from anti-backlash systems.

A kinematic mechanism ensures smooth and precise motion. This novel mechanism incorporates a high precision drive and guidance system, removing the requirement for vulnerable cross-roller slides used by other manufacturers. Combining this with a rigid construction allows mounting in any-orientation without additional supports. Scales are fitted to each axis for resolving the position of the travelling flange on the manual version. The motorised stages are fitted with stepper motors and pre-wired limit and home switches.

Specification Table

MODEL	XY14-64-38	XY14-100-38	XY31-100-38	XY31-100-64	XY31-150-64	XY57-150-150	XY57-150-150
Travelling flange	CF38 70mm (2.75") OD with M6 straddled holes			CF64 114mm (4.5") OD with M8 straddled holes		CF150 203mm (8") OD with M8 straddled holes	
Mounting flange	114mm (4.5") OD CF64 with M8 straddled holes	CF100 152mm (6") OD with M8 straddled holes			CF150 203mm (8") OD with M8 straddled holes		
X Y travel	+/- 14mm (vector)		+/- 31mm (vector)			+/- 57mm (vector)	
X_{MAX}, Y_{MAX}	+/- 10mm		+/- 22mm			+/- 40mm	
Clear bore diameter	51mm		90mm			150mm	
Maximum Probe OD	22mm max to achieve full movement		28mm max to achieve full movement			36.5mm max to achieve full movement	
X Y resolution	Manual drive +/- 0.01mm. Stepper motor driven +/- 0.005mm					Manual drive +/- 0.01mm. Stepper motor driven +/- 0.005mm	

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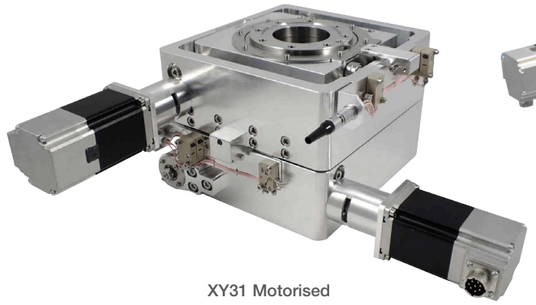
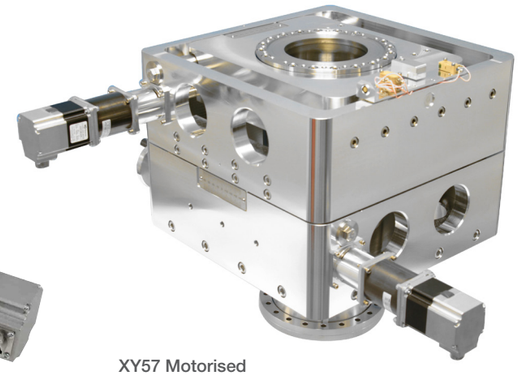


XY31 Motorised

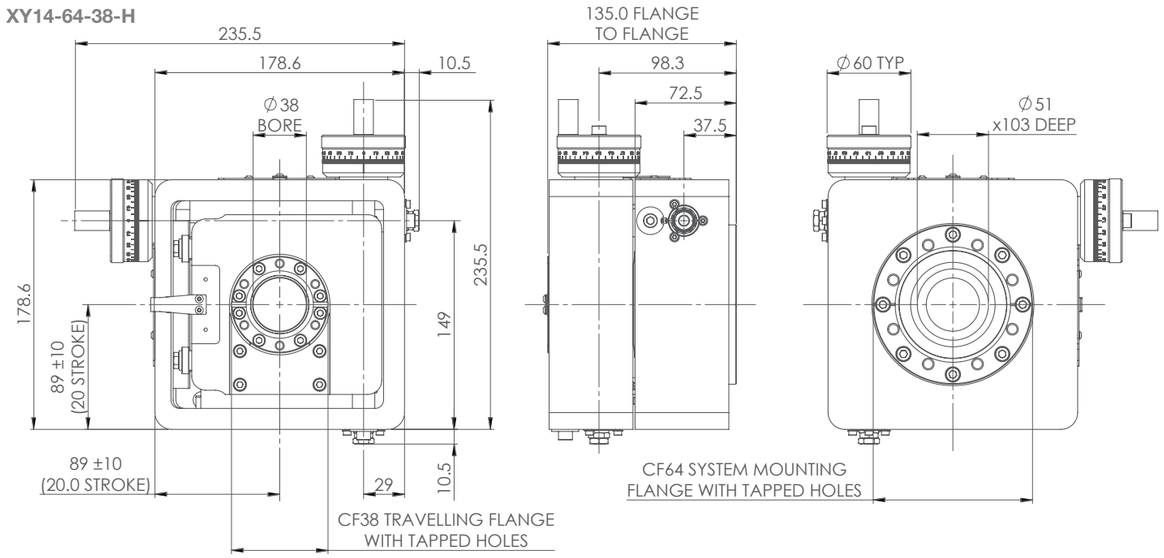


XY57 Motorised

Base Drive Dimensions

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

XY14-64-38-H



MultiBase Series Part Code Generator

Series		Fixed Flange SIze (select one)		Travelling Flange Size (select one)		Actuation Options (select one)		
XY14	+	CF64	64	CF38	38	Manual	Manual handwheel	H
		CF100	100			Motor	In-line stepper motor	IS
XY31	+	CF100	100	CF38	38	Manual	Manual handwheel	H
		CF150	150	CF64	64	Motor	In-line stepper motor	IS
XY57	+	CF150	150	CF150	150	Manual	Manual handwheel	H
						Motor	In-line stepper motor	IS

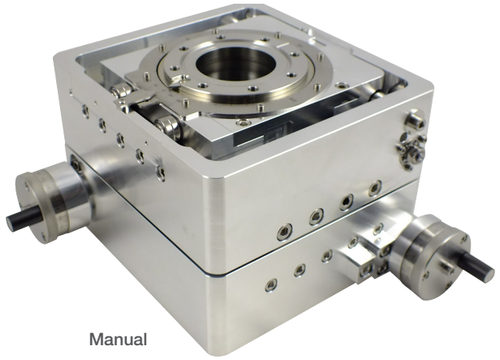
For details of 'plug & play' motor controllers please see section 13

Example Configured Part Number:

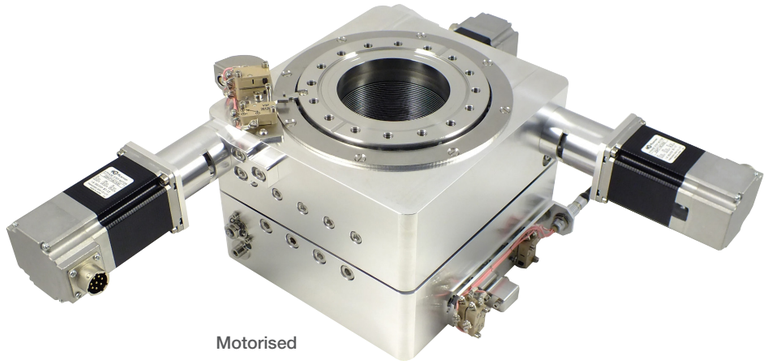
XY14-64-38-H

= **XY14**, CF64 fixed flange **64**, CF38 travelling flange **CF38**, with manual handwheel **H**

Rotatable Axis MultiBase Stage



Manual



Motorised

A unique feature for XY manipulators from UHV Design allows the X and Y axes to be rotated under vacuum enabling precise alignment with a port axis.

For use with techniques where focusing is critical, avoiding the conventional step movements required by other manufacturers of XY stages.

RAMB KEY ADVANTAGES

- **Alignment of X & Y axis with any port/beam under vacuum**
- **Allows precise movement of sample along port axis then orthogonal movement for scanning without loss of focus**
- **No need for sliding seal or differentially pumped rotary housing**

The Rotatable Axis MultiBase XY manipulator enables the X and Y axes to be rotated about the axis of the manipulator, whilst under vacuum, such that they can be aligned precisely with a particular port axis on a chamber. This is a unique feature for XY manipulators, developed by UHV Design.

The feature is particularly useful when using techniques where focusing is absolutely critical, and the user wants to move the sample along the axis of a gun or lens, mounted on ports which are not precisely aligned with the manipulator port axis.

Using the Rotatable Axis MultiBase, the sample can be precisely moved along the axis of any port until optimum focusing is achieved. It can then be moved orthogonally to explore other areas of the sample, without losing focus.

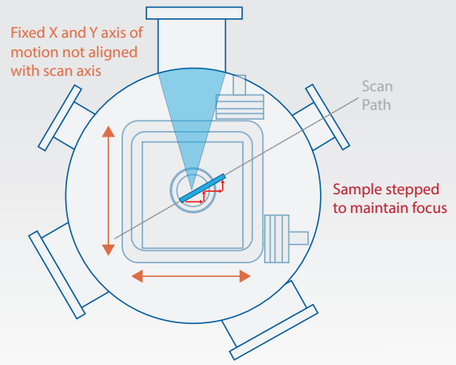
A conventional XY stage would require repeated step movements in the X and Y axes to reach a specific location, followed by further stepping motions on each axis to travel along the desired path or angle. The Rotatable Axis MultiBase removes this requirement, greatly simplifying positioning and focusing tasks. Rotation can be actuated manually or motorised.

Specification Table

MODEL	XY14-64-38	XY14-100-38	XY31-100-38	XY31-100-64	XY31-150-64
Travelling flange	CF38 70mm (2.75") OD with M6 straddled holes			CF64 114mm (4.5") OD with M8 straddled holes	
Mounting flange	CF64 114mm (4.5") OD CF with M8 straddled holes	CF100 152mm (6") OD with M8 straddled holes			CF150 203mm (8") OD CF with M8 straddled holes
X Y travel	+/- 14mm (vector)		+/- 31mm (vector)		
Xmax, Ymax	+/- 10mm		+/- 22mm		
X Y resolution	Manual drive +/- 0.01mm. Stepper motor driven +/- 0.005mm (based upon 400 half-steps per revolution)				
Rotational resolution	Stepper motor driven +/-0.006° per ½ step				
Probe OD	22mm max to achieve full movement		28mm max to achieve full movement		
Actuation	Manual via combined micrometer handwheel and linear scale. Motorised units are stepper motor driven				

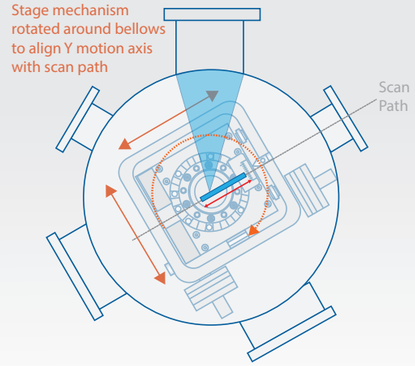
Eucentricity Explained

Traditional XY Stage



The orientation of X & Y axes on traditional XY stages are fixed. As such they require stepping movements to maintain beam alignment, focus and scan.

Rotatable Axis MultiBase



Using the Rotatable Axis MultiBase, the sample can be aligned with the beam port. It can then be precisely moved along the port axis until optimum focusing is achieved. The sample can then be moved orthogonally to explore other areas of the sample, without losing focus.

Rotatable Axis MultiBase Series Part Code Generator

Series	Fixed Flange SIze (select one)		Travelling Flange Size (select one)		XY Actuation Options (select one)		MultiBase Rotation Actuation Options (select one)	
XY14	CF64	64	CF38	38	Manual handwheel	H	Manual handwheel	RH
	CF100	100			In-line stepper motor	IS	In-line stepper motor	RS
XY31	CF100	100	CF38	38	Manual handwheel	H	Manual handwheel	RH
	CF150	150	CF64	64	In-line stepper motor	IS	In-line stepper motor	RS

Example Configured Part Number:

XY31-100-64-H-RH

= **XY31**, CF100 fixed flange **100**, CF64 travelling flange **CF64**, with manual handwheel for XY motion **H** and manual handwheel for MultiBase motion **RH**

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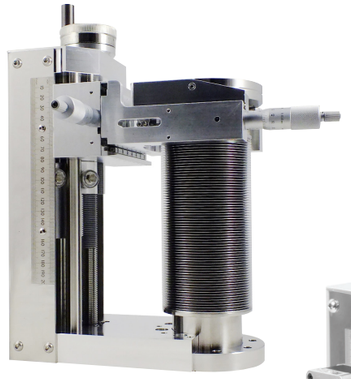


Manual XYZT

Motorised XYZT

XYZT MultiMotion

A compact, single bellows, high precision XYZ manipulator with integral +/- 2° tilt, typically used for:

- Analytical instrumentation for surface analysis equipment
- Synchrotron end-stations

XYZT KEY ADVANTAGES

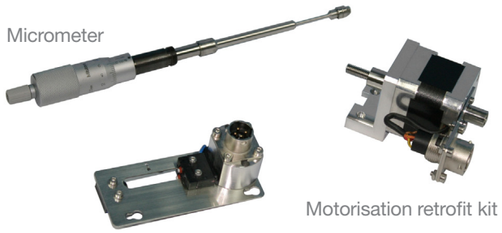
- **» High stability, precision stages**
- **» X, Y and Z translations with +/-2° tilt**
- **» Compact footprint, ideal when space is at a premium**
- **» Simple to upgrade manual to motorised actuation**

For space restricted applications, the combination XYZT MultiMotion series manipulator is ideally designed and priced. Its rugged construction and smaller platform is ideal for surface science chambers where space is at a premium. The use of micrometer actuation provides for accurate, precise adjustment of sample position whilst a built in +/- 2 degrees tilt of the traveling flange assists with alignment issues and overall makes the MultiMotion stage a very attractive solution for many applications.

Z-motion is provided by a precision lead screw and calibrated handwheel, each increment corresponding to 0.01mm of motion.

The drive is kinematic in design and provides smooth motion over extended travels.

X & Y motion is provided by precision micrometer drives having a 0.001mm resolution capability. Tilt is achieved via opposed jack screws. Manual stages can be upgraded to full motorisation by simply removing the micrometers and following the instructions provided with the motorisation retrofit kit.



Motorisation retrofit kit

Specification Table

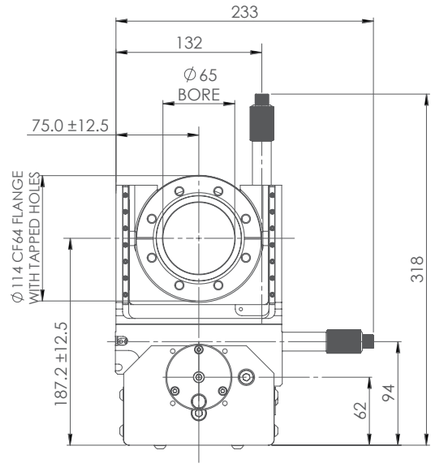
XYZT Model	XYZT64		
Travelling flange	CF64 114mm (4.5") OD with M8 straddled holes		
Mounting flange	CF64 114mm (4.5") OD with 8.4mm clear holes		
XY travel	+/-12.5mm	XY resolution	Manual drive 0.001mm, Stepping motor 0.0025mm per half step
Z travel	50, 100, 150, and 250mm	Z resolution	Manual drive +/- 0.01mm engraved scale, stepping motor +/- 0.001mm
Flange tilt	+/-2 degrees		
Clear bore diameter	65mm		
Bakeout temperature	240°C with motors removed		
Max probe diameter	29.5mm is maximum while retaining full XY capability		

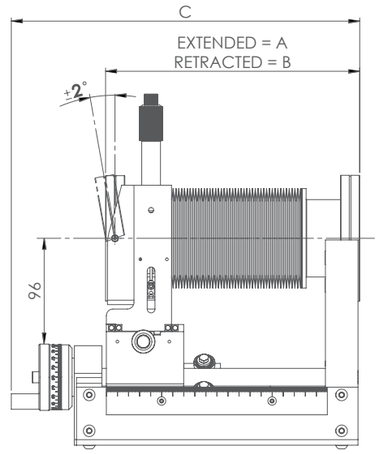
Should your requirements fall outside our standard specifications then please contact us at:

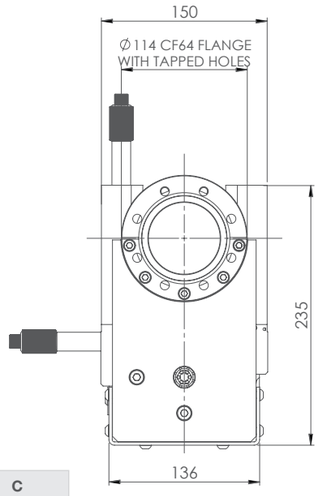
UHV Design

Base Dimensions

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







Stroke (mm)	A	B	C
50	230	180	315
100	280	180	365
150	337	187	422
200	391	191	476
250	448	198	553

XYZTSeries Part Code Generator

Series		Fixed Flange Size (select one)		Stroke (select one)		Actuation Options (select one)		
XYZT	+	CF64	64	50mm	50	Manual	Manual handwheel	H
		CF100	100	100mm	100	Motorised	In-line stepper motor - X, Y & Z	S
				150mm	150		In-line stepper motor - Z only	ZS
				200mm	200		In-line stepper motor - X only	XS
				250mm	250		In-line stepper motor - Y only	YS
							In-line stepper motor - X & Y only	XYS
							In-line stepper motor - X & Z only	XZS
							In-line stepper motor - Y & Z only	YZS

Additional axes & configuration options on page 128

For complete analytical stages - see Section 10

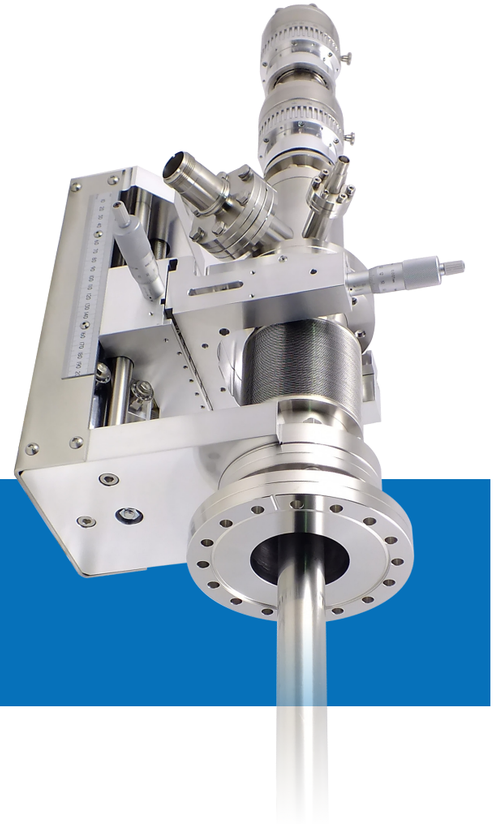
Example Configured Part Number:

XYZT64-100-H

= **XYZT**, CF64 fixed flange **64**, 100mm Z shift **100** with manual handwheel **H**

UHV Design

How to customise the XYZT



The design of the XYZT allows additional modules such as primary (R1) and secondary (R2) rotation to be selected. Simply select the required modules from the table opposite and contact us for more details.

