

Precision Magnetic Manipulators

HV and UHV TRANSFER SYSTEMS

- ➔ **Patented independent linear/rotary motion increases versatility**
- ➔ **Rugged, reliable with repeatable accuracy**
- ➔ **High decoupling force**
- ➔ **Horizontal or vertical operation**
- ➔ **Customer specified transfer lengths**
- ➔ **All metal internal construction**
- ➔ **Customized units available**



Transfer Engineering and Manufacturing, Inc. offers a family of precise magnetically operated linear, rotary, and linear and/or rotary motion sample manipulation systems for use in high vacuum, ultra-high vacuum or other controlled environments.

Precision Magnetic Manipulators (PMMs) are manufactured with all-metal internal construction and bakeable to 250°C.

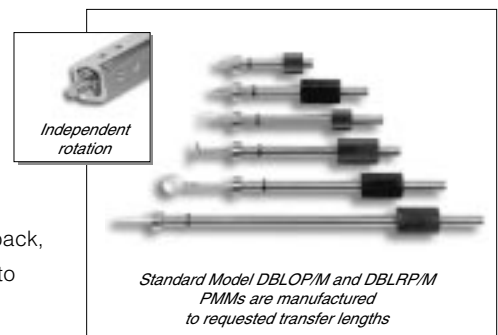
Three main branches of the PMM family are available and each can be easily customized. Styles available are —

- ➔ Standard PMMs with increased force and torque beyond typical magnetically-coupled transfer arms.
- ➔ The PMM-Lite is less-complex and of lower cost for situations requiring simple linear and rotary motion.
- ➔ Rotary-Only units provide versatile, reliable and precise rotary motion into a sealed chamber.
- ➔ Customized units are designed for a wide range of custom or special transfer systems.

LINEAR OR LINEAR/ROTARY PRECISION MAGNETIC MANIPULATORS

Standard, Models DBLOP/DBLOM and DBLRP/DBLRM

Our manipulators handle more axial force and torque and exhibit better compliance and load carrying capability than typically expected from a magnetically-coupled feed-through. This increased force and torque results in greater tactile feedback, lower backlash and a greater ability to overcome friction. Modern rare earth magnets and a unique design were used to develop manipulators with this unusually high performance.



Independence of linear and rotary motion is the key to versatility in these systems.

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The round rotation shaft is contained within a square linear motion shaft and rotates independently. In the linear direction, both shafts move together. Rotary motion and linear motion can be used in combination or separately, providing numerous potential variations of sample movement. Examples include locking devices for sample transfer, clamping devices, vertical lift mechanisms and rotatable stages.

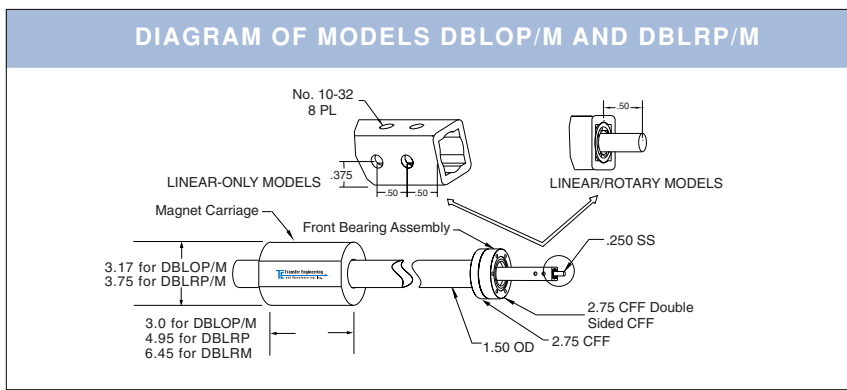
These PMMs are manufactured as linear-only or linear/rotary models. Two are

linear-only models, DBLOM-XX and DBLOR-XX (XX is the stroke length in inches). Two are linear/rotary models, DBLRM-XX and DBLRP-XX. All models have UHV all-metal internal construction.

Models DBLOM-XX and DBLRM-XX use all metal construction throughout, and as a result, have very low stiction. These models are intended for manipulator applications where very good tactical feedback is desired and for high duty-cycle applications.

Models DBLOR-XX and DBLRP-XX use polymeric bearings in the carriage outside the vacuum, and as a result, have a slightly higher stiction than the metal bearing units. They are intended for sample transferring and similar functions where the slight amount of stiction is preferred. This construction is a more economical design than the external metal bearing units.

Specifications are listed on page 3.



PMM-Lite, Model MASLR

The PMM-Lite™ is a single-shaft precision magnetic manipulator that is ideal for situations that require a less sophisticated range of motion than those offered by the standard PMMs. It is ideal for applications requiring conventional linear and/or rotary motions with high linear force and torque. Examples include uncomplicated translation motion and simple loadlocks.

