

Sample Manipulation & Motion

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► Sample Manipulation

Many different terms are associated with sample manipulation and the devices used to achieve it: *motion feedthroughs, sample transfer, translation devices, xyz manipulation, z-only manipulation, sample rotation, rotary drives, linear drives, etc.* All cover different aspects of the same basic requirement—to mechanically move an object that is inside a vacuum chamber and under vacuum. Such devices can provide precise, repeatable movement or coarse positioning. They may move the object just a few micrometers or a few feet. They may provide rotary motion, linear motion, or a combination of both. The most complex devices give motion in three axes and rotations around two of those axes.

The mechanical movement may be generated by two basic mechanisms: a vacuum-tight seal on a mechanical device that moves through the vacuum wall or a magnetic coupling that transfers motion from air-side to vacuum-side.

Rotary Motion

A rotary motion drive is essentially an air-side "handle" that rotates a vacuum-side shaft or tube. At least five types of rotary drive exist, differentiated by actuator mechanism, vacuum sealing, compatible pressure range, and application.

■ Magnetic Coupling

An outer (air-side) rotating ring has a number of strip magnets (the strips parallel to the ring's centerline) mounted so one magnet's poles are opposite in sign to its immediate neighboring magnets. This outer ring magnetically couples through a stainless steel vacuum sheath to a vacuum-side ring with an identical number of strip magnets. A coupling places an outer N pole over an inner S pole.



Magnetically Coupled Rotary Drives

The inner magnet ring is fixed to a shaft rotating on two (MoS₂ impregnated) ball bearings. The lack of mechanical coupling and one-piece construction removes any possibility of leaks. All selected construction materials enable baking to 250° C, making this a rotary drive with high vacuum and UHV compatible. The maximum torque transmitted is determined by the force that decouples the inner/outer magnets and for larger rotary drives this is ~40Nm. If the magnetic coupling is not under high torque, this drive gives very precise



rotary motion. It can be mounted in any orientation and has a long life under continuous rotation (max. 500–1000 rpm). The trade name for this popular device is MagiDrive™.

■ Elastomer Seal

The vacuum seal on this rotary drive is an elastomeric o-ring or "knife-edge" attached to the stationary body and rubs on the rotating shaft in what is called a "dynamic seal." Gas leaks, permeation through the elastomer, and seal wear limit this drive to 10⁻⁵ Torr or 10⁻⁶ Torr range at best. They are used in applications where rotation is



O-Ring Seal

intermittent, rotation speeds are <100 rpm, there is little side-loading on the shaft, poor vacuum conditions are acceptable, but cost must be low. Any mounting orientation is permitted.

■ Ferrofluid Seal

This rotary drive is basically a flanged cylinder with two roller bearings supporting a central rotating shaft. The shaft, a high magnetic-permeability material, is machined in a series of circumferential peaks and

valleys (in section it looks like a cross-cut saw). A ring magnet, mounted in the cylinder, surrounds the shaft, creating a small gap between the shaft's peaks and the ring. This gap is loaded with a ferromagnetic fluid—a low vapor pressure fluid in which extremely small magnetic particles are suspended.



The field concentration effect of each peak causes the ferrofluid to form liquid o-rings that can sustain a 70 Torr differential pressure. That is, designs with >11 peaks provide a non-wearing vacuum seal against atmospheric pressure.

In general, ferrofluid outgassing limits this drive to applications above 1 x 10⁻⁸ Torr.

Some models are capable of high torque loading and high speed (10,000 rpm) with long life under continuous rotation. They can be mounted in any orientation and the continuous shaft means these drives provide precise rotations. The trade name for one manufacturer is Ferrotec™.

► Sample Manipulation

Linear Motion

Linear motion devices, like rotary drives, are essentially air-side “handles” that control some motion in the vacuum. Unlike rotary drives, linear drives are differentiated by what moves and how far it moves, rather than the sealing mechanism.



Linear Positioners

Positioners are bellows-sealed or magnetically coupled rods that move along the rod’s axis. The mechanisms are either manually or pneumatically actuated, enabling a push-pull motion between two stop positions. Another method is a precise screw mechanism, with manual or motorized actuation, that can be stopped at any intermediate position between its travel limits.

Positioners are used in applications needing straight-line, fixed distance movement; for example, beam-stops, shutter actuators, substrate movements, etc., at all pressures between atmosphere and UHV.

Linear positioners sealed with elastomeric o-rings or “knife-edge” seals are available and perform the same functions. However, like other “dynamic seal” devices, they are compatible with pressures between atmosphere and $\sim 10^{-5}$ Torr.

Linear Shifts

A linear shift is a pair of flanges connected by a bellows. One flange is free to move along its axis in relation to the other. The motion is constrained by a rugged, precise slide mechanism so the flange faces are always parallel. Linear shifts may be viewed as the linear version of the rotary platform; that is, they enable wide diameter devices to be inserted into the vacuum chamber and moved linearly between limits. The action is similar to the Z-only manipulator, but its positioning precision and travel length (and therefore cost) are lower. Linear shifts are actuated by hand-wheels or, for higher precision, stepper motors. They are compatible with high vacuum and UHV, and find applications moving heavier, larger-diameter loads than positioners.

Manual Linear Shift

Sample Transfer

The term *sample transfer* covers two different motions: (1) Long travel between two chambers or a load lock and chamber, through vacuum isolation valves using equipment called *transporters*, *probes*, or *transfer devices*; and (2) 3-D motion needed to transfer a sample from a motion device or storage area to a sample stage/holder. The latter is more mechanically complex, enabling intuitive XYZ motion and having a “hook” to attach to the sample and some degree of rotation to enable sample alignment. They are called *wobble sticks* or *mechanical hands*.

Of the long travel transporters described, three are associated with sample-loading components such as load lock doors or sample entry port. The fourth—*radial distribution center*—combines long-travel transportation with directional choice and is associated with moving samples between chambers rather than just sample entry. Unlike short-travel devices, long-travel linear drives are subject to gravitational “droop” at their horizontal travel limits.



Magnetically Coupled Linear Probe

Linear Transfer

The probe—the component that moves—has a “rack” gear along its length. It is supported on two groups of roller bearings (dry lubricated) and is moved by a “pinion” gear on a rotary drive mounted between the bearings. These gears give the device its common name, *linear rack & pinion probe* or *LRP transporter*.



Linear Rack & Pinion

The rotary drive is either wobble-bellows or magnetically coupled for true UHV applications, or ferrofluidic type for high torque and heavy-load applications. The travel distance can be precisely controlled (particularly with motorized drives) with good position repeatability. Since the drive’s actuator is mounted close to the chamber, in the manual version one person can simultaneously move the probe and observe its progress through a viewport. The normal maximum for travel distances is 44” (112 cm) but examples have been built with travel distances up to 96” (244 cm).

► Sample Manipulation

Linear/Rotary Transfer

The probe's "far end" (farthest from the chamber) is attached to an in-vacuum magnetic array. Outside the stainless steel vacuum envelope, a cylindrical magnet actuator couples with the internal magnet. Moving the external magnet moves the probe. Unlike the LRP, this probe's magnetic coupling enables rotary motion, too—leading to its common name of *linear/rotary magnetic probe* (for which the acronym LRM is sometimes used). The probe is UHV compatible and has a maximum travel distance of 60" (152 cm).

The manual magnetic transporter's one disadvantage is that its actuator's location—at the farthest point from the chamber—makes simultaneous movement and probe observation difficult. However, motorization overcomes this.

For maximum load capabilities, "high power" LRMs have a (vertically) magnetic decoupling force up to 310N (180N Standard) and rotary decoupling forces of 4.5Nm. The magnetic transporter's major advantage, particularly for automatic docking/transfer, is its rotation through small (misalignment) or gross (mounting orientation) angles.

Port Aligners

While a *tilt mechanism* is still a bellows connecting two flanges, directional changes are made by a mechanism not used for XY stages or Y-shifts. The flanges have three threaded rods, parallel to the bellows axis, mounted on their periphery. The rods are locked into the fixed flange and have a nut on either side of the moving flange. Tilt motion is induced by first loosening all the top nuts on the moving flange. The bottom nut on one rod is moved (toward or away from the fixed flange) and all the top nuts re-tightened. The result is, the two flanges are no longer parallel. This port aligner has identical flanges at both ends and is available in 2³/₄" CF (DN40), 4¹/₂" CF (DN63), and 6" CF (DN100) flange sizes.

The nominal maximum tilt angle depends on the distance between the flanges which, in turn, depends on the flange's O.D.: 2³/₄" CF ±5°, 4¹/₂" CF ±4°, and 6" CF ±3°. Tilt mechanisms can be baked to 250° C.

Wobble Sticks

Short travel devices used for sample movement rarely involve a sample transfer step. By contrast, long travel transporters almost always require sample transfer from the probe to a sample stage/holder. The *wobble stick* is a device that transmits simple hand movements through the vacuum wall.

A magnetically coupled drive provides linear/rotary motion while bellows provides "wobble" motion, enabling the wobble stick's end to reach positions in an "action cone." On the vacuum side, the probe terminates in a mechanism to attach/detach the sample such as hooks, forks, screw-thread bosses, pincer grips, etc.

Because the magnetic coupling enables complete rotation, the screw-thread sample attachment system is regarded as the most secure sample transfer available.

Radial Distribution Centers (RDC)



Transfer Arm inside RDC Chamber

Essentially, the *radial distribution center*—RDC is a bi-direction transporter mounted in its own (ovoid-shaped) chamber and allowed to rotate (in the horizontal plane through 360°) so the BDT's direction of travel coincides with the centerlines of 4, 6, or 8 ports spaced around the RDC chamber's circumference. The BDT's flange is mounted in the chamber's top surface with the pumping port directly below in the lower surface.

The RDC transfers samples between multiple chambers attached to its ports, one of which is usually a load lock for sample entry/removal. The completed arrangement is not unlike process chambers surrounding the central robot in a cluster tool.



Radial Distribution Center

Most RDCs are UHV compatible and used to connect high vacuum and UHV chambers. One common application is interconnecting chambers designed as/for load lock, plasma etch for sample cleaning, thin film deposition, surface science experiments, and analytical techniques (SIMS or ellipsometry).

Direction Adjustment

Any alignment errors are greatly magnified by long travel transporters. Some of these potential error sources are:

- Flange face not perpendicular to the tube axis on transporter, load lock, gate valve, or chamber port
- Chamber port's centerline not aligned with sample transfer position
- Gravity's action causes the probe to "droop"

Unfortunately, alignment can only be effectively checked when the system is fully assembled and under vacuum. Clearly, to correct these errors, devices were needed that moved the probe's position while the system was still under vacuum. Many such "direction adjustment" devices were developed and became known collectively as *port aligners*.

Y-Shift Adjusters



Y-Shift—Motorized

Some long travel transporters are required to carry loads that exceeded the capabilities of the precise XY stage. For such applications, heavy-duty Y-shifts were developed. Their basic design is like the XY stage—two flanges (one of which moves) are joined by a bellows and built into a cage. However, travel is restricted to one direction so a much sturdier cage and motion actuator (handwheel or motor) construction is possible. Two versions are available (giving fixed flange O.D. first): 4¹/₂" CF to 4¹/₂" CF (DN63 to DN63) with a motion of ±7.5 mm (0.295") and 6" CF to 4¹/₂" CF (DN100 to DN63) with a motion of ±31 mm (1.22").

Although this port aligner is called a Y-shift adjuster, its direction of motion depends on the bolt-hole orientation when the Y-shift is attached to the system. That is, if up-down is not the directional change needed, the shift is rotated 90° before mounting to give left-right motion.

► Sample Manipulation

■ XY Stages

In the *XY stage*, a short flexible metal bellows joins two flanges. A cage holds the flanges at a fixed distance apart and parallel but enables one flange's axis to move laterally (in the *XY plane*) with respect to the other flange's axis. While *XY stages* can have same-size flanges, in most arrangements the fixed flange is larger than the moving flange. Two common sizes are: 4½" O.D. CF to 2¾" O.D. CF (DN63 to DN40) and 6" O.D. CF to 4½" O.D. CF (DN100 to DN63). The moving flange's motion is controlled by two vernier drives acting on two cross-roller slides set at 90°. This enables the *XY position* to be precisely set or re-set.

XYZ Manipulation

A device that precisely moves a sample to any point in space and any rotational orientation (within the design travel limits) is called *XYZ manipulator* or occasionally *XYZ translator*. There are six degrees of freedom for such movement, one along each X, Y, and Z axis, and three rotations about these axes. For most practical applications, no more than five (X, Y, Z plus two rotations) are necessary. In the description **below**, the word *motions* is used only to describe travel along the X, Y, or Z axes (when no specific direction is implied). Similarly, the word *rotations* covers generalized rotation.

The sample is typically mounted at some central position inside the vacuum volume, enabling access for instrumentation or processes. The actuators and devices controlling the motions and rotations are all outside the vacuum volume—motions sealed by flexible bellows and rotations sealed by wobble bellows, linear-acting bellows, or magnetic couplings.

Accessories/ancillaries used with *XYZ manipulators* include:

- Sample/substrate holders or stages
- Heating stages (to raise the sample's temperature)
- Cooling stages (for cryogenic studies on samples)
- Tilt devices (to incline the sample's support probe)
- Motorizing motions and rotation

Terms Used in Motions

If a manipulator is viewed with its Z-travel bellows vertically in front of the observer and its support structure behind it:

- Y-axis runs through the bellows' center and the support's center
- X-axis runs left-right (through the Z-bellows' axis)
- Z-axis is the bellows' axis

Often these are identified as: "sideways" (X-travel), "fore-aft" (Y-travel), and "up-down" (Z-travel).

Terms Used in Rotations

Sample stages/holders at the probe's end may have the sample's surface on the Z-axis or displaced along the Y-axis, either in front of or behind the Z-axis. This displacement is called *offset*. However, whatever the position of the sample's surface, if its (flat) surface is vertical and facing the observer standing in front of the manipulator, the rotations around the various axes are called:

- Z-axis R1-, primary-, polar-, theta-rotation
- Y-axis R2-, azimuthal-, phi-, alpha-rotation
- X-axis R3-, tilt-, third-, flip-, beta-rotation

■ XYZ Manipulators

XYZ manipulators are either "single bellows" or "dual bellows." In both cases, the sample is mounted on a probe supported from the top flange of the Z-travel device. That means the distance from probe support point to sample may be long. Since the probe's "moment arm" will amplify vibrations or motions, the probe has a large diameter to increase its stiffness and rigidity.

Single Bellows manipulators must enable the probe to travel in X-, Y-, and Z-direction *through the one bellows*. That is, the bellows inside diameter (I.D.) determines the extent of X- and Y-travel and, for large probe movements, the I.D. must be large. To illustrate how large, consider a probe ¾" (19 mm) O.D. in a bellows 1½" (38 mm) I.D. The maximum X- or Y-travel is ±¾" (±9.5 mm). To substantially increase the XY-travel, wide-bore bellows are required. Combining that with long Z-travel means the bellows are not only wide, they are also long. Long, wide-bore bellows are exceptionally expensive.

Dual Bellows manipulators separate Z-travel from X- and Y-travel. The Z-travel uses a small I.D. bellows that is as long as needed for the travel distance. For X- and Y-travel, one short, large I.D. bellows is used. The manipulator is constructed with the Z-travel bellows, its entire support structure, the Z-travel's actuator, any rotary drives for rotating the sample, and the probe, built onto a rugged top carriage. The top carriage, in turn, is mounted on a lower carriage. The manipulator is mounted in the lower carriage and connects to the top carriage by the short, large I.D. bellows for the X- and Y-travel. The top carriage is supported on the lower carriage by rearing slides—mounted at a 90° angle—that precisely moves the top carriage in X- and Y-directions relative to the lower carriage. Despite the two bellows manipulator's complexity, it is a more practical and cost-efficient solution to large X-, Y-, and Z-travel motions than a long, wide-bore single bellows design of identical travel limits.

In some manipulator designs, the R1 rotation is continuous. But heating and cooling options limit the rotation to less than a full circle. R2 (and the more unusual R3) rotation is actuated typically by a push-rod movement and limited, normally, to a few degrees. When considering sample holders and rotation, system designers must ensure sufficient clearance (usually around the primary axis), so the sample holder's sweep radius does not cause it to collide with chamber fixtures during the traverse.



XY Stage

MultiStage XYZ

► Sample Manipulation

■ Sample Holders

As their name implies, *sample holders* secure the samples so the manipulator's motion is translated into an identical sample motion. The sample holder can be mounted directly to the XYZ manipulator's probe but is frequently connected to the shaft of a rotary drive, mounted through a hollow probe, to provide R1 rotation. Where R2 motion is needed, the sample holder is designed to include mitre gears that causes rotation (around the pinion's axis) when the rack is moved by a push-rod motion transmitted through the hollow probe.



Docking Stage

■ Heating/Cooling

Heating and cooling options are also sample holder functions. Sample heating can be accomplished by electron bombardment (EB) or thermal radiation (IR). For EB, the sample holder is equipped with a filament capable of thermionic emission. The filament is electrically isolated (or the sample is electrically isolated) and biased to make the filament a high negative potential. This causes electrons to bombard the sample at high energy. For IR, a filament is mounted close to the sample's backside and resistively heated to a high temperature. The IR from the filament heats the sample. Typical maximum temperatures depend on many factors, including the sample material, radiation shielding, sample emissivity, etc., but range from 800° C to 1200° C LN₂ cooling is also available as an option.



Sample Holder

■ Tilt Device

A *tilt device* is a bellows connecting two flanges similar to the tilt mechanisms noted under **Direction Adjustment**. In this device, however, the flanges' non-parallelity is controlled by three vernier screw drives around the flanges' periphery. Moving one or more verniers from the neutral position forces the flanges' faces out-of-parallel. The probe can be pointed in any direction, within a defined cone angle, relative to the manipulator's axis.

■ Motorization

To achieve the highest positioning accuracy, resolution, and repeatability, XYZ manipulator motions/rotations are motorized with air-side mounted stepper motors. Motors are also used for long Z-travel-only manipulators, where making long travel movements by hand can be arduous (because of the exceptionally fine gear ratios), and on XYZ manipulators located at inaccessible points on large systems.

Substrate Rotation, Heating, and Transfer Stages

Why rotate a substrate? Rotation is often associated with thin film deposition. If the flux of material from a PVD source or the precursor gas's local concentration from CVD "shower head" is non-uniform, the film's growth on a static substrate will have a non-uniform thickness. One solution is to rotate the substrate and expose its entire surface area to the more uniform *average* flux.

Why heat a substrate? Heating is often, again, associated with thin film deposition. For PVD techniques, the substrate's temperature influences the surface migration of depositing atoms and the film's morphology—determining its porosity and grain structure. For CVD techniques, the substrate's temperature is the reaction driver, converting the volatile precursor into the solid film.

What is a transfer stage? In some applications, the chamber is vented and opened to load the next substrate on the rotation/heating stage. For R&D applications and some (low base pressure) process applications, however, multiple substrates are stored under vacuum in the main chamber or an adjacent load lock. Substrates are exchanged while still under vacuum and, of necessity, the rotation/heating stage's design must allow such transfer.

There are countless design variations of substrate stages. The simplest are fixed mounts without rotation, heating, or transfer. The next level provides rotation for a single disk about its axis. They are often called platens or turntables. Other platens carry multiple substrates that rotate about the platen's axis or, with suitable gearing, about their own axis, as well as the platen's axis. The basis of this last design is carried forward with hemisphere or dome "planetaries" carrying multiple disk substrates. The substrate not only rotates about

its own axes, but also rotates through different spatial positions on the dome. These are used in production batch coating tools for coating many, relatively small diameter substrates. Almost all rotating platens are driven by an externally mounted, motorized rotary drive.

Because heating and transfer only add to the confusion of variations, the characteristics below focus on one of the more sophisticated substrate heater-rotator-transfer stages commercially available—*EpiCentre*™.



Epi100

► Sample Manipulation

■ Substrate Rotation

Substrate rotation is variable up to 80 rpm using a DC motor or stepper motor. The former is preferred for smooth continuous rotation, and the latter if stage indexing or substrate positioning is required for *in situ* RHEED measurements. The motor is connected through the vacuum wall to the rotating torque tube by a magnetically coupled rotary drive. The absence of gears and use of well-proven ball races ensures hydrocarbon-free operation with negligible particulate generation. The DC motorized rotary drives are available as single, double, or triple stack arrangements to match the specific cradle inertias. The complete stage is bakeable to 250° C, and is compatible with UHV, high vacuum, and reactive gas environments.

■ Substrate Heating

Making a continuously rotating electrical connection that does not arc under vacuum is considered a huge engineering challenge. Disk platens are heated by adding stationary resistive heating elements or high-temperature quartz-halogen lamps to the backside of the platen structure. This form of vacuum heating involves IR radiation heat transfer. A sample's reflection, absorption, and transmission in the IR region are critical to its equilibrium temperature for a given heat input—that is, a "maximum temperature" quoted without the material's characteristics must be treated with caution. Based on a molybdenum block sample, the maximum temperature can be as high as 1200° C.

Heater Modules

The choice of heater module depends on the application. *Pyrolytic graphite coated graphite* heaters are robust, reliable, reach high temperatures, and provide good temperature uniformity. *Pyrolytic boron nitride coated graphite* heaters have a considerably smaller area of exposed graphite, which minimizes "doping" for those applications sensitive to carbon. *Pyrolytic boron nitride* heaters have a layer of (grown) PBN covering an etched (patterned) graphite film deposited on a PBN disk, and are designed for long life, low current heating.

An interesting modification is the *quartz-enclosure* heater, which has its element surrounded by a vacuum-sealed quartz "box" that completely separates the heater's environment from the process environment. The "box" seals against an internal water-cooled flange, creating the secondary vacuum enclosure, which is separately pumped via a port on the stage's service collar. This heater is used where particulate cleanliness is critical, corrosive gases are present, or where high O₂ partial pressures are necessary. Because the element is farther from the substrate and radiates through the quartz, the maximum sample temperature is reduced to 1000° C for a molybdenum block.

Temperature Measurement

Selecting the correct thermocouple type is essential to prevent corrosion or process contamination. The common types used in substrate heating are Type "C" (tungsten/rhenium)—non-magnetic, high maximum temperature, and is generally more resistant to chemical attack and Type "K" (Chromel/Alumel)—costs less, but lower maximum temperature, and is magnetic. The temperature across the central 90% of a Si wafer has nominally ± 2.5° C variation.

■ Substrate Transfer and Manipulation

Placing a single linear shift between the substrate stage and the chamber mounting flange enables the entire stage, including wafer cradle and heater, to move as a unit along the stage's axis (normal to the substrate's surface). This motion is often used to vary the throw distance between substrate and a (PVD) source.

Placing a single linear shift between the heater's service collar and the substrate stage's body enables the heater to be moved away from the substrate cradle, providing a gap through which the substrate can be manually extracted.

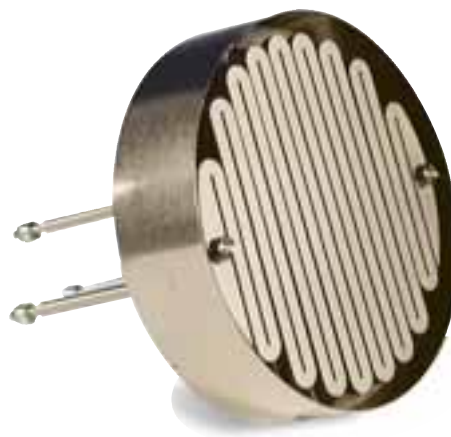
By installing both shifts, the stage may be manipulated in a typical "wafer hand-off" routine. The heater is first retracted to provide access to the substrate and then the entire stage lifted and/or lowered as needed by the substrate hand-off motions. In addition to manually operated substrate hand-offs, the shifts may be motorized or even pneumatically actuated, enabling automated substrate exchange using PLCs.

■ Substrate Holders

The substrate holder, also called a substrate cradle, is made from refractory metal with various designs to hold a standard wafer 25 mm–300 mm (1"–12" diameter) or multiple substrate disks. The holders can be isolated to enable substrate bias up to 2kVDC (and a lower level of RF bias).



Epi Wafer Cradle



Epi Heater Module

► MagiDrive™ UHV Series

■ Overview

MagiDrive uses a large number of high flux magnetic fields interlocking inner and outer rotating assemblies through a solid stainless steel enclosure, giving it exceptionally high torsional rigidity. Because MagiDrive has no bellows, fluids, or dynamic seals, it features totally leak-tight operation.

The production proven range is supplied with CF UHV flanges and is available in 10 sizes to match the torque requirements of each application. The range includes a unique hollow option, enabling MagiDrives to be “stacked” together, offering three independent axes of rotation or possibly used to feed services through such as heating. A number of actuation methods are available, from manually driven units to pneumatic or motorized drives.

Additional options include the use of state-of-the-art bearings for ultra-clean applications, such as semiconductor production. The MagiDrives are extremely compact, bakeable to 250° C, as standard and up to 450° C for high temperature applications.

Features:

- True UHV performance
- Zero-backlash under low load
- Intrinsically safe for leak-tight applications
- Bakeable to 250° C
- Robust, compact construction

Modular Shaft Extension



Shaft Options

The smaller MagiDrives, up to and including the MD25, are supplied with short shafts for end users to attach their load. The larger MagiDrives are supplied with spigot flanges to provide a rigid coupling to the driven load. Customized extension shafts are also available upon request.

Except for the MD10, all MagiDrives can be supplied in a “dual shaft” version, where both input and output shafts are supplied on the drive.

For longer shafts, where concentricity and stability of the rotating shaft is critical, a range of extended bearing housings is offered to support the shaft along its axis of rotation. Please contact us for further information on this option.

Bearing Options

The standard MagiDrive range incorporates specialized molybdenum disulphide coated bearings to provide true UHV rotation.

CeramaDrive bearings offer a ceramic bearing solution to provide ultra-clean rotation predominantly for UHV high-temperature applications. The bearings are non-lubricated, utilizing the low coefficient of friction between the ceramic balls and the ball race to provide extremely smooth, ultra-clean motion.

SemiDrive bearings are specialized for ultra-clean semiconductor applications. The bearings are totally dry, self-lubricating, and compatible with cryogenic temperatures.

Actuation Methods

Manually driven MagiDrives are available with thumb-screw brakes, calibrated thimbles, and timing pulleys for end-user motorization.

The MD16 can be fitted with an external friction system, providing resistance to free motion, typically used for general positioning applications.

Pneumatically Actuated MagiDrives are predominantly used for source shutter applications and have adjustable sweep from 30–170°. Optional Auto Switch assemblies are available to provide confirmation of the position status.



MagiDrive Family

Motorized MagiDrives can be DC or Stepper Motor driven and are available with a selection of motors to match the load, speed, and positioning requirements of each application. To ensure system compatibility, motors can be mounted either to the side or inline with the drive. Motors are easily removed for bakeout and have pre-set mounting brackets to ensure the correct belt tension is maintained when replaced. Controllers are also available. Please see our DC Motor and Stepper Motor Controller pages for more information.



Stepper Motor Option

Pulley Option



Rotary Pneumatic Actuator



► MagiDrive™ UHV Series

■ Motorized Actuation Gearing Options

Drive	Motor Type	Gear Option	Maximum Output Torque (Nm)	Maximum Output Spin Speed (RPM)	
MD10	Inline DC (ID)	1	0.04	363	
		2	0.18	82	
		3	0.18	44	
		4	0.18	19	
	Inline Stepper (IS)	1	0.04	1800	
		2	0.18	360	
		3	0.18	113	
		4	0.18	72	
MD16, MD19*, MD20, MD21*	Inline DC (ID)	1	0.2	230	
		2	0.2	135	
		3	0.3	70	
		4	0.45/0.56*	42	
		5	0.45/0.56*	21	
		6	0.45/0.56*	8	
	Inline Stepper (IS)	1	0.12	1000	
		2	0.45	300	
		3	0.45	150	
		4	0.45	60	
MD25	Side-Mounted DC (SD)	1	0.7	213	
		2	2.0	80	
		3	2.4	40	
		4	2.4	20	
	Inline DC (ID)	1	0.4	320	
		2	1.0	120	
		3	2.0	60	
		4	2.4	30	
	Side-Mounted Stepper (SS)	1	1.0	500	
		2	1.5	200	
		3	2.0	80	
		4	2.4	40	
	Inline Stepper (IS)	1	1.0	500	
		2	2.4	120	
		3	2.4	60	
		4	2.4	30	
	MD35, MD35H	Side-Mounted DC (SD)	1	0.8	175
			2	2.0	65
			3	3.5	33
			4	4.0	16
Inline DC (ID)		1	0.4	320	
		2	1.0	120	
		3	2.0	60	
		4	4.0	30	
Side-Mounted Stepper (SS)		1	1.0	500	
		2	1.6	165	
		3	2.0	66	
		4	4.0	33	
Inline Stepper (IS)		1	1.0	500	
		2	2.4	120	
		3	4.0	60	
		4	4.0	30	
MD64, MD64H	Side-Mounted DC (SD)	1	3.8	235	
		2	7.5	117	
		3	10	48	
		4	10	24	
	Inline DC (ID)	1	2.0	440	
		2	4.0	220	
		3	10	88	
		4	10	44	
	Side-Mounted Stepper (SS)	1	4.5	160	
		2	9.0	80	
		3	10	32	
		4	10	16	
	Inline Stepper (IS)	1	2.5	300	
		2	5.0	150	
		3	10	60	
		4	10	30	

► MagiDrive™ UHV Series

■ Sealed End Series

We offer our MagiDrive Sealed-End Series magnetically coupled rotary drives in a variety of UHV flange terminations.

■ MD10 MicroDrive

Potentially the smallest UHV rotary drive on the market.