Secondary Rotation (R2)

Magnetically-coupled MD16 MagiDrive providing secondary rotation of an inner shaft.

Primary Rotation (R1)

Magnetically-coupled MD35LB hollow MagiDrive providing primary rotation of the main (outer) shaft.

Shaft(s)

Custom insertion lengths available for R1 and R2.

Extended bearing housing supplied to minimise radial run-out.

Service Collar

With feedthrough options for:

- power: 2 pins 16A 700V per pin (MS style connector)
- bias: 5kV 3A (MHV connector)
- thermocouple (Type K or Type N)
- LN2 cooling assembly: 1.98mm ID tubes terminating with copper block

Z travel

Choose from 50, 100, 150, and 250mm strokes.

XYZT Customisation Request Form

Name: .....

Company: .....

Email Address: .....

Phone Number: .....

Module	Options	Enter Selection
Mounting flange	CF64	CF64
Travelling flange	CF64	CF64
Z travel	50, 100, 150 or 250mm	
Z actuation	Manual or Motorised	
1mm increment scale required?	Yes or No	
X actuation	Manual or Motorised	
Y actuation	Manual or Motorised	
Shaft required?	Yes (specify insertion length) or No	
Primary rotation (R1) required?	Yes or No	
Primary rotation actuation	Manual or Motorised	
R1 insertion length (dimension A)	length in mm	
Secondary rotation (R2) required?	Yes or No	
Secondary rotation actuation	Manual or Motorised	
R2 insertion length (dimension B)	length in mm	
Service collar (4 available ports)	Yes or No	
Power	Number of feedthroughs	
Bias	Number of feedthroughs	
Thermocouple	Number of feedthroughs (specify type K or type N)	
LN2	Number of feedthroughs	

For an electronic version of this form or if you need any help completing the form please contact sales@uhvdesign.com

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MultiStage XYZ Stages

Manual

Ultra-stable dual bellows stages providing smooth, precise motion with up to +/-31mm X & Y travel and up to 1000mm in Z travel.

Can be mounted in any-orientation.

XYZ KEY ADVANTAGES

- **25mm-1000mm Z motion in combination with XY**
- **Mounting in any-orientation without additional supports**
- **Smooth, precise kinematic motion**
- **Robust construction for high loads**
- **True UHV performance**

MultiStage manipulators provide precise motion along the X, Y and Z axes. Their robust construction provides a stable platform, enabling mounting in any-orientation.

The range is modular utilising the MultiBase XY stages to provide two generic platforms offering +/-14mm or +/-31mm of motion (vector sum of X & Y). Various Linear Shift Mechanisms can then be fitted to these platforms to provide between 100mm (4") and 1000mm (39") Z stroke. The kinematic motion provided results in smooth and reliable motion.

MultiStage manipulators are offered with manual or motorised actuation. Manual XY actuation is delivered via a combined micrometer handwheel and linear scale assembly. Manual Z motion can be fitted with a 1mm increment scale.

DC and stepper motor driven solutions are also available, along with 'plug and play' motion control systems (see Section 13).

Specification Table

MODEL	XY14-64-38	XY14-100-38	XY31-100-38	XY31-100-64	XY31-150-64
Travelling flange	CF38 70mm (2.75") OD with M6 straddled holes			CF64 114mm (4.5") OD with M8 straddled holes	
Mounting flange	CF64 114mm (4.5") OD with M8 straddled holes	CF100 152mm (6") OD with M8 straddled holes			CF150 203mm (8") OD with M8 straddled holes
X Y travel	+/- 10mm (+/- 14mm vector)		+/- 22mm (+/- 31mm vector)		
X Y resolution	Manual drive +/- 0.01mm. Stepper motor driven +/- 0.005mm (based upon 400 half-steps per revolution).				
Z travel	Z shifts are available with following strokes as standard: 100, 200, 400, 600, 800 and 1000mm.				
Z resolution (manual)	Manual drive +/- 0.5mm with engraved shaft, with digital linear scale 0.01mm				
Z resolution per ½ step (motorised)	100 & 200mm Z travel - +/- 0.000254mm 400 & 600mm Z travel - +/- 0.000508mm			100 & 200mm Z travel - +/- 0.000127mm 300 to 1000mm Z travel - +/- 0.000635mm	

MultiStage Part Code Generator

Model (select one)		+	XY Actuation Options (select one)		+	Z Travel (select one)		+	Z Actuation (select one)	
XY14-64-38			Manual handwheel	H		100mm	Z-100		Manual handwheel	H
XY14-100-38			Stepper motor	S		200mm	Z-200		In-line stepper motor	SS
						400mm	Z-400			
						600mm	Z-600			

Model (select one)		+	XY Actuation Options (select one)		+	Z Travel (select one)		+	Z Actuation (select one)	
XY31-100-38			Manual handwheel	H		100mm	Z-100		Manual handwheel	H
XY31-100-64			Stepper motor	S		200mm	Z-200		Side-mounted stepper motor	SS
XY31-150-38						400mm	Z-400			
						600mm	Z-600			
						800mm	Z-800			
						1000mm	Z-1000			

Additional axes & configuration options on page 132

For complete analytical stages - see Section 10

Example Configured Part Number:

XY31-100-64-H-Z-400-H

= **XY31**, CF100 fixed flange **100**, CF64 travelling flange **CF64**, with manual handwheel for XY motion **H,** 400mm of Z travel **Z400** and manual Z actuation **H**

Six Axes Motion

Combining the MultiStage with UHV Design's MagiDrive rotary feedthroughs allows transmission of rotary motion through the centre. In addition, the hollow MagiDrive allows services, for example heating and cooling apparatus, to be passed through the centre.

The hollow configuration enables stacking of MagiDrives to provide further independent axes of rotation. In this way, the three axes of motion already provided by the MultiStage can be supplemented with up to three more.

Rotatable Axis MultiBase Manipulator

The MultiStage manipulator can also be provided with the 'Rotatable Axis MultiBase' (detailed information on page 124). This unique XY stage enables the X and Y axes to be rotated about the axis of the manipulator such that they can be aligned precisely with a particular chamber port axis or incoming beam. This facility is ideal to focus a sample along a beam and then scan across it without the need to step in each axis.

Should your requirements fall outside our standard specifications then please contact us at:

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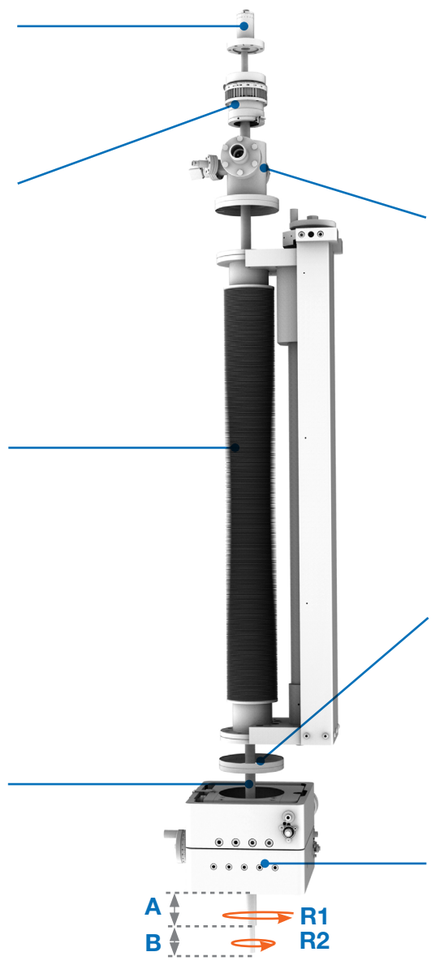
How to customise the MultiStage

Instructions:

Select additional modular options to configure the XYZT.
Use the form opposite to select the options.



Secondary Rotation (R2)

Magnetically-coupled MD16 MagiDrive providing secondary rotation of an inner shaft.

Primary Rotation (R1)

Magnetically-coupled MD35LB hollow MagiDrive providing primary rotation of the main (outer) shaft.

Z travel

Choose from 100, 200, 400, 600, 800 and 1000mm strokes.

Shaft(s)

Custom insertion lengths available for R1 and R2.

Service Collar

With feedthrough options for:

- power: 2 pins 16A 700V per pin (MS style connector)
- bias: 5kV 3A (MHV connector)
- thermocouple (Type K or Type N)
- LN2 cooling assembly: 1.98mm ID tubes terminating with copper block

Dual-point support

Design incorporates two point bearing support system for rigid shaft support, improved rotational concentricity and better vibrational stability.

Multibase XY Stage

+/-10mm and +/-22mm
X & Y travel (max)

UHV Design

MultiStage Customisation Request Form

Name: .....

Company: .....

Email Address: .....

Phone Number: .....

Module	Options	Enter Selection
Mounting flange	CF64	CF64
Travelling flange	CF64	CF64
Z travel	100, 200, 400, 600, 800 or 1000mm	
Z actuation	Manual or Motorised	
1mm increment scale required?	Yes or No	
X actuation	Manual or Motorised	
Y actuation	Manual or Motorised	
Shaft required?	Yes (specify insertion length) or No	
Primary rotation (R1) required?	Yes or No	
Primary rotation actuation	Manual or Motorised	
R1 insertion length (dimension A)	length in mm	
Secondary rotation (R2) required?	Yes or No	
Secondary rotation actuation	Manual or Motorised	
R2 insertion length (dimension B)	length in mm	
Service collar (4 available ports)	Yes or No	
Power	Number of feedthroughs	
Bias	Number of feedthroughs	
Thermocouple	Number of feedthroughs (specify type K or type N)	
LN2	Number of feedthroughs	

For an electronic version of this form or if you need any help completing the form please contact sales@uhvdesign.com

Section 10

ANALYTICAL STAGES

10

UHV Design

MultiCentre Analytical Stages

Configurable analytical stages offering up to 5 axes of motion and options for sample biasing, heating to 1200°C and cooling to <30K. MultiCentres can be configured to accept most common surface analysis sample holders including pucks, flags and ESCA stubs.

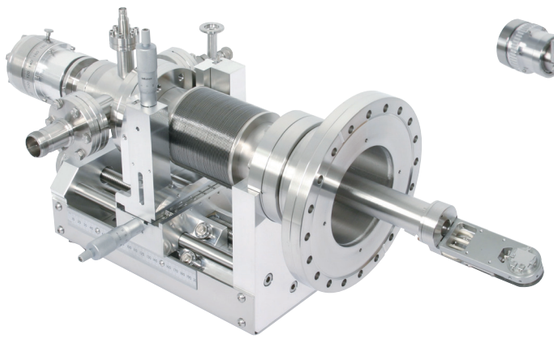
The MultiCentre and associated accessories provide a complete solution for sample transfer and manipulation. Typical applications include analytical instrumentation for surface analysis equipment and synchrotron end stations.

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 and precision.

Each series offers a full range of options including 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 LN2 and heating to 1200°C.

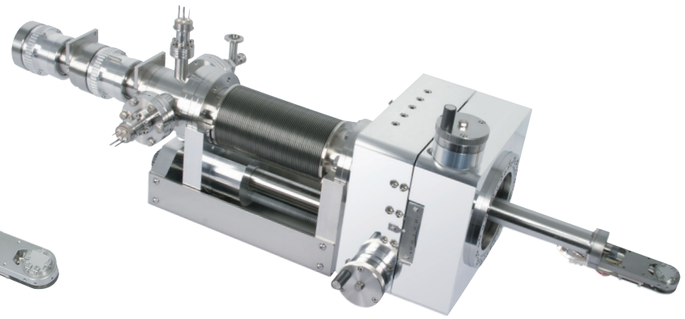
MULTICENTRE KEY ADVANTAGES

- **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 <30K (with LN2 precooling to reduce LHe consumption and costs)**
- **Unique ability to provide continuous azimuthal rotation and LN2 cooling**
- **Flag, puck and ESCA sample compatible stages**



XL-T Series

Compact stages (see page 142)



XL-R Series

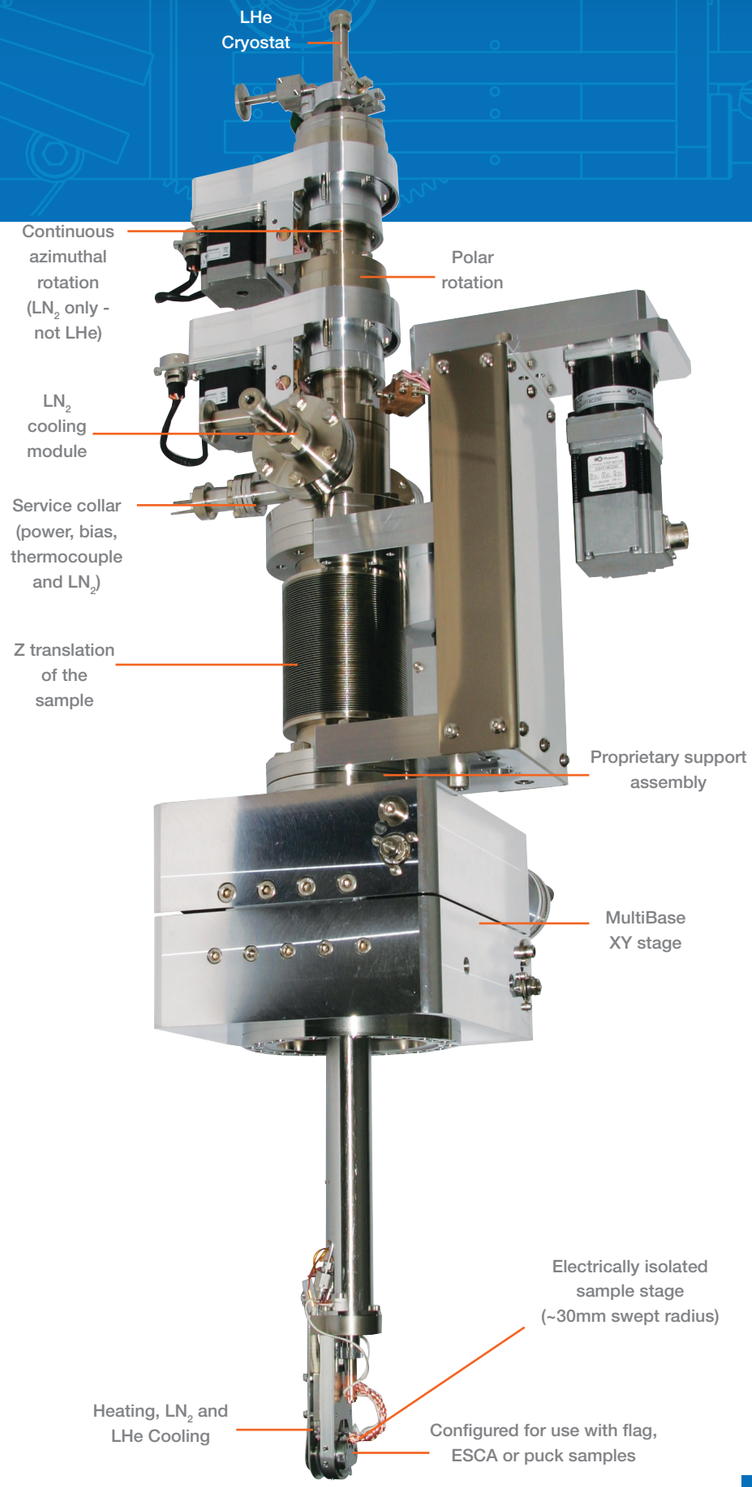
High stability, precision stages (see page 144)

Future-proofed modular design

The innovative MultiCentre range can be configured to match your application requirements (see page 138). 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 as shown on page 143.

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.