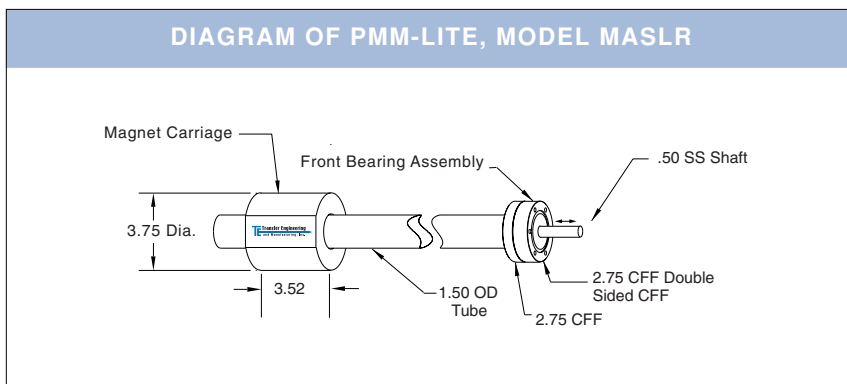
The PMM-Lite, Model MASLR-XX, combines the linear and rotary motions into a single-shaft simplifying the construction and making it a less expensive alternative to the standard PMMs.

The PMM-Lite offers very competitive linear force and torque to that of other conventional manipulators. The PMM-Lite has the same solid "feel" of the standard Transfer Engineering precision magnetic

manipulators and provides good tactile feedback for accurate sample manipulation.

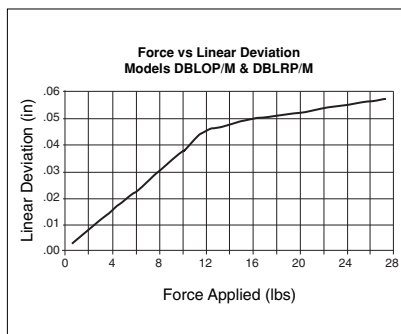
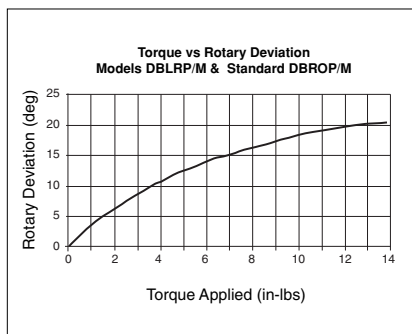
Retaining the UHV characteristics of the standard PMM, the PMM-Lite has only metal parts exposed to vacuum and can be baked to 250°C with the magnet carriage removed. It was designed with low maintenance in mind.

Specifications are listed on page 3.



SPECIFICATIONS AND DESCRIPTION

PMM MODEL	DBLRP/DBLRM	DBLOP/DBLOM	MASLR	DBROP/DBROM
PERFORMANCE				
High linear force	26 lbs	26 lbs	13 lbs	N/A
Tight linear compliance	0.0035 in/lb	0.0025 in/lb	0.0050 in/lb	N/A
Rotary torque	12 in-lb	N/A	8 in-lb	Std. 15 in-lb
Rotary compliance	2 degrees/in-lb	N/A	4 degrees/in-lb	Std. 2 degrees/in-lb
Low droop - spring constant = $(XX)^3/10^6$				
➡ For a 12" stroke	0.002"/lb	0.002"/lb	0.062"/lb	N/A
➡ For a 24" stroke	0.014"/lb	0.014"/lb	0.49"/lb	N/A
➡ For a 36" stroke	0.047"/lb	0.047"/lb	1.67"/lb	N/A
➡ For a 48" stroke	0.110"/lb	0.110"/lb	3.95"/lb	N/A
Bake Temperature with magnet removed				
	250°C	250°C	250°C	250°C
DESCRIPTION				
Material				
➡ Flange, outer tube and square main shaft	304ss	304ss	304ss	304ss
➡ Actuator Housing	Anodized Al	Anodized Al	Anodized Al	Anodized Al
➡ Rare Earth Magnets	NdFeB	NdFeB	NdFeB	NdFeB
Number of shafts				
	2	1	1	Std. - 1 Solid or hollow
Motions				
	Linear and/or Rotation	Linear-Only	Linear/Rotation	Rotation-Only
Length				
	(XX) + 9.53"	(XX) + 6.53"	(XX) + 7.53" (maximum length recommended is 36")	Model dependent
Minimum extension				
	.75" square tube 0" .25" ø shaft 0.5"	.75" square tube 0"	.50" ø shaft 1.0"	Std. round shaft 1.0"
Mounting				
	2.75" OD CFF	2.75" OD CFF	2.75" OD CFF	2.75" OD CFF
Weight				
	~15 pounds	~12 pounds	~10 pounds	~10 pounds
Options/Accessories				
	Motor drives Rho-theta stage KLAMP VMTEX and ALHCS ALDEF	Motor drives	External drive Linear guide Rotation lock Motor drives	Ceramic bearings Motorization Limit switches