- Made possible with the use of the new 1" CF MicroFlange (outside diameter of 1")
- Offers sufficient torque for the majority of miniature feedthrough requirements

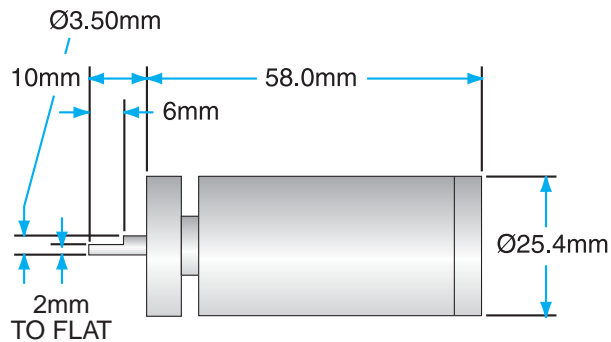
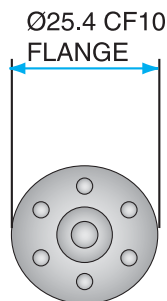
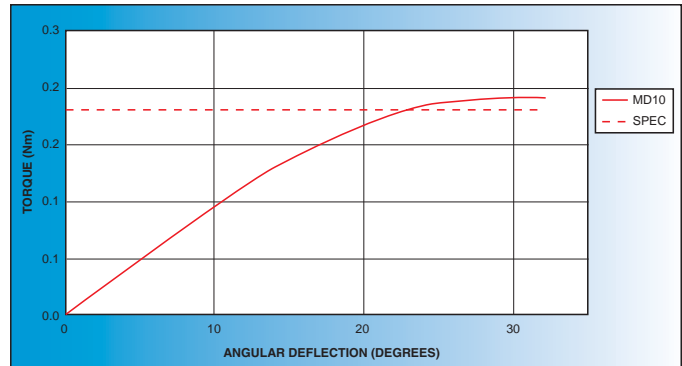


Available Configuration Options:

- Shafts—stub shaft with flat
- Manual Actuation—thimble, friction control, calibrated thimble, timing pulley
- Automated Actuation—inline stepper motor, inline DC motor, pneumatic
- Bearings—standard bearings

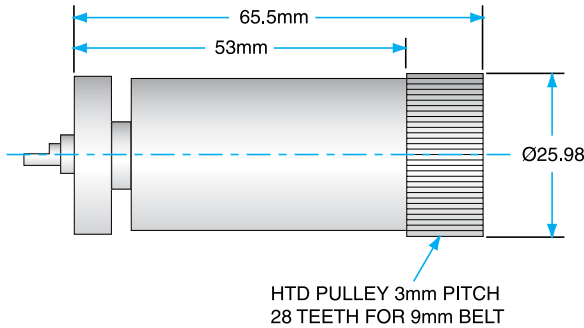
SPECIFICATIONS

MagiDrive Body	MD10
System Mounting Flange	CF10 25.4 mm (1" O.D.)
Construction	Machined from one piece of 316L
Shaft Style	Solid
Breakaway Torque	0.18 Nm (0.13 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	200 rpm
Maximum Shaft Axial Thrust	20 N (4.5 lbf)
Bakeout	250°C

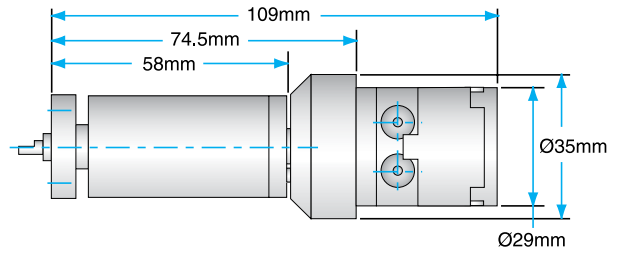


Standard Thimble

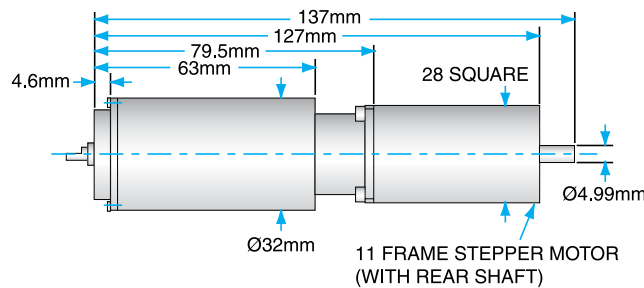
► MagiDrive™ UHV Series



Pulley



Pneumatic



Stepper Motor

Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: **MD10TX000Z** = Call

	Part No. Prefix
Base Size	MD10
	Option Part No.
Actuation Options	
Standard thimble	T
Standard with friction control	TF
Calibrated thimble with friction control	CF
Timing pulley	P
Inline stepper motor	IS
Inline DC motor	ID
Pneumatic actuator	RA
Pneumatic actuator with 2 x reed switches and visual position indicators	RAI
Gearing Options*	
Shaft Options	
Bearing Options	
Standard bearing	Z



*MD10
MicroDrive*

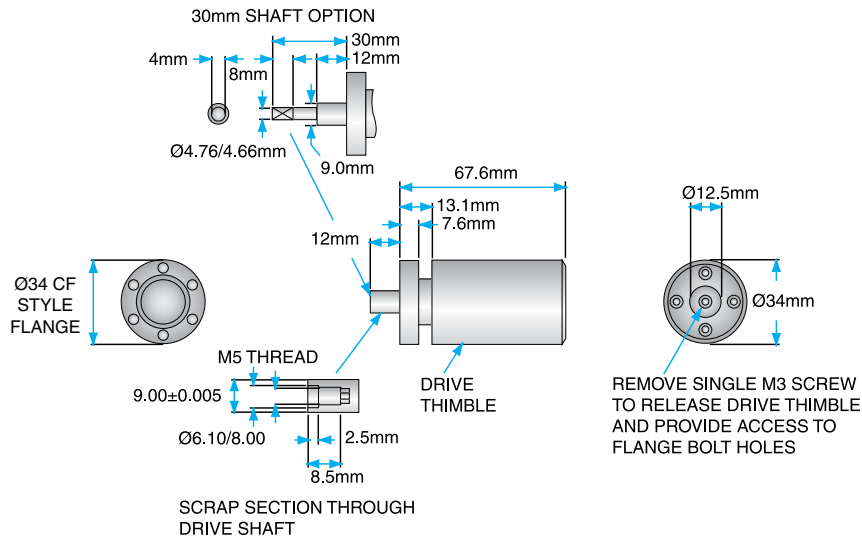
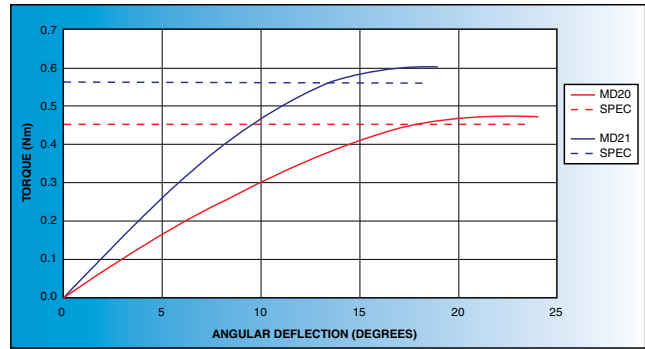
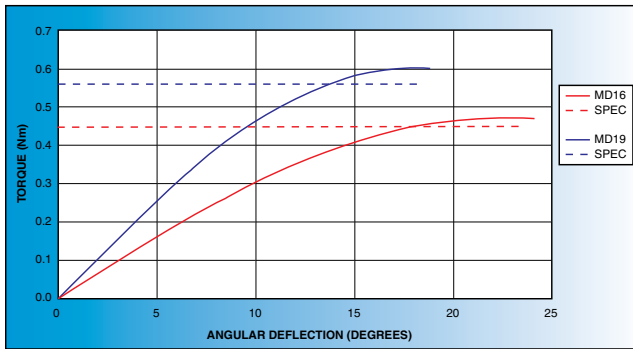
MagiDrive™ UHV Series

MD16, 19, 20, 21 MagiDrives

- Provides rotation solutions to numerous production and research applications
- Offers sufficient torque for the majority of mini-feedthrough requirements

Available Configuration Options:

- Manual Actuation—thimble, friction control, calibrated thimble, thumbscrew brake, timing pulley
- Automated Actuation—inline stepper motor, inline DC motor, pneumatic
- Bearings—standard bearings, CeramaDrive bearings



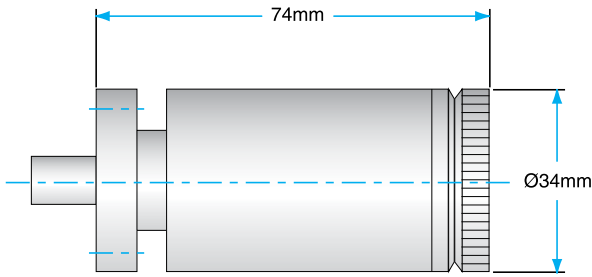
Standard Thimble

SPECIFICATIONS

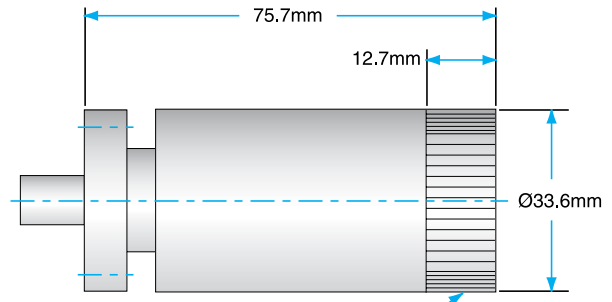
MagiDrive Body	MD16	MD19	MD20	MD21
System Mounting Flange	CF16 34 mm (1.33" O.D.)	CF16 34 mm (1.33" O.D.)	CF35 70 mm (2.75" O.D.)	CF35 70 mm (2.75" O.D.)
Construction	Machined from one piece of 316L	Machined from one piece of 316L	Machined from one piece of 316L	Machined from one piece of 316L
Shaft Style	Solid	Solid	Solid	Solid
Breakaway Torque	0.45 Nm (0.33 lbf ft)	0.56 Nm (0.41 lbf ft)	0.45 Nm (0.33 lbf ft)	0.56 Nm (0.41 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	1000 rpm	1000 rpm	1000 rpm	1000 rpm
Maximum Shaft Axial Thrust	66 N (15 lbf)	66 N (15 lbf)	66 N (15 lbf)	66 N (15 lbf)
Bakeout	250° C	250° C	250° C	250° C

8 Sample Manipulation & Motion

► MagiDrive™ UHV Series

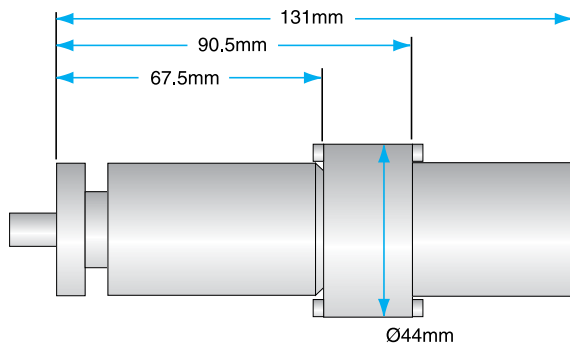


Brake with Friction

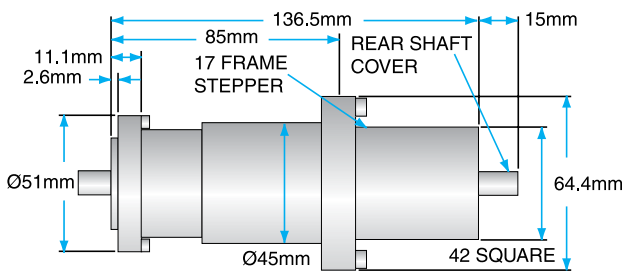


3mm HTD PITCH TIMING PULLEY
36 TEETH TO SUIT 9mm BELT

Pulley



Pneumatic



Stepper Motor

Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: **MD16TX000Z** = Call

	Part No. Prefix
Base Size	MD16
	MD19
	MD20
	MD21
	Option Part No.
Actuation Options	
Standard thimble	T
Standard with friction control	TF
Brake with friction control	BF
Calibrated thimble with friction control	CF
Timing pulley	P
Knurled end cap	K
Knurled end cap with friction control	KF
Dual shaft	D
Inline stepper motor	IS
Inline stepper motor with switches	ISS
Inline DC motor	ID
Pneumatic actuator	RA
Pneumatic actuator with 2 x reed switches and visual position indicators	RAI
Gearing Options*	
Shaft Options	
30 mm shaft	X030
Modular shaft	XM
Bearing Options	
Standard bearing	Z
Ceramic bearing	CE

► MagiDrive™ UHV Series

■ MD25 MagiDrive

A medium-torque drive offered on a 2 3/4" O.D. CF flange.

- Provides a cost-effective solution for various rotation applications

Available Configuration Options:

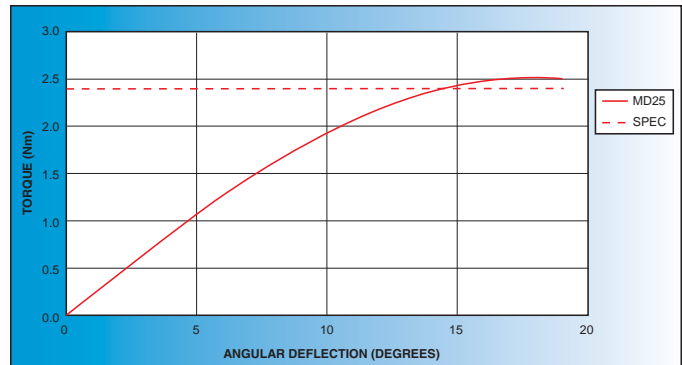
- Shafts—stub shaft with flat, dual shaft
- Manual Actuation—thimble, calibrated thimble, timing pulley
- Automated Actuation—inline stepper motor, side-mounted stepper motor, inline DC motor, side-mounted DC motor, pneumatic
- Bearings—standard bearings, CeramaDrive bearings



8

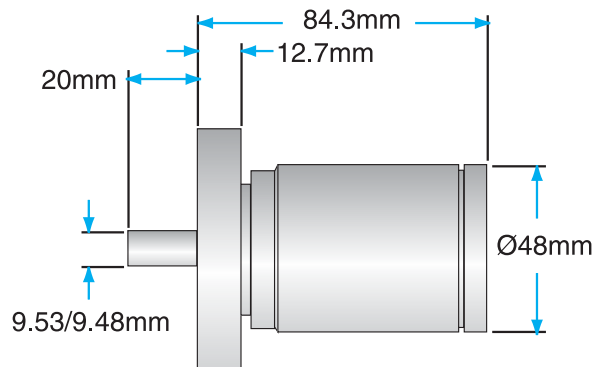
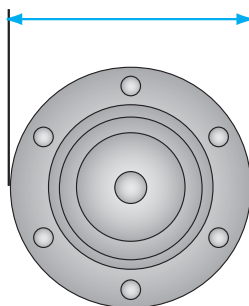
SPECIFICATIONS

MagiDrive Body	MD25
System Mounting Flange	CF38 70 mm (2.75" O.D.)
Rear Flange	None
Construction	Machined from one piece of 316L
Shaft Style	Solid
Breakaway Torque	2.4 Nm (1.77 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	500 rpm
Maximum Shaft Axial Thrust	100 N (22.5 lbf)
Bakeout	250° C



Sample Manipulation & Motion

Ø70 (2 3/4") CF FLANGE



Standard Thimble

► MagiDrive™ UHV Series

■ MD35 MagiDrive

It provides the highest torque available on a 2 3/4" CF flange.

- Ideally suited for applications, such as the rotation of samples and platens, where stability is necessary

Available Configuration Options:

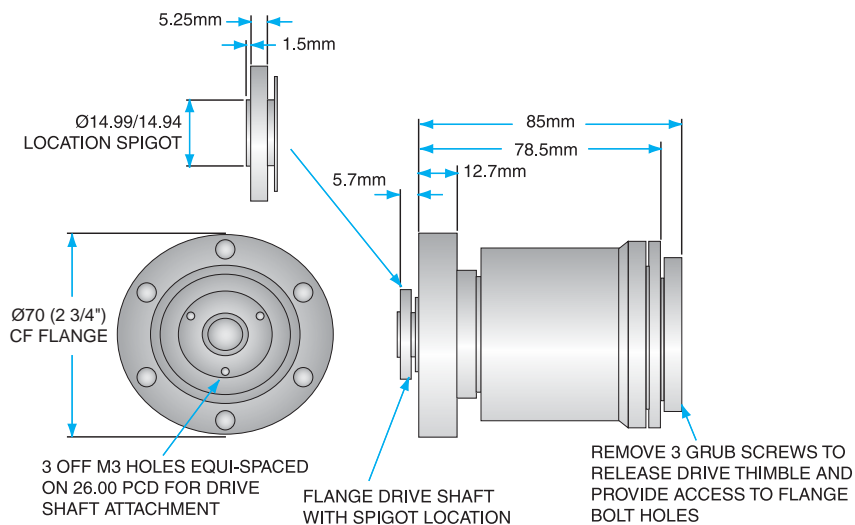
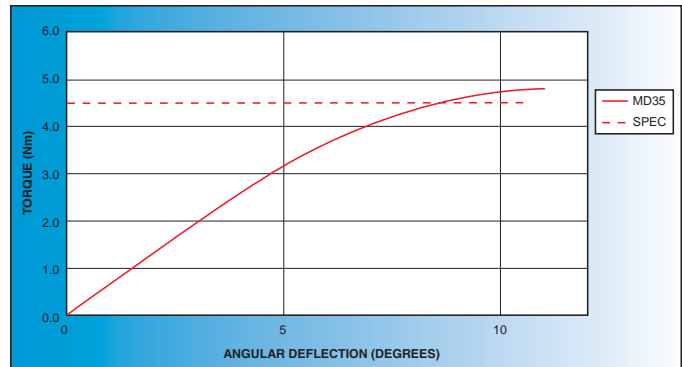
- Shafts—spigot flange, dual shaft
- Manual Actuation—thimble, timing pulley, thumbscrew brake
- Automated Actuation—inline stepper motor, side-mounted stepper motor, inline DC motor, side-mounted DC motor, pneumatic
- Bearings—standard bearings, CeramaDrive bearings, SemiDrive bearings



8

SPECIFICATIONS

MagiDrive Body	MD35
System Mounting Flange	CF38 70 mm (2.75" O.D.)
Rear Flange	None
Construction	Machined from one piece of 316L
Shaft Style	Spigot flange
Breakaway Torque	4.5 Nm (3.32 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	500 rpm
Maximum Shaft Axial Thrust	200 N (45 lbf)
Bakeout	250° C



Standard Thimble

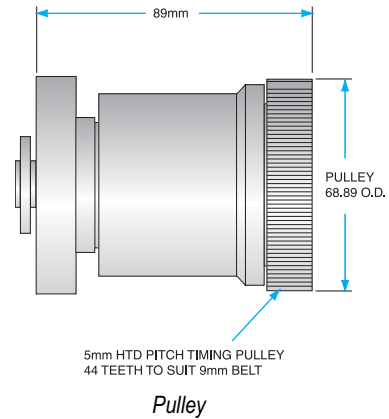
Sample Manipulation & Motion

► MagiDrive™ UHV Series

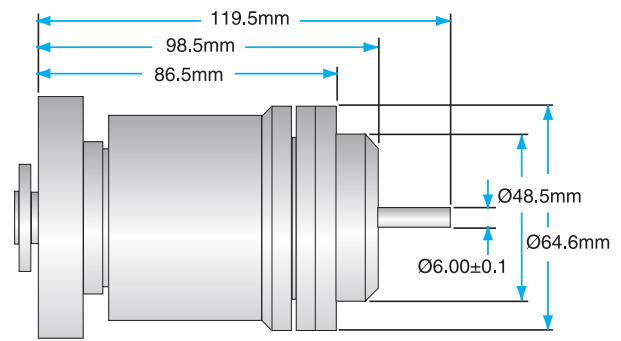
Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: MD35TX000Z = Call

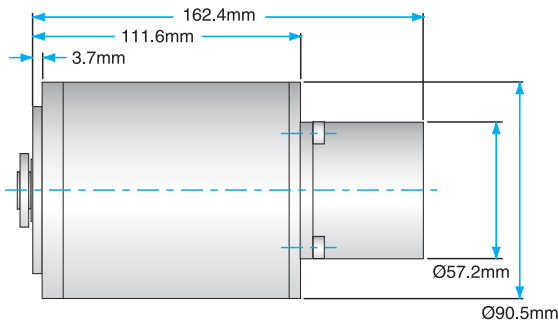
	Part No. Prefix
Base Size	MD35
	Option Part No.
Actuation Options	
Standard thimble	T
Standard with friction control	B
Timing pulley	P
Dual shaft	D
Calibrated thimble with thumbscrew brake	CB
Inline stepper motor	IS
Inline stepper motor with switches	ISS
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Inline DC motor	ID
Side-mounted DC motor	SD
Pneumatic actuator	RA
Pneumatic actuator with 2 x reed switches and visual position indicators	RAI
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z
Ceramic bearing	CE
Semiconductor bearing	SE



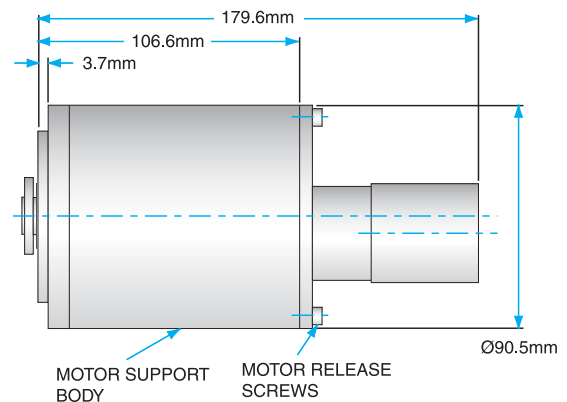
Pulley



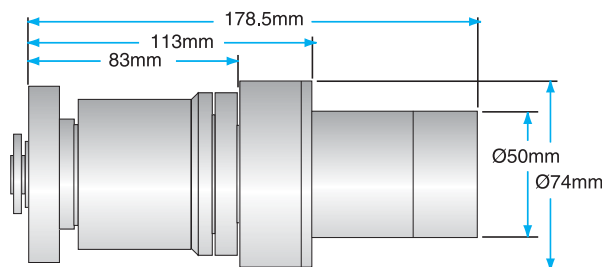
Dual Shaft



Stepper Motor



DC Motor



Pneumatic

► MagiDrive™ UHV Series

■ MD64 MagiDrive

It provides high torque, high stability rotation on a 4½" O.D. CF flange.

- Use in applications such as the rotation and positioning of large platens

Available Configuration Options:

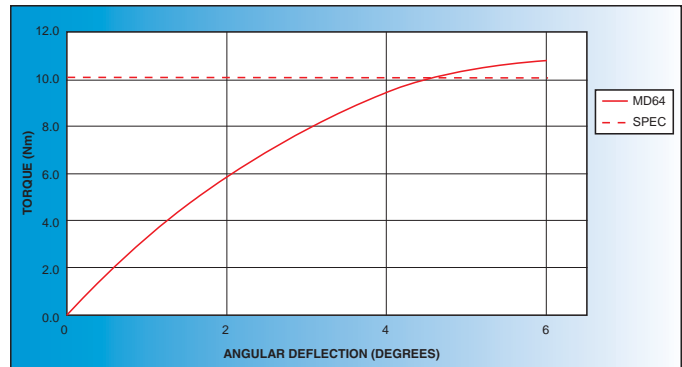
- Shafts—spigot flange, dual shaft
- Manual Actuation—thimble, timing pulley, thumbscrew brake, calibrated thimble
- Automated Actuation—inline stepper motor, side-mounted stepper motor, inline DC motor, side-mounted DC motor
- Bearings—standard bearings, SemiDrive bearings



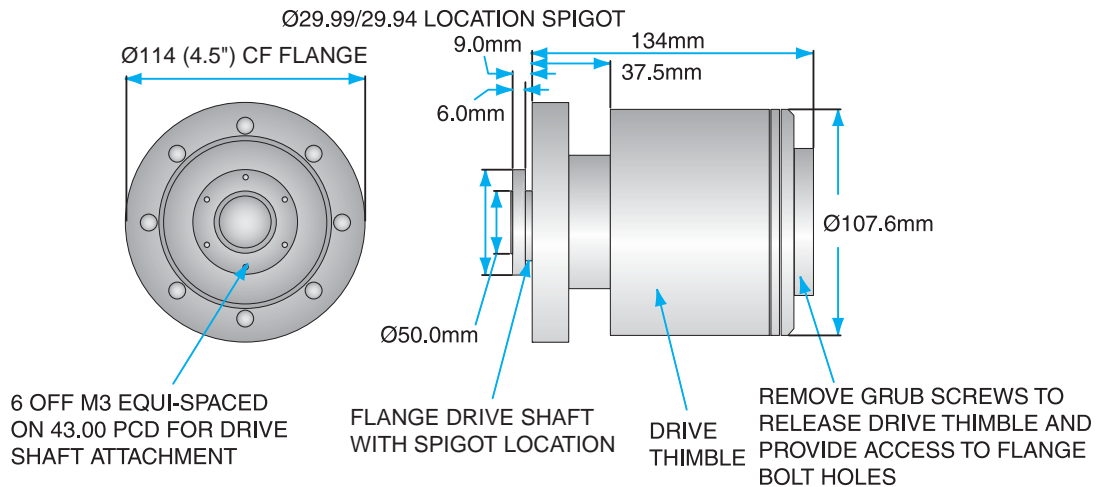
8

SPECIFICATIONS

MagiDrive Body	MD64
System Mounting Flange	CF64 114 mm (4.5" O.D.)
Rear Flange	None
Construction	Machined from one piece of 316L
Shaft Style	Spigot flange
Breakaway Torque	10 Nm (7.38 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	500 rpm
Maximum Shaft Axial Thrust	400 N (90 lbf)
Bakeout	250° C

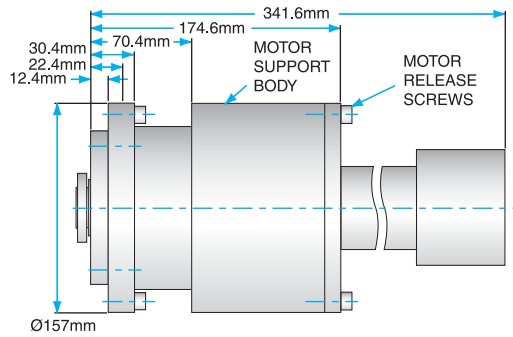


Sample Manipulation & Motion

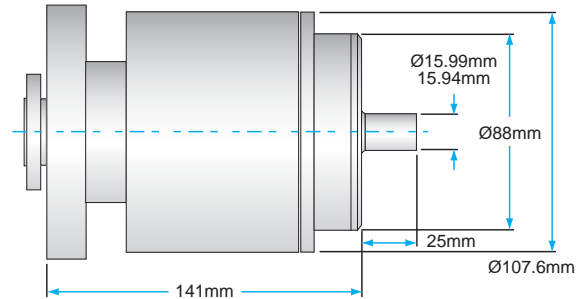


Standard Thimble

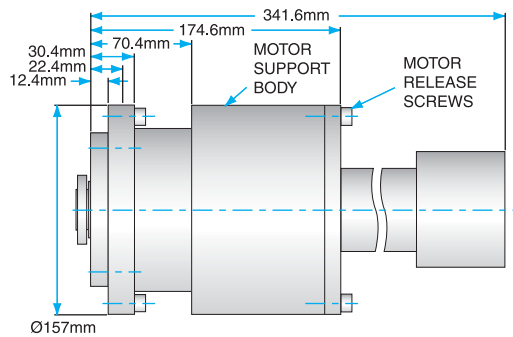
► MagiDrive™ UHV Series



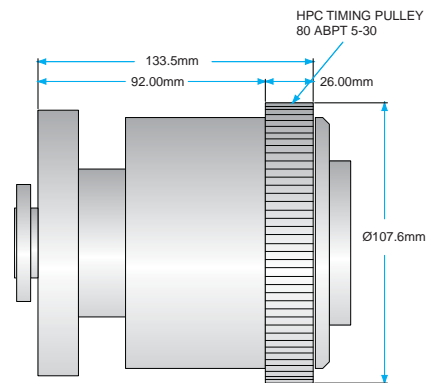
DC Motor



Dual Shaft



Stepper Motor



Pulley

Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: **MD64TX000Z** = Call

	Part No. Prefix
Base Size	MD64
	Option Part No.
Actuation Options	
Standard thimble	T
Brake with friction control	BF
Timing pulley	P
Calibrated thimble with thumbscrew brake	CB
Inline stepper motor	IS
Inline stepper motor with switches	ISS
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Inline DC motor	ID
Side-mounted DC motor	SD
Pneumatic actuator	RA
Pneumatic actuator with 2 x reed switches and visual position indicators	RAI
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z
Semiconductor bearing	SE

MagiDrive™ UHV Series

MD100 MagiDrive

The largest MagiDrive offered.

- Provides breakaway torque of 25Nm
- Offers an excellent solution for high torque, high-precision applications

Available Configuration Options:

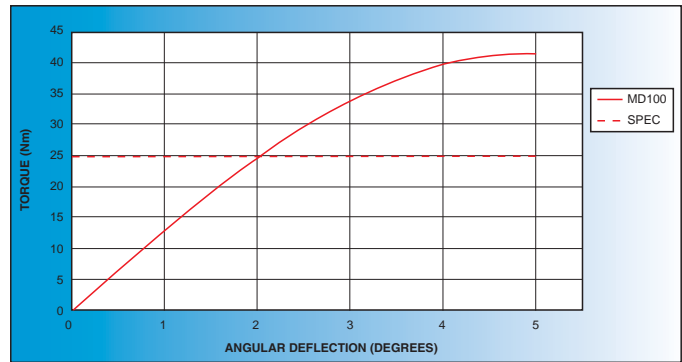
- Shafts—spigot flange, dual shaft
- Manual Actuation—thimble, timing pulley
- Automated Actuation—side-mounted stepper motor, side-mounted DC motor
- Bearings—standard bearings, SemiDrive bearings



8

SPECIFICATIONS

MagiDrive Body	MD100
System Mounting Flange	CF100 152 mm (6" O.D.)
Rear Flange	None
Clear Bore	65 mm
Construction	Fabrication
Shaft Style	Spigot flange
Breakaway Torque	40 Nm (29.5 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	200 rpm
Maximum Shaft Axial Thrust	400 N (90 lbf)
Bakeout	250° C

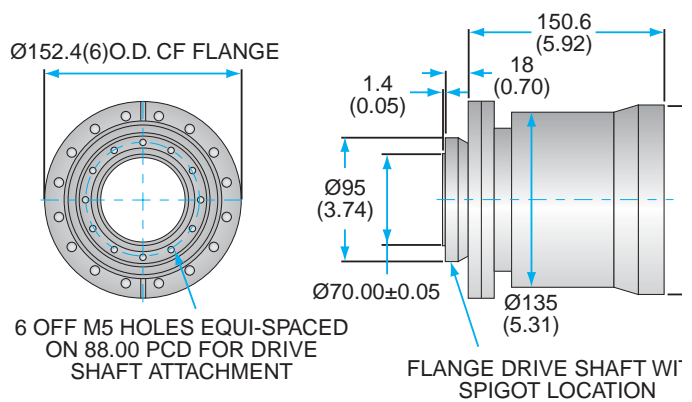


Sample Manipulation & Motion

Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: MD100TX000Z = Call

	Part No. Prefix
Base Size	MD100
	Option Part No.
Actuation Options	
Standard thimble	T
Timing pulley	P
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Side-mounted DC motor	SD
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z



Standard Thimble

► MagiDrive™ UHV Series

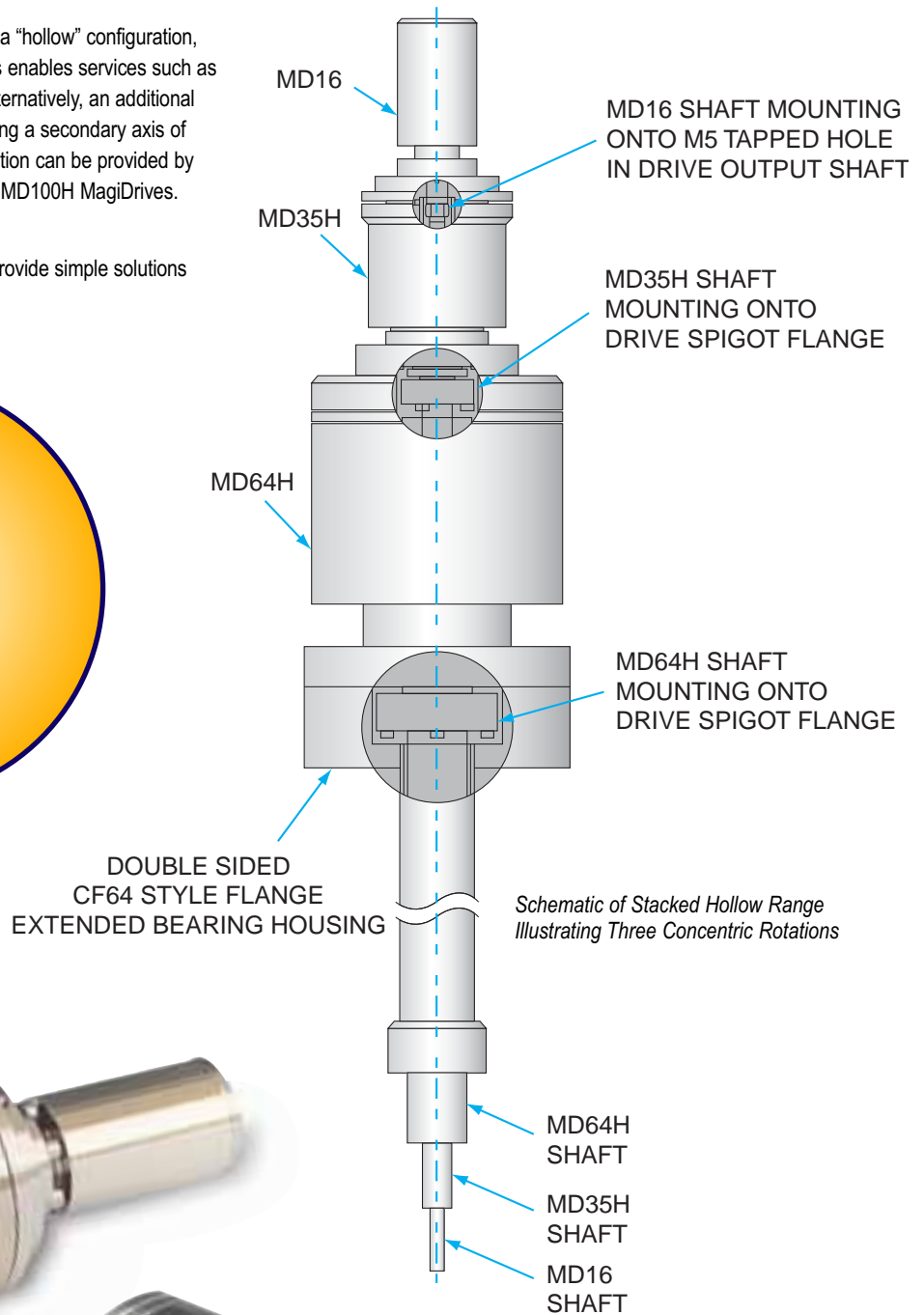
■ Hollow MagiDrive Range

The four largest MagiDrives are available in a “hollow” configuration, terminating with a CF flange at the rear. This enables services such as heating 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 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.