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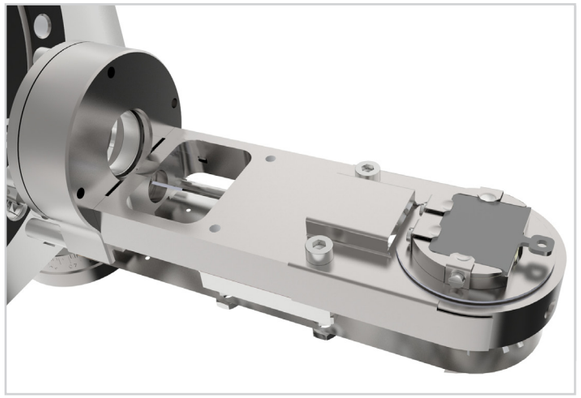
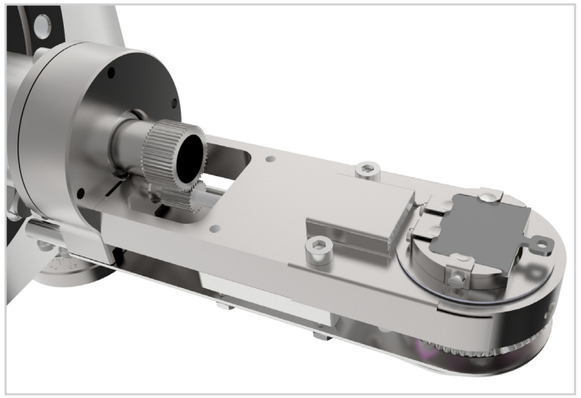
MultiCentre configuration

4-Axis



5-Axis



Heater Module

Resistive Heating to 900°C
Robust self-supporting Ta foil heater, for minimum outgassing and large ratio of heated to open surface area ensuring heater longevity. The filament is also Yttria coated to provide additional robustness in oxidising atmospheres and for protection in the event of an accidental vent. Note: heating limited to 600°C with LHe option.

E-beam Heating to 1200°C
For higher temperature requirements the e-beam heating option achieves sample temperatures up to 1200°C. To upgrade to e-beam heating simply requires a change of power supply unit.

Cooling Options

LN2 Cooling to <-150°C
Innovative LN_2 cooling module provides sample cooling down to <-150°C with continuous azimuthal rotation and temperature measurement. Typically the LN_2 cooling can achieve sample temperatures to <-170°C.

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 <30K
Based on UHV Design's own continuous flow cryostat, cryogenic temperatures below 30K can be achieved in less than one hour.

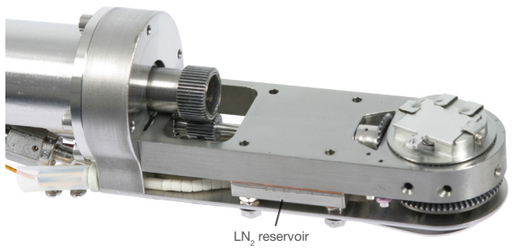
Example Configurations

4-Axis Heat & LN_2 cooling

Heating to 1200°C with cooling to <-150°C (123K)

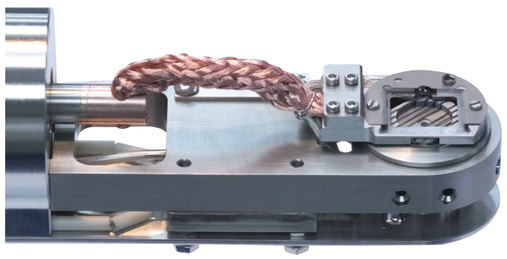
5-Axis Heat & LN_2 cooling

Heating to 1200°C with cooling to <-150°C (123K)



5-Axis Heat & LHe cooling

Heating to 600°C with cooling to <-243°C (<30K)



Configure to suit your application

The modular XL-T and XL-R series of MultiCentres can be configured to meet your requirements.

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.

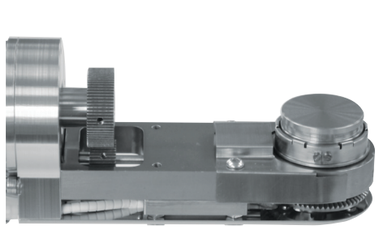
If sample cooling is required, LN2 cooling to <-150°C and LHe to <30K options can be included.

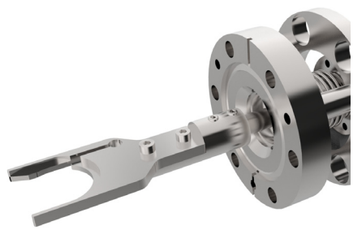
Page 143 outlines further stage options and a range of sample transfer techniques and products.

Sample Handling

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 wobble sticks (Section 5) or PowerProbes (Section 4).

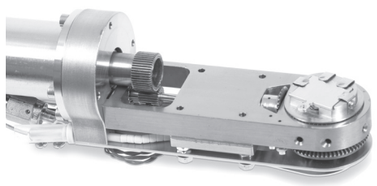
Puck-Style

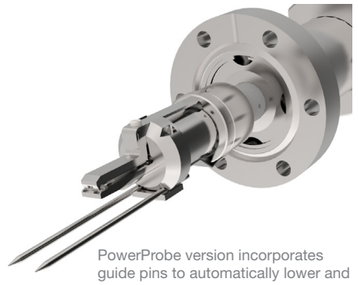




Puck-style gripper available with Wobblestick (Section 5) or PowerProbe (Section 4)

Flag-Style



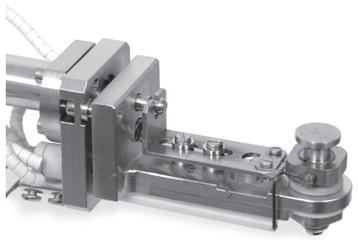


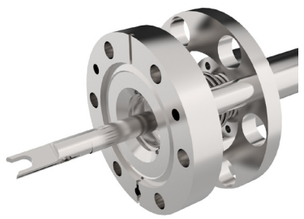
PowerProbe version incorporates guide pins to automatically lower and raise thermocouple during transfer.

Flag-style gripper available with Wobblestick (Section 5) or PP PowerProbe (Section 4).

For Wobblestick sample transfer there is an option to include a toggle switch (b) 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).

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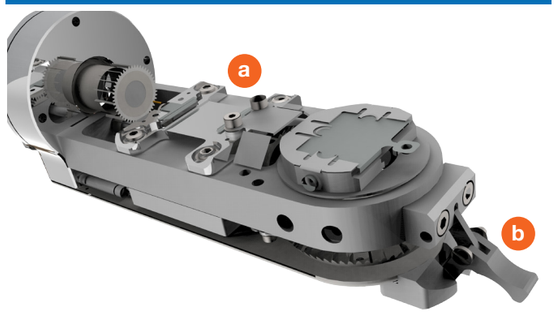
Additional Stage Options

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

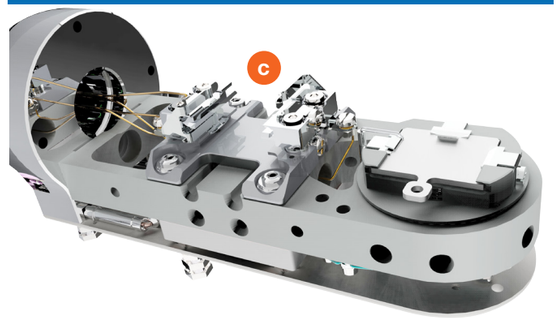


5-axis flag-style heat / cool stage with the following additional features:

(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

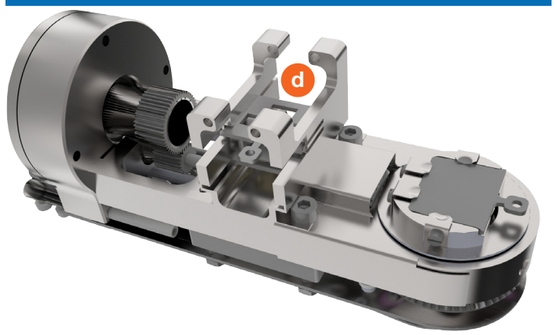
Two level parking positions for 4-axis stage



4-axis flag-style heat / cool stage with a 2 level parking stage (c), both electrically floating and coolable into which can be loaded from either side:

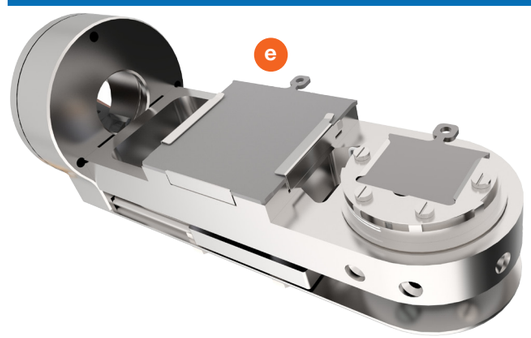
- 2 standard flag samples, or
- two direct current heating flag samples, or
- a mixture thereof
- a special flag-style sample plate with a QMB (Quartz Micro-balance) FTM (Film Thickness Monitor) mounted on it, or
- a special flag-style sample plate with an e-beam heater module which when loaded into the lower position can be used to heat a standard flag-style sample in the upper level to 1200°C

Flag mounted STM tip holder parking stage for 5-axis stage

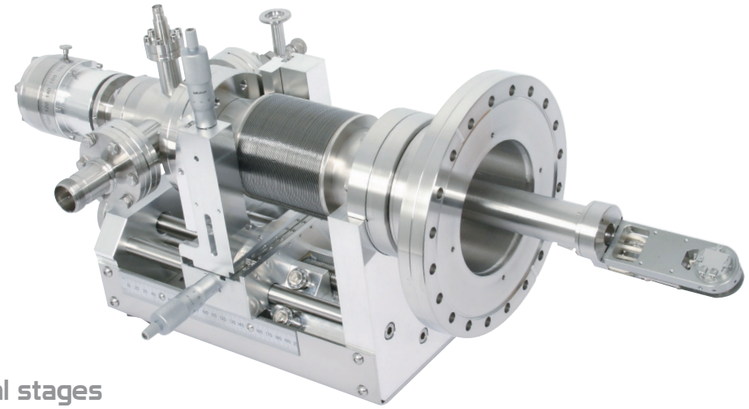


5-axis flag-style heat / cool stage showing a custom parking position for the conditioning of flag mounted STM tips (d)

Large flag-style parking position for 4-axis stage



4-axis flag-style heat / cool stage - showing an additional parking position for a large (30x30mm) flag-style sample plate (e), which is also electrically isolated for biasing and sample current measurement, and can be cooled



XL-T Series

Single bellows, compact analytical stages

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 XYZT MultiMotion series manipulator, its rugged construction and smaller platform is ideal for surface science chambers where space is at a premium.

XL-T KEY ADVANTAGES

- Single bellows 3, 4 or 5 axes
- +/- 12.5 XY Motion
- 50-250mm Z Motion
- Puck, Flag or ESCA sample handling
- E-beam heating, LN2 cooling plus biasing options
- Continuous azimuthal rotation & LN2 cooling

The large 65mm ID 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.

MODEL	Puck-Style	Flag-Style	ESCA Stub
Mounting flange	CF64 114mm (4.5") OD CF or CF100 152mm (6") OD CF		
X-Y travel	+/- 12.5mm		
Z travel	50, 100, 150 and 250mm		
Polar rotation	+/- 180°		
Azimuthal rotation	Continuous with LN_2 cooling		N/A
Maximum sample size	25mm diameter	15mm x 18mm	14mm diameter
Resistive heating	> 900°C	> 900°C	> 900°C
e-beam heating	> 1200°C	> 1200°C	N/A
LN_2 cooling	< -150°C (<-170°C typically achievable) (< -150°C with continuous azimuthal rotation)		< -140°C
Sample current measurement	Isolation > +/- 1000 V Resistance > 500 MOhm		

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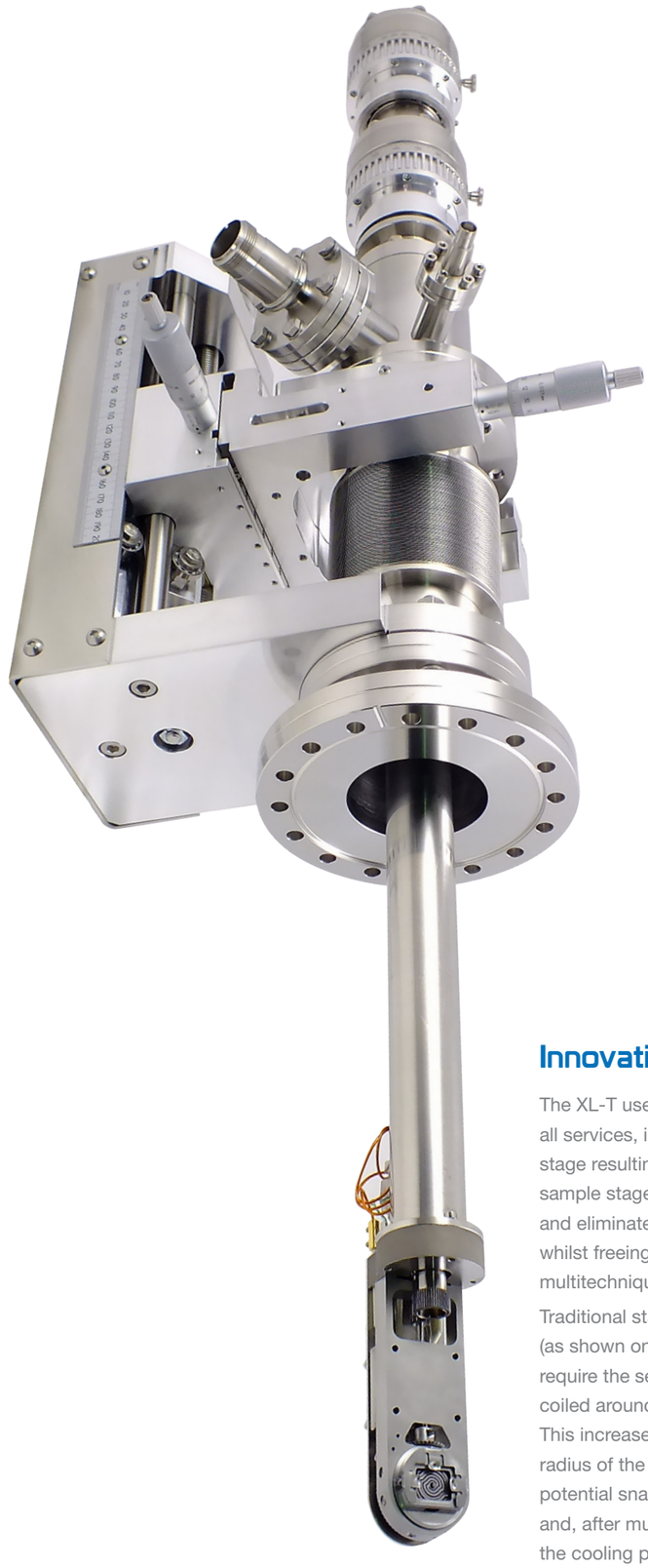
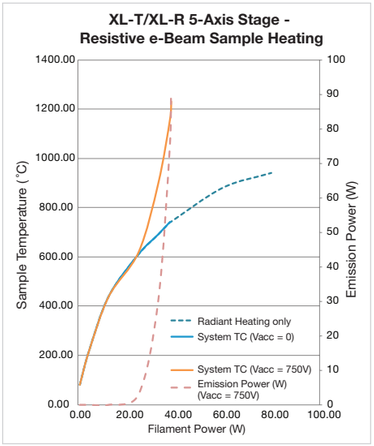
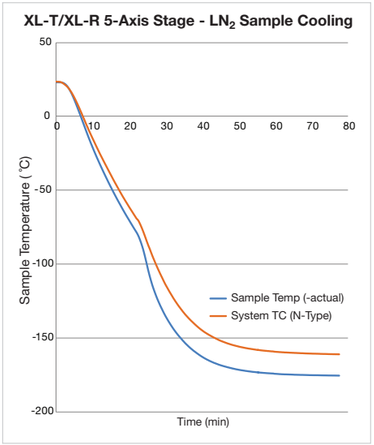


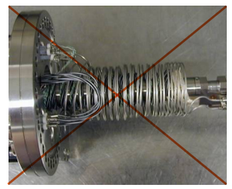




Innovative uncluttered stage

The XL-T uses the large 65mm ID 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.



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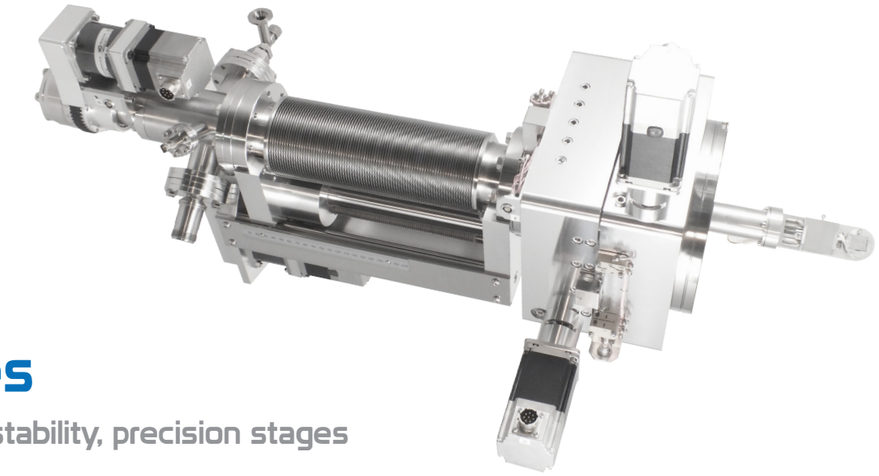

XL-R Series

Dual bellows, high stability, precision stages

The XL-R series is a truly modular dual bellows stage. Based on the proven design of the MultiStage series of manipulators, a full range of XY and Z stage modules are available which are interchangeable, resulting in complete flexibility.