DBLOP – linear-only external polymeric bearings
 DBLOM – linear-only external metal metal bearings
 DBLRP – linear-rotary polymeric external bearings
 DBLRM – linear-rotary external metal bearings
 DBROP – rotary-only external polymeric bearings
 DBROM – rotary-only external metal bearings

XX – length of linear travel

Precision Magnetic Manipulators are covered by U.S. Patent Number 5,105,932.

Specifications subject to change without notice.

ROTARY-ONLY, MODEL DBROM

The Transfer Engineering Rotary-Only, Model DBROP/M, precision magnetic manipulator has no stroke length. The Rotary-Only PMM provides a versatile, reliable and precise solution to the general problem of introducing rotary motion into a sealed chamber eliminating rotary mechanical feedthroughs with high failure rates.



Various styles of Model DBROM Rotary-Only

The Rotary-Only PMMs exhibit a high breakaway torque, a tight angular compliance and, as an option, you may request extremely accurate (± 0.3 degrees) coupling. Similar to the standard PMMs, Model DBROP has polymeric bearings in the carriage assembly for more economical conventional applications

and DBROM has all metal construction for motorization or high-duty cycles.

The innovative design of the Rotary-Only incorporates all welded stainless steel tubing to avoid wear-related leaks, outgassing of residual oils and burping. It provides an extremely reliable, positive vacuum and gas seal. There are no failure modes that result in a rotary-seal leak. The Rotary-Only can withstand a heat load while in operation and can be baked at 250°C. Rotary-Only PMMs are impervious to most liquids and gases and offer a built in clutch.

A wide range of user specified options are available. These include the size and number of shafts, choice of shaft material, length of shaft, ceramic bearings, choice of hollow or solid shaft, and end details such as flats, threaded, etc.

Common UHV and high-vacuum applications for the Rotary-Onlys include activating shutters, rotating sample carriers, driving gimbal mechanisms, selecting targets, rotating wafers, coupling power into controlled environments (glove box fans), etc.

Specifications are listed on page 3.

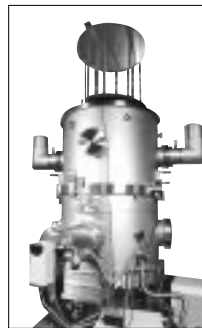
CUSTOMIZED PMM SYSTEMS

Each of the Transfer Engineering PMMs can be customized in length, extensions, etc. to meet customer requirements.

Examples of special customized units that have been provided are —

- ➔ Compact PMMs for HV applications where a smaller, more compact unit is desirable
 - ➔ Robust PMMs with reinforced tubing, added bearings, and mounted on a 4.5" CFF for heavy-duty, automated use
 - ➔ Very high force PMMs with internal magnets for HV applications
 - ➔ Model DHDRH, dual shaft rotary-only
 - ➔ Hollow-shafts for electrical feedthrus
- PMMs can be motorized for computer

This custom system has motor driven PMMs and was designed to vertically lift then lower and seal an internal 500 pound chamber



control and/or with a remote joystick or keypad. If this brochure does not list the exact unit for your requirements, please give us a call as we may have designed something similar. New systems are continually being developed to meet our customers needs.

About Transfer Engineering & Mfg, Inc.

Transfer Engineering and Manufacturing provides innovative products for OEM, Production Facility and R&D/University Lab customers in the Semiconductor, Media, Sputter Deposition and R&D markets. TEAMS core expertise is in the handling, transporting, positioning, and manipulation of samples, semiconductor wafers, substrates, flat panels, and other materials with precision and reliability in HV, UHV, ultra-clean and other challenging controlled environments.

Product lines include —

- ➔ Linear, Rotary and Linear/Rotary Precision Magnetic Manipulators
- ➔ Sample transfer & loadlock systems including the MASCOT MESC-compatible wafer transport system
- ➔ HV and UHV heating and/or cooling assemblies
- ➔ Motion and placement systems
- ➔ Automated loadlock systems
- ➔ Custom systems

At Transfer Engineering we believe the key to providing the best product solution is to work closely with customers to understand their process and objectives and to involve them in the product design to ensure that goals are met. Contact us for technical information or a quotation.

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