Triple Stack MagiDrive



Double Stack MagiDrive



► MagiDrive™ UHV Series

We offer our MagiDrive Hollow Through-Bore Series magnetically coupled rotary drives in a variety of UHV flange terminations.

■ MD35H MagiDrive

The hollow version of the MD35 MagiDrive.

- A secondary drive, such as the MD16, can be mounted to its rear fixed 1 1/3" O.D. CF flange, enabling a second axis of independent rotation to be achieved

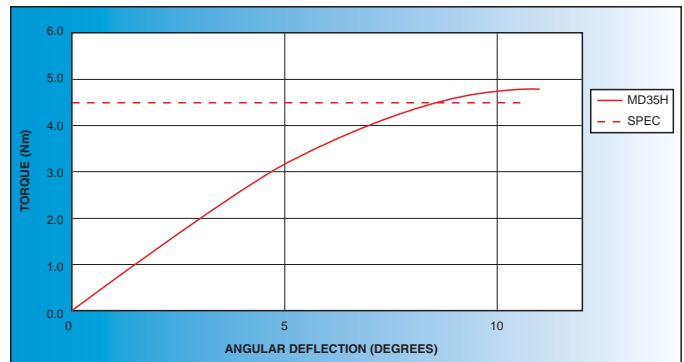
Available Configuration Options:

- Shafts—spigot flange
- Manual Actuation—thimble, timing pulley, thumbscrew brake
- Automated Actuation—side-mounted stepper motor, side-mounted DC motor
- Bearings—standard bearings, CeramaDrive bearings, SemiDrive bearings



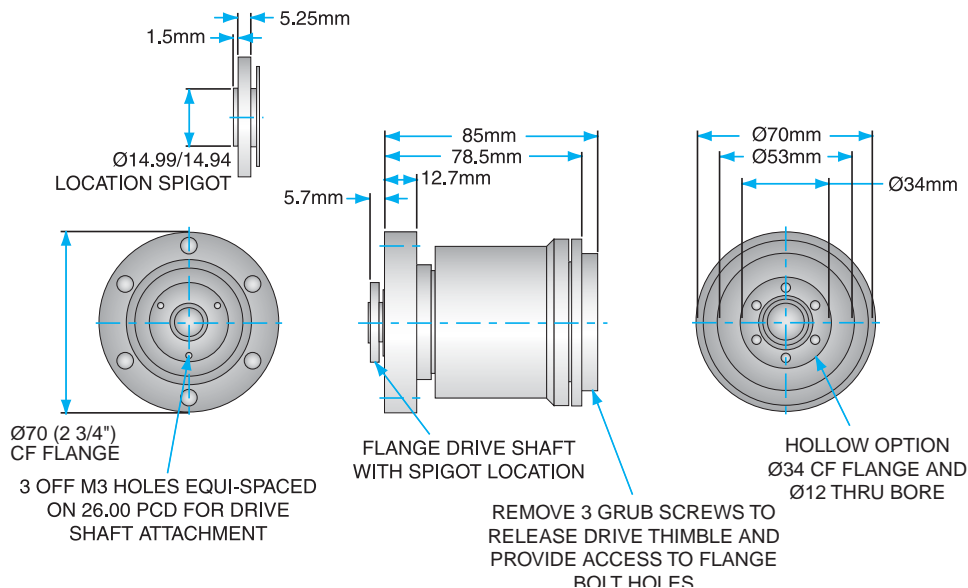
SPECIFICATIONS

MagiDrive Body	MD35H
System Mounting Flange	CF38 70 mm (2.75" O.D.)
Rear Flange	CF16 34 mm (1.33" O.D.)
Construction	Machined from one piece of 316L
Shaft Style	Spigot flange
Breakaway Torque	4.5 Nm (3.32 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	500 rpm
Maximum Shaft Axial Thrust	200 N (45 lbf)
Bakeout	250° C



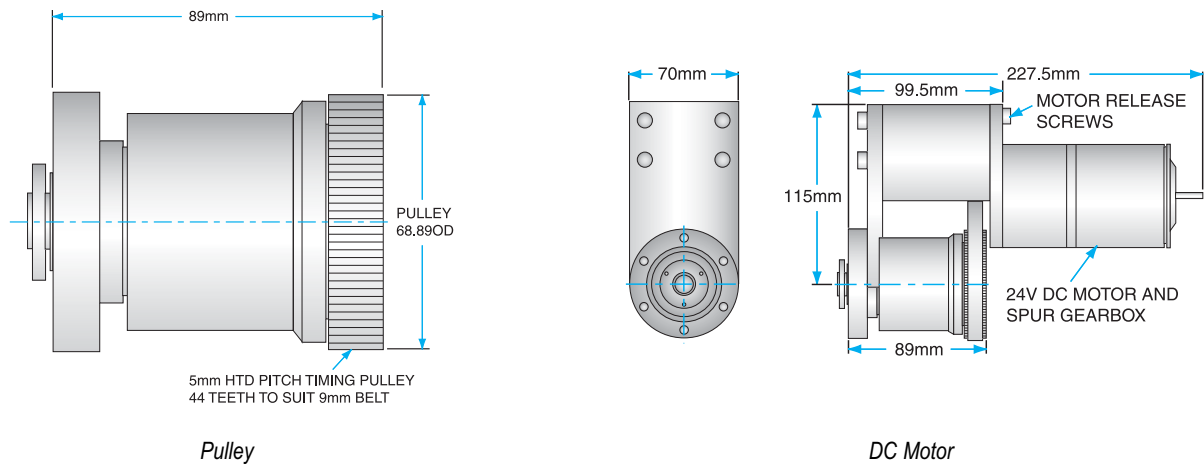
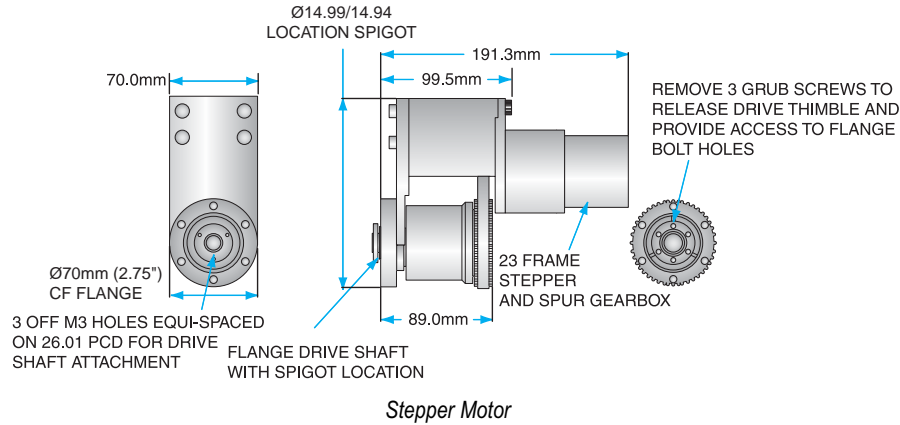
8

Sample Manipulation & Motion



Standard Thimble

► MagiDrive™ UHV Series



Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: **MD35HTX000Z** = Call

	Part No. Prefix
Base Size	MD35H
	Option Part No.
Actuation Options	
Standard thimble	T
Timing pulley	P
Calibrated thimble with thumbscrew brake	CB
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Side-mounted DC motor	SD
Side-mounted Pneumatic actuator	SRA
Side-mounted Pneumatic actuator with 2 x reed switches and visual position indicators	SRAI
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z
Ceramic bearing	CE
Semiconductor bearing	SE

► MagiDrive™ UHV Series

■ MD64H MagiDrive

The hollow version of the MD64 MagiDrive.

- Provides high torque, high stability rotation on a 4½" CF flange
- Incorporates a fixed 2¾" CF rear flange that enables a secondary drive, such as the MD35, to be mounted to it

Available Configuration Options:

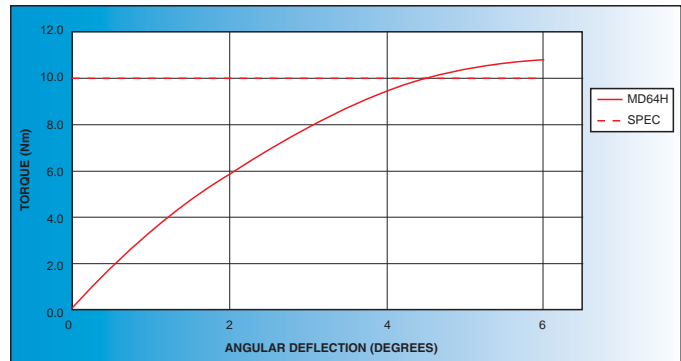
- Shafts—spigot flange
- Manual Actuation—thimble, timing pulley, thumbscrew brake, calibrated thimble
- Automated Actuation—side-mounted stepper motor, side-mounted DC motor
- Bearings—standard bearings, SemiDrive bearings



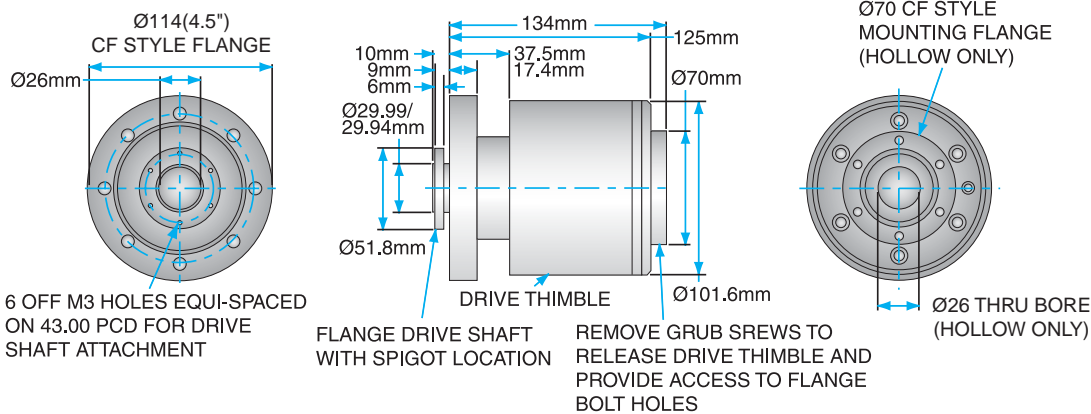
8

SPECIFICATIONS

MagiDrive Body	MD64H
System Mounting Flange	CF64 114 mm (4.5" O.D.)
Rear Flange	CF38 70 mm (2.75" O.D.)
Construction	Machined from one piece of 316L
Shaft Style	Spigot flange
Breakaway Torque	10 Nm (7.38 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	500 rpm
Maximum Shaft Axial Thrust	400 N (90 lbf)
Bakeout	250° C

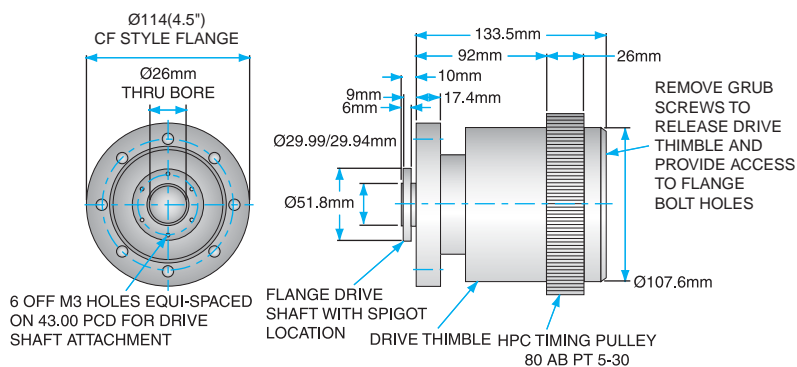


Sample Manipulation & Motion

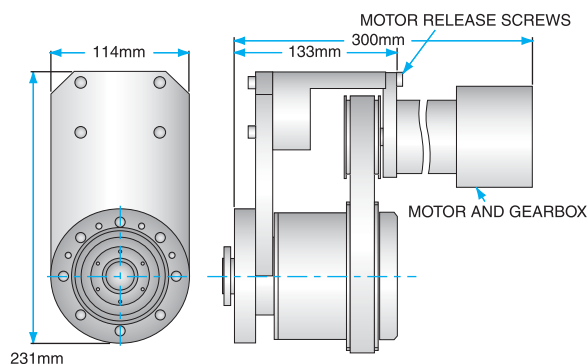


Standard Thimble

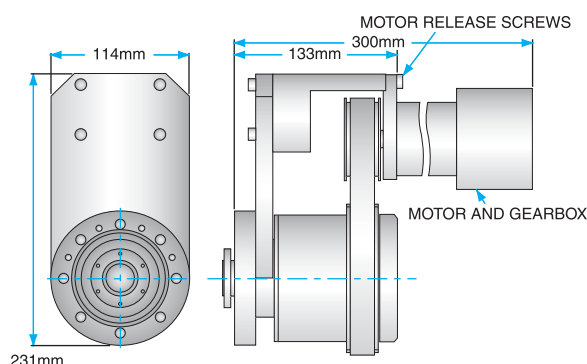
► MagiDrive™ UHV Series



Pulley



DC Motor



Stepper Motor

Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: **MD64HTX000Z** = Call

Part No. Prefix	
Base Size	MD64H
Option Part No.	
Actuation Options	
Standard thimble	T
Timing pulley	P
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Side-mounted DC motor	SD
Side-mounted Pneumatic actuator	SRA
Side-mounted Pneumatic actuator with 2 x reed switches and visual position indicators	SRAI
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z
Semiconductor bearing	SE

MagiDrive™ UHV Series

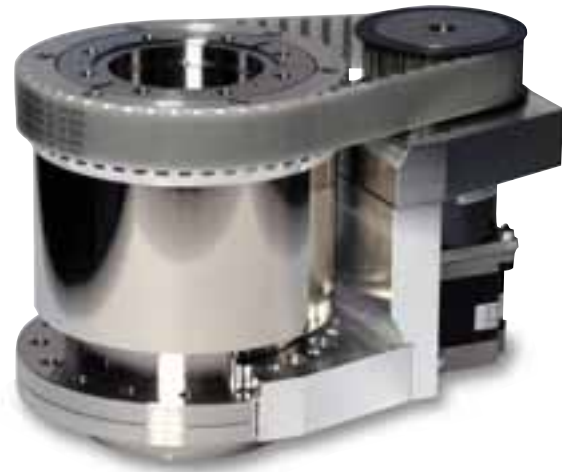
MD100H MagiDrive

The hollow version of the MD100 MagiDrive—it's the most powerful rotary drive in the range.

- Incorporates a 2³/₄" O.D. CF fixed rear flange, enabling a secondary drive, such as an MD35, to be fitted and provide a second independent coaxial axis of motion

Available Configuration Options:

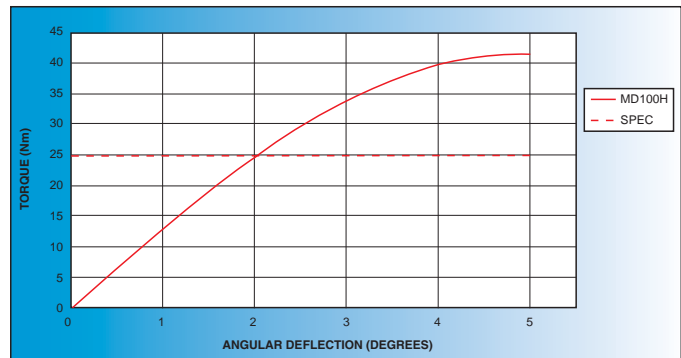
- Shafts—spigot flange
- Manual Actuation—thimble, timing pulley
- Automated Actuation—side-mounted stepper motor, side-mounted DC motor
- Bearings—standard bearings, SemiDrive bearings



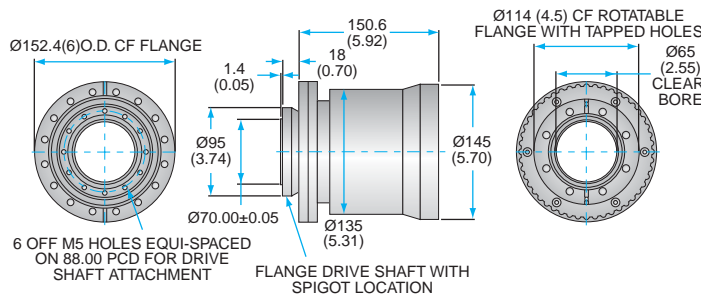
8

SPECIFICATIONS

MagiDrive Body	MD100H
System Mounting Flange	CF100 152 mm (6" O.D.)
Rear Flange	CF64 114 mm (4.5" O.D.)
Clear Bore	65 mm
Construction	Fabrication
Shaft Style	Spigot flange
Breakaway Torque	40 Nm (29.5 lbf ft)
Maximum No Load Spin Speed (Standard Bearings)	200 rpm
Maximum Shaft Axial Thrust	400 N (90 lbf)
Bakeout	250° C



Sample Manipulation & Motion



Choose the base size, actuation, shaft, and bearings. Next, compose the order code as shown, below. *For information on gearing options for motorized MagiDrives please see page 8-9.

Example Configuration Part No.: MD100HTX000Z = Call

	Part No. Prefix
Base Size	MD100H
Actuation Options	Option Part No.
Standard thimble	T
Timing pulley	P
Side-mounted stepper motor	SS
Side-mounted stepper motor with switches	SSS
Side-mounted DC motor	SD
Gearing Options*	
Shaft Options	
Spigot flange	X000
Bearing Options	
Standard bearing	Z

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

IN THIS SECTION ➤

KJLC Ferro-Magnetic Fluid Rotary Feedthroughs

Features

- Use a special magnetic fluid (ferrofluid) in place of an o-ring seal around dynamic parts
- Fluid hermetically seals the shaft, making a liquid o-ring while a permanent magnet keeps the fluid in place
- Ferrofluid magnetically held in stages formed by grooves machined into either the shaft or pole pieces
- Unlike regular o-rings, the ferrofluid o-ring remains intact for years of operation despite the shaft's motion

Applications

- Rotary stages
- Barrels
- Platens
- Planetaries
- Web coater rollers used in thin film deposition and etching processes

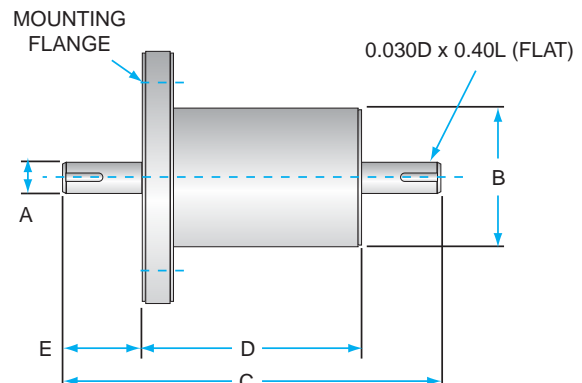
■ CF Flanged Solid Shaft–KJLC Standard

Designed to provide rotary motion under high vacuum, these Ferro-Magnetic Fluid Sealed feedthroughs have ConFlat® compatible (CF) mounting flanges. Normal helium leak detectors capable of detecting 1×10^{-11} std cc/sec of Helium flow detect no leakage for CF mounts under static and dynamic testing. Our CF flanged rotary motion feedthroughs routinely operate in the 10^{-6} Torr range and, when properly prepared and installed, may be used to mid 10^{-10} Torr using ConFlat compatible (CF) Mounting Flanges.

SPECIFICATIONS

Mounting	Water Cooling	Shaft O.D.	Ferrotec Equivalent	Part No.
1.33" CF	No	1/4"	FE103915	KLFDCF025133
2.75" CF	No	1/4"	FE103532	KLFDCF025275
2.75" CF	Yes (1.07", 1.24")	1/4"	FE103501	KLFDCF025275W
2.75" CF	No	3/8"	FE103154	KLFDCF037275
2.75" CF	Yes (1.07", 1.24")	3/8"	FE103912	KLFDCF037275W
2.75" CF	No	1/2"	FE103909	KLFDCF050275

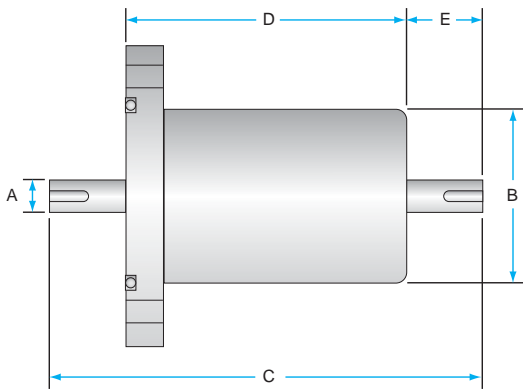
Dimensions (in.)					Part No.	Price
A	B	C	D	E		
0.25	0.75	3.25	1.75	0.75	KLFDCF025133	Call
0.25	1.5	4.06	2.56	0.75	KLFDCF025275	Call
0.25	1.5	4.06	2.56	0.75	KLFDCF025275W	Call
0.375	1.5	4.06	2.56	0.75	KLFDCF037275	Call
0.375	1.5	4.56	3.06	0.75	KLFDCF037275W	Call
0.5	2.375	8.656	4.906	2.5	KLFDCF050275	Call



➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ O-Ring Flanged Solid Shaft–KJLC Standard

These Ferro-Magnetic Fluid sealed rotary drives are designed for high vacuum applications where the chamber port has a flat, polished outer surface suitable for seating an o-ring surrounding a hole through the vacuum wall. Each feedthrough has a fluorocarbon o-ring installed in the flange. These flanges do not correspond to standard vacuum industry flange systems; however, the dimension table provides the information needed to mate to the chamber. Alternatively, we can supply an adapter spool piece to mate any feedthrough to a vacuum flange.



SPECIFICATIONS

Mounting	Water Cooling	Shaft O.D.	Face Seal O-Ring	Ferrotec Equivalent	Part No.
Standard					
6.00" Flange O.D.	No	1/2"	O-V234	FE103244	KLFDOF05060
6.00" Flange O.D.	Yes (0.5", 1.74")	1/2"	O-V234	FE103182	KLFDOF05060W
7.00" Flange O.D.	Yes (2.25", 1.5")	1/2"	O-V351	FE103329	KLFDOF05070W
5.00" Flange O.D.	Yes (1.58", 1.54")	3/4"	O-V337	FE103904	KLFDOF07550W
6.00" Flange O.D.	No	3/4"	O-V234	FE103246	KLFDOF07560
6.00" Flange O.D.	Yes (1.72", 1.54")	1"	O-V340	FE103259	KLFDOF10060W
Metric					
80mm Flange O.D.	No	6 mm	O-V214	—	KLFDMOF0680
80mm Flange O.D.	No	10 mm	O-V217	—	KLFDMOF1080
90mm Flange O.D.	No	12 mm	O-V220	—	KLFDMOF1290
105mm Flange O.D.	No	20 mm	O-V226	—	KLFDMOF20105
160mm Flange O.D.	No	30 mm	O-V346	—	KLFDMOF30160

Bolt Holes	Keyway	Dimensions (in./mm)					Part No.	Price
		A	B	C	D	E		
Standard (in.)								
(4) x 0.75" O.D. on 4.75" BC	0.126" W x 0.077" D x 1.00" L	0.50	2.87	6.03	3.56	1.22	KLFDOF05060	Call
(4) x 0.75" O.D. on 4.75" BC	0.126" W x 0.077" D x 1.00" L	0.50	2.87	6.03	3.56	1.22	KLFDOF05060W	Call
(6) x 0.406" O.D. on 6.00" BC	0.375" W x 0.210" D x 3.38" L	0.50	5.00	16.32	6.00	4.32	KLFDOF05070W	Call
(6) x 0.406" O.D. on 6.00" BC	0.188" W x 0.114" D x 1.00" L (2.00" Lg Vac Sd)	0.75	3.00	9.39	4.88	1.84	KLFDOF07550W	Call
(4) x 0.75" O.D. on 4.75" BC	0.188" W x 0.114" D x 1.00" L	0.75	2.87	6.03	3.56	1.25	KLFDOF07560	Call
(6) x 0.406" O.D. on 5.00" BC	0.250" W x 0.141" D x 2.50" L (3.50" Lg Vac Sd)	1.00	4.00	12.625	5.38	3.00	KLFDOF10060W	Call
Metric (mm)								
(4) x 10 mm O.D. on 60 mm BC	N/A	6	38	97.5	57.5	20	KLFDMOF0680	Call
(4) x 10 mm O.D. on 60 mm BC	2.984 mm W x 1.85 mm D x 14.0 mm L	10	44	119.5	69.5	25	KLFDMOF1080	Call
(4) x 10 mm O.D. on 70 mm BC	3.970 mm W x 2.50 mm D x 20.0 mm L	12	48	133.5	73.5	30	KLFDMOF1290	Call
(4) x 10 mm O.D. on 85 mm BC	5.985 mm W x 3.55 mm D x 25.0 mm L	20	63	151.5	81.5	35	KLFDMOF20105	Call
(6) x 10 mm O.D. on 135 mm BC	9.964 mm W x 5.00 mm D x 80.0 mm L	30	105	321	141	90	KLFDMOF30160	Call

8 Sample Manipulation & Motion

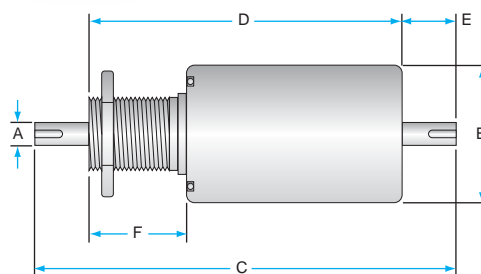
➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ Thread Mount Solid Shaft–KJLC Standard

These Ferro-Magnetic Fluids sealed rotary feedthroughs are sealed to a flat surface by a fluorocarbon o-ring. The operator mounts these drives to the vacuum chamber by screwing them into a corresponding threaded hole, or on some models by placing them in a suitable smooth-sided port in the chamber wall and using a capture nut. Some models are threaded only part way. They will accommodate various wall thicknesses when used with a sleeve or spacer over the unthreaded portion so that the nut compresses the o-ring.

In vacuum practice, the o-ring is compressed against the vacuum chamber's inner surface to limit virtual leaks. As shown in the dimensional drawings, most Ferro-Magnetic Fluid sealed feedthroughs are designed to be installed this way. A few, however, are intended to have the o-ring sealing against the atmosphere side surface. To reduce the virtual leaks associated with the thread, the feedthrough has a flat machined along the length of its threaded portion.

Please refer to the technical notes about loading, temperature, and other relevant information before specifying a feedthrough.



SPECIFICATIONS

Mounting	Water Cooling	Shaft O.D.	Face Seal O-Ring	Ferrotec Equivalent	Part No.
Standard					
5/16-24 UNF-2A Thread	No	3/16"	O-V012	FE103971	KLFDTM018516
7/16-24 UNF-2A Thread	No	1/4"	O-V015	FE103978	KLFDTM025716
1-14 UNS-2A Thread *	No	3/4"	O-V128	FE103193	KLFDTM075114
1-14 UNS-2A Thread *	Yes (0.89", 1.74")	1/2"	O-V128	FE103204	KLFDTM050114W
1-14 UNS-2A Thread *	No	1/2"	O-V128	FE103191	KLFDTM050114
1-14 UNS-2A Thread *	Yes (0.89", 1.74")	3/4"	O-V128	FE103206	KLFDTM075114W
Metric					
M12 x 1.5 Thread	No	4 mm	O-V015	—	KLFDMTM04M12
M12 x 1.5 Thread	No	5 mm	O-V015	—	KLFDMTM05M12
M12 x 1.5 Thread	No	6 mm	O-V015	—	KLFDMTM06M12
M25 x 1.5 Thread	No	12 mm	O-V220	—	KLFDMTM12M25
M25 x 1.5 Thread	Yes	12 mm	O-V220	—	KLFDMTM12M25W
M30 x 1.5 Thread	No	30 mm	O-V226	—	KLFDMTM20M30
M30 x 1.5 Thread	Yes	30 mm	O-V226	—	KLFDMTM20M30W

* Supplied with nut and washer.

Keyway	Dimensions (in./mm)						Part No.	Price
	A	B	C	D	E	F		
Standard (in.)								
—	0.1875	0.63	2.562	1.58	0.482	0.28	KLFDTM018516	Call
—	0.25	0.75	3.437	1.937	0.75	0.375	KLFDTM025716	Call
—	0.50	2.87	8.812	5.072	1.25	1.51	KLFDTM050114	Call
—	0.50	2.87	8.812	5.072	1.25	1.51	KLFDTM050114W	Call
—	0.75	2.87	8.812	5.072	1.25	1.51	KLFDTM075114	Call
—	0.75	2.87	8.812	5.072	1.25	1.51	KLFDTM075114W	Call
Metric (mm)								
N/A	4	21	76.5	46.5	15	10	KLFDMTM04M12	Call
N/A	5	21	76.5	46.5	15	10	KLFDMTM05M12	Call
N/A	6	21	76.5	46.5	15	10	KLFDMTM06M12	Call
3.970 mm W x 2.50 mm D x 20.0 mm L	12	48	179	109	30	35	KLFDMTM12M25	Call
3.970 mm W x 2.50 mm D x 20.0 mm L	12	48	179	109	30	35	KLFDMTM12M25W	Call
5.970 mm W x 3.50 mm D x 25.0 mm L	20	63	211	121	35	39	KLFDMTM20M30	Call
5.970 mm W x 3.50 mm D x 25.0 mm L	20	63	211	121	35	39	KLFDMTM20M30W	Call

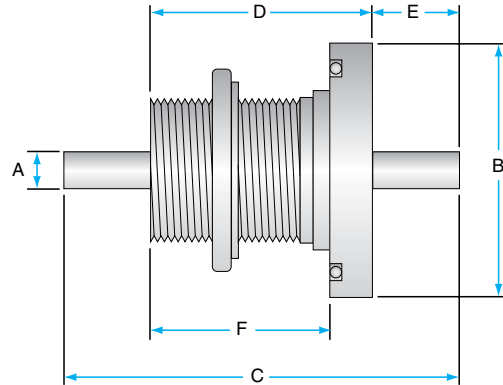
➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ Baseplate Mount Solid Shaft-KJLC Standard

These Ferro-Magnetic Fluid sealed rotary feedthroughs are sealed to the baseplate by a fluorocarbon o-ring. The operator mounts these drives to the vacuum chamber by placing them in a suitable smooth-sided port in the chamber wall and using a capture nut. Some models are threaded only part way. They will accommodate various wall thicknesses when used with a sleeve or spacer over the unthreaded portion so that the nut compresses the o-ring.