XL-R KEY ADVANTAGES

- **Dual bellows with 3, 4 or 5 axes**
- **Up to +/- 40mm XY Motion**
- **Dual-point support for ultimate stability**
- **100-1000mm Z Motion**
- **Puck, Flag or ESCA sample handling**
- **E-beam heating, LN2 cooling plus biasing options**

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.

MODEL	Puck-Style	Flag-Style	ESCA Stub
Mounting flange	CF100 152mm (6") OD CF / CF150 203mm (8") OD CF		
X-Y travel	+/- 19mm or +/- 40mm		
Z travel	100, 200, 300, 400, 600, 800 and 1000mm		
Polar rotation	+/- 180° (+/- 100° with LHe option)		
Azimuthal rotation	Continuous with LN_2 cooling (+/- 100° with LHe cooling)		N/A
Maximum sample size	25mm diameter	15mm x 18mm	14mm diameter
Resistive heating	> 900°C	> 900°C (600°C with LHe option)	> 900°C
e-beam heating	> 1200°C	> 1200°C (Not available with LHe option)	N/A
LN_2 cooling	< -150°C (<-170°C typically achieved)		< -140°C
LHe cooling	Not available	<30K	N/A
Sample current measurement	Isolation > +/- 1000 V Resistance > 500 MOhm.		

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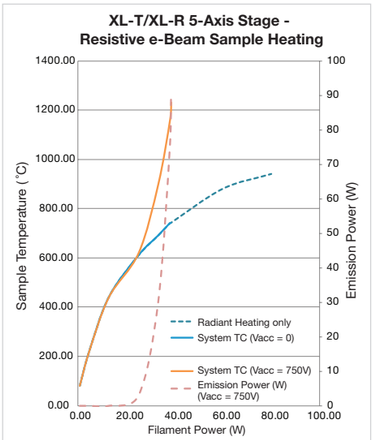

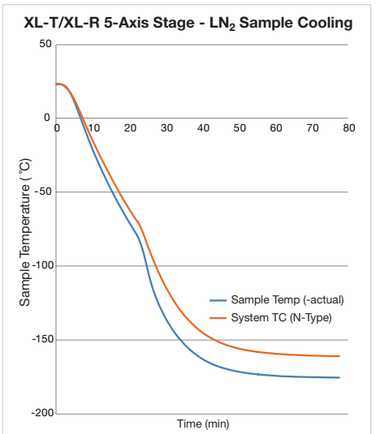

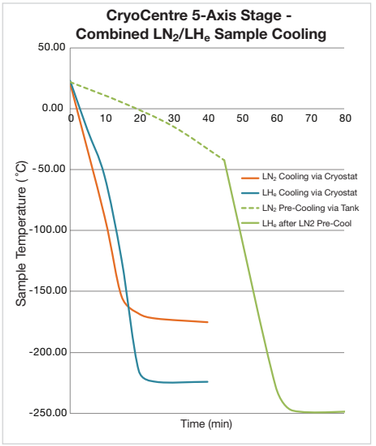

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Additional options

MultiCentre radiative heating power supply

Universal voltage 90-240 V power supply with integrated Eurotherm temperature control for optimal control of sample temperature using resistive heating. Key features include:

- Compact 2 U rack mount
- Uses industry-standard Eurotherm temperature controller (32h8)
- Suitable for K, E & N type thermocouples
- Manual or automatic (PID) control
- Remote sense functionality of heater current & voltage

See section 14 for more details.

MultiCentre heater power supply

MultiCentre radiative with e-beam heating power supply

Universal voltage 90-240 V power supply providing regulated filament power, and the ability to 'float' either the filament (cathode) negative, or the sample (anode) to achieve high temperature electron beam heating of samples. Key features include:

- Radiant and e-Beam Heating, highly efficient 1500W 3U unit
- Wide range of temperature sensors, thermocouples
- Wide measurement range (1.4-2470K) with manual or PID control of temperature or ramp rate
- Remote control by RS232, Bluetooth and Ethernet – Web enabled
- Comprehensive, intuitive touch screen GUI

Contact us for more details.

35L LN_2 Dewar

LN_2 dewar

Strong, lightweight LN_2 storage dewars available in 5L, 10L , 15L, 25L and 35L capacity.
Contact us for details.

LN_2 transfer line

Low thermal mass LN_2 transfer line designed specifically for the MultiCentre range to minimise stage cooling times at low LN_2 flow rates. Key features include

- 5m inlet line to connect to dry LN_2 supply line
- Pressure gauge with 2 safety pressure valves, inlet pressure regulator to control flow
- Insulated low thermal mass cryogen transfer line with coupling to fit MulitCentre stage

Contact us for details.

LN_2 Dewar transfer line

Multi-axis Stepper Motor Controller

Multi-axis stepper motor controller to provide ultra smooth, high resolution motion. Key features include:

- Control of up to 6 –axes from a single compact 3U rack mount box
- Ergonomic user friendly control panel for control of all axes with
  - o Joy stick & track ball control of motions with Keypad control
    - To store / recall up to 255 multi-axis positions
    - Jump between relative and absolute
    - Lock an axis / axes
    - Backlash correction, speed and limit settings
    - And numerous other functions
- RS232 control of all functionality when connected to a PC data system

Contact us for details.

Multi-axis Stepper Motor Controller

UHV Design

MultiCentre Quick Quote Request Form

Instructions

Photocopy/scan the form below and fill in your requirements. When complete, please email to sales@uhvdesign.com or fax to +44(0)1323 811999.

If you prefer an electronic copy or need help in completing this form please contact sales@uhvdesign.com or call your nearest UHV representative (full list on back cover of this catalogue).

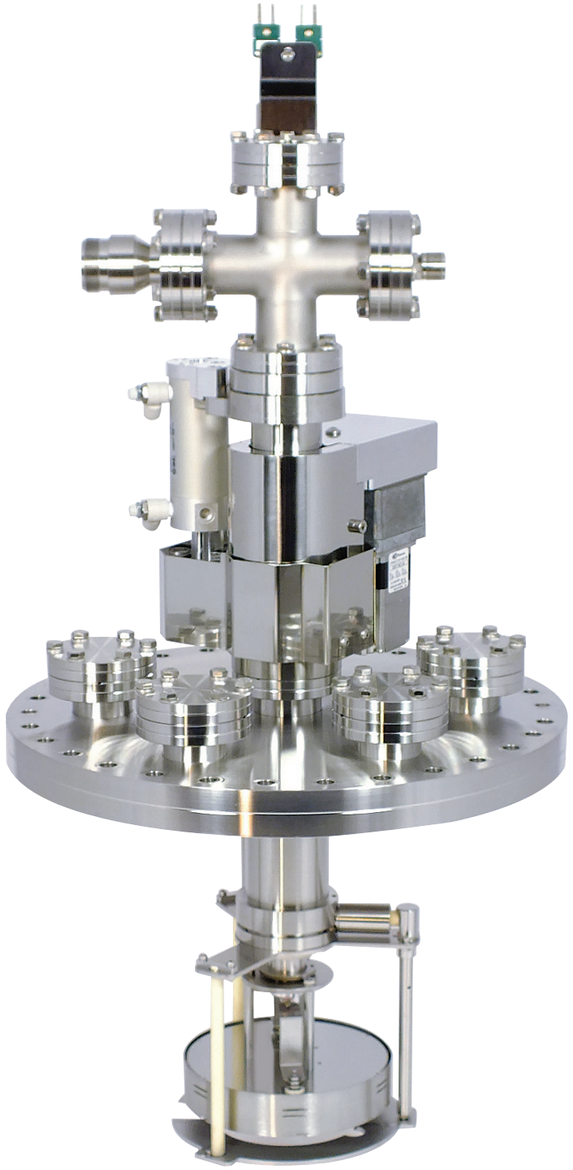
Name: .....

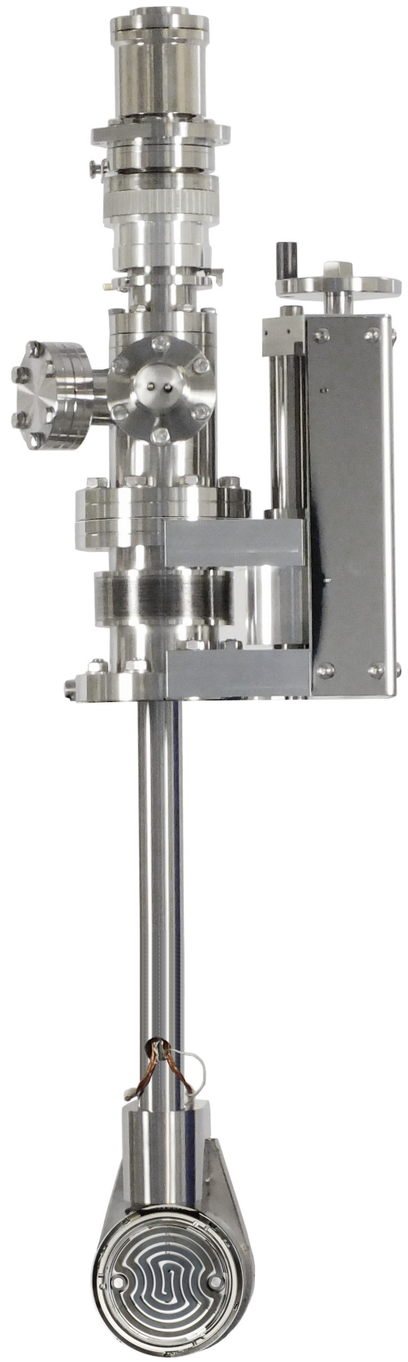
Company: .....

Email Address: .....

Phone Number: .....

	Write answers below
What is the application?	
What are the sample materials?	
What is the maximum sample size?	
Flag, Puck, ESCA or other?	
Will the sample be mounted normal or parallel to the mounting flange?	
How will the stage be mounted? Vertical (on top of the chamber) Horizontal (on side of chamber) Vertical (underneath chamber)	
What will the base pressure of the chamber be?	
What maximum temperature do you wish to heat the sample to?	
For how long will the sample be heated at this maximum temperature?	
Do you need sample cooling? If so, to what temperature?	
What is the maximum X motion you require?	
What is the maximum Y motion you require?	
What is the maximum Z motion you require?	
Do you require polar rotation?	
Do you require sample (azimuthal) rotation?	
Do you require motorisation? If so please specify on which axes.	
Do you require sample biasing?	





DEPOSITION STAGES

UHV Design

EpiCentre Deposition Stages

The EpiCentre range of deposition stages employs cutting -edge design and engineering technology to give high temperature, uniform and durable substrate heating with precise manipulation under true UHV conditions.

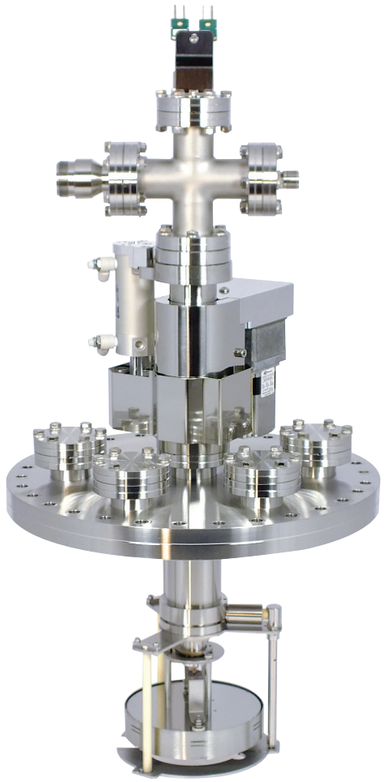
EpiCentres have been designed for deposition applications such as MBE (Molecular Beam Epitaxy), sputtering and CVD (Chemical Vapour Deposition). Substrate annealing, degassing and other high temperature material modifications can also be performed.

EpiCentres can be mounted in any-orientation to suit customer chamber designs and application configurations.

The EpiCentre range has been used by pioneering research laboratories around the world for many years. End user references are available for a variety of applications and substrate types and sizes. The range comprises four model types: EC-I, EC-R, GLAD and Preparation Stages summarised on the opposite page.

EPICENTRE KEY ADVANTAGES

- **Choice of in-line, right-angle and glancing angle configurations**
- **High uniformity substrate heating to 1200°C**
- **RF & DC substrate biasing with ultra-stable plasma**
- **Substrate rotation to 60rpm**
- **Modular design allows application specific configuration**
- **Substrate sizes up to 8"**



EC-I Series

An in-line design presenting the substrate parallel to the mounting flange. The EC-I provides substrate rotation, heating, electrical biasing, substrate transfer motion, deposition height adjustment and homing for automatic transfer.

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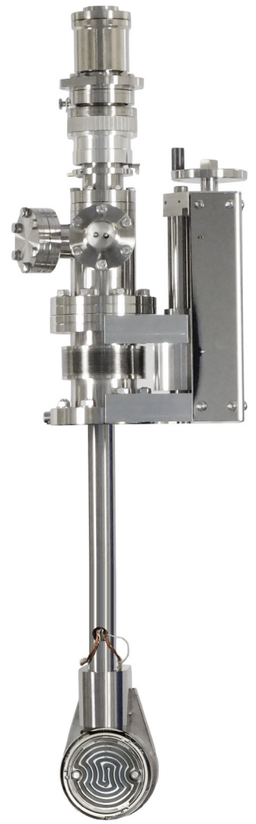

EC-R Series

A right-angle design presenting the substrate at 90° to the mounting flange. The EC-R provides substrate tilt, rotation, heating and electrical biasing with X,Y and Z motion options if required.

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GLAD Series

An in-line glancing-angle design presenting the substrate at a variable glancing angle to the mounting flange. Additionally includes continuous rotation, heating, electrical biasing, deposition height adjustment and rotation of tilt axis to align with numerous sources.

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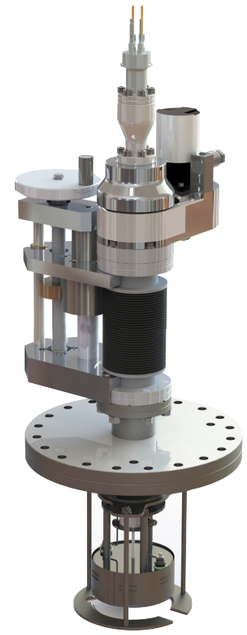

Preparation Stages

A basic range of in-line stages configured for sample preparation offering heating to 800°C, rotation and transfer/deposition height adjustment options.

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UHV Design

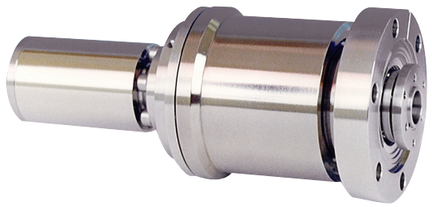
Technology Advantages

Substrate tilt and azimuthal rotation

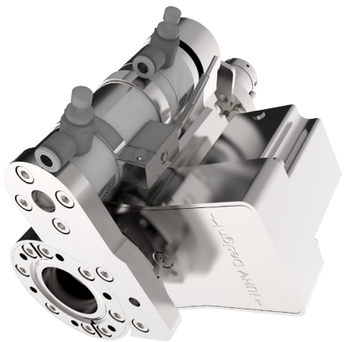
The EpiCentre uses magnetically-coupled drives in high duty cycle areas for substrate and polar rotation or tilt. Eliminating the use of edge-welded bellows, o-ring seals and ferromagnetic components improves reliability and removes possible sources of contamination.

Hollow variants of MagiDrives allow coaxial stacking for true independence of polar and azimuthal rotation without the need for costly head positioning gears.

Eliminating unnecessary bellows and dynamic seals from the EpiCentre design ensures true UHV performance, increases reliability and reduces the risk of down-time making them ideal for critical applications.



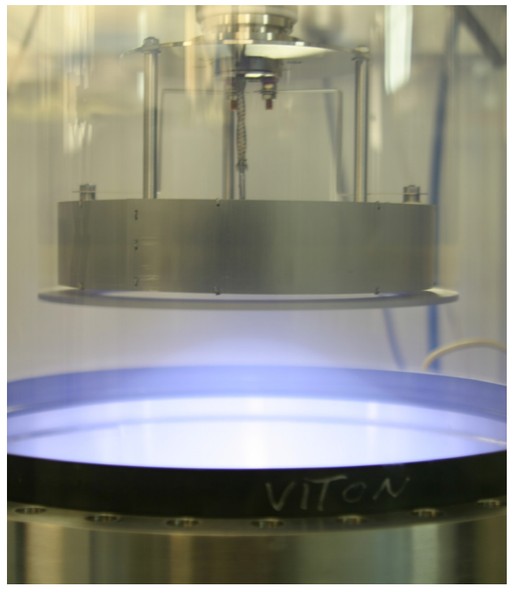
MD16/MD35H MagiDrive magnetically-coupled stack provides substrate rotation and tilt on EC-R and GLAD stages.



MagiLift magnetically-coupled drive provides substrate rotation and cradle lift/lower on the EC-I stages.

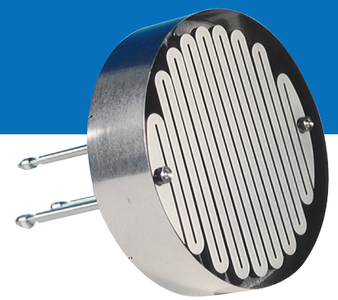
Substrate biasing with ultra-stable plasma

EpiCentre stages can be provided with the facility to apply an electrical bias to control substrate deposition characteristics and to generate a plasma for substrate sputter cleaning prior to deposition. Bias can be applied during continuous heating and rotation at up to 1kV DC and/or 100 W RF power as standard. Dark space shielding is provided as standard to prevent parasitic plasma formation around the electrical path and other susceptible areas.



Propriety substrate biasing technology provides unrivalled ultra-stable performance, typically with zero maintenance and long operational life.

High uniformity, high temperature substrate heating



Until recently, Pyrolytic Graphite Coated Graphite (PgG) heaters have been used in the majority of deposition stages providing robust performance in UHV applications. However, graphite heaters oxidise and are consumed when run in the presence of high partial pressures of O_2 at high temperature. For sputtering applications that involve high partial pressures of O_2, other technologies are also available. UHV Design now offer a choice of either Solid Silicon Carbide (sSiC) or Silicon Carbide coated Graphite (SiCg) heater elements which deliver excellent temperature uniformity in addition to O_2 resistance.

Both options have been fully characterised in terms of typical lifespan against partial pressure of O_2 and temperature, and guidance is available from UHV Design on the best option for your application.

EpiCentre heater modules have a self-supporting element, refractory metal enclosure and are capable of producing substrate temperatures up to 1200°C as standard. Higher temperatures are available on request. By virtue of the exceptionally high ratio of heated to open heater area, the elements run at considerably lower temperatures than conventional metal wire heaters. This extends the operational life of the heating element. Multiple layer heat shielding is also provided to reduce unwanted heating of surroundings.

SiCg heater element

sSiC heater element

Temperature Uniformity

UHV Design's heater modules provide outstanding temperature uniformity without the need for dual zone heaters. Performance is dependent on substrate type and sample holder design.

SiC coated elements

SiCg elements are similar to PgG elements being primarily composed of graphite but have a coating of Silicon Carbide (SiC). This provides improved durability when using oxidising atmospheres in comparison to PgG. However, as SiC is an insulator, gaps are required in the coating to allow connections to be made to the underlying graphite. The heater is therefore still somewhat vulnerable to oxidation at these locations in the longer term.

Solid SiC heaters

Solid SiC heaters are manufactured from a conducting solid SiC material in the ß phase and are more robust in all respects. They are durable under mechanical or electrical shocking and when exposed to reactive gases including oxidising atmospheres at high temperature. They are also optimised to give the very best in temperature uniformity.

In-line Deposition Stages

EpiCentre EC-I Series

Substrate parallel to plane of mounting flange

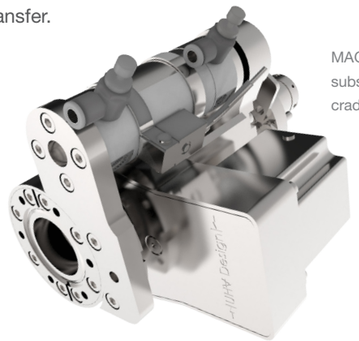
The EC-I series provides state-of-the-art performance for various growth and deposition techniques including MBE, sputtering and CVD. The EC-I offers continuous substrate rotation, high temperature and high uniformity heating, DC/RF biasing, and facilities for substrate transfer, while maintaining true UHV compatibility.

EC-I KEY ADVANTAGES

- **Substrate heating to 1200°C**
- **Continuous substrate rotation**
- **Homing for automatic transfer alignment**
- **Substrate lift/lower for transfer**
- **DC/RF substrate biasing**
- **Adjustable deposition height**
- **SEMI standard 2" to 200mm Ø samples**

The series includes models to accommodate SEMI standard wafers from 2" to 200mm diameter. Special substrate cradles can be provided to accommodate specific substrate shapes and designs up to 200mm diameter.

The EC-I series benefits from the success of UHV Design's unique hollow magnetic coupling technology using the CF38 mounted MagiLift drive. This single compact device provides magnetically-coupled substrate rotation and axial motion to lift and lower substrates for transfer. The hollow drive technology facilitates the passing of services through the drive to a stationary wafer heating module in close proximity to the substrate, eliminating the need for vulnerable high current rotational connections. The MagiLift provides continuous rotation of the substrate cradle, which supports the substrate, for better temperature and layer uniformity. It further provides a pneumatically actuated 25mm lift and lower for substrate transfer.



MAGILIFT provides substrate rotation and cradle lift and lower.

The stationary heater module employs multiple refractory metal Molybdenum heat shields to minimise heat loss, (Inconel and other materials available upon request), and a choice of either SiCg (SiC coated Graphite) or sSiC (solid SiC) heater elements, both of which are capable of heating wafers to 1200°C and operating within O_2 rich environments.

The electrically-isolated substrate cradle can be biased with either DC or RF to facilitate sputter cleaning prior to deposition or for better control of deposition kinetics. 'Faraday Dark Space Shielding' is supplied as standard on all biased stages. This confines plasma to the substrate cradle region. Our proprietary substrate biasing technology provides unrivalled flicker-free performance, typically with zero maintenance and long operational life.

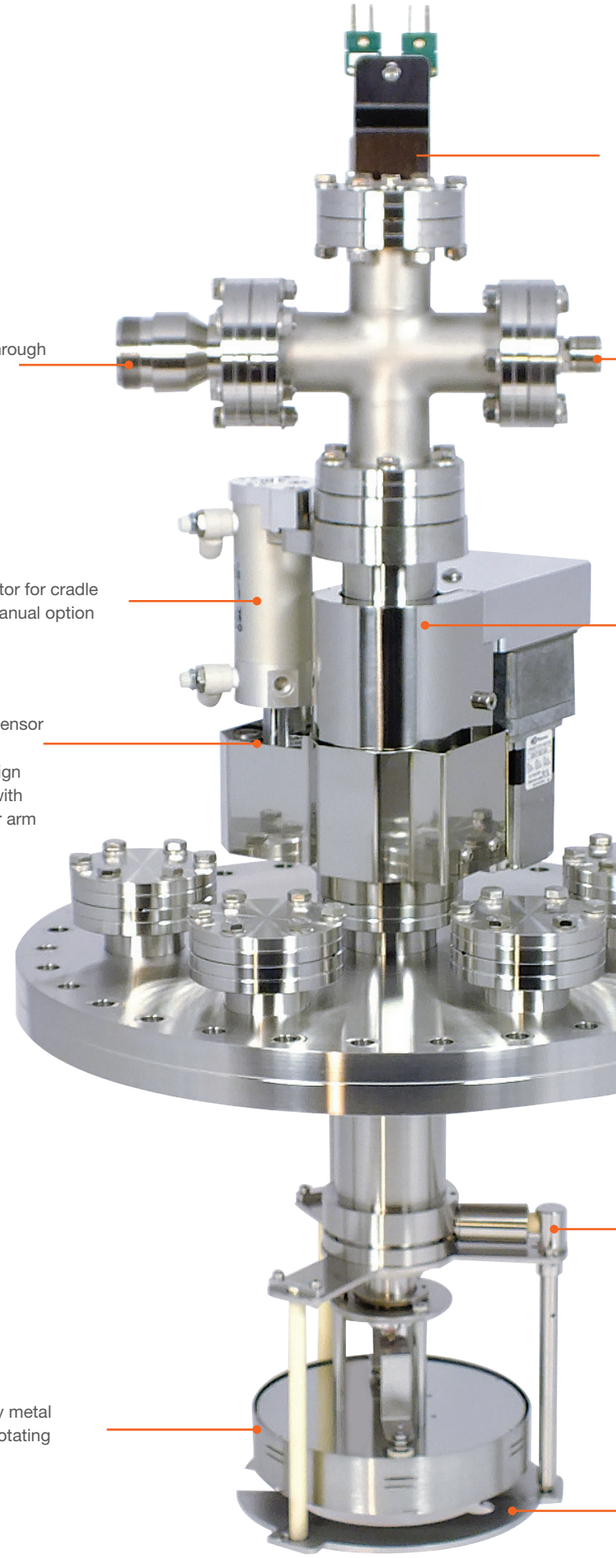
The deposition height adjustment facility allows the Z position of the substrate to be adjusted to optimise the distance from the deposition flux.

The stages can be mounted in any-orientation, although they are most commonly mounted vertically with the wafer facing up or down and parallel to the mounting flange. Other orientations can be accommodated with special wafer holders. Options are also available to configure EpiCentres for higher pressure and corrosive environments.

The series has a full suite of options including choice of system mounting flanges, manual or pneumatic substrate shutters and thermocouple materials.

Should your requirements fall outside our standard specifications then please contact us at:

UHV Design



EC-I Series Options

Mounting Flange

Four standard CF type flanges are available. Each includes at least one port to fit a shutter assembly.

Deposition Height Adjustment

The deposition height adjustment option allows the Z position of the substrate to be adjusted by up to 50mm to optimise the distance from the deposition flux affecting deposition uniformity and deposition rate. Other height options available upon request. See Figure 1.

DC & RF Bias

Our proprietary substrate biasing technology provides unrivalled flicker-free performance, typically with zero maintenance and long operational life.

Solid Silicon Carbide Heater Element

Solid SiC heaters are manufactured from a conducting solid SiC material in the ß phase and are more robust in all respects. They are durable under mechanical or electrical shocking and when exposed to reactive gases including oxidising atmospheres at high temperature. They are also optimised to give the very best in temperature uniformity. See Figure 2.

Thermocouple Options

Type C and Type K options available with a choice of UHV or HV fittings. HV versions include an o-ring sealed connector allowing thermocouple position to be adjusted to match the pyrometer reading of substrate temperature, removing the need for calibration adjustments.

Deposition Shields

Deposition shields can be fitted to protect the heater module and services from the deposition flux. The deposition shields are easy to demount for cleaning and are typically stainless steel (refractory metal version available upon request).

Substrate Shutter

Manual or pneumatically actuated substrate shutter to control line-of-sight between substrate and depostion source. Shutter blades are typically Molybdenum with other materials are available upon request. See Figure 3.

Homing Sensor

An external magnetic proximity home switch is also provided for position sensing the internal rotor to align the stage to within 0.1° for automated substrate transfer.

Figure 1. EC-I with manual adjustable deposition height adjustment option

Figure 2.Solid Silicon Carbide (sSiC) heater element option.

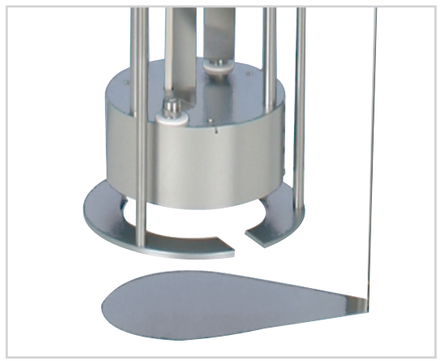


Figure 3.Substrate shutter option

UHV Design

Stage Configuration: EC-I Series

STANDARD CONFIGURATION				
Substrate diameter	50mm (2")	100mm (4")	150mm (6")	200mm (8")
CF200/10" OD system flange	✓	✓	×	×
CF250/12" OD system flange	✓ (s)	✓ (s)	✓	×
CF300/14" OD system flange	✓ (s)	✓ (s)	✓ (s)	✓
CF350/16.5" OD system flange	✓ (s)	✓ (s)	✓ (s)	✓ (s)
Heater element	Silicon Carbide coated graphite (SiCg) as standard (see options below)			
Heater module shielding & construction	Molybdenum			
Substrate rotation	Stepper motorised			
Cradle movement for substrate transfer	25mm pneumatic via MagiLift			
Insertion length (flange face to substrate)	240mm (+25mm for substrate transfer)			
Deposition height adjustment	Not adjustable as standard (see options below)			
Achievable temperature	1200°C (based on heating a Molybdenum sample) as standard			
STAGE MOTION OPTIONS				
Azimuthal rotation	24 V DC motor or Smart Motor or no motor (gearbox only fitted, customer supplies and fits NEMA 23 frame motor)			
Deposition height adjustment	Z = 50mm (other options available upon request)			
Deposition height actuation	Stepper, 24 V DC motor or Smart Motor or no motor (gearbox only fitted, customer supplies and fits NEMA 23 frame motor)			
Cradle movement for substrate transfer	Manual hand wheel actuation (standard actuation is pneumatic)			
ADDITIONAL OPTIONS				
DC & RF bias	DC bias ≤ 1kV, RF ≤ 100W (including dark space shielding)			
Substrate shutter	Manual, pneumatic or motorised. See system flange options (s)			
Heater element	Solid Silicon Carbide (sSiC)			
Heater module shield	Inconel heat shields instead of standard Molybdenum for higher O_2 partial pressures ("Achievable temperature" limited to 1000°C)			
Thermocouple options - with RF / DC bias	UHV Option: 2 x CF bellows-sealed sheathed Type K or HV option: 2 x O-ring sheathed Type K			
with no RF / DC bias	1 x CF (unsheathed) Type K or Type C			
Homing sensor	24V pre-wired DC NPN sensor kit			
Deposition shield cans to protect stage mechanism	Available on request			
Custom insertion length	Available on request			

KEY: ✓ = Substrate size can be accommodated on specified system flange
✓(s) = Substrate shutter option is available on specified system flange
× = Not available

Right Angle Deposition Stages

EC-R Series

Substrate at right angle to plane of mounting flange

The EC-R supports the substrate at a right-angle to the plane of the mounting flange. It can then provide continuous substrate rotation, tilt, heating and electrical biasing. It can also be mounted on UHVD's range of manipulators to provide motion in the X, Y and Z axes.

EC-R KEY ADVANTAGES

- **» 2" to 6" substrate diameters**
- **» Substrate heating to 1200°C**
- **» Continuous azimuthal rotation**
- **» Polar rotation (tilt) up to +/- 180°**
- **» DC/RF substrate biasing**
- **» X,Y & Z motion options**

The base EC-R configuration provides polar rotation to adjust the angle of incidence with respect to the depostion flux and sample heating. The modular EC-R concept provides the flexibility to select options such as azimuthal rotation to continuously rotate the substrate to maximise temperature and deposition uniformity. Electrical biasing is also available, DC and/or RF, to facilitate sputter cleaning prior to deposition or for better control of deposition kinetics. 'Faraday Dark Space Shielding' is supplied as standard on all biased stages. This confines plasma to the substrate cradle region. Our proprietary substrate biasing technology provides unrivalled flicker-free performance, typically with zero maintenance and long operational life. X, Y and Z motion can then be added to tailor the stage to meet your specific application.

The concept of this stage was strongly influenced by a complete review of existing right-angled deposition stages to provide unrivalled performance and durability.

By stacking two magnetically-coupled MagiDrive rotary feedthroughs, UHV Design are able to achieve a dual axis, concentric rotation system which eliminates the head positioning gear train typically used in other designs.

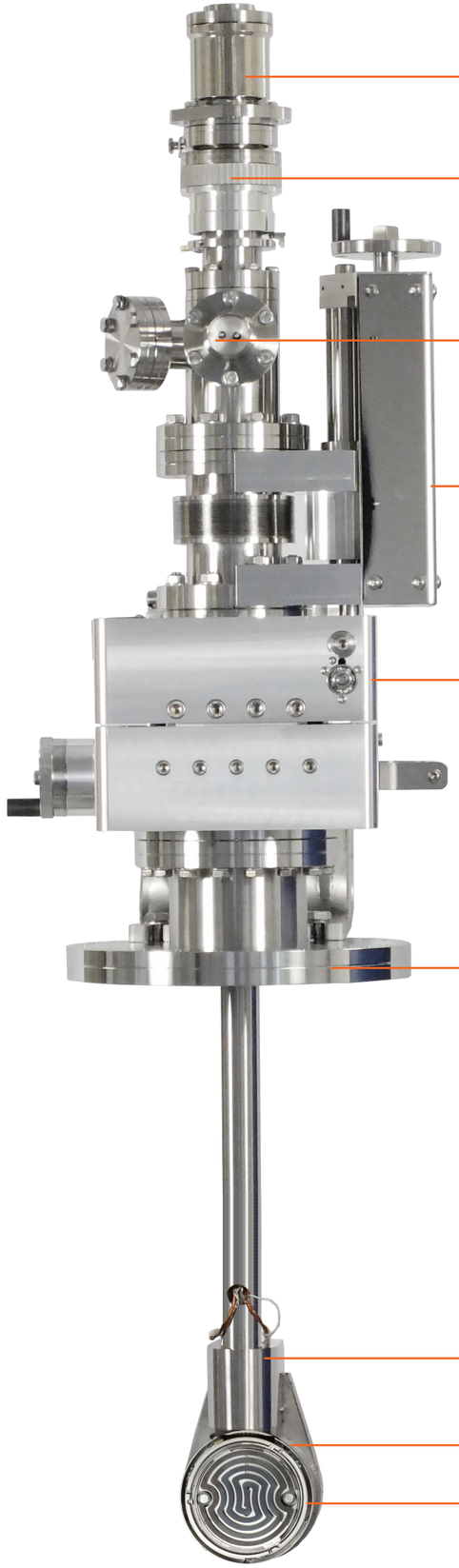
The absence of any bellows, O-rings or dynamic seals ensures clean, true UHV performance with high reliability making them ideal for critical applications.