In vacuum practice, the o-ring is compressed against the vacuum chamber's inner surface to limit virtual leaks. As shown in the dimensional drawings, most of these Ferro-Magnetic Fluid sealed feedthroughs are designed to be installed this way. A few, however, are intended to have the o-ring sealing against the atmosphere side surface. To reduce the virtual leaks associated with the thread, the feedthrough has a flat machined along the length of its threaded portion.

Please refer to the technical notes about loading, temperature, and other relevant information before specifying a feedthrough.



SPECIFICATIONS

Mounting	Shaft O.D.	Face Seal O-Ring	Ferrotec Equivalent	Part No.
Standard				
1" BP	1/4"	O-V026	FE103237	KLFDBP02510
1" BP	1/4"	O-V026	FE103519	KLFDBP02510E
1.5" BP	1/4"	O-V132	FE103979	KLFDBP02515
3/4" BP	1/4"	O-V026	FE103236	KLFDBP02575
1" BP	3/8"	O-V026	FE103664	KLFDBP03710
1.5" BP	3/8"	O-V132	FE103991	KLFDBP03715
Metric				
32 mm BP	6 mm	P35	—	KLFDMBP0632
38 mm BP	10 mm	P41	—	KLFDMBP1038

Dimensions (in./mm)						Part No.	Price
A	B	C	D	E	F		
Standard (in.)							
0.25	1.625	3.44	1.93	0.75	1.68	KLFDBP02510	Call
0.25	1.618	3.12	1.62	0.75	1.37	KLFDBP02510E	Call
0.375	2.12	3.97	2.47	0.75	2.22	KLFDBP02515	Call
0.375	1.625	3.44	1.93	0.75	1.68	KLFDBP02575	Call
0.375	1.62	3.39	1.65	0.865	1.3	KLFDBP03710	Call
0.375	2.12	3.97	2.47	0.75	2.22	KLFDBP03715	Call
Metric (mm)							
6	55	97.5	57.5	20	47.5	KLFDMBP0632	Call
10	60	119.5	69.5	25	59.5	KLFDMBP1038	Call

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ CF Flanged Solid Shaft–Ferrotec

IN THIS SECTION ➤

Ferrotec Ferrofluidic® Rotary Drives —Hollow Shaft

- Fluid hermetically seals the shaft making a liquid o-ring, while a permanent magnet keeps the fluid in place
- Feedthroughs use multiple rings of ferrofluid magnetically held in stages formed by grooves machined into either the shaft or pole pieces
- Magnetic fluid (ferrofluid) used instead of an o-ring seal around dynamic parts
- Unlike regular o-rings, the ferrofluid o-ring remains intact for years of operation, despite the shaft's motion

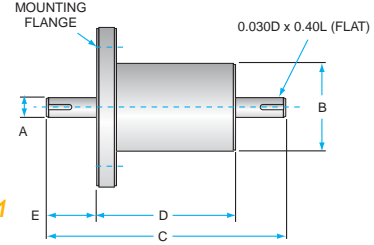


Figure 1

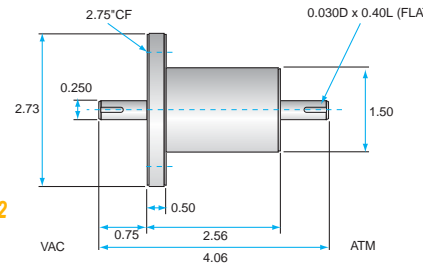


Figure 2

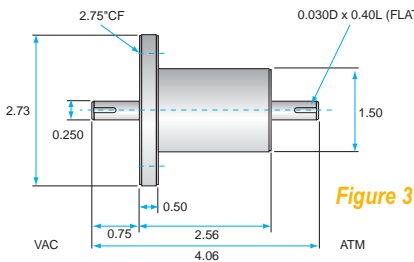


Figure 3

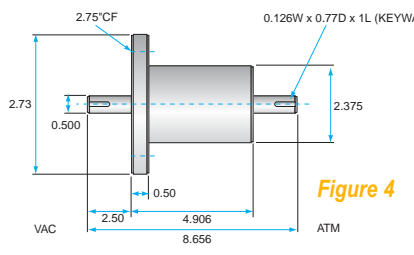


Figure 4

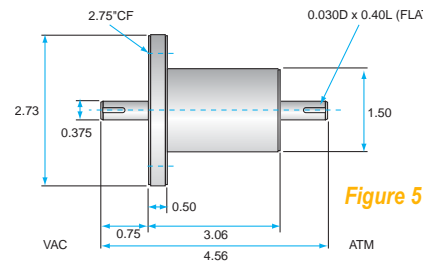


Figure 5

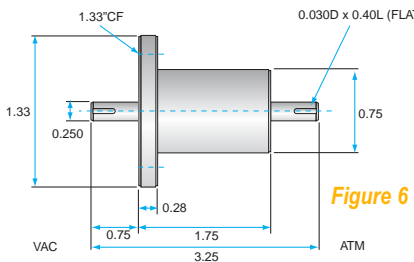


Figure 6

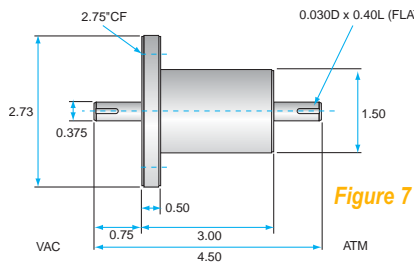


Figure 7

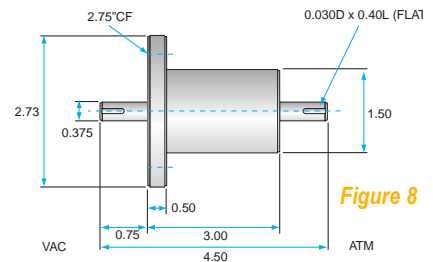


Figure 8

Figure	Mounting	Water Cooled	Shaft O.D.	Bearings (Type/Material)	Part No.	Price
1	2.75" CF	No	0.375" (9.5 mm)	Radial/SS	FE103154	Call
2	2.75" CF	Yes (1.14", 1.87")	0.25" (6.35 mm)	R4/SS	FE103501	Call
3	2.75" CF	No	0.25" (6.35 mm)	R4/SS	FE103532	Call
4	2.75" CF	No	0.50" (12.7 mm)	R8/SS	FE103909	Call
5	2.75" CF	Yes (1.07", 1.24")	0.375" (9.5 mm)	R6/SS	FE103912	Call
6	1.33" CF	No	0.25" (6.35 mm)	R4/SS	FE103915	Call
7	2.75" CF	No	0.375" (9.5 mm)	6800/SS	FE121060	Call
8	2.75" CF	Yes (0.75")	0.375" (9.5 mm)	6800/SS	FE121099	Call

Note: Shaft mount measured 1" from process side face of feedthrough.

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ O-Ring Flanged Solid Shaft–Ferrotec

These Ferrofluidic® rotary drives are designed for high vacuum applications where the chamber port has a flat, polished outer surface suitable for seating an o-ring surrounding a hole through the vacuum wall. Each feedthrough has a fluorocarbon o-ring installed in the flange. These flanges do not correspond to standard vacuum industry flange systems; however, the dimension table provides the information needed to mate to the chamber. Alternatively, we can supply an adapter spool piece to mate any feedthrough to a vacuum flange.

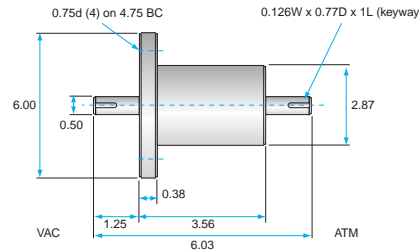


Figure 1

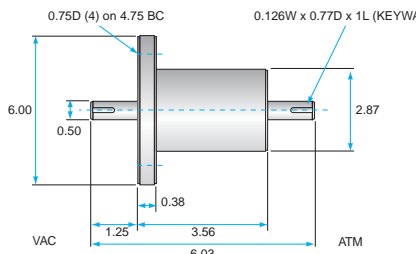


Figure 2

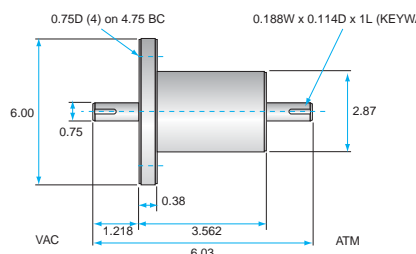


Figure 3

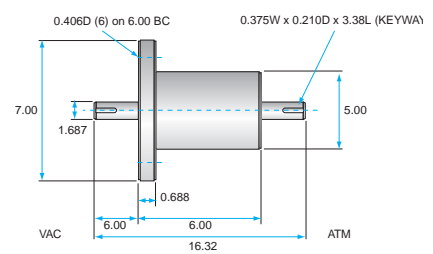


Figure 4

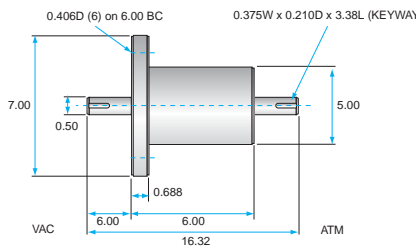


Figure 5

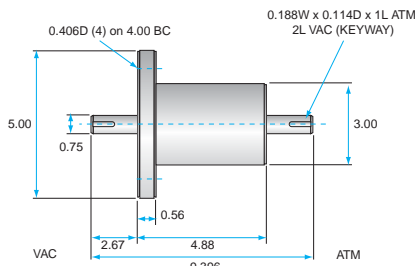


Figure 6

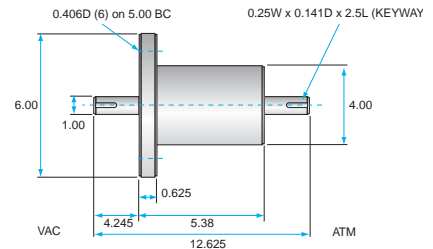


Figure 7

Figure	Mounting	Water Cooled	Shaft O.D.	Bearings (Type/Material)	Face Seal O-Ring	Part No.	Price
1	6.00" Flange O.D.	Yes (0.5", 1.74")	0.50" (12.7 mm)	R8/SS	O-V234	FE103182	Call
2	6.00" Flange O.D.	No	0.50" (12.7 mm)	R8/SS	O-V234	FE103244	Call
3	6.00" Flange O.D.	No	0.75" (19 mm)	R12/SS	O-V234	FE103246	Call
4	7.00" Flange O.D.	Yes (2.25", 1.5")	1.687" (42.85 mm)	Ang. Cont/BS	O-V351	FE103328	Call
5	7.00" Flange O.D.	Yes (2.25", 1.5")	0.50" (12.7 mm)	Ang. Cont/BS	O-V351	FE103329	Call
6	5.00" Flange O.D.	Yes (1.58", 1.54")	0.75" (19 mm)	7305/BS	O-V337	FE103904	Call
7	6.00" Flange O.D.	Yes (1.72", 1.54")	1.00" (25.4 mm)	Ang. Cont/BS	O-V340	FE104259	Call

Note: Shaft mount measured 1" from process side face of feedthrough.

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ Thread Mount Solid Shaft–Ferrotec

Like the flanged group, these feedthroughs are sealed to the chamber by a fluorocarbon o-ring; however, the operator may mount them to the vacuum chamber either by screwing them into a corresponding threaded hole or by placing them in a suitable smooth-sided port in the chamber wall and using a capture nut.

Some models are threaded only partway. While intended for 3/4" or 1" chamber ports, they will accommodate various wall thicknesses when used with a sleeve or spacer over the unthreaded portion for nut compression of the o-ring.

In vacuum practice, the o-ring is compressed against the vacuum chamber's inner surface to limit virtual leaks. As shown in the dimensional drawings, most Ferrofluidics® baseplate feedthroughs are designed to be installed this way. A few, however, are intended to have the o-ring sealing against the air surface. To reduce the virtual leaks associated with the thread, the feedthrough has a flat machined along the length of its threaded portion.

8

Sample Manipulation & Motion

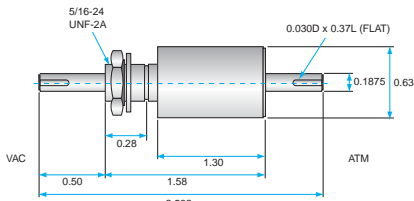


Figure 1

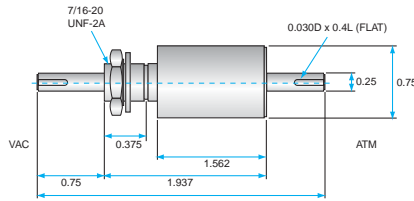


Figure 2

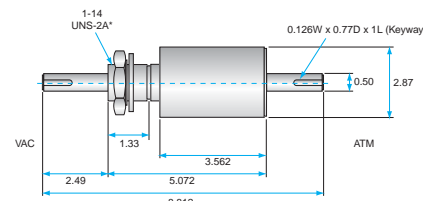


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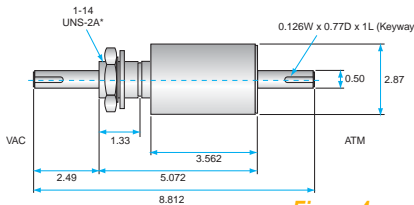


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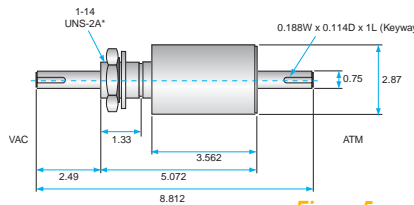


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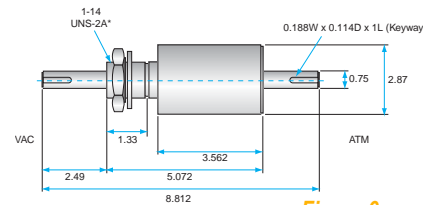


Figure 6

Figure	Mounting	Water Cooled	Shaft O.D.	Bearings (Type/Material)	Face Seal O-Ring	Part No.	Price
1	1-14 UNF-2A Thread *	No	0.50" (12.7 mm)	R8/SS	O-V128	FE103191	Call
2	1-14 UNF-2A Thread *	No	0.75" (19 mm)	R12/SS	O-V128	FE103193	Call
3	1-14 UNF-2A Thread *	Yes (0.89", 1.74")	0.50" (12.7 mm)	R8/SS	O-V128	FE103204	Call
4	1-14 UNF-2A Thread *	Yes (0.89", 1.74")	0.75" (19 mm)	R12/SS	O-V128	FE103206	Call
5	5/16-24 UNF-2A Thread	No	0.1875" (4.76 mm)	R166/SS	O-V012	FE103971	Call
6	7/16-20 UNF-2A Thread	No	0.25" (6.35 mm)	R4/SS	O-V015	FE103978	Call

* Shaft mount measured 1" from process side face of feedthrough.

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ Baseplate Mount Solid Shaft–Ferrotec

These Ferrofluidic® rotary feedthroughs are sealed to the baseplate by a fluorocarbon o-ring. The operator mounts these drives to the vacuum chamber by screwing them into a corresponding threaded hole, or on some models by placing them in a suitable smooth-sided port in the chamber wall and using a capture nut. Some models are threaded only part way. They will accommodate various wall thicknesses when used with a sleeve or spacer over the unthreaded portion so that the nut compresses the o-ring.

In vacuum practice, the o-ring is compressed against the vacuum chamber's inner surface to limit virtual leaks. As shown in the dimensional drawings, most ferrofluid feedthroughs are designed to be installed this way. A few, however, are intended to have the o-ring sealing against the air surface. To reduce the virtual leaks associated with the thread, the feedthrough has a flat machined along the length of its threaded portion.

Please refer to the technical notes about loading, temperature, and other relevant information before specifying a feedthrough.

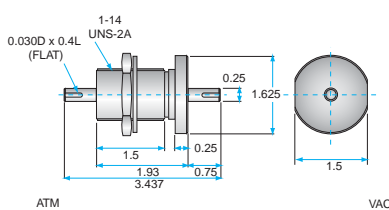


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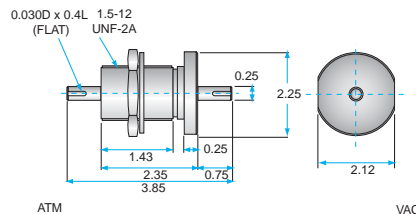


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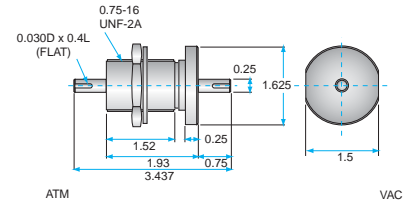


Figure 1

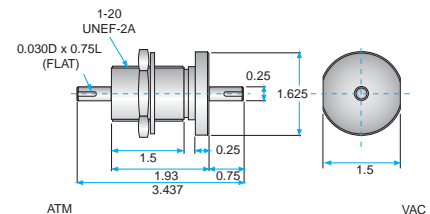


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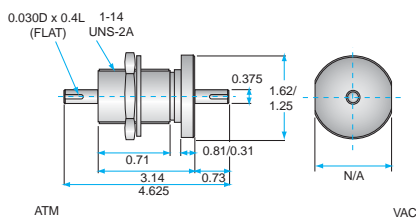


Figure 5

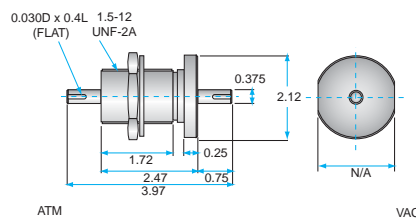


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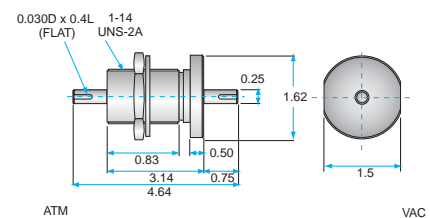


Figure 7

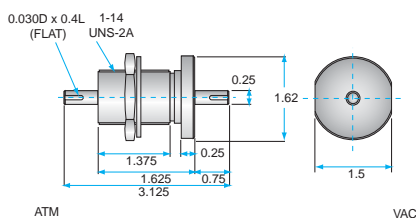


Figure 8

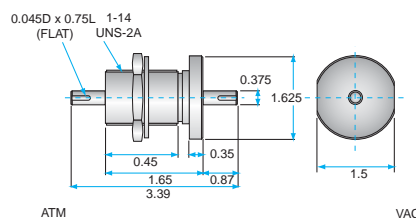


Figure 9

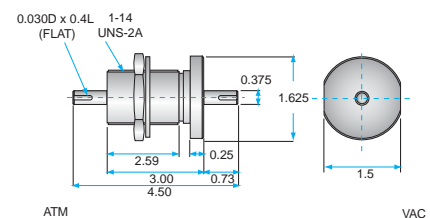


Figure 10

Figure	Mounting	Shaft O.D.	Bearings (Type/Material)	Face Seal O-Ring	Part No.	Price
1	3/4" BP	0.25" (6.35 mm)	R4/SS	O-V026	FE103236	Call
2	1" BP	0.25" (6.35 mm)	R4/SS	O-V026	FE103237	Call
3	1.5" BP	0.25" (6.35 mm)	Radial/SS	O-V132	FE103979	Call
4	1" BP	0.25" (6.35 mm)	R4/SS	O-V215	FE103982	Call
5	1" BP	0.375" (9.5 mm)	R6/SS	O-V026	FE103990	Call
6	1.5" BP	0.375" (9.5 mm)	R6/SS	O-V132	FE103991	Call
7	1" BP	0.25" (6.35 mm)	Radial/SS	O-V026	FE104445	Call
8	1" BP	0.25" (6.35 mm)	R4/SS	O-V026	FE107519	Call
9	1" BP	0.375" (9.5 mm)	R6/SS R620/SS	O-V026	FE108664	Call
10	1" BP	0.375" (9.5 mm)	6800/SS	O-V026	FE121132	Call

8 Sample Manipulation & Motion

➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ O-Ring Flanged Hollow Shaft–Ferrotec

These Ferrofluidic® rotary feedthroughs are particularly useful for process development applications involving modified shaft details requiring supply of cooling, power, or instrumentation leads to the rotating part. Most models in this group of feedthroughs have o-ring grooved

ANSI/ASA compatible flanges (alternate flange designs are listed with dimensions below).

Please note, a Deublin water union enables for external water connections; the water feed tubes rotate with the feedthrough.

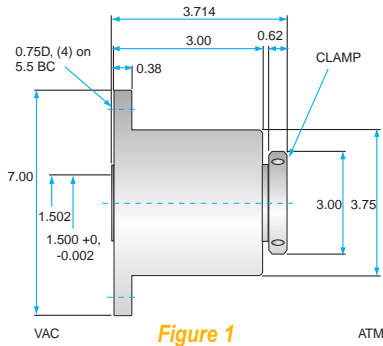


Figure 1

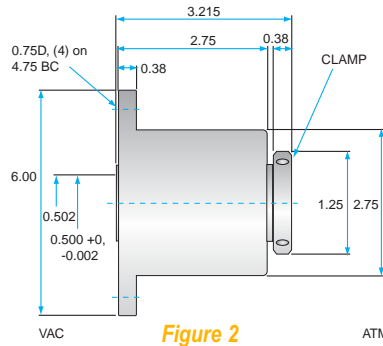


Figure 2

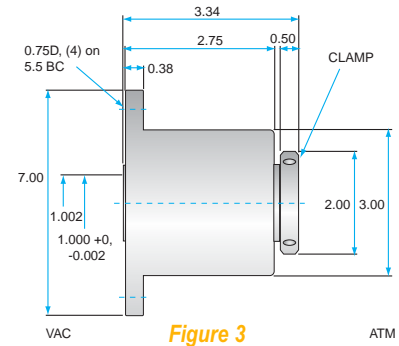


Figure 3

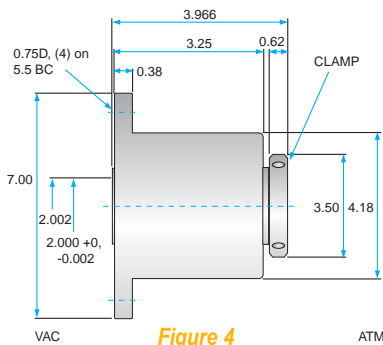


Figure 4

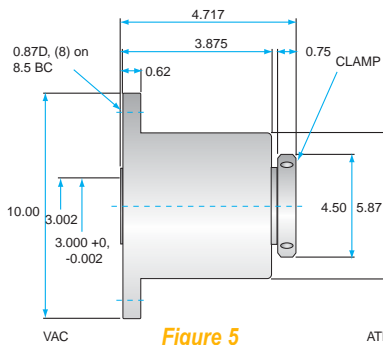


Figure 5

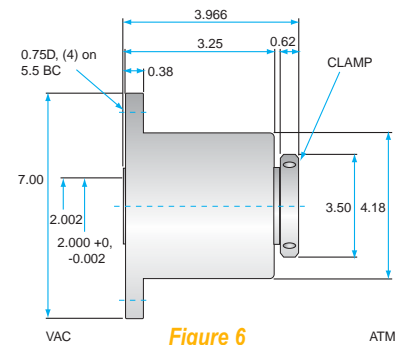


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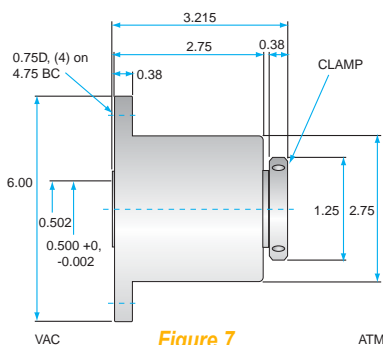


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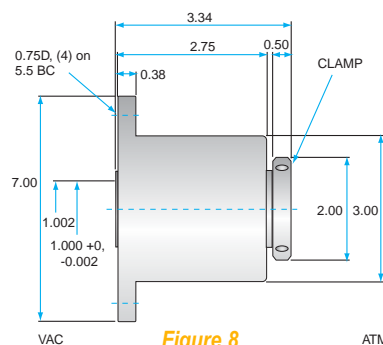


Figure 8

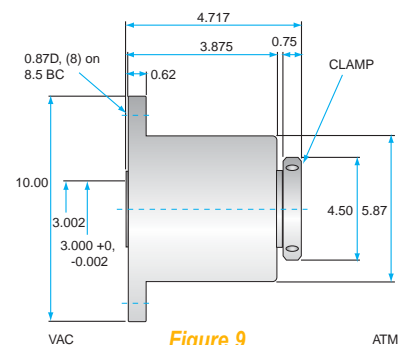


Figure 9

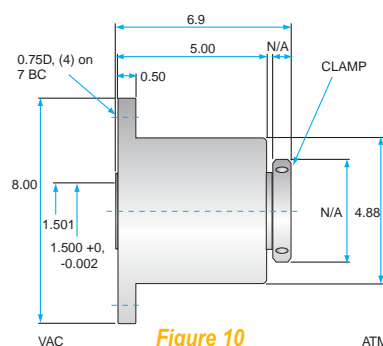


Figure 10

➤ Ferro-Magnetic Fluid Rotary Feedthroughs



NOTE: A Deublin water union enables for external water connections; the water feed tubes rotate with the feedthrough.

Figure	Mounting	Water Cooled	Shaft O.D.	Bearings (Type/Material)	Face Seal O-Ring	Part No.	Price
1	7.00" Flange O.D.	Yes (0.55", 1.13")	Accepts 1.500" (+0" / -0.002")	6909/BS	O-V244	FE103354	Call
2	6.00" Flange O.D.	No	Accepts 0.500" (+0" / -0.002")	6903/BS	O-V238	FE103358	Call
3	7.00" Flange O.D.	No	Accepts 1.000" (+0" / -0.002")	6906/BS	O-V244	FE103359	Call
4	10.00" Flange O.D.	No	Accepts 3.000" (+0" / -0.002")	Radial/BS	O-V262	FE103360	Call
5	7.00" Flange O.D.	No	Accepts 2.000" (+0" / -0.002")	6911/BS	O-V244	FE103361	Call
6	7.00" Flange O.D.	No	Accepts 1.500" (+0" / -0.002")	Radial/BS	O-V244	FE103362	Call
7	7.00" Flange O.D.	Yes (0.62", 1.23")	Accepts 2.000" (+0" / -0.002")	6911/BS	O-V244	FE103921	Call
8	6.00" Flange O.D.	Yes (0.54", 1.15")	Accepts 0.500" (+0" / -0.002")	6903/BS	O-V238	FE105395	Call
9	10.00" Flange O.D.	Yes (1.635", 1.29")	Accepts 3.000" (+0" / -0.002")	Radial/BS	O-V262	FE105397	Call
10	8.00" Flange O.D.	Yes (0.44", 1.28")	Accepts 1.500" (+0" / -0.002")	7012/BS	O-V256	FE107428	Call

Kurt J. Lesker
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➤ Ferro-Magnetic Fluid Rotary Feedthroughs

■ Cartridge Mount Hollow Shaft–Ferrotec

- Can replace existing vacuum shafts or spindles that use dynamic o-ring seals (defined as o-ring seals that press against a moving surface)
- Dynamic o-ring seals frequently cause leaks in processes using vacuum in a manufacturing environment. To remedy this, replace the shaft that has the dynamic seal and select a cartridge feedthrough with an O.D. that slips inside the seal “well” in the process vacuum wall.
- The static o-ring seals on the cartridge’s grooved outer surface do not move, making them far less likely than dynamic o-ring seals to leak

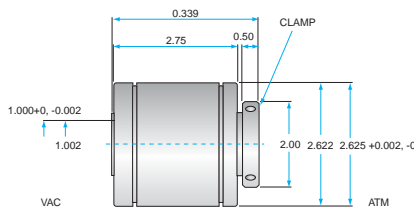


Figure 1

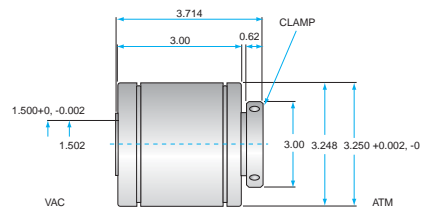


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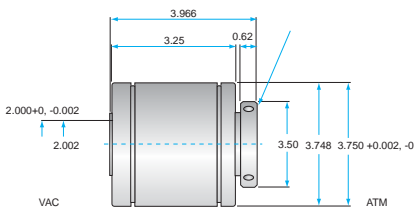


Figure 3

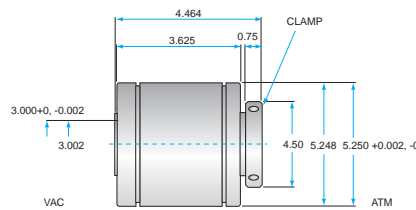


Figure 4

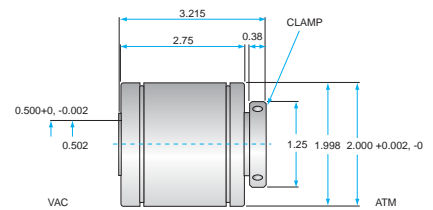
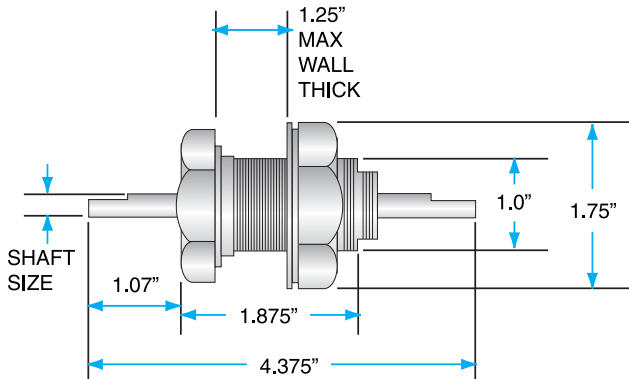


Figure 5

Figure	Mounting	Shaft O.D.	Bearings (Type/Material)	Outer O-Ring	Inner O-Ring	Part No.	Price
1	Cartridge	Accepts 1.000"(+0" / -0.002")	6906/BS	O-V037	O-V022	FE103319	Call
2	Cartridge	Accepts 1.500"(+0" / -0.002")	6909/BS	O-V041	O-V029	FE103320	Call
3	Cartridge	Accepts 2.000"(+0" / -0.002")	6911/BS	O-V153	O-V033	FE103321	Call
4	Cartridge	Accepts 3.000"(+0" / -0.002")	Radial/BS	O-V159	O-V151	FE103322	Call
5	Cartridge	Accepts 0.500"(+0" / -0.002")	6903/BS	O-V032	O-V014	FE132405	Call

► Dynamic O-Ring Shaft Seal



NOTE: Vacuum seals for moving shafts are best run discontinuously and infrequently. Since the elastomers in o-ring seals are dynamic—rubber presses against a moving metal surface—they are susceptible to leaks and should be used for rough and high-vacuum conditions only.

■ Rubber Shaft Seal—O-Ring

- 1/4" shaft versions house two ball bearings that support the shaft of the o-ring seal for the smooth, low-torque operation usually found only in expensive motion feedthroughs
- Bronze bushings support the shaft on the 3/8" and 1/2" shaft versions
- A pre-loaded fluorocarbon o-ring seals the shaft, making over- or under-compression by inexperienced operators impossible
- Seal allows dismantling in seconds and without tools, enabling operator to replace or re-grease the o-ring easily from the atmosphere side
- Feedthroughs offer non-continuous manual or motor-driven operation at speeds up to 500 rpm
- Aluminum or stainless steel casings
- Use barrel adapters to mate larger shaft diameters
- Feedthrough uses a 1" baseplate fitting to mount to a standard 1" feedthrough port

Shaft Size (in.)	Material	Part No.	Price
1/4	Aluminum	FMH-25A	Call
1/4	Stainless	FMH-25SS	Call
3/8	Aluminum	FMH-37A	Call
3/8	Stainless	FMH-37SS	Call
1/2	Aluminum	FMH-50A	Call
1/2	Stainless	FMH-50SS	Call

Shaft Size (in.)	Replacement Parts		
	Description	Part No.	Price
1/4	Replacement Bearing & Seal Package, 1/4" Shaft Drive	FMH-25BK	Call
3/8	Replacement Bearing & Seal Package, 3/8" Shaft Drive	FMH-37BK	Call
1/2	Replacement Bearing & Seal Package, 1/2" Shaft Drive	FMH-50BK	Call

1985

Artificial Heart

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Kurt J. Lesker Company introduced our first bound Vacuum Products Catalog. A 400-page black and white book featuring the Lesker Line of Hydrocarbon fluids, Fomblin®, and Dow Corning® oils and greases.

► Linear Shifts

■ Linear Shifts Introduction



8

Sample Manipulation & Motion

Linear Shift Mechanisms (linear translators) 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 wafer applications. Fully bakeable to 250°C, the range is supplied on CF flanges and provides true UHV performance.

The bellows sealed Linear Shift Mechanisms 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.

The bellows are manufactured from 316L stainless steel as standard and offer a minimum design life of 10,000 cycles. Customized units are available, offering a design life of up to 1 million cycles.

Product selection

The Linear Shift Mechanism range is possibly the largest of its type on the market with more than 500 variations. To simplify selection, the range is divided into five standard series to suit the majority of applications and includes strokes of up to 1 meter. A summary of each is included below as a quick reference guide.

Code	Linear Shift Series	Summary
KZLSM	Standard	This is the most comprehensive series, offering a multitude of flange sizes, strokes up to 350mm, and actuation options
KZLSML	Long Travel	The Long Travel series includes an upgraded structure, enabling up to 1m of stroke
KZLSMC	Compact	The Compact series has the shortest flange-to-flange dimension, offered with a variety of flange sizes and stroke
KZLSMT	Tilt	The Tilt series provides the ability to tilt the traveling flange by $\pm 2^\circ$ to enable final adjustment of the driven load
KZLSMX	X-Travel	The X-Travel series provides the ability to laterally adjust the traveling flange by ± 5 mm for final adjustment of the driven load



LSM with Tilt



LSM with X-Travel



LSM Compact

➤ Linear Shifts



Actuation Options

Linear Shift Mechanisms can be actuated manually, pneumatically, or via a DC or Stepper Motor

Code	Actuation Method	Description
Blank	Manual	A manual handwheel provides the most basic method of actuation. Larger bore versions are fitted with a geared handwheel to overcome vacuum loading forces.
P	Pneumatic	Pneumatic actuators provide a simple solution to automated operation.
SD	DC Motorized	A 12 or 24VDC motor provides the motion and is mounted to the side of the leadscrew mechanism.
SS	Stepper Motorized	A stepper motor provides the motion and is mounted to the side of the leadscrew mechanism.
UP	Wiring Upgrade	When purchasing an LSM for use with one of our controllers, an additional wiring upgrade is available. The upgrade includes a bakeable socket connector mounted to the frame to which the limit switches are pre-wired. On stepper-driven products an extra home switch is also provided. The motor lead terminates with a connector for plug and play connection to the controller.



Position Readout/Feedback Options

Linear Shift Mechanisms are offered with a variety of position readout/feedback solutions

Code	Item	Description
ES	Engraved Shaft	Linear Shift Mechanisms can be fitted with a scale with 1mm increments for visual positioning.
DLA	Digital Linear Scale	Digital scale displays are fitted to Linear Shift Mechanisms 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.
LP	Linear Potentiometer	The Linear potentiometer option is selected where position feedback of the Linear Shift Mechanism traveling flange is required for closed-loop control applications. The LP provides resolution and repeatability of 2 microns. The LP has a conductive resistive track and precious metal wiper that can be interfaced to a number of analog devices such as a PLC or motor controller. The LP is attached to the LSM frame with a kinematic mount enabling it to be removed if bakeout is required.

8 Sample Manipulation & Motion

► Linear Shifts

IN THIS SECTION ► Linear Shifts

Linear transfer mechanisms are UHV clear-bore bellows assemblies in which the top flange moves toward or away from the bottom flange, maintaining parallelism.

- Rugged design ensures smooth and precise motion along the Z-Axis
- Support high loads, but the actuator should be carefully chosen to suit the physical effort and precision required for positioning
- Flange options: 1" O.D. (MicroFlange), 1¹/₃", 2³/₄", 4¹/₂", 6", or 8" O.D. CF with straddled bolt-hole orientation, metric tapped holes as standard
- Demountable bellows assembly
- Precision stainless steel ACME leadscrew
- Precision-ground stainless steel guide system

NOTE: Devices are serviced in the U.S. and U.K.

■ LSM and HLSM Linear Shifts

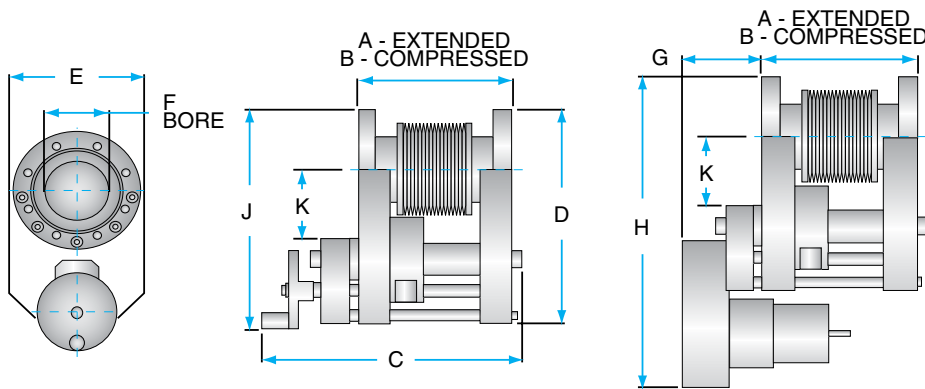
- Designed for the linear movement of large flange-mounted instruments with minimum tilt or wobble in the movement, and enabling precision alignment before and after pump-down
- Manual units operate handwheel drives
- Motorized units driven by stepper motor or DC motor mechanisms
- Drives support bellows assemblies in a precision kinematic guide system, complete with anti-rotation and anti-deflection systems
- Standard travel distances of 25 mm through 100 mm (custom units available)
- **LSM** Series has tapped flanges top and bottom
- **HLSM** Series has tapped flanges on top and clear bolt holes on the bottom mounting flange
- Ideal for manipulation of surface science tools with respect to a sample's position, manipulation of evaporation and sputter sources, substrate and source shutters, sample heating stage adjustment, sample transfer applications, and general sample manipulation

8

Sample Manipulation & Motion



➤ **Linear Shifts**



Turn the page for continued
LSM and HLSM Linear
Shifts info! ➤

Flange Size	Bolt Holes	Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)										Part No.
				A	B	C	D	E	F	G	H	J	K	
CF10 (1" O.D.)	M3 Tapped	8	250° C	77.3	52.3	95	130.4	25.4	8	—	—	60.7	27	LSM10-25
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	98.7	73.7	180	155.2	75	38	72	257	163.5	39	LSM38-25
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	123.7	73.7	204	155.2	75	38	72	257	163.5	39	LSM38-50
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	162	87	243	155.2	75	38	72	257	163.5	39	LSM38-75
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	187	87	268	155.2	75	38	72	257	163.5	39	LSM38-100
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	250	100	331	155.2	75	38	72	257	163.5	39	LSM38-150
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	281	106	363	155.2	75	38	72	257	163.5	39	LSM38-175
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	312.5	112.5	394	155.2	75	38	72	257	163.5	39	LSM38-200
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	377.5	127.5	459	155.2	75	38	72	257	163.5	39	LSM38-250
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	446.5	146.5	531	155.2	75	38	72	257	163.5	39	LSM38-300
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	509	159	594	155.2	75	38	72	257	163.5	39	LSM38-350
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	106.7	81.7	180	155.2	75	38	72	257	163.5	39	HLSM38-25
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	131.7	81.7	212	155.2	75	38	72	257	163.5	39	HLSM38-50
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	170	95	251	155.2	75	38	72	257	163.5	39	HLSM38-75
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	194.5	94.5	275.5	155.2	75	38	72	257	163.5	39	HLSM38-100
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	260	110	341	155.2	75	38	72	257	163.5	39	HLSM38-150
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	291	116	373	155.2	75	38	72	257	163.5	39	HLSM38-175
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	322.5	122.5	404	155.2	75	38	72	257	163.5	39	HLSM38-200
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	387.5	137.5	469	155.2	75	38	72	257	163.5	39	HLSM38-250
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	456.5	156.5	541	155.2	75	38	72	257	163.5	39	HLSM38-300
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	519.5	169.5	604	155.2	75	38	72	257	163.5	39	HLSM38-350
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	136	111	232	203	122.5	65	72	297	212	64	LSM64-25
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	161	111	258	203	122.5	65	72	297	212	64	LSM64-50
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	186	111	283	203	122.5	65	72	297	212	64	LSM64-75
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	211	111	308	203	122.5	65	72	297	212	64	LSM64-100
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	261	111	358	203	122.5	65	72	297	212	64	LSM64-150
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	317	117	415	203	122.5	65	72	297	212	64	LSM64-200
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	378	128	475	203	122.5	65	72	297	212	64	LSM64-250
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	448	148	535	203	122.5	65	72	297	212	64	LSM64-300
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	136	111	232	203	122.5	65	72	297	212	64	HLSM64-25
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	161	111	258	203	122.5	65	72	297	212	64	HLSM64-50
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	186	111	283	203	122.5	65	72	297	212	64	HLSM64-75
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	211	111	308	203	122.5	65	72	297	212	64	HLSM64-100
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	274	124	370	203	122.5	65	72	297	212	64	HLSM64-150
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	336	136	433	203	122.5	65	72	297	212	64	HLSM64-200
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	404	154	500	203	122.5	65	72	297	212	64	HLSM64-250
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	467.3	167.3	564	203	122.5	65	72	297	212	64	HLSM64-300
CF100 (6" O.D.)	M8 Tapped	102	250° C	175	150	289	266.5	177	102	105	376	273	92	LSM100-25
CF100 (6" O.D.)	M8 Tapped	102	250° C	200	150	314	266.5	177	102	105	376	273	92	LSM100-50
CF100 (6" O.D.)	M8 Tapped	102	250° C	225	150	339	266.5	177	102	105	376	273	92	LSM100-75
CF100 (6" O.D.)	M8 Tapped	102	250° C	250	150	364	266.5	177	102	105	376	273	92	LSM100-100
CF100 (6" O.D.)	M8 Tapped	102	250° C	300	150	414	266.5	177	102	105	376	273	92	LSM100-150
CF100 (6" O.D.)	M8 Tapped	102	250° C	350	150	464	266.5	177	102	105	376	273	92	LSM100-200

8 Sample Manipulation & Motion

Linear Shifts

LSM and HLSM Linear Shifts (continued)

Flange Size	Bolt Holes	Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)										Part No.
				A	B	C	D	E	F	G	H	J	K	
CF100 (6" O.D.)	M8 Tapped	102	250° C	175	150	289	266.5	177	102	105	376	273	92	HLSM100-25
CF100 (6" O.D.)	M8 Tapped	102	250° C	200	150	314	266.5	177	102	105	376	273	92	HLSM100-50
CF100 (6" O.D.)	M8 Tapped	102	250° C	225	150	339	266.5	177	102	105	376	273	92	HLSM100-75
CF100 (6" O.D.)	M8 Tapped	102	250° C	250	150	364	266.5	177	102	105	376	273	92	HLSM100-100
CF100 (6" O.D.)	M8 Tapped	102	250° C	300	150	414	266.5	177	102	105	376	273	92	HLSM100-150
CF100 (6" O.D.)	M8 Tapped	102	250° C	358	150	472	266.5	177	102	105	376	273	92	HLSM100-200
CF150 (8" O.D.)	M8 Tapped	149	250° C	176	151	288	305	229	149	104	414	313	105	LSM150-25
CF150 (8" O.D.)	M8 Tapped	149	250° C	201	151	317	305	229	149	104	414	313	105	LSM150-50
CF150 (8" O.D.)	M8 Tapped	149	250° C	226	151	338	305	229	149	104	414	313	105	LSM150-75
CF150 (8" O.D.)	M8 Tapped	149	250° C	251	151	367	305	229	149	104	414	313	105	LSM150-100
CF150 (8" O.D.)	M8 Tapped	149	250° C	276	151	388	305	229	149	104	414	313	105	LSM150-150
CF150 (8" O.D.)	M8 Tapped	149	250° C	365	165	479	305	229	149	104	414	313	105	LSM150-200
CF150 (8" O.D.)	M8 Tapped	149	250° C	176	151	288	305	229	149	104	414	313	105	HLSM150-25
CF150 (8" O.D.)	M8 Tapped	149	250° C	201	151	317	305	229	149	104	414	313	105	HLSM150-50
CF150 (8" O.D.)	M8 Tapped	149	250° C	226	151	338	305	229	149	104	414	313	105	HLSM150-75
CF150 (8" O.D.)	M8 Tapped	149	250° C	251	151	367	305	229	149	104	414	313	105	HLSM150-100
CF150 (8" O.D.)	M8 Tapped	149	250° C	276	151	388	305	229	149	104	414	313	105	HLSM150-150
CF150 (8" O.D.)	M8 Tapped	149	250° C	372	172	486	305	229	149	104	414	313	105	HLSM150-200

8

Sample Manipulation & Motion

Choose the model, stroke, actuation, scale, and wire upgrade. Next, compose the order code as shown, below.

Example Configuration Part No.: **LSM38-25-H** = Call

	Part No. Prefix
Model	LSM 10
	LSM 38*
	LSM 64*
	LSM 100*
	LSM 150*
	Option Part No.
Stroke (mm)	25
	50
	75
	100
	150
	175
	200
	250
	300
	350
Actuation Options	
Manual handwheel	H
Pneumatic	P
Side-mounted stepper motor	SS
Side-mounted DC motor	SD
Scale Options	
Engraved shaft	ES
Digital linear scale	DLA
Linear potentiometer	LP
Wiring Upgrade	
Wiring upgrade with switches for connection to controller	UP

* Add an "H" to the beginning of the part number to order clear bolt holes in the base flange rather than the standard tapped bolt holes. This is not available on all sizes.



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12 MONTH WARRANTY ON ALL PUMPS
PUMP EXCHANGE PROGRAM



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Scroll Rotary Piston Ion
Diffusion Screw Blower
Dry Process

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FOR UP TO DATE INVENTORY

➤ Linear Shifts

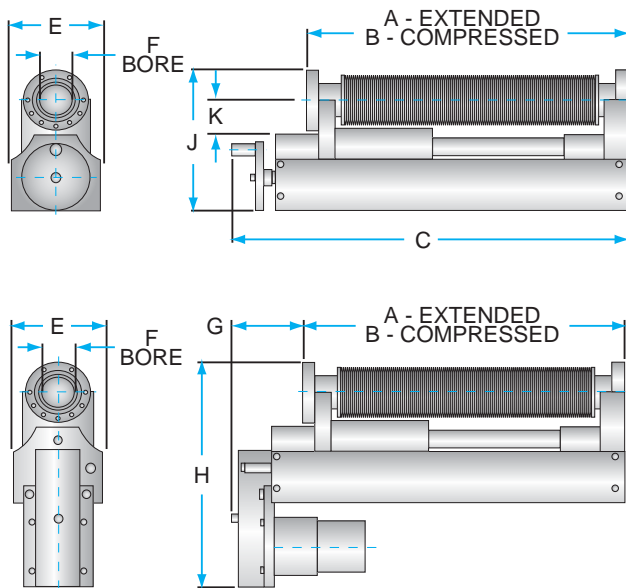


■ LSML Long Travel Linear Shift Mechanism Series

- Similar to the LSM Series but designed for longer travel
- Up to 1000 mm (39") stroke
- Smooth kinematic motion
- Reliable, rigid construction
- Manual and motorized actuation
- Demountable bellows assembly

Choose the model, stroke, actuation, scale, and wire upgrade.
Next, compose the order code as shown, below.

Example Configuration Part No.: **LSML38-200-H** = Call



	Part No. Prefix
Model	LSML 38
	LSML 64
	HLSML 38
	HLSML 64
	Option Part No.
Stroke (mm)	200
	300
	400
	500
	600
	800
	1000
Actuation Options	
Manual handwheel	H
Pneumatic cylinder	P
Side-mounted stepper motor	SS
Side-mounted DC motor	SD
Scale Options	
Engraved shaft	ES
Digital linear scale	DLA
Wiring Upgrade	
Wiring upgrade with switches for connection to controller	UP

* "H" LSML version indicates clear holes on the H-Manual actuation mounting flange

Flange Size	Bolt Holes		Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)											Part No.
	Travel	Flange Base Flange			A	B	C	D	E	F	G	H	J	K		
CF38 (2.75" O.D.)	M6 Tapped	M6 Tapped	38	250° C	322	122	402	161	102.5	38	72	259	163.5	39	LSML38-200	
CF38 (2.75" O.D.)	M6 Tapped	M6 Tapped	38	250° C	452.5	152.5	534	161	102.5	38	72	259	163.5	39	LSML38-300	
CF38 (2.75" O.D.)	M6 Tapped	M6 Tapped	38	250° C	576	176	657	161	102.5	38	72	259	163.5	39	LSML38-400	
CF38 (2.75" O.D.)	M6 Tapped	M6 Tapped	38	250° C	707	207	788	161	102.5	38	72	259	163.5	39	LSML38-500	
CF38 (2.75" O.D.)	M6 Tapped	Clear Holes	38	250° C	335	135	416	161	102.5	38	72	259	163.5	39	HLSML38-200	
CF38 (2.75" O.D.)	M6 Tapped	Clear Holes	38	250° C	462.5	162.5	533	161	102.5	38	72	259	163.5	39	HLSML38-300	
CF38 (2.75" O.D.)	M6 Tapped	Clear Holes	38	250° C	586	186	667	161	102.5	38	72	259	163.5	39	HLSML38-400	
CF38 (2.75" O.D.)	M6 Tapped	Clear Holes	38	250° C	717	217	798	161	102.5	38	72	259	163.5	39	HLSML38-500	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	311	111	399	204	161	65	41.2	314	163.5	64	LSML64-200	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	446	146	534	204	161	65	41.2	314	163.5	64	LSML64-300	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	592	192	663	204	161	65	41.2	314	163.5	64	LSML64-400	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	700	200	771	204	161	65	41.2	314	163.5	64	LSML64-500	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	860	260	1009	204	161	65	41.2	314	163.5	64	LSML64-600	
CF64 (4.5" O.D.)	M8 Tapped	M8 Tapped	65	250° C	1111	311	1181	204	161	65	41.2	314	163.5	64	LSML64-800	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	325	125	413	204	161	65	41.2	314	163.5	64	HLSML64-200	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	459	159	547	204	161	65	41.2	314	163.5	64	HLSML64-300	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	602	202	673	204	161	65	41.2	314	163.5	64	HLSML64-400	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	700	200	771	204	161	65	41.2	314	163.5	64	HLSML64-500	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	860	260	1009	204	161	65	41.2	314	163.5	64	HLSML64-600	
CF64 (4.5" O.D.)	M8 Tapped	Clear Holes	65	250° C	1111	311	1181	204	161	65	41.2	314	163.5	64	HLSML64-800	

8 Sample Manipulation & Motion

Linear Shifts

Compact CLSM Series

- Designed for the linear movement of large flange-mounted instruments with minimum tilt or wobble in the movement, and enabling precision alignment before and after pump-down
- Manual units operated handwheel drives
- Motorized units driven by stepper motor or DC motor mechanisms
- Drives support bellows assemblies in a precision kinematic guide system, complete with anti-rotation and anti-deflection systems
- Standard travel distances of 25mm through 100mm (custom units available)
- Ideal for manipulation of surface science tools with respect to a sample's position, manipulation of evaporation and sputter sources, substrate and source shutters, sample heating stage adjustment, sample transfer applications, and general sample manipulation

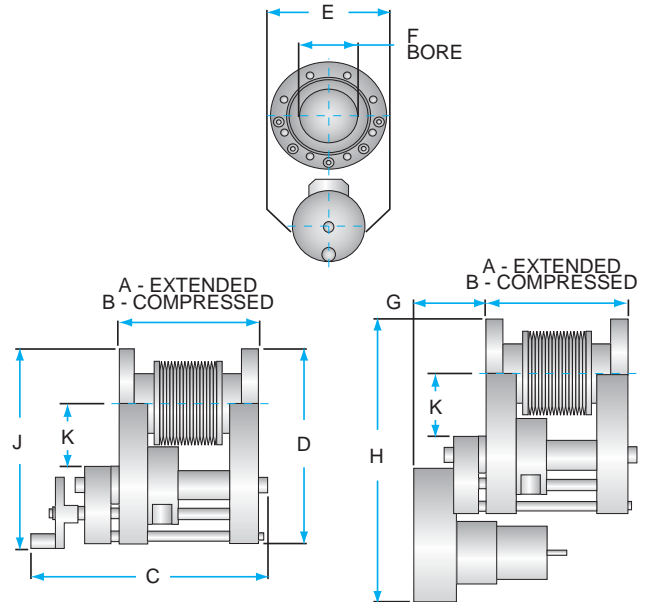


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Choose the model, stroke, actuation, scale, and wire upgrade. Next, compose the order code as shown, below.

Example Configuration Part No.: **CLSM38-25-H** = Call

	Part No. Prefix
Model	CLSM 38 CLSM 64
	Option Part No.
Stroke (mm)	25 50 75 100
Actuation Options	
Manual handwheel	H
Pneumatic	P
Side-mounted stepper motor	SS
Side-mounted DC motor	SD
Scale Options	
Engraved shaft	ES
Digital linear scale	DLA
Wiring Upgrade	
Wiring upgrade with switches for connection to controller	UP



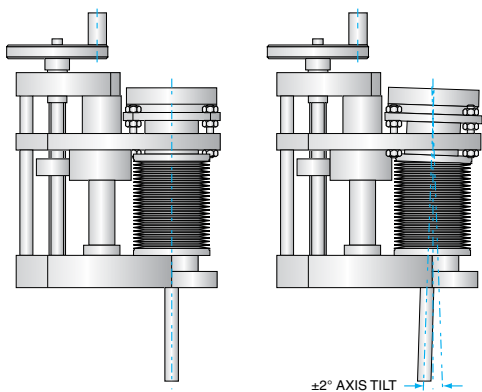
Flange Size	Bolt Holes	Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)											Part No.
				A	B	C	D	E	F	G	H	J	K		
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	63	38	173	142	75	39	102	247	152	39	CLSM38-25	
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	92	42	202	142	75	39	102	247	152	39	CLSM38-50	
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	125	50	235	142	75	39	102	247	152	39	CLSM38-75	
CF38 (2.75" O.D.)	M6 Tapped	38	250° C	163	63	273	142	75	39	102	247	152	39	CLSM38-100	
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	106	81	221	206	122.5	65	73	300	215	67	CLSM64-25	
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	131	81	221	206	122.5	65	73	300	215	67	CLSM64-50	
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	156	81	221	206	122.5	65	73	300	215	67	CLSM64-75	
CF64 (4.5" O.D.)	M8 Tapped	65	250° C	188	88	221	206	122.5	65	73	300	215	67	CLSM64-100	

Sample Manipulation & Motion

Linear Shifts

Tilt LSMT Series

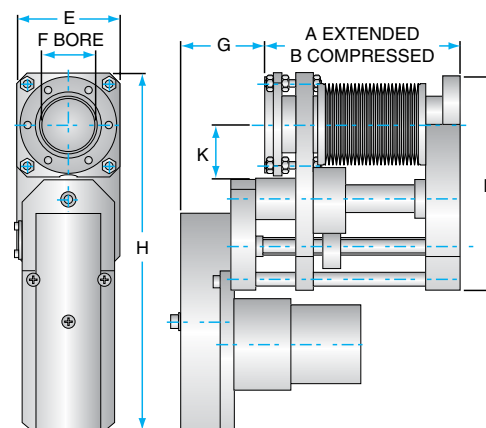
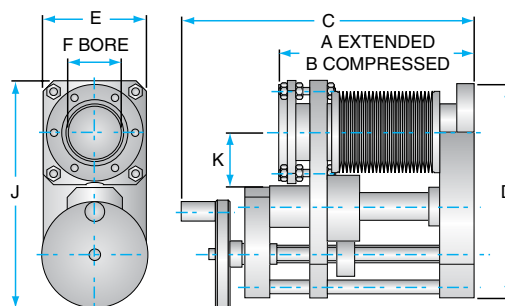
- Designed for the linear movement of large flange-mounted instruments with minimum tilt or wobble in the movement, and enabling precision alignment before and after pump-down
- Manual units operated handwheel drives
- Motorized units driven by stepper motor or DC motor mechanisms
- Drives support bellows assemblies in a precision kinematic guide system, complete with anti-rotation and anti-deflection systems
- Standard travel distances of 25 mm through 100 mm (custom units available)
- Ideal for manipulation of surface science tools with respect to a sample's position, manipulation of evaporation and sputter sources, substrate and source shutters, sample heating stage adjustment, sample transfer applications, and general sample manipulation



Choose the model, stroke, actuation, scale, and wire upgrade. Next, compose the order code as shown, below.

Example Configuration Part No.: **LSMT38-50-H** = Call

	Part No. Prefix
Model	LSMT 38
	LSMT 64
	Option Part No.
Stroke (mm)	25
	50
	100
Actuation Options	
Manual handwheel	H
Pneumatic	P
Side-mounted stepper motor	SS
Side-mounted DC motor	SD
Scale Options	
Engraved shaft	ES
Digital linear scale	DLA
Wiring Upgrade	
Wiring upgrade with switches for connection to controller	UP



Flange Size	Bolt Holes	Traveling Flange Tilt	Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)										Part No.
					A	B	C	D	E	F	G	H	J	K	
CF38 (2.75" O.D.)	M6 Tapped	±2 °	38	250° C	142	92	213	155	75	38	89	259	165	39	LSMT38-50
CF38 (2.75" O.D.)	M6 Tapped	±2 °	38	250° C	199.5	99.5	270.5	155	75	38	89	259	165	39	LSMT38-100
CF64 (4.5" O.D.)	M8 Tapped	±2 °	65	250° C	180.5	130.5	307	203	122.5	65	55.5	298	213	64	LSMT64-25
CF64 (4.5" O.D.)	M8 Tapped	±2 °	65	250° C	230.5	130.5	307	203	122.5	65	55.5	298	213	64	LSMT64-50

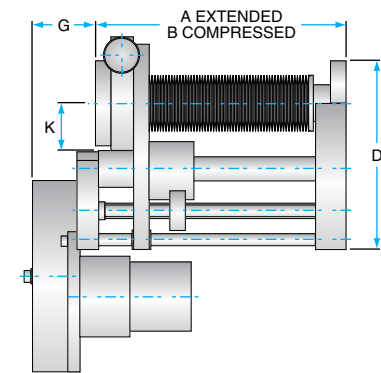
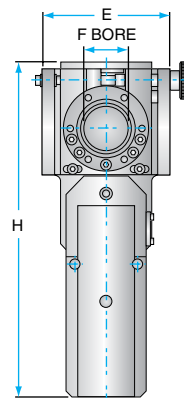
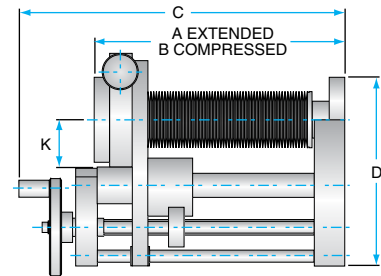
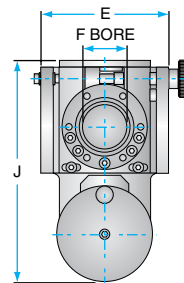
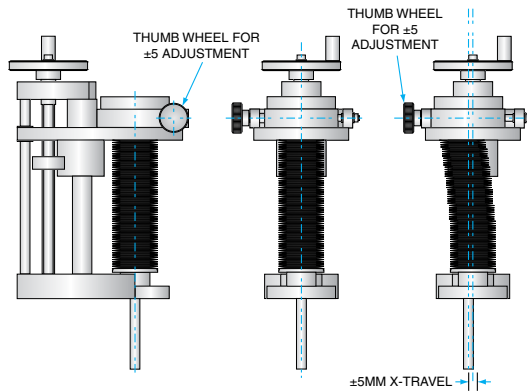
Linear Shifts

X-Shift LSMX Series

- Designed for the linear movement of large flange-mounted instruments with minimum tilt or wobble in the movement, and enabling precision alignment before and after pump-down
- Manual units operated handwheel drives
- Motorized units driven by stepper motor or DC motor mechanisms
- Drives support bellows assemblies in a precision kinematic guide system, complete with anti-rotation and anti-deflection systems
- Standard travel distances of 50mm or 100mm (custom units available)
- Ideal for manipulation of surface science tools with respect to a sample's position, manipulation of evaporation and sputter sources, substrate and source shutters, sample heating stage adjustment, sample transfer applications, and general sample manipulation



8 Sample Manipulation & Motion



Choose the model, stroke, actuation, scale, and wire upgrade. Next, compose the order code as shown, below.

Example Configuration Part No.: **LSMX38-50-H** = Call

	Part No. Prefix
Model	LSMX 38
	LSMX 64
	LSMX 100
	Option Part No.
Stroke (mm)	50
	100
Actuation Options	
Manual handwheel	H
Pneumatic	P
Side-mounted stepper motor	SS
Side-mounted DC motor	SD
Scale Options	
Engraved shaft	ES
Wiring Upgrade	
Wiring upgrade for motor controller	UP

Flange Size	Bolt Holes	Traveling Flange Offset	Clear Bore (mm)	Maximum Bakeout	Dimensions (mm.)										Part No.
					A	B	C	D	E	F	G	H	J	K	
CF38 (2.75" O.D.)	M6 Tapped	±5 mm	38	250° C	143	93	205	155	105	38	52	257	183	39	LSMX38-50
CF38 (2.75" O.D.)	M6 Tapped	±5 mm	38	250° C	206	106	267	155	105	38	52	257	183	39	LSMX38-100

➤ Linear Positioners

■ Magnetic Push-Pull Positioners

Three Series:

MPPRL (rotary and push-pull linear actuation)

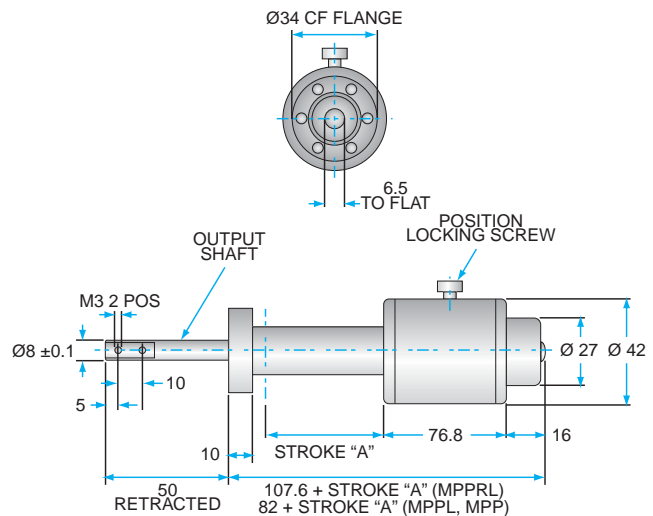
- Offers a combination of linear and rotary translation to the vacuum shaft
- Utilizes a unique magnetic coupling, based on the MagiDrive™ and PowerProbe technology
- Breakaway torque in excess of 0.4Nm and over 90N linear thrust before coupling separation

MPPL (push-pull linear-only translation)

- Offers linear-only translation of the vacuum shaft, which is guided internally, guaranteeing rotation-free motion
- 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
- This range can be actuated manually, pneumatically, or motorized. Additionally, switches can be provided to prevent over-travel and to aid system interlocks

MPP (push-pull linear translation with freely rotating shaft)

- Offers linear actuation of an unguided vacuum shaft
- Used to manipulate slides or pivot arms where a guided system may conflict with the mechanism (please note, though the vacuum shaft is free to rotate, the drive does not provide rotation)
- This range can be actuated manually, pneumatically, or motorized. Additionally, switches can be provided to prevent over-travel and to aid system interlocks

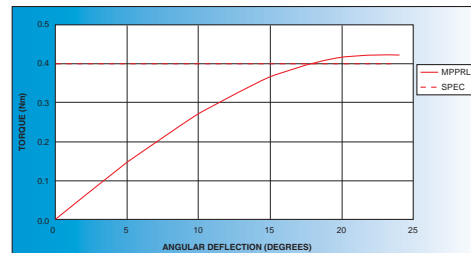


Choose the size, stroke, and actuation. Next, compose the order code as shown, below.