High temperature heating

By incorporating our latest heater module technology into this stage (see section 12), improvements upon conventional designs have been achieved in terms of the ultimate temperature capability and uniformity and therefore deposition uniformity. Significant technology resides within the rotary head which enables continuous azimuthal rotation with high precision positioning whilst heating from ambient to 1200°C.

Refractory metal deposition shielding is provided as standard to protect the heating module.

The EC-R can also be configured specifically as a retrofit instrument for MBE systems such as the VG Semicon V80H.



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EC-R with:

- Polar Rotation (R1)
- 50mm height adjustment
- High temperature heating

EC-R with:

- Polar Rotation (R1)
- Substrate Rotation (R2)
- 50mm height adjustment
- High temperature heating

EC-R Series Options

1. Azimuthal rotation

Continuous azimuthal rotation to maximise temperature and deposition uniformity. Smooth, long-life rotation, typically up to 20rpm tolerant of high temperatures.

2. Polar rotation

Provides the ability to tilt the sample with respect to a deposition flux.

3. Thermocouple options

Type C and Type K options available with choice of UHV and HV fittings and height adjustment. HV versions include an o-ring sealed connector allowing thermocouple position to be adjusted to match the pyrometer reading of the substrate temperature, eliminating the need for calibration adjustments.

4. DC & RF bias

Our proprietary substrate biasing technology provides unrivalled flicker-free performance, typically with zero maintenance and long operational life.

5. Z motion

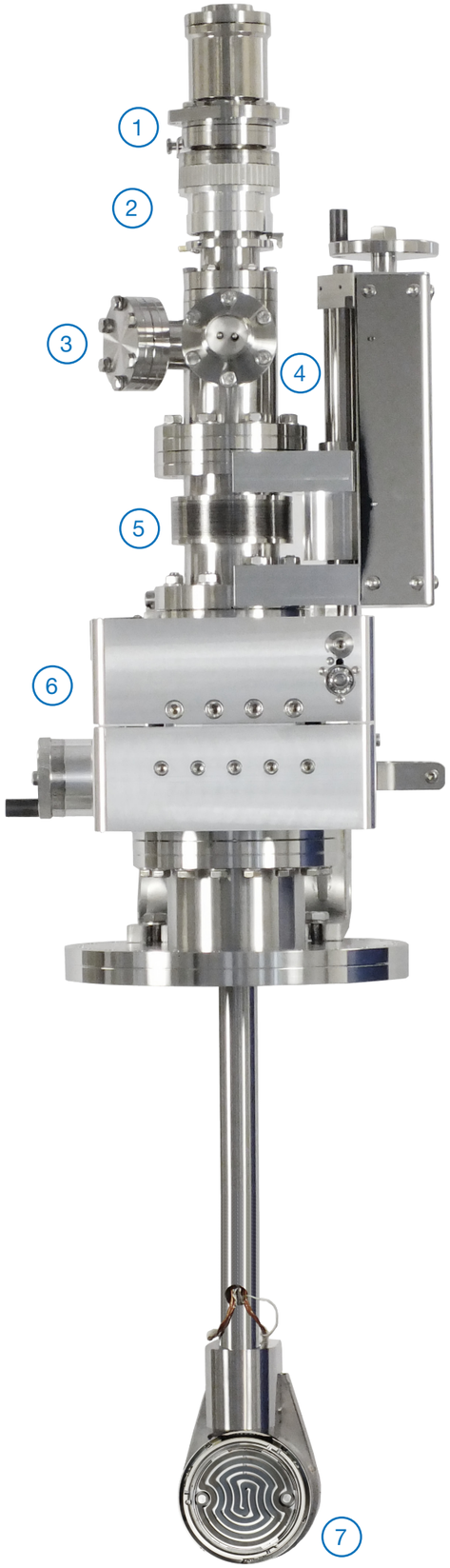
Use of UHVD's linear shift mechanism (see section 8) to provide Z motion with strokes from 50 - 300mm and motorisation options.

6. XY motion

Precise X & Y motion up to +/- 19mm (+/-27mm vector) with motorisation options.

7. Solid Silicon Carbide heater element

Solid SiC heaters are manufactured from a conducting solid SiC material in the ß phase and are more robust in all respects. They are durable under mechanical or electrical shocking and when exposed to reactive gases including oxidising atmospheres at high temperature. They are also optimised to give the very best in temperature uniformity.



UHV Design

Stage Configuration: EC-R Series

STANDARD CONFIGURATION			
Substrate diameter	50mm (2")	100mm (4")	150mm (6")
CF150/8" OD system flange	✓	×	×
CF200/10" OD system flange	✓	✓	×
CF250/12" OD system flange	✓	✓	✓
POLAR ROTATION			
Adjustable position	Manual (1° resolution)		
HEATING			
Heater element	Silicon Carbide coated graphite (SiCg) as standard (see options below)		
Achievable temperature	1200°C (based on heating a Molybdenum sample)		
STAGE MOTION OPTIONS			
TILT ROTATION			
Stepper motorised	0.025° resolution		
AZIMUTHAL ROTATION			
Manually driven	Manual thimble		
DC motorised	Up to 60rpm (maximum 20rpm recommended with bias)		
Stepper motorised	Up to 60rpm (maximum 20rpm recommended with bias)		
XYZ MOTION OPTIONS	XL-T Range	XL-R Range	
Z AXIS			
Z stroke range offered	50-300mm	50-1000mm	
Resolution manual	0.01mm	1mm	
Resolution stepper motorised	0.001mm	0.001mm	
XY AXIS			
Manual actuation	+/- 15mm (+/-21mm vector)	+/- 19mm (+/-27mm vector)	
X-Y resolution manual	0.001mm	0.01mm	
Motorised actuation	+/- 14mm (+/-20mm vector)	+/- 18mm (+/-25.5mm vector)	
X-Y Resolution stepper motorised	0.0025mm	0.005mm	
AXIS ALIGNMENT			
Adjustable position (manual)	+/-2°	N/A	
ADDITIONAL OPTIONS			
DC & RF bias	DC bias ≤ 1kV, RF ≤ 40W (including dark space shielding)		
Heater element	Solid Silicon Carbide (sSiC)		
Insertion length (nominally 240mm)	Customer specified		
Motorisation	Stepper or Smart Motor (DC only for azimuthal)		
X,Y and Z encoders	Option		
Azimuthal home position sensor	Option		
Temperature measurement	Type K or Type C thermocouple		
Water cooling of head assembly (NOT substrate) to aid heat dissipation	Option		

KEY: ✓ = Substrate size can be accommodated on specified system flange
× = Not available

Should your requirements fall outside our standard specifications then please contact us at:

www.uhvdesign.com +44 (0)1323 811188 sales@uhvdesign.com

Glancing Angle Deposition
GLAD Series Stages

Substrate at a variable glancing angle to the mounting flange

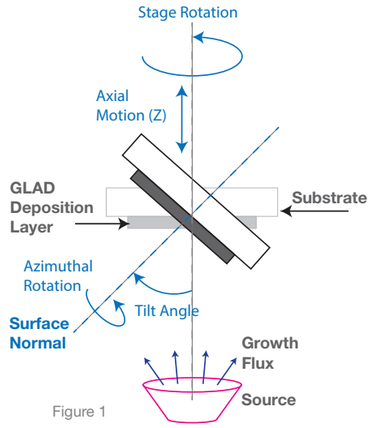


Figure 1

Glancing Angle Deposition (GLAD) is creating great interest in areas where structured three-dimensional deposition is required. Based on UHV Design's highly successful EpiCentre range, the GLAD stage provides an in-line solution (as with the EC-I Series) but with the addition of substrate tilt. Being an in-line stage, a large range of axial (Z) motion can be provided.

By precisely controlling the polar and azimuthal rotations simultaneously, novel structures can be grown, which have, for example, columnular morphology or a nano-helical structure or are structured via anisotropic shadowing. Such materials have applications in many highly topical fields such as photonics, catalysis, bio-compatible materials and fuel cells.

Being fully UHV compatible, the GLAD stage is eminently suitable for use with all the usual directional deposition sources, such as thermal evaporation, physical vapour deposition, pulsed laser deposition and magnetron sputtering.

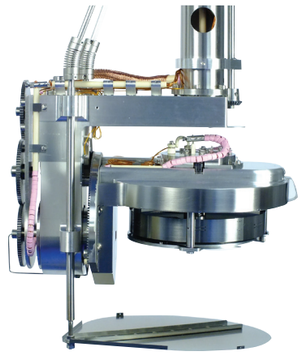
Features

- Continuous azimuthal rotation from 0.1 - 20rpm, but at any tilt angle from zero to +/- 85 degrees. See Figure 1.
- Substrate temperature heating to 1200°C, with solid Silicon Carbide technology option to provide durability in O_2 rich environments.
- DC bias ≤ 1 kV for sputter process modification – ultra-stable plasma during azimuthal rotation.
- RF bias to 100W power for substrate cleaning prior to deposition. Ultra-stable plasma during azimuthal rotation.
- Z-axis travel up to 200mm to accommodate different source geometries.
- Optional rotation of the entire stage/tilt axis orientation to facilitate glancing angle deposition using out-of-plane sources. (Requires the use of a differentially pumped rotary feedthrough that can be fitted as an option.)

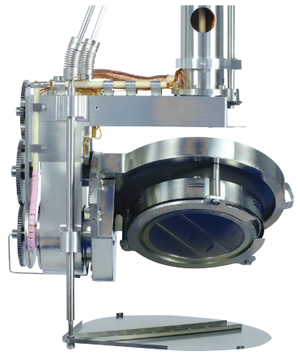
UHV Design

Stage Configuration: GLAD Series

STANDARD CONFIGURATION		
Substrate size	2" (50mm)	4" (100mm)
CF300 / 14" OD system flange	✓	✓
CF350 / 16.5" OD system flange	✓	✓
Heater element	Silicon Carbide coated graphite (SiCg) as standard (see Options below)	
Substrate rotation	Continuous, Stepper motorised, 0.1 - 20 rpm	
Substrate tilt	Manual actuation +/- 85°	
Insertion length	240mm flange face to substrate centre	
Deposition height adjustment	None (see options below)	
Thermocouple	1 x Type K	
Achievable temperature	1200°C (based on heating a Molybdenum sample)	
OPTIONS		
DC & RF bias	DC bias ≤ 1kV, RF ≤ 100W (inc. dark space shielding - must use screened thermocouple options)	
Shutter	Manual, pneumatic, steppper motorised	
Heater element	Solid Silicon Carbide (sSiC)	
Thermocouple options	1 x (screened) Type K 1 x (screened) Type C	
Deposition height adjustment	up to 200mm (other values on request)	
Deposition height automation	24 V DC Motor, stepper motor, Smart Motor, no motor* (*gearbox only fitted, customer supplies and fits NEMA 23 frame motor)	
Substrate rotation	24 V DC motor or Smart Motor or no motor* (*gearbox only fitted, customer supplies and fits NEMA 23 frame motor)	
Substrate tilt automation	Stepper motor, Smart Motor, no motor* (*gearbox only fitted, customer supplies and fits NEMA 23 frame motor)	
Homing sensor	Internal magnetic switch	
Custom insertion length	Available on request	
Stage / Tilt axis rotation (via DPRF)	Available on request	
Stage / Tilt axis rotation automation	Available on request	



Normal angle of incidence



Variable angle of incidence via stepper motor control

Glancing maximum angle of incidence at +/-85°

Should your requirements fall outside our standard specifications then please contact us at:

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GLAD Series Options

Deposition Height Adjustment

The deposition height adjustment option allows the Z position of the substrate to be adjusted by up to 200mm to optimise the distance from the deposition flux. Other height options available upon request.

DC & RF Bias

Our proprietary substrate biasing technology provides unrivalled flicker-free performance, typically with zero maintenance and long operational life.

Solid Silicon Carbide Heater Element

Solid SiC heaters are manufactured from a conducting solid SiC material in the ß phase and are more robust in all respects. They are durable under mechanical or electrical shocking and when exposed to reactive gases including oxidising atmospheres at high temperature. They are also optimised to give the very best in temperature uniformity. See Figure 1.

Thermocouple Options

Type C and Type K options available with choice of UHV and HV fittings and height adjustment.

Substrate Shutter

Manual or pneumatically actuated substrate shutter to control line-of-sight between substrate and deposition source.
See Figure 2.

Homing Sensor

Internal magnetic home switch to align the stage to within 0.1° for automated substrate transfer.

Figure 1.Solid Silicon Carbide (sSiC) heater element option.

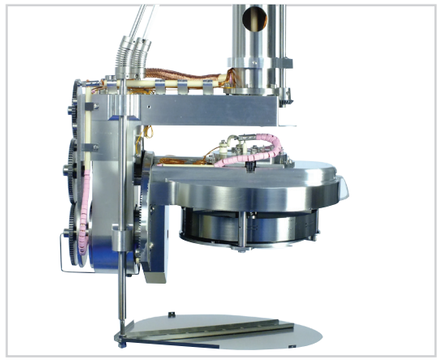
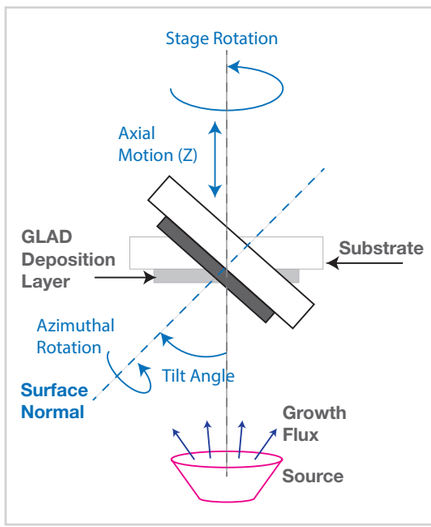
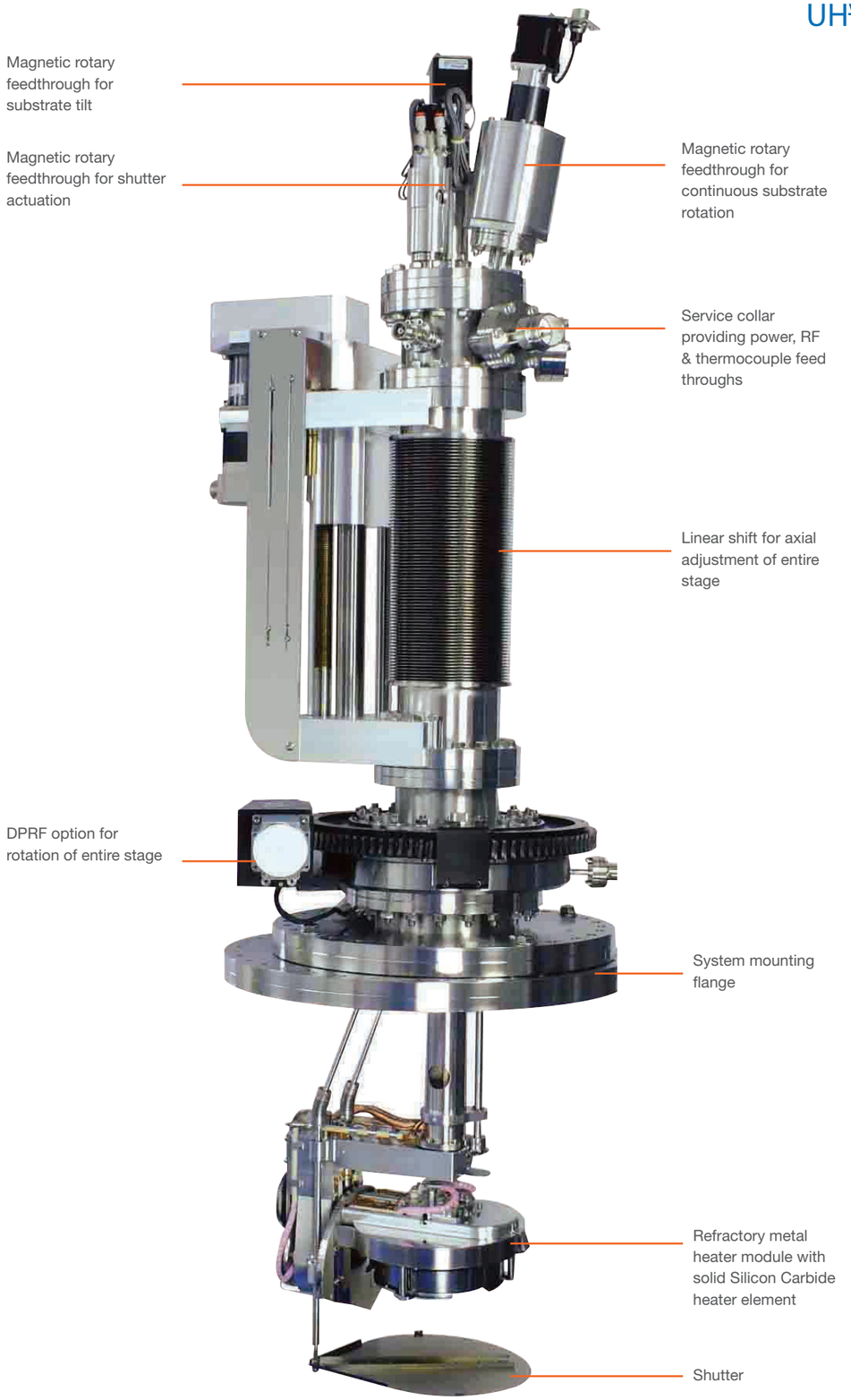


Figure 2.Substrate shutter option



UHV Design



UHV Design

Preparation Stages

EPS Series

Substrate parallel to plane of mounting flange

Cost-effective in-line preparation stages for 2" & 4" substrate preparation offering high uniformity heating to 800°C with substrate rotation, height adjustment and shutter options.

EPS KEY ADVANTAGES

- » 2" or 4" substrates
- » Substrate heating to 800°C
- » Substrate rotation to 60rpm
- » 50mm height adjustment
- » Manual and motorised actuation

The EPS series of in-line preparation stages support the substrate parallel to the mounting flange. The stationary EPS heating module provides durable and uniform heating of 2" or 4" substrates to 800°C with Molybdenum heat shields provided to minimise heat loss. A Type K thermocouple is provided as standard.

Manual or motorised substrate rotation to 60rpm is provided by the magenetically-coupled MagiDrive rotary drives. Eliminating unnecessary bellows and dynamic seals from the EPS ensures true UHV performance and increases reliability.

In addition to substrate rotation, the 50mm height adjustment option allows the substrate position to be optimised via manual or motorised actuation.

The EPS series of preparation stages provide cost-effective and durable sample preparation capability.

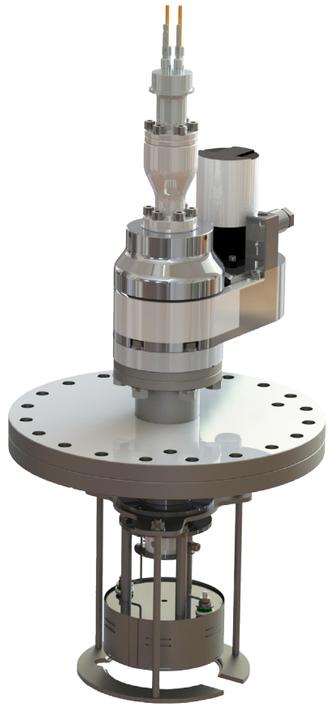
For higher temperature heating, DC/RF biasing or additional capabilities see the EC-I series on page 154.

Specification Table

EPS		
Substrate size	50mm (2")	100mm (4")
Mounting flange size	CF150/8" OD system flange	CF200/10" OD system flange
Substrate heating	800°C	
Heater element	Refractory metal module with Silicon Carbide Coated Graphite (SiCg) heating element	
Flange to cradle distance	200mm	
Height adjustment (option)	50mm	
Fixed height shutter (option)	Includes extended bearing housing for 4" substrates	
Thermocouple	Type K	

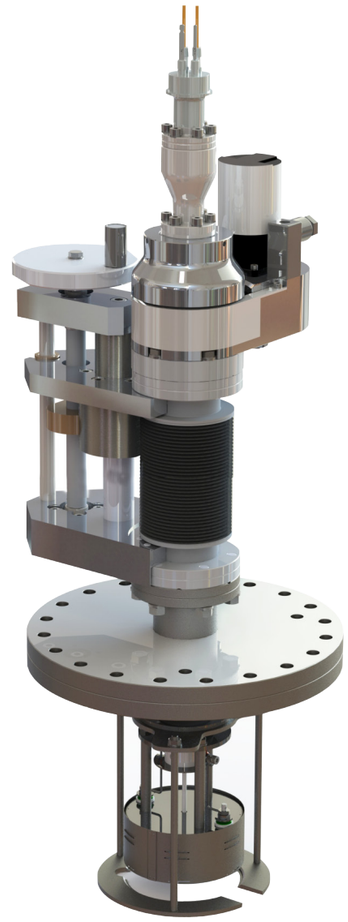
EPS with:

- Heating to 800°C



EPS with:

- Heating to 800°C
- Substrate rotation option (motorised)



EPS with:

- Heating to 800°C
- Substrate rotation (motorised)
- 50mm height adjustment option (manual)

EPS Part Code Generator

Model		+	Substrate Size		+	50mm height adjustment		+	Substrate rotation		+	Shutter	
EPS	EPS		2" substrate	2		None	N		None	N		None	N
			4" substrate	4		Manual	ZH		Stepper motorised	SS		Manual shutter	SH
						Stepper motorised	ZS		DC motorised	SD		Pneumatic shutter	SP
						DC motorised	ZSADC						

Example Part Number:

EPS-4-N-SS-SH

= EPS for 4" substrates with stepper motorised substrate rotation and manual shutter

Should your requirements fall outside our standard specifications then please contact us at:

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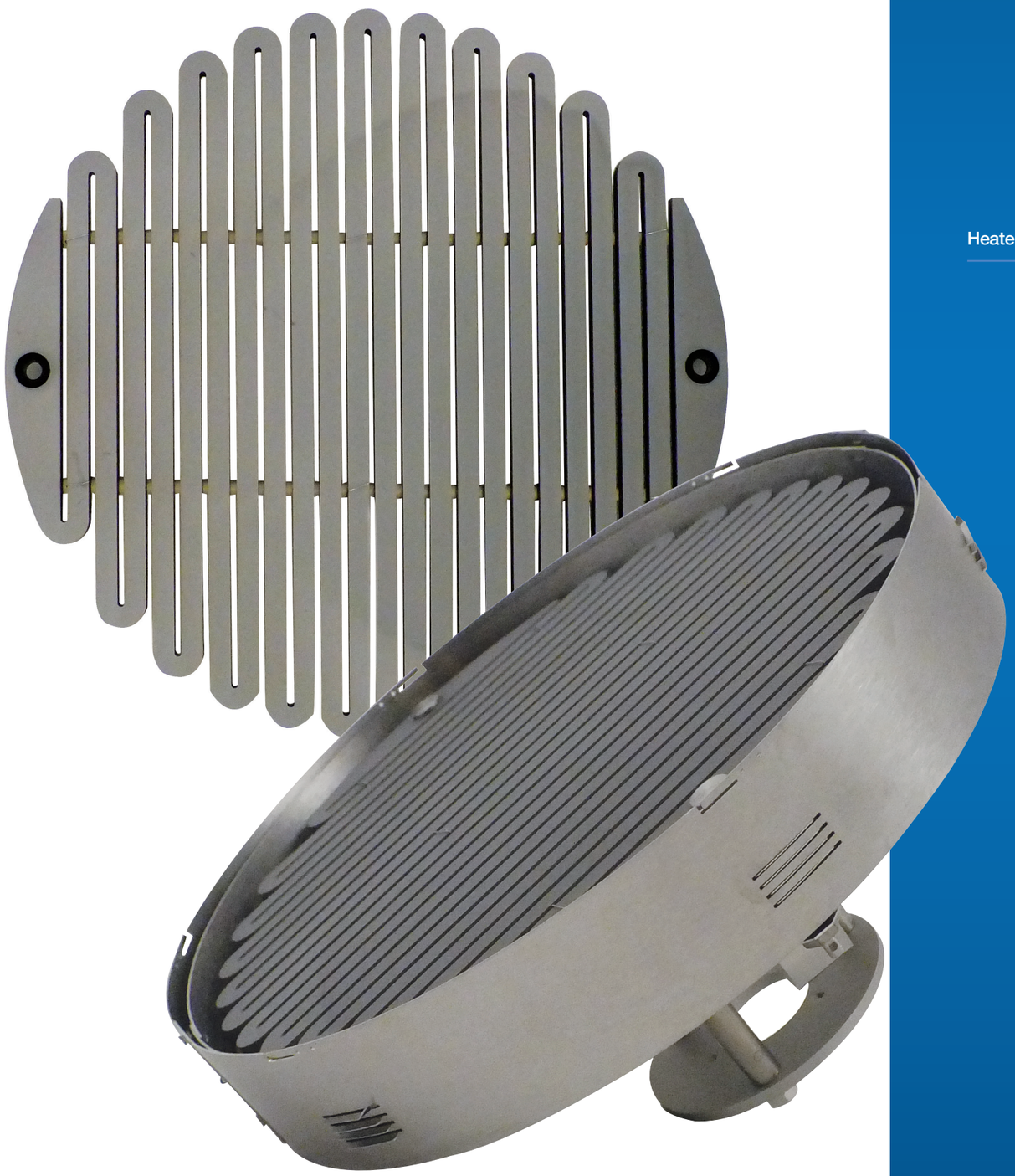

HEATER MODULES

Heater Modules

A cost-effective solution to sample heating whilst benefiting from proven cutting-edge heater technology. They comprise CVD processed heating elements packaged in refractory metal cases.

Key Advantages

- **High uniformity heating to 1200°C**
- **Elements with large radiating surface to gap ratio – able to run at lower temperatures than conventional metal heaters**
- **Refractory metal hot zone – uncompromised performance at high temperatures**

In addition to the complete sample heating solutions offered in the EpiCentre section (page 148) UHV Design also offers a range of individual heater modules for end users to incorporate into their own heater stage designs. The range provides end users with a cost-effective solution to sample heating, whilst benefiting from a proven heater technology used in market leading stages.

Heater Module Overview

UHV Design heater modules are used in vacuum applications for radiantly heating semiconductor wafers, holder supported samples or various other substrates to high temperatures. The modules feature CVD processed heating elements packaged in refractory metal cases.

The immediate hot zone holding the element is constructed from refractory metals such as Molybdenum, Tantalum and ceramics and does not include any other materials to compromise performance at high temperature. These modules are therefore particularly suitable for ultra-high vacuum applications.

Thermocouples

Heater modules are available with type ‘C’ or ‘K’ thermocouples and can be supplied with semiconductor grade quartz guards to protect the heater element from mechanical damage, i.e. accidental contact with the sample transfer tool. Type C (Tungsten/Rhenium) thermocouples are provided as standard. For applications in which the use of Tungsten or Rhenium would be undesirable, a type K (Chromel/Alumel) thermocouple can be supplied.

Figure 1.Solid Silicon Carbide (sSiC) heater element option.

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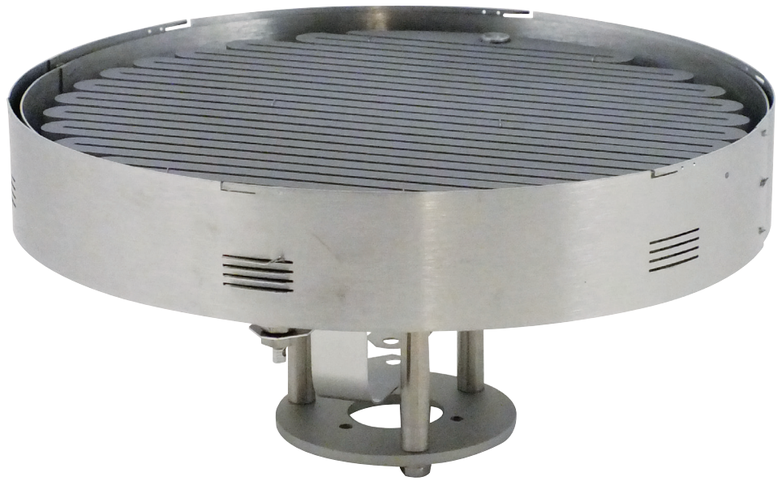


Choosing the right element

Until recently, graphite heaters have been used in the majority of deposition stages and are still the mainstay providing robust performance in UHV applications such as MBE. However, graphite heaters oxidise and are consumed when run in the presence of high partial pressures of O_2 at high temperature.
For sputtering applications which involve high partial pressures of O_2, other technologies are also available with superior performance.

SiCg Elements

Solid Silicon Carbide coated Graphite elements provide improved durability when using oxidising atmospheres by comparison with PgG. Being an insulating form of SiC, holes are required in the coating to make electrical connection and the underlying Graphite is exposed and vulnerable to oxidation at these locations.

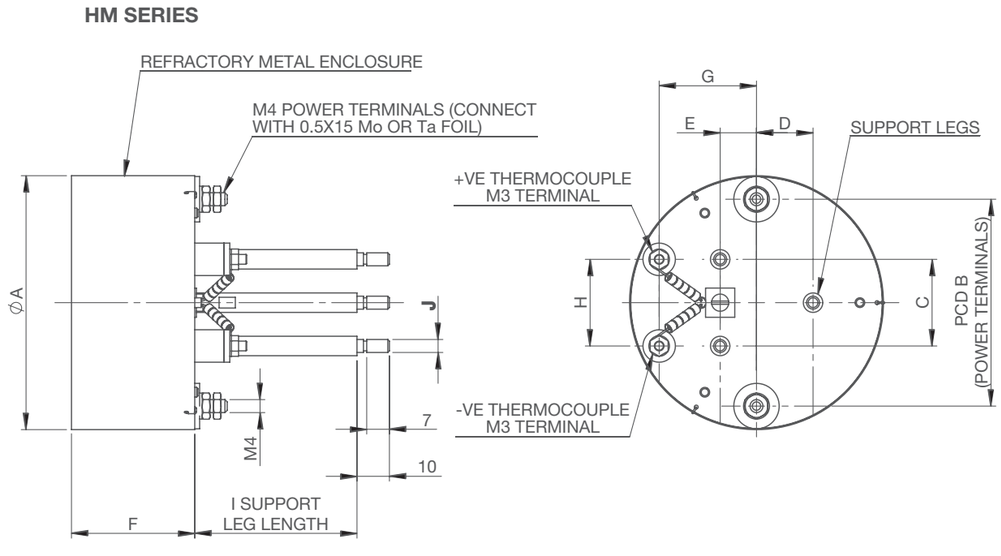
sSiC Elements

Solid Silicon Carbide elements (see Figure 1) are manufactured from a conducting solid SiC material in the ß phase and are more robust in all respects. They are durable to mechanical or electrical shocking, reactive gas/oxidation immunity at temperature. They are also optimised to give the very best in temperature uniformity. By virtue of the large radiating surface to gap ratio, all these elements run at considerably lower temperatures than often used metal wire heaters which ensures heater longevity. The typical ratio of heated element surface to meander gap is >5:1 resulting in excellent substrate heating uniformity, even without rotation.

UHV Heater Technology

Relative Performance of Heater Technologies Rated on a scale of 1(Low) -5 (High)		
Technology	SiC Coated Elements	Solid ßSiC Heaters
Characteristic	Silicon Carbide coated Graphite	Solid Silicon Carbide
UHV Performance	5	5
Ultimate achievable temperature	4	4
Oxidation resistance	4	5
Mechanical robustness	2	4
Cost	3	5

Specification Table



HEATER MODULE SIZE	HM-25*	HM-50	HM-75	HM-100	HM-150	HM-200**
A (dia)	50	78	112.5	137.5	180	230
B (pcd)	34	63.5	89.8	115.25	157.25	204.5
C	20.8	26.7	26.7	26.7	78	78
D	12	17.4	17.4	17.4	45	45
E	6	11.2	11.2	11.2	22.5	22.5
F	18	38	38	38	38	38
G	15.5	30	30	30	30	30
H	19	26.7	26.7	26.7	26.7	26.7
I	40	50	50	50	50	50
J	M2.5	M4	M4	M4	M4	M4

NOTE: *25mm Sample Size on SSiC options only.
**200mm and larger available on request.

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Quick Reference Guide: Typical Standard Heater Element Resistance

ELEMENT MATERIAL	SAMPLE SIZE	COLD RESISTANCE Ω (20°C)	HOT RESISTANCE Ω (1000°C)	ELECTRICAL CHARACTERISTICS AT 1000°C		
				WATTS	AMPS	VOLTS
SiC Coated Graphite	2"	1.4	1.2	840	26.5	31.7
	3"	1.7	1.1	1150	32.3	35.6
	90mm (EC282)	2.9	1.9	850	21.2	40.2
	100mm	1.6	1	1500	38.7	38.7
	150mm	1.8	1.3	2500	43.9	57.0
	200mm	2.2	1.45	3600	49.8	72.2
Solid SiC	1"	9.5	5.5	400	8.5	46.9
	2"	10	5.7	840	12.1	69.2
	3"	10	5.7	1150	14.2	81.0
	90mm (EC282)	12	7	850	11.0	77.1
	100mm	12	7	1500	14.6	102.5
	150mm	12	7	2500	18.9	132.3

Heater Module Part Code Generator

Heater Module		Sample Size		Heater Element		Thermocouple Type	
HM	+	25mm* or 1" wafer/sample size	25	Silicon carbide coated graphite	SiC	Type C, Tungsten Rhenium	C
		50mm or 2" wafer/sample size	50	Solid Silicon Carbide	sSiC	Type K, Chromel Alumel	K
		75mm or 3" wafer/sample size	75				
		100mm or 4" wafer/sample size	100				
		150mm or 6" wafer/sample size	150				
		200mm** or 8" wafer/sample size	200				

NOTE: *25mm Sample Size on SSiC options only.
**200mm and larger available on request.