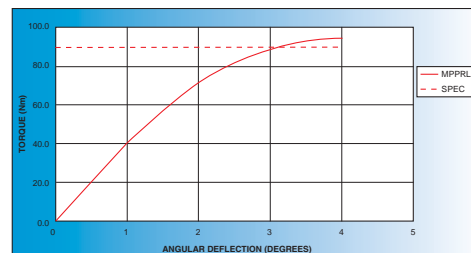
Example Configuration Part No.: **MPP-50-H** = Call

	Part No. Prefix
Size	MPPRL
	MPPL
	MPP
	Option Part No.
Stroke (mm) "A"	50
	100
	150
	250
Actuation Options	
Manual thimble	H
Pneumatic	P
Inline DC motor	ID
Inline stepper motor	IS

Note: MPPRL available in "H" manual actuation only.



Torsional Stiffness



Axial Stiffness

Linear Positioners

Linear Screw Drive KLSD Series (Manual & Motorised)

- UHV linear positioners with 25, 51, 102, 153, and 203 mm travel manual screw drive actuator
- Mounting flanges are 1-1/3" O.D. CF and 2-3/4" O.D. CF flanges
- Bakeable to 250°C fully assembled
- Operating pressure 1 atm to 10-11 Torr
- Edge-welded bellows seal
- Engraved Actuator Knob
- 3/8" O.D. output shaft with M4 tapped mounting holes
- Motorization Kit is available separately and is retrofittable to all KLSD series drives
- Applications include: sample positioning and other finer, repeatable linear-motion needs



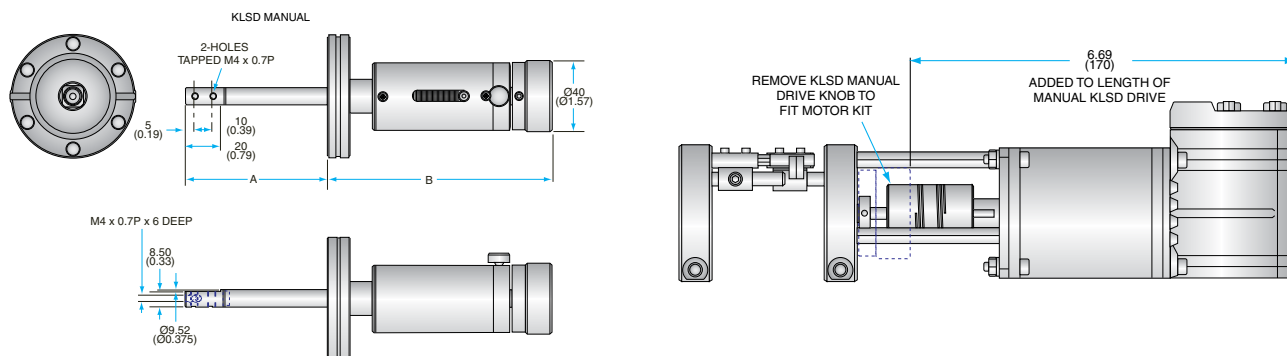
Motorisation Kit – KLDMK1

- Anamatics 'Smart Motor' with gearbox (48v DC)
- PC control via serial port (cable supplied)
- Control software from Anamatics (internet download)
- Travel limit micro-switches
- Simple bolt on conversion for manual KLSD series drives

We service this and other equipment at our facilities in Pennsylvania, USA, and Hastings, England.

8

Sample Manipulation & Motion



Flange Size	Travel	Retracted A	Extended B	Part No.	Price
N/A	N/A	N/A	N/A	KLDMK1	Call
1.33" CF	25 mm (0.98")	81 mm (3.18")	126 mm (4.96")	KLSDAA	Call
2.75" CF	25 mm (0.98")	80 mm (3.15")	127 mm (5")	KLSDAB	Call
1.33" CF	51 mm (2.00")	81 mm (3.18")	160 mm (6.30")	KLSDBA	Call
2.75" CF	51 mm (2.00")	80 mm (3.15")	161 mm (6.34")	KLSDBB	Call
1.33" CF	102 mm (4.02")	81 mm (3.18")	233 mm (9.17")	KLSDCA	Call
2.75" CF	102 mm (4.02")	80 mm (3.15")	234 mm (9.21")	KLSDCB	Call
1.33" CF	153 mm (6.02")	81 mm (3.18")	306 mm (12.05")	KLSDDA	Call
2.75" CF	153 mm (6.02")	80 mm (3.15")	307 mm (12.09")	KLSDDB	Call
1.33" CF	203 mm (7.99")	81 mm (3.18")	378 mm (14.88")	KLSDCA	Call
2.75" CF	203 mm (7.99")	80 mm (3.15")	379 mm (14.92")	KLSDCB	Call

➤ Linear Positioners

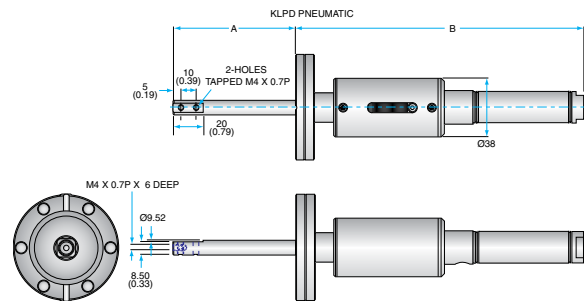
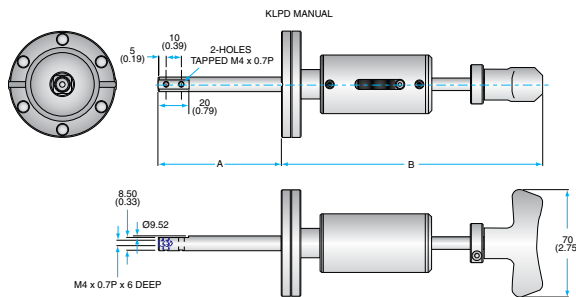
■ Push-Pull Drive KLPD Series (Manual & Pneumatic)

Manual Drive

- UHV linear positioners with 25, 51, 102, and 153 mm travel
- Mounting flanges are 1-1/3" O.D. CF and 2-3/4" O.D. CF flanges
- Bakeable to 200°C with handle or cylinder removed
- Operating pressure 1 atm to 10-11 Torr
- Edge-welded bellows seal
- Adjustable travel limit lock
- 3/8" O.D. output shaft with M4 tapped mounting holes
- Applications include: shutters, beam stops, and other linear-motion needs

Pneumatic Drive

- Double acting 3/4" bore cylinder, maximum operating pressure 17.2 Bar (250 psi)
- Two ports (open/close) to accept 1/8" NPT Male fittings – Fittings NOT supplied with drive
- Internal magnet within cylinder, provides the option of using reed switches for position feedback



Flange Size	Actuation	Travel	Retracted A	Extended B	Part No.	Price
1.33" CF	Manual	25 mm (0.98")	81 mm (3.18")	169 mm (6.65")	KLPDAA	Call
1.33" CF	Pneumatic	25 mm (0.98")	81 mm (3.18")	188 mm (7.40")	KLPDAAP	Call
2.75" CF	Manual	25 mm (0.98")	80 mm (3.15")	170 mm (6.69")	KLPDAB	Call
2.75" CF	Pneumatic	25 mm (0.98")	80 mm (3.15")	189 mm (7.44")	KLPDABP	Call
1.33" CF	Manual	51 mm (2.00")	81 mm (3.18")	229 mm (9.01")	KLPDBA	Call
1.33" CF	Pneumatic	51 mm (2.00")	81 mm (3.18")	248 mm (9.76")	KLPDBAP	Call
2.75" CF	Manual	51 mm (2.00")	80 mm (3.15")	229 mm (9.01")	KLPDBB	Call
2.75" CF	Pneumatic	51 mm (2.00")	80 mm (3.15")	249 mm (9.80")	KLPDBBP	Call
1.33" CF	Manual	102 mm (4.02")	81 mm (3.18")	353 mm (13.9")	KLPDCA	Call
1.33" CF	Pneumatic	102 mm (4.02")	81 mm (3.18")	371 mm (14.6")	KLPDCAP	Call
2.75" CF	Manual	102 mm (4.02")	80 mm (3.15")	354 mm (13.9")	KLPDCB	Call
2.75" CF	Pneumatic	102 mm (4.02")	80 mm (3.15")	372 mm (14.6")	KLPDCBP	Call
1.33" CF	Manual	153 mm (6.02")	81 mm (3.18")	476 mm (18.7")	KLPDDA	Call
1.33" CF	Pneumatic	153 mm (6.02")	81 mm (3.18")	495 mm (19.5")	KLPDDAP	Call
2.75" CF	Manual	153 mm (6.02")	80 mm (3.15")	477 mm (18.8")	KLPDDB	Call
2.75" CF	Pneumatic	153 mm (6.02")	80 mm (3.15")	496 mm (19.5")	KLPDDBP	Call

► Linear/Rotary Motion

■ PowerProbe Series Overview

PowerProbe builds on the success of the MagiDrive as the premier magnetically coupled UHV rotary feedthrough. This coupling forms the basis of the PowerProbe sample transfer arm range, providing linear or combined linear and rotary motion within ultra high vacuum. These unique probes avoid the limitations of conventional designs, offering up to an order of magnitude improvement in key aspects of performance.

PowerProbes have unrivalled transmission performance. The standard linear coupling has a breakaway force of 180 N (40lbf) in comparison to the 26-50 N of our nearest competitors. A high power option is also available with a staggering 310 N (69lbf).

In the attached figures, the axial stiffness chart shows that the coupling on the standard probe deflects by less than 1 mm for a 98 N (22lbf) load.

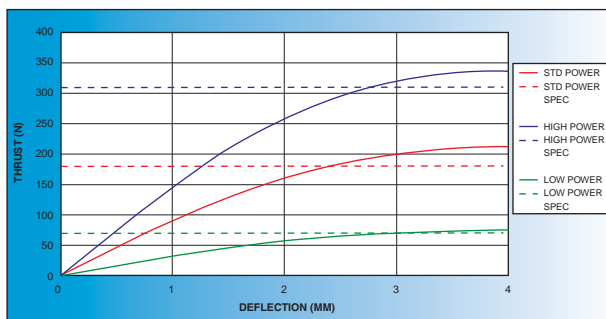
Features

- True UHV performance
- Linear or linear/rotary motion
- High power coupling
- Bakeable to 250° C
- Unrivalled performance

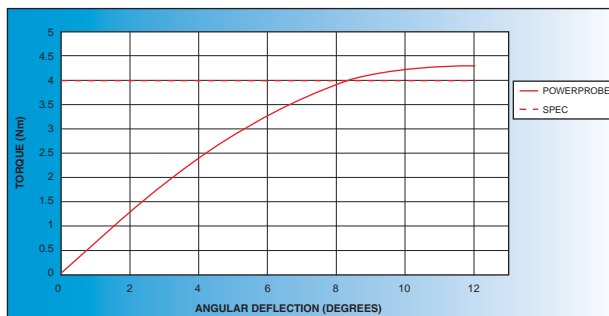


The rotary transmission is essentially based upon the MD35 MagiDrive, delivering over 4Nm of breakaway torque. This is four times the leading competitor. The unique rotary coupling retains the angular rigidity of the MagiDrive series.

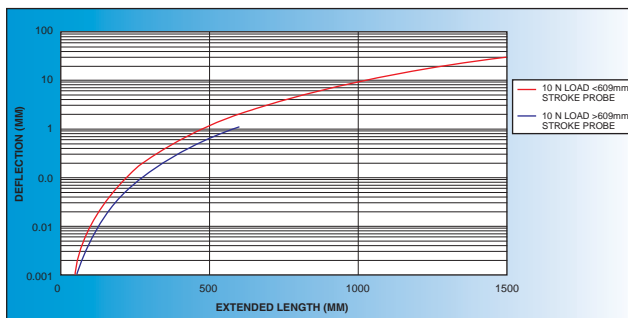
The probe deflection chart shows the deflection characteristics at the end of a horizontally mounted PowerProbe arm as a function of the extended length, and with an applied load of 10 N. The relationship between load and deflection is approximately linear for typical transfer loads.



Axial Stiffness



Torsional Stiffness



Probe Deflection versus Applied Load

Product Range

Item	Code	Description
LPP	Linear PowerProbe	Linear Motion Only
PP	Linear/Rotary PowerProbe	Linear and Rotary Motion
ASPP	Axis Selectable PowerProbe	Independent Linear, Rotary, or Combined Linear and Rotary Motion
EPP	Elevating PowerProbe	Linear Motion With 12 mm of Vertical Left on the End Effector for Sample Transfer
DAPP	Dual Axis PowerProbe	Linear Motion of the Main Shaft and Rotary Motion of a Second Internal Shaft

➤ Linear/Rotary Motion

■ Linear PowerProbe (LPP Series)

Use where linear translation only 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 carriage. This removes the need for external linear guide bars used by other manufacturers.

- Linear motion only
- No external guidance required
- 10x the thrust of conventional probes
- Fully bakeable to 250° C
- Motorization options
- Position switch options
- Adjustable stop collar

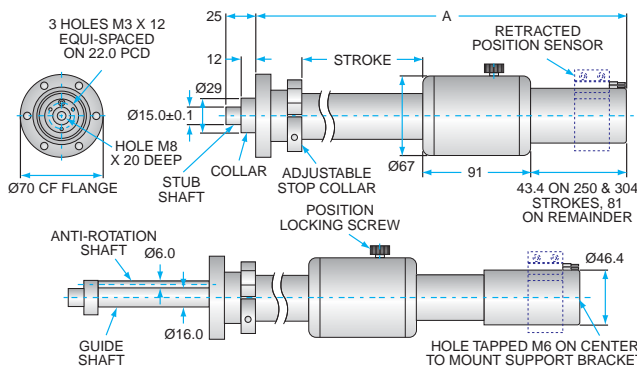


8

SPECIFICATIONS

Model/Series	Mounting	Bakeout	Pressure Range	Position Locking	Breakaway Linear Force
Linear PowerProbe (Low Power)	2 ³ / ₄ " (70 mm) CF Flange	250° C (motor removed)	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	70 N (15.75 lbf)
Linear PowerProbe (Standard Power)	2 ³ / ₄ " (70 mm) CF Flange	250° C (motor removed)	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	180 N (40 lbf)
Linear PowerProbe (High Power)	2 ³ / ₄ " (70 mm) CF Flange	250° C (motor removed)	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	310 N (69 lbf)

Note: Maximum recommended internal load carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 50 Nm. See deflection versus load chart on page 8-55.



Choose the series, flange size, linear stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **LPP35-304-H** = Call

	Part No. Prefix
Series	
Standard power	LPP
Low power	LPPL
High power	LPPH
	Option Part No.
Flange Size	35
Linear Stroke	304
	457
	609
	914
	1219
Actuation Method	
Manual	H
Manual with bakeable limit switch for retracted position	HR
Extension handle	E
Side-mounted 24V DC motor with bakeable limit switches at extended and retracted positions	SD
Side-mounted stepper motor with bakeable home and limit switches at extended and retracted positions	SS

Linear PowerProbe Dimensions

Linear Stroke	Flange Size	Dimensions (mm) A
304 mm (12")	CF38 70 mm O.D.	514
457 mm (18")	CF38 70 mm O.D.	692
609 mm (24")	CF38 70 mm O.D.	870
914 mm (36")	CF38 70 mm O.D.	1225
1219 mm (48")	CF38 70 mm O.D.	1530

➤ Linear/Rotary Motion

■ PowerProbe (PP Series)

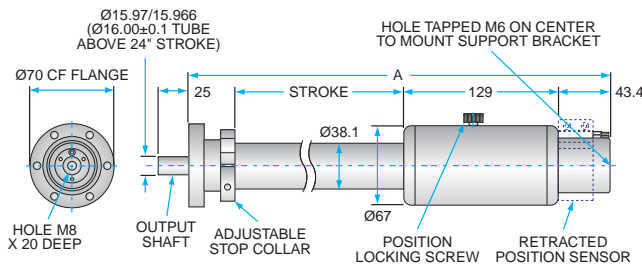


Dual axis translator enables both linear and rotary motion of the sample. The high-torque characteristics are achieved by installing a MagiDrive rotary coupling in tandem with the MagiGlide linear coupling. This ensures optimum drive performance on both axes. Twisting while pushing the external drive carriage of the PowerProbe will result in precise translation of this motion to the sample.

SPECIFICATIONS

Model/Series	Mounting	Breakaway Torque	Bakeout	Pressure Range	Position Locking	Break-Away Linear Force
PowerProbe (Low Power)	2 ³ / ₄ " (70 mm) CF Flange, 4.5" (114 mm) CF Flange for 60" Travel Unit	4 Nm (2.95 lbf-ft)	250° C	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	70 N (15.75 lbf)
PowerProbe (Standard Power)	2 ³ / ₄ " (70 mm) CF Flange, 4.5" (114 mm) CF Flange for 60" Travel Unit	4 Nm (2.95 lbf-ft)	250° C	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	180 N (40.5 lbf)
PowerProbe (High Power)	2 ³ / ₄ " (70 mm) CF Flange, 4.5" (114 mm) CF Flange for 60" Travel Unit	4 Nm (2.95 lbf-ft)	250° C	Atm to 5 x 10 ⁻¹¹ mbar	Thumbscrew	310 N (69.75 lbf)

Note: Maximum recommended internal load carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 50 Nm. See deflection versus load chart on page 8-55.



PowerProbe Dimensions

Linear Stroke	Flange Size	Dimensions (mm) A
304 mm (12")	CF38 70 mm O.D.	514
457 mm (18")	CF38 70 mm O.D.	692
609 mm (24")	CF38 70 mm O.D.	870
914 mm (36")	CF38 70 mm O.D.	1225
1219 mm (48")	CF38 70 mm O.D.	1530

Choose the series, flange size, linear stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **PP35-304-H** = Call

	Part No. Prefix
Series	
Standard power	PP
Low power	PPL
High power	PPH
	Option Part No.
Flange Size	35
	64*
Linear Stroke	304
	457
	609
	914
	1219
	1524*
Actuation Method	
Manual	H
Manual with bakeable limit switch for retracted position	HR

* 1524 mm (60") stroke "Long PowerProbes" are mounted on CF64 114 mm (4.5") O.D. flanges

➤ Linear/Rotary Motion

■ Axis Selected PowerProbe (ASPP Series)

Unique tool performs as the PowerProbe with the axis of rotation locked off to ensure linear translation as needed.

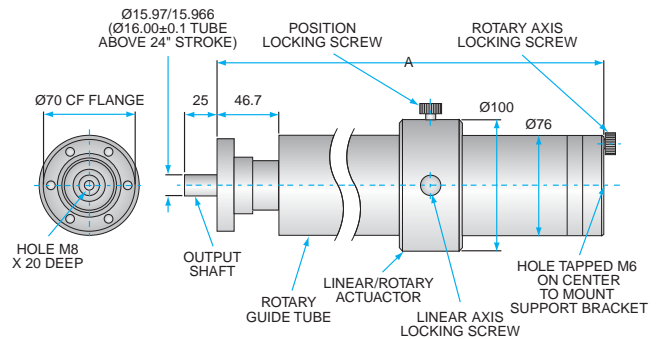
- Linear motion only, rotation locked
- Rotation only, linear locked
- Linear and rotary motion combined
- Linear and rotary both locked
- The design also includes a general position lock to prevent motion of either axis.
- Linear, rotary, linear and rotary motion
- Maximum user flexibility
- 10x the thrust, 4x the torque of conventional probes
- Fully bakeable to 250° C
- Adjustable stop collar



SPECIFICATIONS

	Axis Selected PowerProbe
Mounting	2 ³ / ₄ " (70 mm) CF Flange
Breakaway Force	180 N (40.5 lbf)
Breakaway Torque	4 Nm (2.95 lbf-ft)
Pressure Range	Atm to 5 x 10 ⁻¹¹ mbar
Bakeout	250° C
Position Locking	Thumbscrew
Index Locking	Spring-Loaded Pin

Note: Maximum recommended internal load carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 50 Nm. See deflection versus load chart on page 8-55.



Choose the series, flange size, linear stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **ASPP35-304-H** = Call

	Part No. Prefix
Series	ASPP
	Option Part No.
Flange Size	35
Linear Stroke	304
	457
	609
	914
Actuation Method	
Manual	H

Axis PowerProbe Dimensions

Linear Stroke	Flange Size	Dimensions (mm) A
304 mm (12")	CF38 70 mm O.D.	558
457 mm (18")	CF38 70 mm O.D.	711
609 mm (24")	CF38 70 mm O.D.	862
914 mm (36")	CF38 70 mm O.D.	1168

➤ Linear/Rotary Motion



■ Elevating PowerProbe (EPP Series)

Unique tool enables its end effector to elevate throughout its stroke.

- Linear motion with elevation
- 12 mm lift throughout stroke
- 10x the thrust of conventional probes
- Fully bakeable to 250° C
- Adjustable stop collar

SPECIFICATIONS

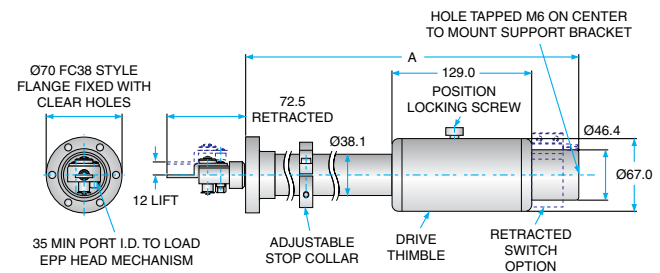
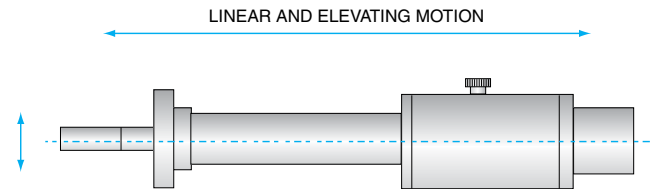
	Elevating PowerProbe
Mounting	2 ³ / ₄ " (70 mm) CF O.D.
Breakaway Linear Force	180 N (40 lbf)
Pressure Range	Atm to 5 x 10 ⁻¹¹ mbar
Bakeout	250° C
Position Locking	Thumbscrew
Elevating (Lift) Motion	12 mm

Note: Maximum recommended internal load carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 50 Nm. See deflection versus load chart on page 8-55.

Choose the series, flange size, linear stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **EPP35-304-H** = Call

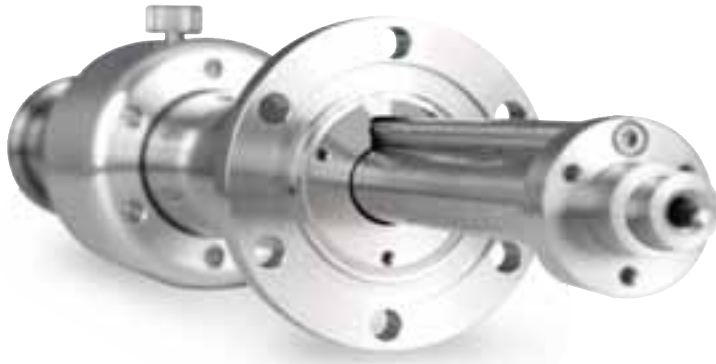
	Part No. Prefix
Series	EPP
Flange Size	35
Linear Stroke	304
	457
	609
	914
	1219
Actuation Method	
Manual	H
Manual with bakeable limit switch for retracted position	HR



Elevating PowerProbe Dimensions

Linear Stroke	Flange Size	Dimensions (mm) A
304 mm (12")	CF38 70 mm O.D.	556
457 mm (18")	CF38 70 mm O.D.	721
609 mm (24")	CF38 70 mm O.D.	870
914 mm (36")	CF38 70 mm O.D.	1226
1219 mm (48")	CF38 70 mm O.D.	1530

► Linear/Rotary Motion



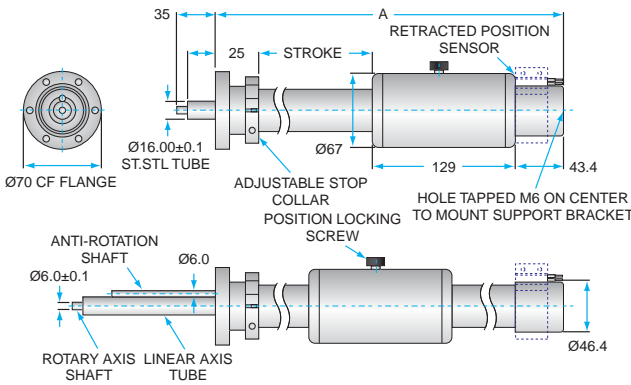
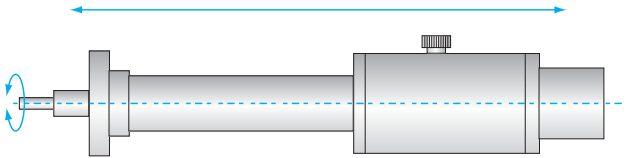
■ Dual Axis PowerProbe (DAP Series)

Unique tool enables linear motion and rotary motion of a second internal shaft.

- Linear primary motion
- Secondary internal rotating shaft
- 10x the thrust, 4x the torque of conventional probes
- Fully bakeable to 250° C
- Retracted switch options
- Adjustable stop collar

8

LINEAR MOTION AND ROTATION OF SECONDARY SHAFT



SPECIFICATIONS

Dual Axis PowerProbe	
Mounting	2 ³ / ₄ " (70 mm) CF Flange
Breakaway Linear Force	180 N (40.5 lbf)
Pressure Range	Atm to 5 x 10 ⁻¹¹ mbar
Bakeout	250° C
Position Locking	Thumbscrew
Breakaway Torque	4 Nm (2.95 lbf ft)

Note: Maximum recommended internal load carrying capacity will be a function of probe extension, but we recommend not to exceed a moment of 50 Nm. See deflection versus load chart on page 8-55.

Choose the series, flange size, linear stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **DAP35-304-H = Call**

Part No. Prefix	
Series	DAP
Option Part No.	
Flange Size	35
Linear Stroke	304
	457
	609
	914
	1219
Actuation Method	
Manual	H
Manual with bakeable limit switch for retracted position	HR

Dual Axis PowerProbe Dimensions

Linear Stroke	Flange Size	Dimensions (mm) A
304 mm (12")	CF38 70 mm O.D.	556
457 mm (18")	CF38 70 mm O.D.	721
609 mm (24")	CF38 70 mm O.D.	870
914 mm (36")	CF38 70 mm O.D.	1226
1219 mm (48")	CF38 70 mm O.D.	1530

Sample Manipulation & Motion

Wobble Sticks

Wobble Sticks

The term “wobble stick” describes a manually operated device that enables motion in three orthogonal directions (X, Y, and Z) without gears or mechanisms.

- Used to transfer samples and sample cassettes from one position to another inside a UHV chamber
- Can operate a shutter or variable orifice that has no external actuator
- Position a measuring probe or thermocouple

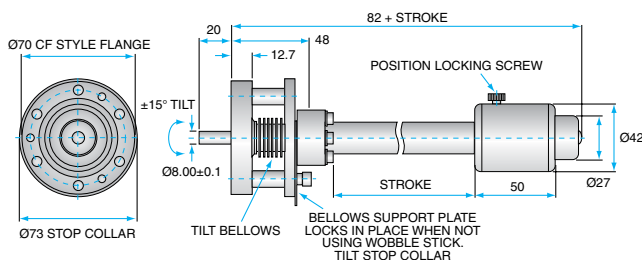
The magnetically coupled wobble stick series is built on a modular concept. The basic WSL series provides lateral and tilt movement through a robust hydro-formed bellows adapter and linear push-pull motion through a magnetic coupling. The WSLR series adds continuous rotation to the WSL series.

This design eliminates the need for long edge-welded bellows stacks employed with conventional wobble sticks. This reduces the risk of leaks and does not subject the device to the thrust due to vacuum resulting in smooth, free-moving operation.

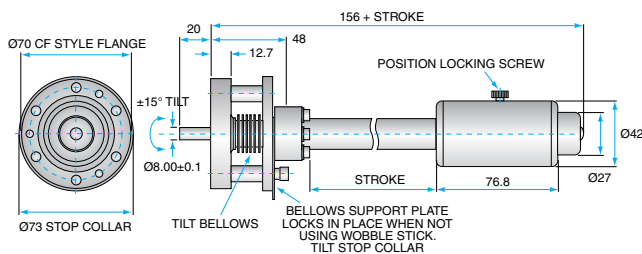


SPECIFICATIONS

	WSL	WSLR
Mounting	2 3/4" (70 mm) CF Flange	2 3/4" (70 mm) CF Flange
Break-away Torque	N/A	0.45 Nm (0.33 lbf-ft.)
Bakeout	250° C	250° C
Break-away Linear Force	95 N (21.38 lbf)	95 N (21.38 lbf)
Maximum Sample Mass	260 g	260 g
Rotation	N/A	Continuous
Tilt	±15°	±15°



WSL Series



WSLR Series

Series	Stroke Length (mm)		End Effector	
	150	250	Pincer	Gripper
WSL	60	100	P	G
WSLR	60	100	P	G

Choose the series, linear travel stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **WSL-150-H** = Call

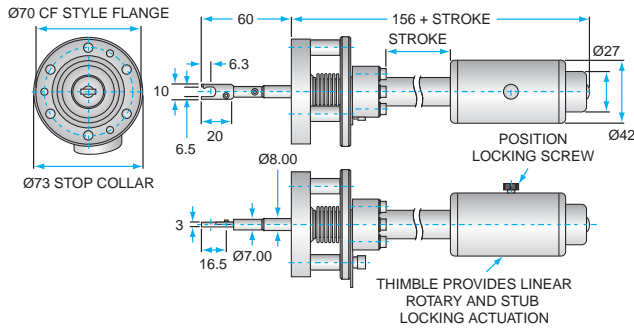
	Part No. Prefix
Series	WSL
	WSLR
	Option Part No.
Linear Stroke	150
	250
Actuation Method	
Manual	H

► Wobble Sticks

■ Gripper Style Wobble Sticks

Grippers and pincers are available on the WSLR series wobble sticks to suit many surface science applications. The gripper is primarily designed as a retrofit for existing ESCALAB sample stub handling

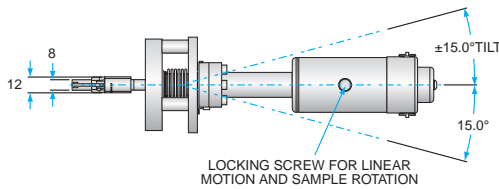
systems, while the pincer is a universal sample grip system suitable for the majority of small sample handling applications. All wobble sticks have $\pm 15^\circ$ of tilt in any direction.