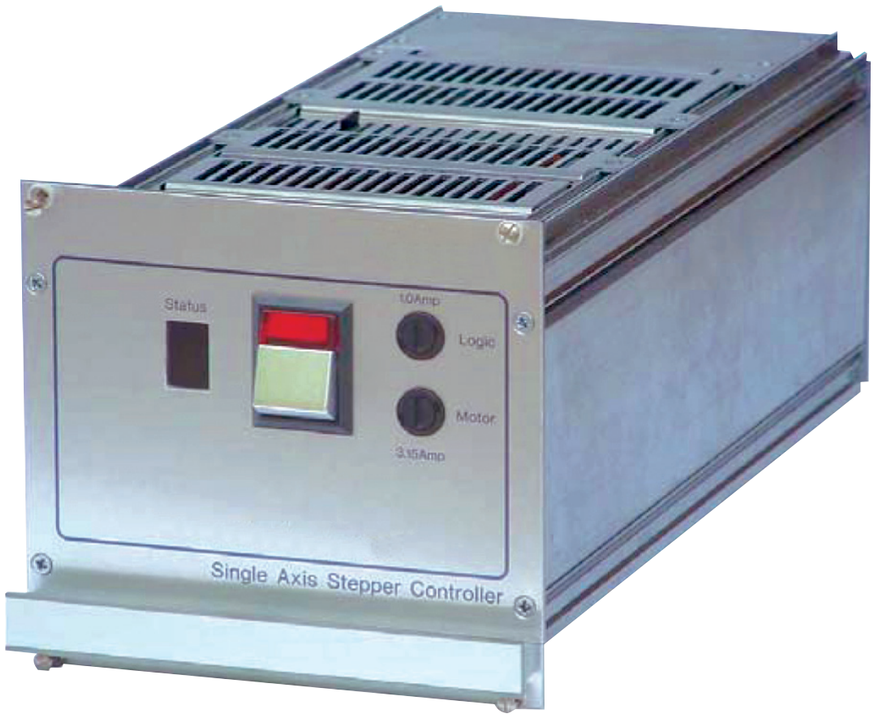
Example Configured Part Number:

HM-50-SiC-C

= Heater Module **HM**, 50mm/2" wafer/sample size **50**, Silicon Carbide coated Graphite heating element **SiC**, Type C Thermocouple **C**

Heater Module Power Supplies

For details of compatible power supply and temperature controller packages contact sales@uhvdesign.com.



Section 13

MOTION CONTROLLERS

Hand Held DC Controller

A bi-directional variable speed DC motor controller which provides cost-effective, 'plug & play' single-axis remote control of manipulation products including MagiDrives and Linear Shift Mechanisms.

Key Advantages

- **Brushless DC motor technology for longer life.**
- **Full torque from 100 to 3000 rpm.**
- **Smooth running even at low speeds.**
- **50W power output.**
- **Universally-rated to ensure voltage compatibility.**

UHV Design's DC motor controller has been developed to offer simple, single-axis remote control of its manipulation products.

The control interface module with both speed and direction controls, can be plugged into the motor directly. Alternatively an extension cable can be utilised for remote control. The control interface can then take two inputs for limit switches, thus preventing over-drive in either direction. The hand-held DC motor controller provides a simple cost-effective solution to DC motorisation.

Operation

The system has the advantage over many conventional variable voltage supplies in that it is a true speed controller and gives full torque throughout the speed range. It has particularly smooth running characteristics (even at slow speeds).

Universally-rated to ensure voltage compatibility, the controller is fully compliant with EMC test regulations and carries the CE mark.

The DC Motor controller is only specified for DC motor driven components it has been supplied with. This will ensure product compatibility.

Specification Table

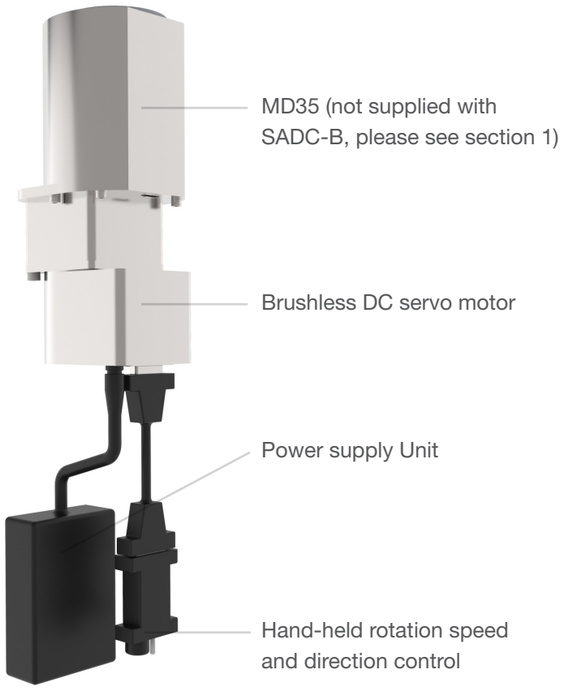
Input voltage	90 - 220 Vac
Nominal output voltage	+24 V DC
Current output (max)	1.9 A (45 W)
Speed Control	100 - 3000 RPM @ full torque

MagiDrive Rotary Motion Controller (SADC-B)

Simple hand-held control of rotation speed and direction for the MagiDrive range of magnetically-coupled drives.

The SADC-B includes:

- Base model and extension cable:
- Brushless DC servo motor
- Direction and speed control module
- Switch mode AC Power Supply Unit
- Control module extension cable



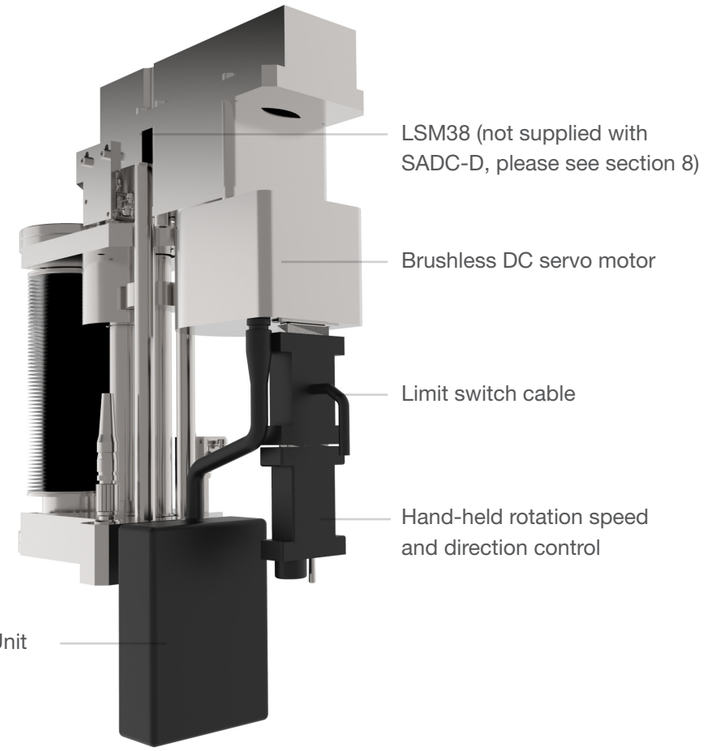
Linear Shift Mechanism Motion Controller (SADC-D)

Simple hand-held control of linear speed and direction for the LSM range of linear shift mechanisms.

The SADC-D includes:

- Base model with limit switch cable:
- Brushless DC servo motor
- Direction and speed control module
- Switch mode AC Power Supply Unit
- Limit Switch signal control cable

Note: must be purchased with Linear Shift Mechanism (see catalogue Section 8)



UHV Design

Modular Stepper Motor Controller

The MSMC integrated stepper motor controller provides a cost-effective solution to a wide range of applications that require accurate manipulation of the driven mechanism.

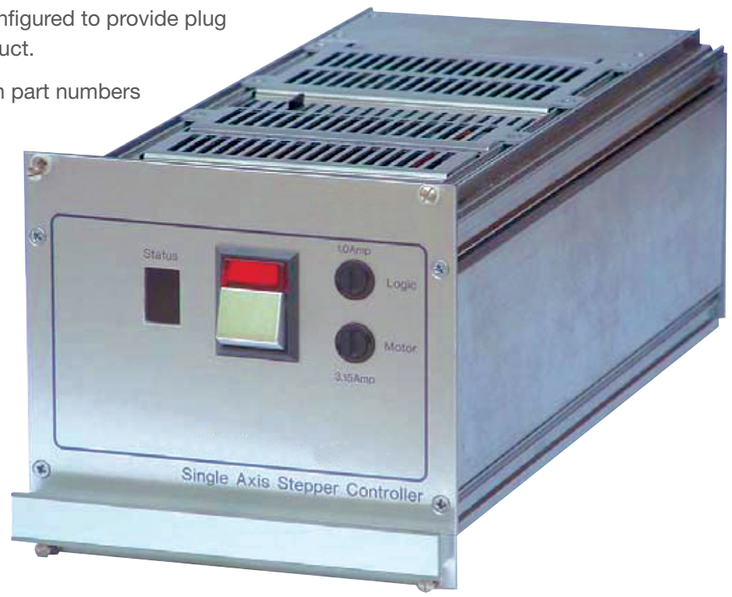
Key Advantages

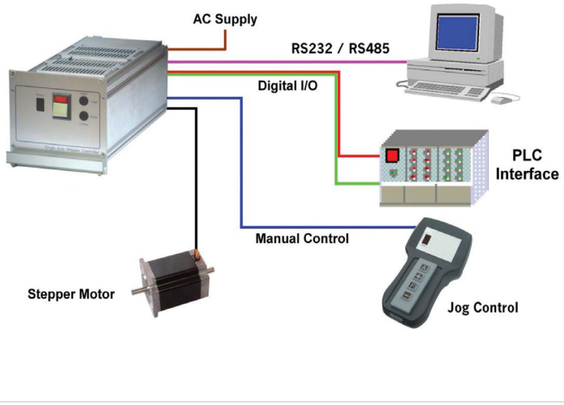
- » Single and Multiple axis control
- » A complete system solution
- » Plug and run simplicity
- » Programmable positioning
- » Optional closed loop control
- » Matching size 17–34 frame motors
- » Bench or rack mounting options

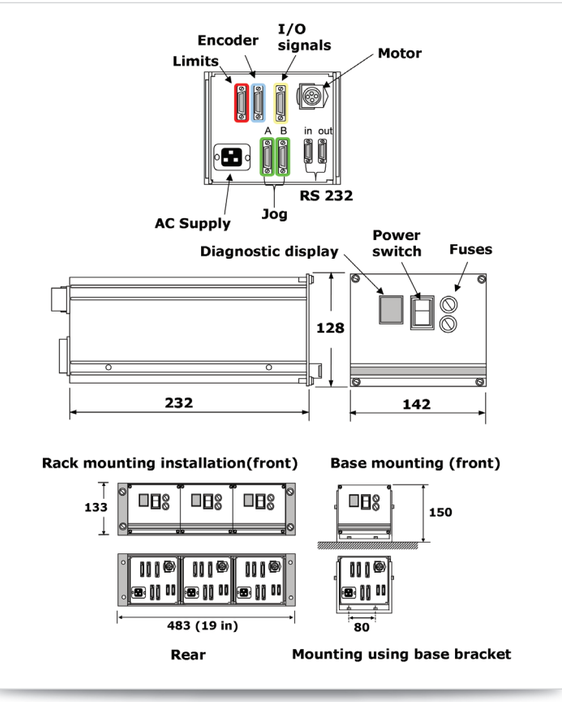
A user-friendly command line interface is used to communicate to the MSMC via a host computer. The commands are inputted as a string of ASCII characters that can then be transferred via the RS232 or RS485 connection to the controller. A number of strings can be stored in the MSMCs' on board memory to form a sequence of moves that can be triggered by the available inputs.

The Modular Stepper Motor Controller is configured to provide plug and play compatibility with the desired product.

Contact sales@uhvdesign.com for advice on part numbers







- Integrated power supply for direct connection to AC supply
- Choice of 115 or 230 Vac, 50 or 60Hz operation
- Integrated high efficiency bi-polar drive stage 400 step/rev. (half-step mode) motor resolution provides smooth operation
- Integrated motion controller
- RS232 or RS485 communication
- Up to 99 units can be daisy-chained to a single port
- Internal memory stores sequences for stand alone operation
- Programmable position, acceleration, deceleration and velocity
- 8 in and 8 out programmable digital I/O to interface with other process functions
- Dedicated inputs for limits and datums
- Optional jog box for manual operation
- Choice of matched size 17, 23 and 34 frame motors
- Encoder input for closed loop control

Part Number Information

Contact us for more information on +44(0)1323811188 or email sales@uhvdesign.com.

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Section 14

HEATER POWER SUPPLIES

14

Heater Power Supplies

UHV Design's series of DC heater power supplies combines DC power supply with a Eurotherm temperature controller in a single compact unit. Provides plug & play compatibility with MultiCentre and EpiCentre stages.

Key Advantages

- **Cost-effective plug & play compatibility with EpiCentre and MultiCentre stages**
- **Provides optimised temperature control**
- **Compatible with RHEED analysis**
- **Compact unit**

UHV Design's range of heater power supplies have been designed to offer cost-effective plug and play heater control for MultiCentre and Epicentre stages (see catalogue Sections 10 & 11).

The compact, single case unit comprises DC power supply (compatible with RHEED techniques) and an integrated Eurotherm temperature controller. Load current information is displayed on the front panel of the case.

In addition to manual temperature control, the Eurotherm controller includes a convenient autotuning facility. This automatically characterises the heater module and allows for set point temperatures to be achieved in the shortest possible time and maintained automatically.

The heater power supplies are compatible with K, C, N and E type thermocouples and are provided with an interlock feature for integration into system control software if required.

UHV Design's heater power supplies are configured to match the specification of the MultiCentre or EpiCentre stage. Use the part numbering information on the page opposite to find the correct part number.

Heater power supplies are also compatible with UHV Design's range of Heater Modules (see catalogue Section 12). Contact us for more details.

For details of power supply and temperature controller packages over 3kW contact sales@uhvdesign.com.

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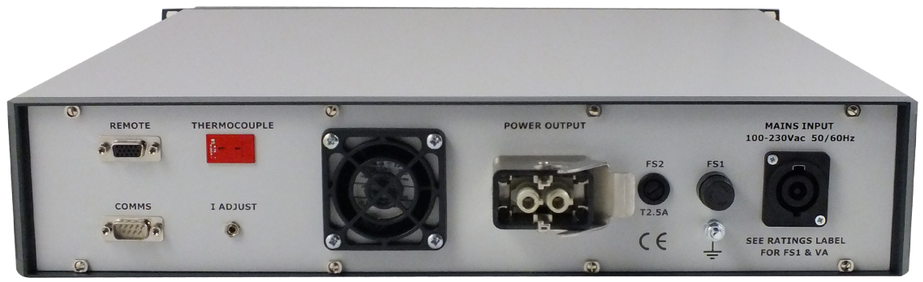

Part Number Information

MultiCentre

PSU Part Number	Max Sample Temp*	Sample Size or Type: Flag 900°C	Flag 1200°C	Puck 900°C	ESCA Stub 900°C
PSU-DC-30-27-K-7MC		Resistive		Resistive	Resistive
PSU-DC-30-27-N-7MC		Resistive		Resistive	Resistive
PSU-DC-30-27-E-7MC		Resistive		Resistive	Resistive
PSU-EB-30-10-K-7EB			E-Beam		
PSU-EB-30-10-N-7EB			E-Beam		
PSU-EB-30-10-E-7EB			E-Beam		

EpiCentre

PSU Part Number***	Max Sample Temp**	25mm (1") PBN 1000°C	25mm (1") PBN 1200°C	25mm (1") Solid SiC 1000°C	25mm (1") Solid SiC 1200°C	50mm (2") SiCG 1000°C	50mm (2") SiCG 1200°C	50mm (2") Solid SiC 1000°C	50mm (2") Solid SiC 1200°C	75mm (3") SiCG 1000°C	75mm (3") SiCG 1200°C	75mm (3") Solid SiC 1000°C	75mm (3") Solid SiC 1200°C
PSU-DC-36-42-K-7EC						■	■			■			
PSU-DC-48-62-K-7EC											■		
PSU-DC-60-25-K-7EC		■	■	■	■			■				■	
PSU-DC-60-50-K-7EC													
PSU-DC-96-31-K-7EC									■				■

PSU Part Number***	Max Sample Temp**	90mm SiCG 1000°C	90mm SiCG 1200°C	90mm Solid SiC 1000°C	90mm Solid SiC 1200°C	100mm (4") SiCG 1000°C	100mm (4") SiCG 1200°C	100mm (4") Solid SiC 1000°C	100mm (4") Solid SiC 1200°C	150mm (6") SiCG 1000°C	150mm (6") SiCG 1200°C	150mm (6") Solid SiC 1000°C	150mm (6") Solid SiC 1200°C
PSU-DC-36-42-K-7EC													
PSU-DC-48-62-K-7EC		■	■			■	■			■			
PSU-DC-60-25-K-7EC													
PSU-DC-60-50-K-7EC											■		
PSU-DC-96-31-K-7EC				■	■			■	■			■	■

* Based on Molybdenum holder ** Based Silicon Wafer ***For C type replace 'K' with 'C'

UHV Design

Product Index

UHV Design

UHV MOTION AND HEATING

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