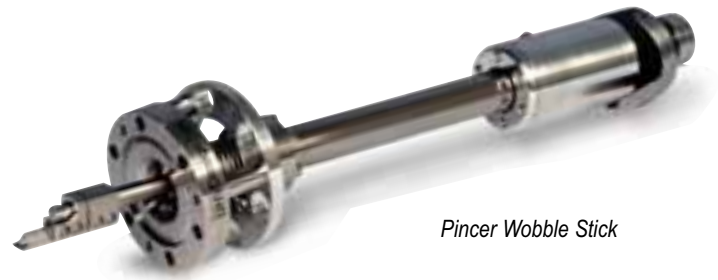
Gripper Wobble Stick



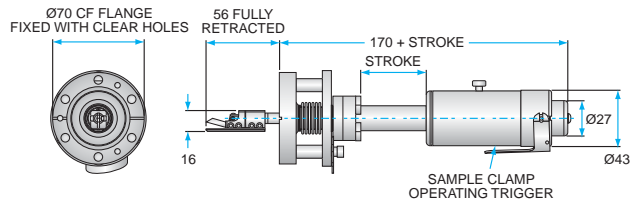
Gripper Wobble Stick



Pincer Wobble Stick



Pincer Wobble Stick



Pincer Wobble Stick



Pincer Grip

Choose the series, linear travel stroke, and actuation method. Next, compose the order code as shown, below.

Example Configuration Part No.: **WSLRP-150-H** = Call

	Part No. Prefix
Series	WSLRP
	WSLRG
	Option Part No.
Linear Stroke	150
	250
Actuation Method	
Manual	H

NOTE: Contact us at uhvproducts@lesker.com for other style grippers.

8 Sample Manipulation & Motion

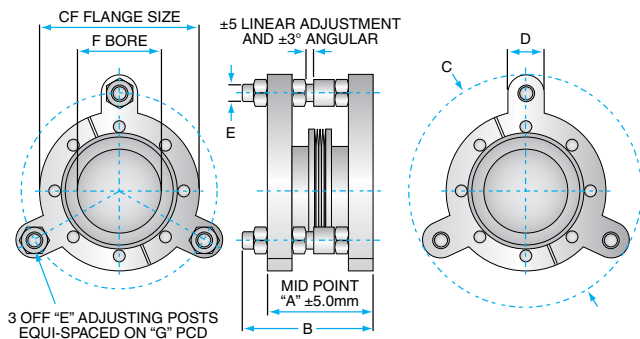
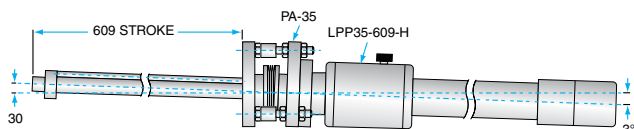
► Port Aligners

■ Port Aligners

- Port aligner range enables the distance and angular relationship between two flanges to be adjusted.
- Design consists of two parallel flanges—one remains fixed, other may be adjusted with respect to the first
- Fixed flange supports three equi-spaced threaded shafts
- Alignment of the traveling flange is achieved by adjusting the floating mounts attached to each threaded shaft
- Range can be mounted in any orientation
- Bakeable to 250° C
- High-quality, flexible, 316L edge-welded bellows spans the flanges to accommodate the required motion while ensuring an all-metal vacuum enclosure

Port Aligner Range:

- When adjusted, this simple device provides a stable platform for instrument alignment
- Consists of three series mounted on CF38 (2³/₄" O.D. CF), CF64 (4¹/₂" O.D. CF), and CF100 (6" O.D. CF) flanges
- Each flange can be supplied with either tapped or clear holes
- Each range provides ± 5mm axial adjustment, with a nominal amount of angular flexibility



Flange Size	Dimensions						
	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



35 Port Aligner



64 Port Aligner

Choose the series, flange size, and bolt holes configuration. Next, compose the order code as shown, below.

Example Configuration Part No.: **PA35-H** = Call

	Part No. Prefix
Series	PA
	Option Part No.
Flange Size	35
	64
	100
	150
	200
Bolthole Configuration	
Clear Holes	H
Tapped Holes	T

Y-Shifts

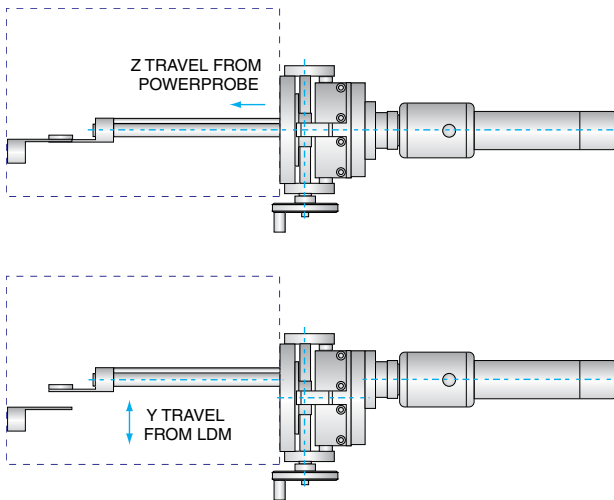
Linear Displacement Mechanism

- For Y-shift adjustment or alignment of specimen transfer tools
- Compatible with ultrahigh vacuum
- Provides small movement normal (90°) to the axis of a transfer system mainly to correct transporter droop
- Mounting flange is either a metric tapped 4 1/2" or 6" O.D. CF (also tapped at half-pitch, allowing for "inline" [European] or "straddle" [U.S.] orientation)
- Support cantilevered loads
- Work in any orientation—provides horizontal movement if mounted horizontally, diagonal if mounted diagonally, etc.
- Can provide the extra axis of freedom required for sample hand-off when combined with any standard rack-and-pinion or magnetically coupled transfer arm
- Can align any flange-mounted instrument
- Handwheel, optional DC motor, or stepper motor actuation
- Travel range: ±5mm
- Bakeable to 250° C (with motor removed)
- Precision-ground stainless steel guide system



8

Sample Manipulation & Motion



Choose the series, Y shift, actuation. Next, compose the order code as shown, below.

Example Configuration Part No.: **LDM 64 - 38 - H** = Call

Series	Part No. Prefix
	LDM
	Option Part No.
Y Shift Type	
CF38 70 mm (2.75") O.D.	
CF64 114 mm (4.5") O.D.	64-38
+/- 7.5 mm	
CF64 114 mm (2.75") O.D.	
CF64 114 mm (4.5") O.D.	64-64
+/- 7.5 mm	
CF38 70 mm (2.75") O.D.	
CF100 152 mm (4.5") O.D.	100-38
+/- 31 mm	
CF64 114 mm (2.75") O.D.	
CF100 152 mm (4.5") O.D.	100-64
+/- 31 mm	
Actuation Method	
Manual	H
Side-mounted stepper motor	SS
Side-mounted DC motor	SD

► Multi-Axis Manipulation

■ Introduction to Multi-Axis Manipulation


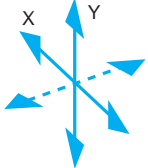
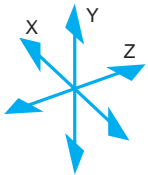
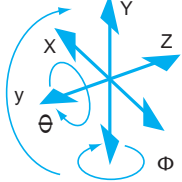
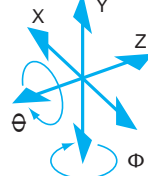
For applications requiring multiple axes of translation, tilt, rotation, or perhaps, sample heating/cooling and transfer, this product range can compound their various modular components to build sophisticated manipulators with up to six axes of independent motion (example shown to the right).

Typical applications might include electron spectroscopy experiments for surface science, laser/optical probes, beam line manipulators, and various deposition techniques. The various building blocks have been preconfigured into commonly used instruments and are delineated for convenience in the table below, each of which are then detailed in the following section.



8

Sample Manipulation & Motion

	Axes of motion	Description
	Y	Y-SHIFT—provides accurate, repeatable axial alignment along the Y-axis.
	X - Y	MULTIBASE—provides XY translation with a multitude of flange sizes, clear bores and actuation methods.
	X - Y - Z	MULTISTAGE—a range of XYZ stages based upon the combined use of the XY MultiBase (above) and the Linear Shift Mechanism range of Z translators.
	X - Y - Z - θ - φ - y	By combining the XYZ MULTISTAGE (above) with the MagiDrive rotary feedthrough range, up to six axes of independent motion can be provided, as depicted in the diagram to the left.
	X - Y - Z - θ - φ	MULTICENTRE—a complete sample manipulator solution, built using the XYZ MultiStage, but which also provides transferable sample holders and stage receptors. The receptor can provide up to two rotations—polar rotation θ (also referred to as specimen tilt), and azimuthal rotation ϕ (specimen rotation about the sample surface normal). Additionally, the transferable samples can also be heated and cooled, providing temperature control in the range of -150° C to 1200° C.

XYZT Stage

XYZT MultiMotion

For space restricted applications, the combination LSMXY2T series manipulator is ideally designed and priced. It's rugged construction and smaller platform is ideal for surface science chambers where space is a premium. The use of micrometer actuation provides for accurate, precise adjustment of the sample position relative to measuring equipment while a built in ± 2 degrees tilt of the traveling flange assists with alignment issues and overall makes the XYZT stage a very attractive solution for many applications.

Z-motion is provided by a precision lead screw and calibrated handwheel, each increment corresponding to $10\mu\text{m}$ of motion. The drive is kinematic in design and provides smooth motion over extended travels.

X-and Y-motion is provided by precision micrometer drives having a $1\mu\text{m}$ resolution capability. Tilt is achieved via opposed jack screws giving $\sim 2.5^\circ$ per rotation.



SPECIFICATIONS

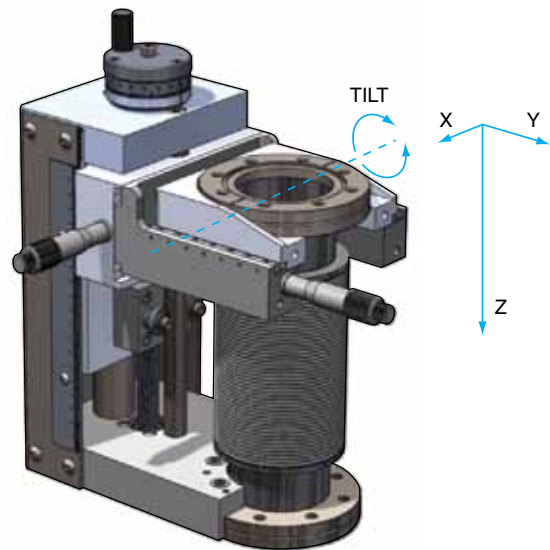
XYZT Model	LSMXY2T64
Mounting Flange	CF64 114 mm (4.5") O.D. with M8 straddled holes
Clear Bore	65 mm
XY Travel	± 12.5 mm
XY Resolution	$\pm 1\mu\text{m}$
Tilt About Axis	$\pm 2^\circ$
Z Travel	50, 100, 150, and 200 mm.
Z Resolution	$\pm 10\mu\text{m}$
Bakeout	250°C

Note: Options to motorize Z-motion available. X, Y, and T offered as manual actuation.

Choose the model, Z Travel, and Z Actuation configuration. Next, compose the order code as shown, below.

Example Configuration Part No.:
XYZT64 - 50 - H = Call

	Part No. Prefix
Model	XYZT64
	Option Part No.
Z Travel	50
	100
	150
	200
Z Actuation Method	
Manual handwheel	H
Side-mounted stepper motor	SS
Side-mounted DC motor	SD



8 Sample Manipulation & Motion

► **XY Stage**

■ **XY Stage: MultiBase**

MultiBase stages provide modular platforms for the manipulation of components in the X and Y planes. A MultiBase may be used as a discrete stand alone component or combined with our range of Linear Shift Mechanisms and MagiDrives to build a multiaxis manipulator with up to six axes of motion.

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 that allows mounting in any orientation.

The MultiBase design includes two parallel flanges. One remains fixed, while 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 traveling flange is controlled through two external lead-screws.

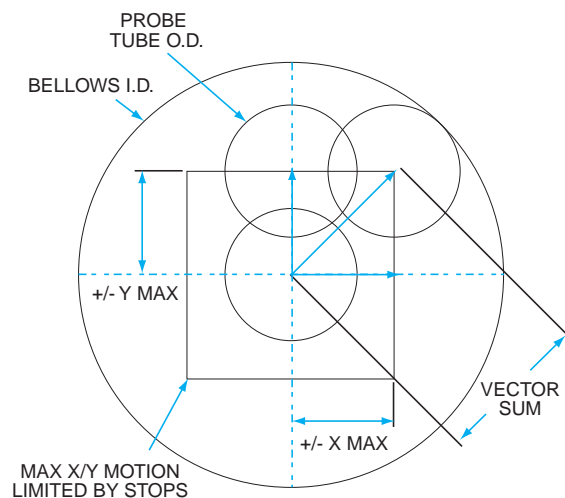
- Up to ±31mm of X and Y motion
- Can be mounted in any orientation
- Smooth kinematic motion
- Robust construction for high loads

Choose the model, fixed flange, traveling flange, and actuation configuration. Next, compose the order code as shown, below.

Example Configuration Part No.: XY14 - 64 - 38 - H = Call

	Part No. Prefix
Model	XY14 XY31
	Option Part No.
Fixed Flange Options	64 100 150
Travelling Flange Options	38 64
Actuation Method	
Manual handwheel	H
Inline stepper motor	IS

Note: Fixed flange supplied with tapped holes as standard, clear holes available on request.



SPECIFICATIONS

Model	XY14-64-38	XY14-100-38	XY31-100-38	XY31-100-64	XY31-150-64
Travelling Flange	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF64 114 mm (4.5") O.D. with M8 straddled holes	CF64 114 mm (4.5") O.D. with M8 straddled holes
Mounting Flange	114 mm (4.5") O.D. CF64 with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF150 203 mm (8") O.D. with M8 straddled holes
X Y Travel*	±14 mm	±14 mm	±31 mm	±31 mm	±31 mm
X Max, Y Max	±10 mm	±10 mm	±22 mm	±22 mm	±22 mm
X Y Resolution	Manual drive ±0.01 mm. Stepper motor driven +/- 0.0005 mm				
Probe O.D.	22 mm max to achieve full movement	22 mm max to achieve full movement	28 mm max to achieve full movement	28 mm max to achieve full movement	28 mm max to achieve full movement
Actuation	Manual via combined micrometer handwheel and linear scale. Motorized units are stepper motor driven.				

* MultiBase travel is defined as the maximum vectorial sum of X and Y travels.

► XY Stage

■ XY Stage: Rotatable Axis MultiBase

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

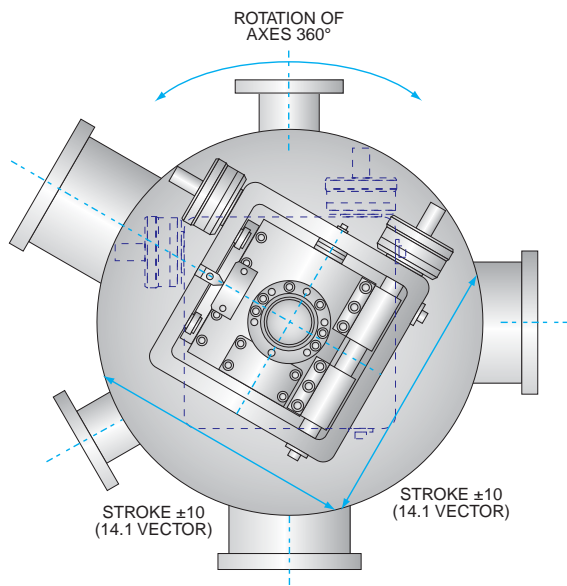
The feature is particularly useful when using techniques where focusing is absolutely critical, and the user wants to move the sample along the axis of a gun or lens, etc., mounted on ports that are not exactly parallel or perpendicular to the manipulator axes.

- Rotatable axis of motion orientation
- Up to ±31mm of X and Y motion
- Can be mounted in any orientation
- Smooth kinematic motion
- Robust construction for high loads



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Sample Manipulation & Motion



Choose the model, fixed flange, traveling flange, actuation, and R.A.M.B. configuration. Next, compose the order code as shown, below.

Example Configuration Part No.:

XY14- 64- 38- H- RH = Call

	Part No. Prefix
Model	XY14 XY31
	Option Part No.
Fixed Flange Options	64 100 150
Travelling Flange Options	38 64
Actuation Method	
Manual handwheel	H
Inline stepper motor	IS
Rotatable Axis MultiBase Actuation	
Manual	RH
Stepper Motor Driven	RS

Note: Fixed flange supplied with tapped holes as standard, clear holes available on request.

► MultiStage Series XYZ

■ MultiStage Platform

- Modular range utilizes MultiBase X/Y stages to provide two generic platforms that offer ± 14 mm and ± 31 mm X/Y motion (vector)
- Various Linear Shift Mechanisms can be fitted to these platforms to provide between 1" (25 mm) and 39" (1000 mm) Z stroke
- Benefits from a kinematic motion design, providing smooth and reliable motion XY mechanism incorporates a high-precision drive and guidance system, removing the requirement for vulnerable cross-roller slides
- Support-free mounting in any orientation
- Bakeable to 250° C
- 316L demountable edge-welded bellows
- High-load carrying capability
- Engineered for stability and precision
- Z-Shift ± 0.25 mm resolution with engraved shaft, 0.01 mm with digital linear scale, ± 0.0005 mm with stepper motor



SPECIFICATIONS

XY Model	XY14-64-38	XY14-100-38	XY31-100-38	XY31-100-64	XY31-150-64
Travelling Flange	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF38 70 mm (2.75") O.D. with M6 straddled holes	CF64 114 mm (4.5") O.D. with M8 straddled holes	CF64 114 mm (4.5") O.D. with M8 straddled holes
Mounting Flange	CF64 114 mm (4.5") O.D. with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF100 152 mm (6") O.D. with M8 straddled holes	CF150 203 mm (8") O.D. with M8 straddled holes
XY Travel	± 10 mm (± 14 mm vector)	± 10 mm (± 14 mm vector)	± 22 mm (± 31 mm vector)	± 22 mm (± 31 mm vector)	± 22 mm (± 31 mm vector)
XY Resolution	Manual drive 0.01 mm, Stepping motor 0.0005 mm				
Actuation Options	Manual via combined micrometer handwheel and linear scale. DC or stepper motor driven.				
Z Travel	Z shifts are available with following strokes as standard: 25, 50, 100, 200, 400, 600, and 1000 mm.				
Actuation	Manual handwheel actuation. Motorization via side-mounted DC or stepper motors.				
Z Resolution	Manual drive ± 0.25 mm with engraved shaft, with digital linear scale 0.01 mm, stepping motor ± 0.0005 mm				



Choose the model, XY actuation, optional R.A.M.B, Z Travel, and Z Actuation configuration. Next, compose the order code as shown, below.

Example Configuration Part No.:

XY14 - 64 - 38 - H - R - Z-25 - H = Call

	Part No. Prefix
Model	XY14-64-38
	XY14-100-38
	XY31-100-38
	XY31-100-64
	XY31-150-64
	Option Part No.
XY Actuation Method	
Manual handwheel	H
Side-mounted stepper motor	S
Side-mounted DC motor	D
Rotatable Axis MultiBase Actuation	
Manual actuation	R
Stepper motor driven	RS
Z Travel	Z-25
	Z-50
	Z-100
	Z-200
	Z-400
	Z-600
	Z-1000
Z Actuation Method	
Manual handwheel	H
Side-mounted stepper motor	SS
Side-mounted DC motor	SD

MultiCentre Sample Handling Systems (M.S.H.S.)

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

- Complete engineered solution for scientific and analytical applications
- High stability/precision stages
- Up to ±31 mm XY motion
- 25 mm-1000 mm Z motion
- Tilt and azimuthal sample rotation
- 33mm sample puck or stub system
- Failsafe hand-off to PowerProbe transfer systems
- Heating, e-beam heating, cooling to LN2 temperatures and biasing options

MultiCentre XYZ stages are modular by design, utilizing the MultiStage range to provide X, Y and Z translations. The unique "Rotatable Axis" XY stages can also be incorporated to provide a truly eucentric stage. MagiDrive rotary feedthroughs are also utilized to provide the basic rotational axes.



The MultiCentre range provides sample transfer pucks and sophisticated manipulator end stations/receptors with optional heating and cooling to provide a complete sample handling solution.

The MultiCentre range includes two discrete sample mounting and transfer systems. The first is based upon a large 33 mm diameter puck, whereas the second employs an ESCA sample stub and wobble stick transfer fork. The general capabilities of each range are summarized below, with a more detailed section for each afterwards.

Puck Handling System

To provide flexibility, the sample transfer puck is larger than most competing products, at 33 mm diameter, so a multitude of small samples can be mounted simultaneously, or a single larger sample can be mounted. A range of puck materials can be provided:

- 316 stainless steel is used for the basic unit

- Molybdenum pucks are provided when heating and heating/cooling options are selected



- For the best in cooling with limited heating, copper pucks can be supplied

End Receptors

Receptors come in two basic configurations. One providing sample tilt only (i.e., rotation around an axis lying in the plane of the sample), and one providing both tilt and azimuthal

SPECIFICATIONS

Puck Handling Model	MC-P14	MC-P31
XY Travel	±7 mm (± 9.9 mm vector)	±20.5 mm (±29 mm vector)
Mounting Flange	114 mm (4.5") O.D. CF64 with M8 straddled holes	152 mm (6") O.D. CF100 with M8 straddled holes
XY Resolution	Manual drive ±0.01 mm, Stepping ±0.0005 mm	
XY Actuation	Manual via combined micrometer handwheel and linear scale. Motorized units are stepper motor driven.	
Z Travel	Z-shifts are available with following strokes as standard 25, 50, 100, 200, 400, 600, and 1000 mm.	
Z Actuation	Manual handwheel actuation. Motorization via side-mounted DC or stepper motors.	
Z Resolution	Manual drive ±0.25 mm with engraved shaft, Digital linear scale ± 0.005 mm, Stepping motor ± 0.0005 mm.	
Polar Rotation & Resolution	Maximum rotation = +/- 200° Resolution < 1.0° when driven from the same direction Manual and stepper motor driven actuation.	
Azimuthal Rotation & Resolution	Continuous without cooling Maximum rotation = ±100° with cooling Resolution < 0.5° when driven from the same direction.	
Heating	PBN: Maximum temperature measured using in-situ thermocouple at the sample puck > 1000° C E-Beam: Maximum temperature measured using in-situ thermocouple at the sample puck > 1200° C	
Cooling	Ultimate low temperature measured using in-situ thermocouple at the sample puck < -150° C Cool down time to ultimate < 30 min	
Electrical Isolation	Sample transfer puck: Electrical isolation > ±500 V Electrical leakage resistance > 500 MOhm.	
Sample Transfer	Via UHV Design PowerProbe transfer arms	

8 Sample Manipulation & Motion

► MultiCentre Sample Handling Systems (M.S.H.S.)

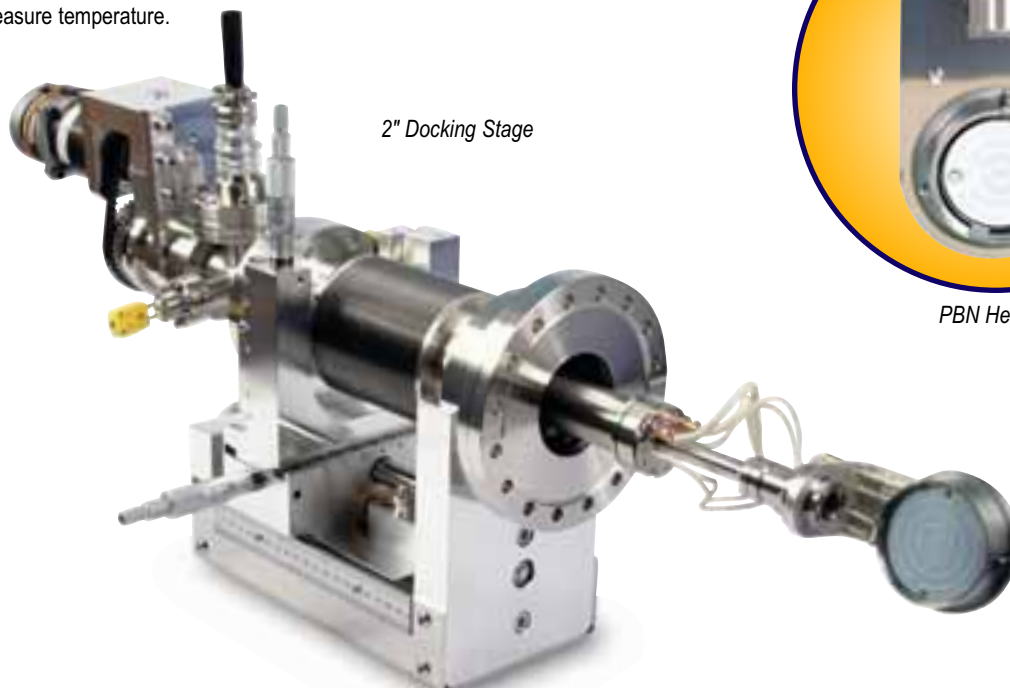
rotation (about the sample surface normal). Both receptors accept the same sample puck that is latched in place through a positive bayonet actuation. The sample is electrically isolated to 500 V to provide for sample current measurement and biasing.

Cooling

The receptors can be provided with an LN2 cooling system, which employs an ingenious LN2 tank design where the LN2 is in direct thermal contact with the receptor and provides the electrical isolation. There is no need for separate electrical insulation, which then also acts as a good thermal insulator. In this way even the relatively large puck can still be cooled to LN2 temperatures quickly. K-type thermocouples are normally supplied unless there is a need for very low residual magnetic fields, in which case N type are preferred

PBN Heater

A 200 W PBN coated graphite disc heater is installed immediately beneath the sample puck, which can rapidly heat the sample to 1000° C. A thermocouple is located inside the puck receptor in close proximity to the puck to measure temperature.



2" Docking Stage

PBN Heating

SPECIFICATIONS

Stub Handling Model	MC-S14	MC-S31
XY Travel	±7 mm (± 9.9 mm vector)	±20.5 mm (±29 mm vector)
Mounting Flange	114 mm (4.5") O.D. CF64 with M8 straddled holes	152 mm (6") O.D. CF100 with M8 straddled holes
XY Resolution	Manual drive ±0.01 mm, Stepping ±0.0005 mm	
XY Actuation	Manual via combined micrometer handwheel and linear scale. Motorized units are stepper motor driven.	
Z Travel	Z-shifts are available with following strokes as standard 25, 50, 100, 200, 400, 600 and 1000 mm.	
Actuation	Manual handwheel actuation. Motorization via side-mounted DC or stepper motors.	
Z Resolution	Manual drive ±0.25 mm with engraved shaft, with digital linear scale 0.01 mm, Stepping motor ±0.0005 mm	
Polar Rotation & Resolution	Rotation = continuous Resolution < 1.0° when driven from the same direction	
Heating	Tantalum wire heater around the stub holder Maximum temperature measured using in-situ thermocouple at the sample stub > 800°C	
Cooling	Ultimate low temperature measured using in-situ thermocouple at the sample stub < -130° C Cool down time to ultimate < 45 min	
Electrical Isolation	Electrical isolation > ±500 V Electrical leakage resistance > 500 MOhm.	
Sample Transfer	Via UHV Design's Power Probe transfer arms	

E-Beam Heating

For even higher temperature flash heating of the puck, an electrically floating filament is located immediately beneath the puck, which when heated, emits electrons that are accelerated onto the back side of the puck. This can heat the puck up to 1200° C.

Sample Transfer

Sample transfer from an entry lock, for example, is accomplished using a PowerProbe magnetic transfer arm with a puck transfer fork mounted on the end.

MultiCentre Sample Handling Systems (M.S.H.S.)

Stub Handling System

When disengaged, heat loss to the cooling circuit is eliminated, improving heating performance. K-type thermocouples are normally supplied unless there is a need for very low residual magnetic fields, in which case N-type are preferred.

Heater

For heating, a tantalum wire heater is installed in the end receptor that can heat the sample to 800° C.

Sample Transfer



Transfer Pod

For an entry lock, this is accomplished using our PowerProbe magnetic transfer arms in conjunction with our bellows sealed wobble stick.

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The sample transfer stub is compatible with the well known ESCALAB stub system:

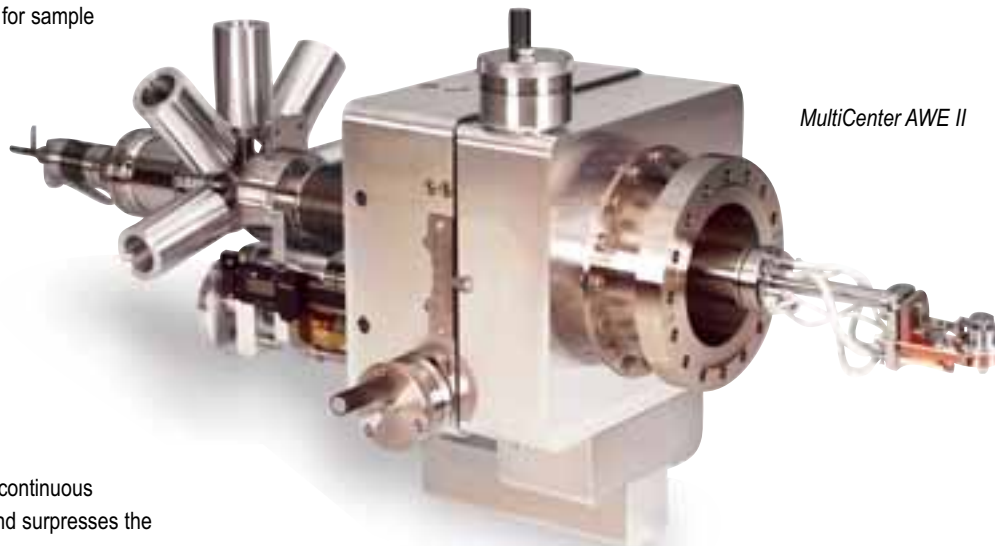
- 316 stainless steel is used for the basic unit
- Molybdenum stubs are provided when heating and heating/cooling options are selected
- For the best in cooling with limited heating, copper stubs can be supplied
- Standard stub sizes of 10 mm and 14 mm diameter

End Receptors

Provide electrical isolation to 500 V for sample current measurement and biasing.

Cooling

The receptor can be provided with an LN₂ cooling system, which employs an ingenious Cold Lance design, where the LN₂ is transmitted through a coaxial tube that is docked into the receptor using an additional spring-loaded z-shift. This has the advantage of being able to provide continuous polar rotation when disconnected and suppresses the need for coiled cooling pipes.



MultiCenter AWE II

SPECIFICATIONS

Model/Series	XY Travel	Z Travel	Polar Rotation	Azimuthal Rotation	Max Sample Size	Heating	E-Beam Heating	Cooling	Sample Current Measurement
Puck System	Up to ±29mm	25 mm to 1000 mm	±200°	Continuous or ±100° With Cooling	60 mm Diameter	> 1000° C	> 1200° C	< -150° C	Isolation ≥±500V, Resistance >500MΩ
Stub System	Up to ±29mm	25 mm to 1000 mm	±200°	N/A	14 mm Diameter	> 800° C	N/A	< -130° C	Isolation ≥±500V, Resistance >500MΩ

► Radial Distribution Center (RDC)

■ Radial Distribution Center (RDC)



Our Radial Distribution Center (RDC) facilitates multichamber in-vacuum substrate transfer ideal for cluster tool environments. The RDC is typically mounted at the center of a series of chambers, acting as a central hub from which the sample transfer occurs. A linear rack-and-pinion transporter, controlled by a rotary drive, moves and rotates the sample about its center axis between chambers through the shared ports.

Please refer to 14-6 for more information on our RDC and its applications ►



8

Sample Manipulation & Motion



Kurt J. Lesker

Company



- Quality Products & Services
- On-time Delivery
- Continual Improvement
- Effective Employee Training
- Customer Satisfaction

Providing Quality You Can Trust for Over 55 Years!

► Motor Controllers

■ DC Controller

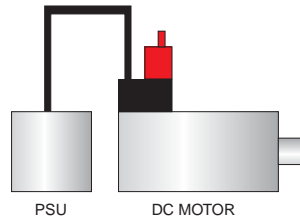
This DC controller has been developed to offer simple, single-axis remote control for its manipulation products.

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

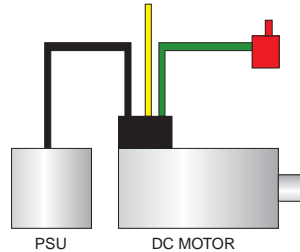
**Please note that the DC Motor controller is only specified for the DC motor-driven components it has been supplied with. If you have an existing DC motor application you wish to retro-fit, the DC controller to, please contact Sales.

- Input voltage 90-220 VAC
- Current output (max) 1.9A/45W
- Nominal output voltage +24 VDC
- Speed control 100-3000 rpm @ full torque

Description	Part No.	Price
DC Motor Controller, Base Unit, Direction & Speed Control	SADC-A	Call
Extension Cable, 5m Long	SADC-EC	Call
Limit Switch Signal Control Cable	SADC-LS	Call



BASE MODEL:
BRUSHLESS DC SERVO MOTOR
DIRECTION & SPEED CONTROL MODULE
SWITCH MODE AC POWER SUPPLY UNIT



FULL SYSTEM:
BRUSHLESS DC SERVO MOTOR
DIRECTION & SPEED CONTROL MODULE
SWITCH MODE AC POWER SUPPLY UNIT
CONTROL MODULE EXTENSION CABLE
LIMIT SWITCH SIGNAL CONTROL CABLE

■ Modular Stepper 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. The MSMC incorporates a less sophisticated software interface to that of the SMC range.

- Single and multiple axis control
- Complete system solution
- Plug and run simplicity
- Programmable positioning
- Optional closed loop control
- Matching size 17-34 frame motors
- Bench or rack-mounting options
- 0.5 to 3.5 A per phase current output
- 48 VDC

A user-friendly command line interface is used to communicate to the MSMC via a host computer. The commands are input 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 MSMC's on-board memory to form a sequence of moves that can be triggered by the available inputs. Simply connect the intelligent drive to a PC, motor, travel limits, etc, and an AC power supply using cables provided, and the system is fully operational. Please contact us for further information.



Description	Part No.	Price
Modular Stepper Controller, One Axis	MSMC1	Call
Motor Cable, 5m Long	MSMC-MC	Call
Limits & Datum Cable, 5m Long	MSMC-LDC	Call
Motor & Limit Switch Junction Box	MSMC-MLJB	Call

8 Sample Manipulation & Motion

➤ Motor Controllers

■ Programmable Stepper Motor Control Center (PSMCC)

Introduction

The PSMCC series offers a complete solution for intelligent motion control of stepper motor driven products for up to four axes of motion. The units are provided with user-friendly Microsoft® Windows® based software, offering a multitude of features to accommodate both general and complex motion control requirements.

The Complete Solution

Stepper motors require an electronic module to accept command signals and interpret these in terms of providing power to the motor. This module is called a driver. Drivers also require a further electronic system with software to compute and execute the required motion profile, interface with other systems, and control the sequence and timing of events. This system is called a controller. The PSMCC series controller combines both the driver and controller with the necessary peripheral components required for an industrial standard, programmable stepper motor control center.

To ensure "plug and play" with all motion and manipulation products, various upgrades are offered including pre-wired bakeable home and limit switches, along with input and motor connectors.

PSMCCs can be used together to provide up to four separate axes of motion, enabling complete motion control solutions to be constructed.

Performance Features

The control centers are each housed in 19-inch rack-mounted cases. The front panel features switches for starting a sequence, jogging, and an emergency stop. All other control functions are entered through the PSMCC's software. This Microsoft Windows based software package enables the user to set motor current, idle current, step resolution, jogging parameters, limit switch polarity, and even define the units to be used.

The user-friendly software provides an excellent interface to write both simple and complex motion control programs. Once programmed, the center may be



disconnected from the PC and on the start command, will execute the downloaded control commands. Software interface examples can be found below.

Ultra-Smooth Motion

A micro-stepping driver is used to ensure smooth motor operation, avoiding the cogging associated with stepper motors. Micro stepping subdivides 1.8° steps (standard motors) with a choice of up to 13 further step resolutions. The highest setting divides each full step into 254 micro-steps.

Module Configuration

Schematic diagrams for single and multiple axis control systems can be found below. As illustrated, each axis requires a separate control center with corresponding cables. Each can then be fitted with a remote jog facility if required. PSMCC control centers can be configured for 110 VAC or 220 VAC. Please contact us for further information.



Product Description	Part No.	Price
Programmable Stepper Motor Control Center, 110 VAC	PSMCC1-110V	Call
Programmable Stepper Motor Control Center, 220 VAC	PSMCC1-220V	Call
Communications Cable, KZSMC2 Hub to Other KZSMC Units	PSMCC1-COMM	Call
Input Cable	PSMCC1-IC	Call
Interlock Cable	PSMCC1-INT	Call
Motor Cable, 5m Long	PSMCC1-MC	Call
Output Cable	PSMCC1-OC	Call
PC Cable, Interface Between KZSMC1 & PC Terminal	PSMCC1-PC	Call
Remote Jog Facility	PSMCC1-RJ	Call
Second Axis Programmable Stepper Motor Control Center, 110 VAC	PSMCC2-110V	Call
Second Axis Programmable Stepper Motor Control Center, 220 VAC	PSMCC2-220V	Call
Third Axis Programmable Stepper Motor Control Center, 110 VAC	PSMCC3-110V	Call
Third Axis Programmable Stepper Motor Control Center, 220 VAC	PSMCC3-220V	Call
Fourth Axis Programmable Stepper Motor Control Center, 110 VAC	PSMCC4-110V	Call
Fourth Axis Programmable Stepper Motor Control Center, 220 VAC	PSMCC4-220V	Call

8 Sample Manipulation & Motion

► EpiCentre Deposition Stages

■ Introduction

EpiCentre Deposition Stages

Wafer Heater, Rotational, and Wafer Transfer Stage:

Our EpiCentre is a combined wafer heater and rotational stage designed for critical thin film deposition, wafer processing, substrate modification, surface science, and MBE processes.

The modular construction lets the user combine exactly the components needed to match the desired requirements for substrate rotation, automatic substrate removal, axial positioning of the substrate, and substrate temperature.

EpiCentres, bakeable to 250° C, can accept substrate biasing. Their minimum outgassing qualities make them compatible for UHV, high

vacuum, and reactive gas environments.

The EpiCentre range can be mounted in any orientation and can also be configured for low pressure and corrosive environments.

There Are 3 Major Series to the EpiCentre Range:

EpiCentre 100—Modular inline stages that offer heating, rotation, sample biasing, manipulation, and transferring of samples and substrates

Epi100

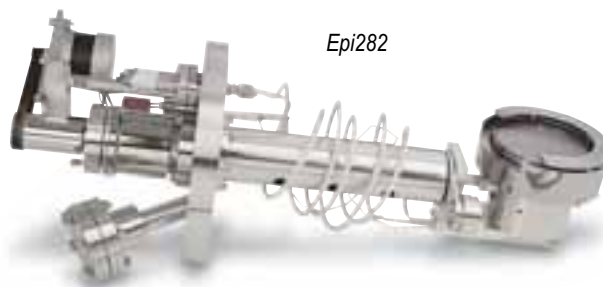


EpiCentre EpiPro—Economical inline series provides heating, rotation, and simple transfer motion

EpiPro



Epi282



EpiCentre 282—Right-angled stage designed to replace manipulators on specific MBE systems, offering heating along with primary and azimuthal rotation



NOTE: For an EpiCentre quotation request form, please visit www.lesker.com/epirequest.

SPECIFICATIONS

Model/Series	Sample/Wafer Capacity	Elements	Maximum Heater Temperature	Temperature Uniformity	Rotational Speed	Thermocouple Options	Biasing Capabilities
Epi100 Series	25 mm-300 mm (Standard)	PgG and PBN	1200° C (standard modules) 1000° C (quartz-enclosed modules) (based on heating a Mo test block)	Nominally ±2.5° C (across central 90% of Si wafer)	Up to 80	Type "C" (Tungsten Rhenium) Type "K" (Chromel Alumel)	2kV DC Isolation/ 80WRF Power
EpiPro Series	25 mm-300 mm (Standard)	PgG and PBN	1200° C (standard modules) (based on heating a Mo test block)	Nominally ±2.5° C (across central 90% of Si wafer)	Up to 80	Type "C" (Tungsten Rhenium) Type "K" (Chromel Alumel)	2kV DC Isolation 80WRF Power
Epi282 Series	25 mm-90 mm (Standard)	PgG and PBN	1000° C (based on heating a Mo test block)	Nominally ±2.5° C (across central 90% of Si wafer)	(N/A)	Type "C" (Tungsten Rhenium)	(N/A)

8 Sample Manipulation & Motion

► Epi100 Series Deposition Stages

EpiCentre 100 UHV Manipulator Stages

Modular inline stages offering heating, rotation, biasing, manipulating, and transferring of samples/substrates.

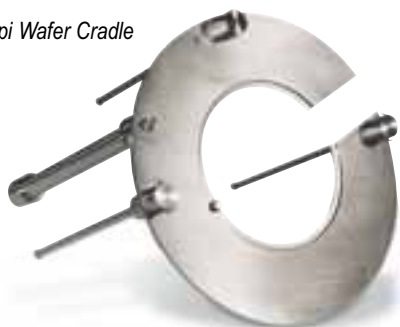
The EpiCentre range provides true UHV heating solutions for various deposition techniques such as MBE, sputtering, and CVD. The EpiCentre range can be mounted in any orientation and can also be configured for higher pressure and corrosive environments.

As each application demands differing capabilities, the EpiCentre 100 series was developed in a modular fashion, enabling users to select from a variety of modules to suit their specific needs. This modular design enables the 100 series to provide both sophisticated multi-axis control and simple handwheel-operated manipulation for cost-effective research and development applications.

Sample and Wafer Cradles

Cradle assemblies are custom designed to support standard wafers from 25mm through 200mm diameter and can also be configured for single or multiple sample holder platens. Refractory metal cradles such as Molybdenum or Tantalum have been fashioned to adapt to most common sample handling techniques.

Epi Wafer Cradle



Refractory Metal Heater Module

EpiCentre heater modules are capable of producing wafer temperatures up to 1200°C. By virtue of the exceptional coupling of heat to the wafer, the elements run at considerably lower temperature than conventional metal heaters. Clean UHV operation is ensured with the use of:

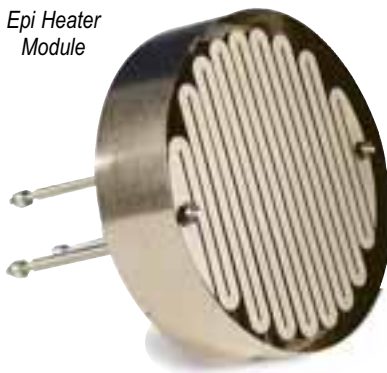
- Reduced element operating temperature
- Self-supporting element
- Insulator free hot zone
- Refractory metal enclosure construction

As standard, heater modules are available with two types of element, PgG and PBN coated

graphite, though other options are available upon request.

In some cases conditions within the vacuum system will be detrimental to the lifetime and efficiency of the heating element; for instance, systems that contain a high partial pressure of oxygen. In such cases, heater elements can be enclosed within a quartz bell jar to separate the heater from the process gases. Please see below for more information on Quartz enclosures.

Epi Heater Module



Thermocouple options

Selecting the correct thermocouple type is essential to avoid potential degradation, corrosion, and process contamination. Two types of thermocouples are offered as standard, 'type C' (Tungsten/ Rhenium) and "type K" (Chromel/Alumel), though other types are available upon request. Type C is non-magnetic, has a high temperature range, and is generally more resistant to chemical attack. Type K is a more cost-effective solution, has a lower temperature capability, is magnetic, and tends to be more robust and durable.

Heater Elements

Two heater element variants are available as standard although special options are available on request.

PgG elements

Pyrolytic graphite coated Graphite (PgG) elements are the standard type used for the EpiCentre deposition stages. Robustness, reliability, high temperature capability, excellent uniformity, and cost are all aspects that make this element a desirable choice.

PBN elements

Pyrolytic Boron Nitride (PBN) elements are made from a grown PBN disc with a graphite film, etched into an element formation. This is then coated/sealed with a PBN layer to minimize

exposure to the system. Two graphite areas remain exposed to the system to enable electrical contact. This design offers robust, long life, low-current heating.

Quartz enclosed heater modules for reactive processes

The EpiCentre 100 is available with a quartz-enclosed heater module that separates the heater and its services from the process environment.

This module is typically selected where:

- System cleanliness is absolutely critical
- Corrosive gases are present in the application
- High partial pressures of oxygen are present

The system works by creating a separate environment for the heater module to operate within, thereby making the heater totally immune from the process gas. Heat is radiated from the element, through the quartz-enclosure, to the sample/wafer that is mounted on the cradle. As the heat must be radiated through the quartz, the attainable sample temperature is reduced to 1000° C.

The quartz enclosure seals against an internal water-cooled flange, creating the secondary vacuum enclosure. This quartz system is then (Continued.)

Epi Quartz Enclosure



► Epi100 Series Deposition Stages

(Continued.) separately pumped through the length of the EpiCentre stage via a port on the service collar. The heater module is then maintained at vacuum, without exposure to the process chamber. Vacuum pumps are not supplied.

MagiGear for continuous substrate rotation

The patented MagiGear offers a simple, robust and clean rotation system. This unique eccentric feedthrough transmits rotation through a solid vacuum enclosure to an internal torque tube with a massive 47 mm clear bore. This provides the access for power, cooling,



EpiHeater
Enclosure

thermocouple, or even independent pumping of the heater module. The absence of gears and use of well-proven precision ball races ensures hydrocarbon free operation with negligible particulate generation. The MagiGear can be DC or stepper motorized and is fitted with a manual thumbwheel to enable positioning for sample transfer. Alternatively, a laser homing system is available for automated applications. The MagiGear is available in single, double, and triple

"stack" configurations to match the substrate load requirements.

Laser Homing

The laser homing option enables the user to define an absolute reference or "home" position to enable accurate and repeatable orientation of the cradle. This is typically used for automated sample hand-off applications where the cradle needs to be aligned with a waiting transfer fork.

RF/DC Biasing Connection

EpiCentre stages can be provided with the facility to apply an electrical bias to control sample deposition characteristics. Two versions are available, one for 2kV DC isolation and one for DC/RF biasing up to 80 watt power. In the case of RF biasing or high pressure applications, dark space shielding is also fitted to prevent unwanted parasitic plasma formation around the electrical path and other susceptible areas.

Substrate Shutters

EpiCentre stages can be fitted with rotary shutters to control line-of-sight between the substrate and the deposition source. Shutters are based upon the "Rotary Source Shutter" range and are fitted with customized shaft and refractory metal blades to suit each application. Shutters can be actuated manually or pneumatically. In the case of the latter, reed switch assemblies can also be fitted to aid system interlocks.



Epi MagiGear

Deposition Height Adjustment and Sample Transfer

The distance between the wafer cradle and the system mounting flange is usually specified by the customer to suit individual applications. An important feature in the EpiCentre 100 concept is the option to insert single or multiple Z shifts (Linear Shift Mechanisms) into the build to achieve varying levels of wafer manipulation as shown.

A single Z shift placed between the MagiGear rotary feedthrough and the system mounting flange will adjust the entire stage by moving both wafer cradle and heater along an axis normal to the substrate (Z axis). This is typically used to vary the deposition height.

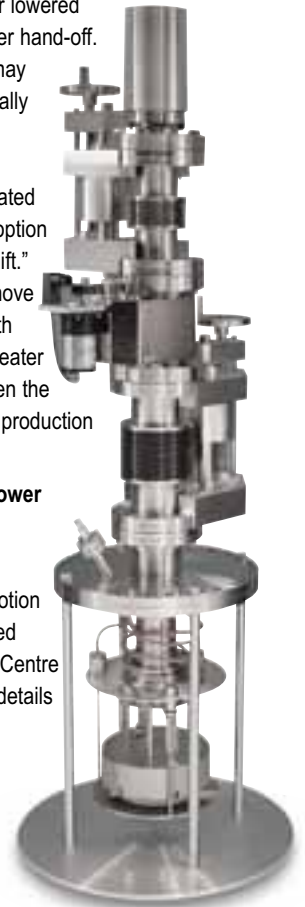
By installing a single Z shift between the MagiGear rotary feedthrough and the heater module service collar, the heater module may be retracted away from the wafer, hence providing a gap for manually transferring the sample.

By installing both Z shifts, the stage may be manipulated in a typical wafer handoff routine, as the heater may be retracted from the wafer to provide extraction space and the entire stage lifted or lowered to perform the wafer hand-off.

These operations may be controlled manually or automated via motorization or pneumatically activated systems. A further option is the "double Z-shift." Which will simply move the wafer cradle with respect to a fixed heater position. This is often the choice selected for production applications.

Controllers and Power Supplies

A full range of temperature and motion controllers are offered for use with the EpiCentre series; please see details on page 8-81.



Epi100

SPECIFICATIONS

Epi100 Series						
Sample/Wafer Capacity	25-300 mm as standard, larger versions available on request					
Elements	PgG and PBNG					
Maximum Heater Temperature	1200° C for standard modules, 1000° C for quartz-enclosed modules (Based on heating a Mo test block)					
Temperature Uniformity	Nominally ±2.5° C (across central 90% of Si wafer)					
Rotational Speed	Up to 80 RPM					
Thermocouple Options	Type "C" (Tungsten Rhenium), Type "K" (Chromel Alumel)					
Biasing Capabilities	2kV DC isolation or 80WRF Power					
Sample/Wafer Size	25-50 mm	75 mm	100 mm	125 mm	150 mm	200 mm
Standard Flange Type	6"UHV-8"UHV	8"UHV	10"UHV	10"UHV	12"UHV	14"UHV
MagiGear Stack Type	Single	Single	Single/Double	Double	Double	Double

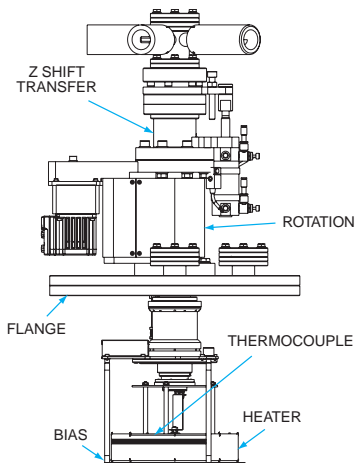
► EpiPro Series Deposition Stages

■ EpiPro UHV Modular Manipulator Stages

The EpiPro series is intended to be modular in concept such that a range of heater modules can be configured from the various building blocks and with increasing complexity, starting for example, with a simple heater stage mounted from a flange to a heater stage with Z-shift and/or rotation through to a complete, fully configured deposition manipulator with all the "bells and whistles." The table at the foot of this page indicates how various components can be assembled as a "walk of man" concept and how corresponding part numbers are derived.

The EpiPro offers the most cost-effective heating solution in the EpiPro range, providing sample heating, rotation, and simple motion to aid sample transfer. Unlike the EpiCentre 100 range, however, the EpiPro has a fixed heater position and so the deposition height cannot be adjusted without increasing the distance between the substrate and the heater.

The range benefits from the same tried and true EpiCentre 100 modules such as the MagiGear rotary feedthrough, and UHV heaters, be they pyrolytic graphite coated graphite (PGCG) or pyrolytic boron nitride coated graphite (PBNG).



SPECIFICATIONS

Epi346 Series	
Sample/Wafer	25-300 mm as standard
Capacity	Larger versions available on request
Elements	PgG and PBNG
Maximum Heater Temperature	1200° C for standard modules, 1000° C (based on heating a Mo test block)
Temperature Uniformity	Nominally ±2.5° C (across central 90% of Si wafer)
Rotational Speed	Up to 80 RPM
Thermocouple Options	Type "C" (Tungsten Rhenium), Type "K" (Chromel Alumel)
Biasing Capabilities	2kV DC Isolation & up to 80W of RF Power
Sample/Wafer Size	25-75 mm 100 mm 125-150 mm 200 mm 300 mm



NOTE: For an EpiCentre quotation request form, please visit www.lesker.com/epirequest.

DC and RF biasing capabilities are standard options, making the design very suitable for high-performance sputter coating applications. The RF design includes "dark space shielding" throughout, eliminating parasitic plasma that can be confined to the important substrate cradle area only. A unique safety feature is also incorporated so that, should the substrate be lowered for transfer, it is automatically electrically isolated.

The patented MagiGear rotary feedthrough assembly includes a magnetic homing system to enable orientation of the substrate cradle to facilitate automated transfer.

There is a magnetically coupled substrate lowering capability, which is pneumatically actuated to facilitate substrate transfer. The design removes the need for vulnerable and costly bellows assemblies, while providing a more compact and reliable design.



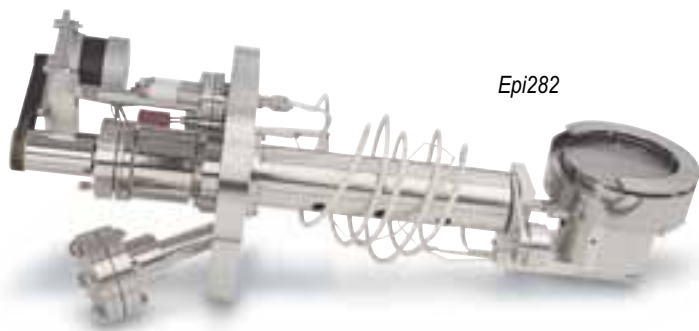
EpiPro

Choose the model, rotation, flange size, heater, thermocouple, and bias. Next, compose the order code as shown, below.

Example Configuration Part No.: **EP-Z25-R-300-8-C-D** = Call

Model	Part No. Prefix
EP	EP
Z Shift Transfer	Option Part No.
None	N
25mm	Z25
Rotation	R
+Home Sw	RH
Flange Size	64
	100
	150
	200
	250
	275
	300
	350
	400
Heater	1
1"	2
2"	4
4"	6
6"	8
8"	12
Thermocouple	C
C Type	K
K Type	
Bias	N
None	D
DC Only	R
RF and DC	

► Epi282 Series Deposition Stages



Epi282

EpiCentre 282 UHV Manipulator Stages

The EpiCentre 282 is a full heating and rotation stage intended primarily as a retrofit instrument for molecular beam epitaxy systems such as the V80H. This component differs from the EpiCentre 100 and 346 in that it supports the substrate at a right angle to the general manipulator Z axis. Two axes of rotation provide continuous azimuthal rotation for the sample and a limited primary rotation for substrate orientation.

An awareness of existing right-angled manipulator design drove a complete rethinking of the concept of this stage. By stacking two MagiDrive rotary feedthroughs, we are able to achieve a dual axis, concentric rotation system that eliminates the head positioning gear train typically used by other manufacturers. By incorporating the EpiCentre heater module technology into this component, we are able to improve on ultimate temperature capability, uniformity, and reliability.

System Design Philosophy

The azimuthal drive is achieved through a bevel gear train actuated by the MD16 MagiDrive. Particular attention has been paid to the design of this section of the instrument, because it has conventionally been the source of premature failure. The gear train is supported in a precision housing that ensures the gear pitch distance does not reduce for increased temperature. The substrate cradle drive mechanism is positioned farther from the hot zone and uses large ball races in an arrangement tolerant of the thermal stresses. This all results in low radial run-out of the cradle during rotation, which is important for serious RHEED measurements.

Stage Positioning

The EpiCentre 282 may be fitted with a simple manual tilt positioning selector. Alternatively, a

fully automated system is available. Manual positioning is achieved by thimble adjustment of an MD35H MagiDrive. A positioning ring with an external spring-loaded pin is attached to the drive. Releasing the pin enables the drive to be rotated to a number of pre-defined positions. These ensure simple and repeatable locking of the stage for sample transfer, growth, flux monitoring, and RHEED. The RHEED position may be finely tuned to enable chamber geometry variations. The automated option provides stepper motor control over the MD35H. Bakeable switches protect the system from travel beyond its limits and provide an absolute homing point. When coupled to the SMC1 series motor controller this system enables precise positioning to be achieved throughout the desired range.

Heater Modules

The 282 series is available with the same 100 series heater element technology including PgG (Pyrolytic graphite coated Graphite) and PBN (Pyrolytic Boron Nitride coated graphite). These heater elements offer the best ratio of heat radiating surface to gap and therefore run at lower temperatures for a given power transmission.

The heater module is also available with a quartz guard to protect the element during sample transfer. The heater element power graph plots the required Volts or Amps (left scale) to reach temperatures

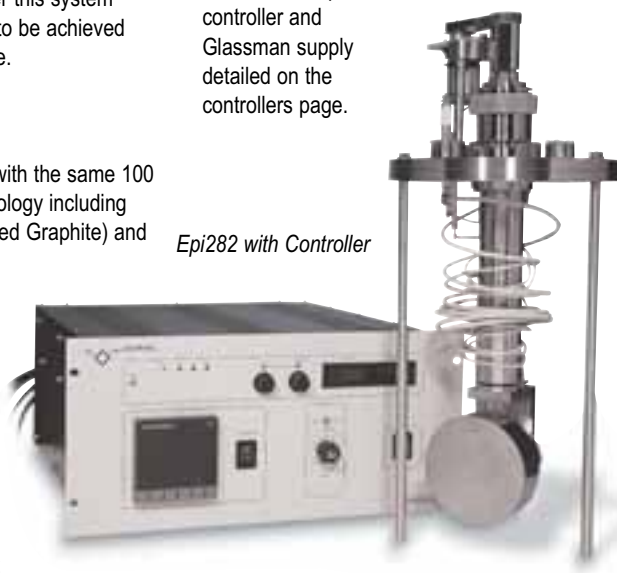
SPECIFICATIONS

Component	Description
Primary Drive System	MD35 MagiDrive for manual positioning of substrate for deposition, transfer, flux monitoring etc. The MD35 is fitted with an indexing head for fast and simple positioning. The RHEED position is adjustable to enable fine tuning of experiments.
Secondary Drive System	MD16 MagiDrive for continuous substrate rotation fitted with a DC or stepping motor. Includes an extended bearing housing for pinion support.
Heater Module	Designed for sample heating up to 1,000° C (based on heating a Mo test disc) dependant on duration of heating PgG, PBN elements (further options upon request) Type C, Tungsten Rhenium (W/Re) thermocouple Refractory metal enclosure Optional quartz disc guard for heater protection
Sample	Molybdenum sample cradle assembly configured to accept a 90 mm diameter substrate holder which accommodates wafers in the range of 25 mm to 90 mm diameter.
System Flange	8" UHV flange fitted with porting for rotary drive stack, main substrate shutter, power and thermocouple feedthroughs, and flux monitor.

ranging from 400° C-820° C. The graph then illustrates the total power (watts) required for the same temperature range (right scale). Below this the heater resistance is plotted versus temperature. Other heater configurations can be provided on special request.

Substrate Spin, Positioning, Temperature Control, and Power Supply Options

The 282 may be fitted with DC or stepper motors for continuous substrate rotation. Both options may be controlled using the motor control options detailed on their respective pages. The heating element is designed to match the temperature controller and Glassman supply detailed on the controllers page.



Epi282 with Controller



NOTE: For an EpiCentre quotation request form, please visit www.lesker.com/epirequest.

► EpiCentre Controllers & Heater Module

EpiCentre Controllers and Power Supplies

The EpiCentre range can be configured to enable the use of existing motor, temperature controller, and heater power supplies. Where new equipment is required, we offer complete solutions from a series of high quality, modular, control packages.



Power Supply

Substrate Rotation

EpiCentre stages with wafer sample rotation may be fitted with DC or stepper motors. The DC option is preferred for smooth, continuous rotation; however, if indexing or positioning of the substrate is required, then a stepper motor should be selected.

Stepper Motors

The Programmable Stepper Motor Control Center (SMC series) provides a complete solution to substrate rotation. Supplied with its own Windows® based software, the interface is intuitive while providing a comprehensive array of control options. It may also be linked to an existing host controller via various inputs and outputs.

DC Motors



DC Motor Control

If DC motors are selected for the EpiCentre substrate spin system, then the rotation controller may be used. This unit is a 24 VDC power supply providing speed control. A rear panel connector allows remote operation from a 0-10 volt programming signal. The unit is housed in a half rack, 3U enclosure and complies with CE regulations.

Axial Translation

For motorization of the various axial translations offered it is recommended that the customer uses either the Programmable Stepper Motor Control Center or the hand-held DC controller.

Temperature Controller

For optimal stage heating and substrate temperature control the KZTC1 power supply with 3-term proportional temperature control is offered. The unit comprises a Eurotherm PID (Proportional, Integral, and



Temperature Controller

Derivative) temperature controller driving a Glassman high performance programmable DC power supply of suitable voltage/current rating to match the heater requirement.

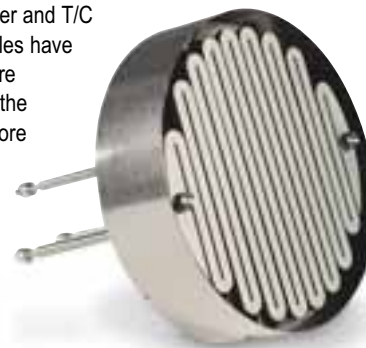
The Glassman unit offers reliable, low-noise operation, resulting in low element stress and minimal EMC interference when performing RHEED measurements.

The TC1 is CE compliant and can be supplied with a range of features.

Heater Module

For heating applications not requiring the complete EpiCentre stage, such as preparing and conditioning samples prior to process, we offer heater modules that can be mounted in preparation chambers and load locks. These individual modules are the same assemblies that are used on the EpiCentres and are provided completely ready for power and T/C hook up. All heater modules have the same high temperature performance as listing in the EpiCentre section. For more information, sizes, and prices, please call us at 1-800-245-1656.

Two heated element variants are available as standard although special points are available on request.



Epi Heater Module

PgG Elements

Pyrolytic graphite coated Graphite (PgG) elements are the standard type used for the EpiCentre deposition stages. Robustness, reliability, high temperature capability, excellent uniformity, and cost are all aspects that make this element a desirable choice.

PBN Elements

Pyrolytic Boron Nitride (PBN) elements are made from a grown PBN disc with a graphite film, etched into an element formation. This is then coated/sealed with a PBN layer to minimize exposure to the system. Two graphite areas remain exposed to the system to enable electrical contact. This design offers robust, longlife, low-current heating.

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 - More than 20,000 items available online
 - Worldwide pricing
 - Same-day shipping capabilities
- Volumes of technical information and FAQs
- Weekly specials
- Browse our growing inventory of remanufactured pumps
- Custom part configurators
- Quotation and information request forms
- Fully searchable
 - Use VacuFind to quickly find what you need
- Access to VacuCADSM, our free engineering file download service
 - More than 3,000 files available for download, and growing daily

