

Custom Transfer & Positioning Systems

FOR HV, UHV AND CONTROLLED ENVIRONMENT APPLICATIONS

- ➔ **Transporters constructed of unusual materials and shapes**
- ➔ **Dual purpose loadlocks**
- ➔ **Heating and cooling units for varied applications**
- ➔ **Goniometers**
- ➔ **UHV linear guides**
- ➔ **Sample/wafer holders to grip, turn or manipulate substrates**
- ➔ **Custom chambers for special purposes**
- ➔ **Modified SMIF pods**
- ➔ **Multi-directional transfer systems**



A major portion of Transfer Engineering business involves modification to standard products as well as customized systems designed to meet unique customer requirements. With years of experience in UHV, our engineers understand materials and environmental issues and work closely with customers to understand their process and objectives to make sure goals are met. This has led to customer requests for a wide variety of systems for use in high vacuum, ultra-high vacuum or controlled environments.

A Transfer Engineering catalog has not been published as the range of products continually increases and catalog listings seem to suggest limits on what products are available. Datasheets with specifications on standard products are available upon request. This brochure gives a few examples of unique customer requirements and the modified and custom systems provided to fill those needs. Let us know what we can provide for you.

CUSTOM TRANSFER SYSTEMS

Magnetically-Coupled Transfer Trolley Tube

Customer Request: Capability to load and move samples between a variety of surface analysis and deposition systems while keeping the sample under ultra-high vacuum (UHV).

Provided: A UHV magnetically-coupled trolley and delivery system that can position a loaded cassette of five sample holders for insertion into a multitude of different analysis and process chambers. The samples can be loaded onto the trolley following insertion into the loadlock from a glovebox. The loaded trolley can then be manually positioned near any instrument requiring delivery of a sample holder. The individual sections can be isolated with gate valves and additional sections can be added as necessary.

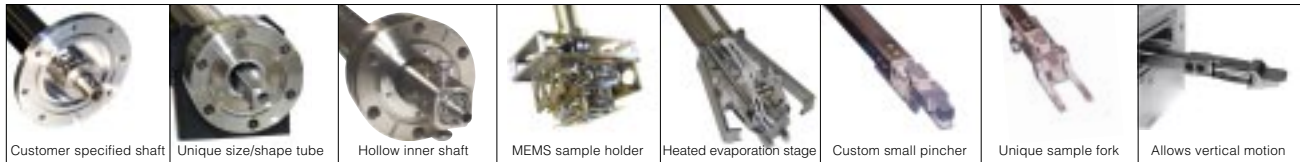
Transfer Engineering has provided similar trolley tube transfer systems for MBE applications, but his system was designed around Physical Electronics sample holders (pucks) and surface analysis tools. The system is completely UHV compatible.



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SPECIAL MAGNETICALLY-COUPLED TRANSPORTERS

Even Precision Magnetic Manipulators (PMMs), the key technology in many of our transfer systems, are assembled to requested transfer lengths — not just stocked in predetermined sizes. PMMs are modified to meet needs of specific applications, i.e., non-standard shafts of different sizes, shapes and materials as well as multiple shafts. The patented independent motions of the DBLRP/Ms allows the rotation of the inner shaft to operate a cam for vertical lift, flex a gripper, open/close a pincher, rotate a disk orthogonally or secure a locking mechanism.



Motorized Transporter with Quartz Rod

Customer Request: A transfer mechanism and manipulation system was needed to deliver a wafer into a furnace and rotate continuously at a preset speed. The process required the internal rod to be fabricated of quartz.

Provided: This Model DBLRM with a quartz shaft is stepper motor driven via a keypad HMI (Human Machine Interface). The PMM is mounted vertically and a platter will be mounted to the end of the shaft. A wafer is loaded onto this platter and delivered upward into a furnace. While in the furnace the wafer is rotated continuously at a preset speed. The unit is equipped with optical limit switches for home and the HMI that can be programmed by the user to change many different operational parameters (i.e., delivery distance, rotational speed, etc.).



Series of Linear Pneumatic Manipulators

Customer Request: A series of positioning devices to be used on an optical system in a controlled environment. The system is pumped down and then backfilled with a gas. A laser beam is sent through a viewport on the front end of the system. The positioning devices allow for lens' to be moved into the line of the beam and withdrawn as required.

Provided: Transfer Engineering provided pneumatically driven Model DBLDM manipulators with lube free, ceramic ball, hybrid bearings. These PMMs replaced existing bellows manipulators from another manufacturer. The user found that material outgassing from the bellows manipulators was contaminating the lens causing problems with experiments.



Large Custom System with Heavy-Duty Manipulators

Customer Request: The ultimate goal of this project was to allow the users to study materials which had been introduced and frozen onto plates at liquid nitrogen temperatures (77k). In order to do this, gases would be introduced into the vacuum system which would freeze onto the plates. A second chamber within the vacuum system which was also cooled would then be lowered to separate the vacuum system into two distinct volumes. The materials trapped on the plates would then be studied as the temperature of the plates was raised. The material being studied was radioactive, therefore, the customer did not want to use welded bellows (which could rupture), or any other vacuum seals with a potential to leak.

Provided: Transfer Engineering developed heavy duty magnetic manipulators to allow us to move the large inner chamber (shown in insert) through the vacuum wall. Six of these manipulators were used, each with a coupling force of 180 lbs. They are driven up and down with a large motor, leadscrew drive mechanism and simple motion control system.

MODIFIED AND CUSTOM LOADLOCKS AND VACUUM SYSTEMS



Dual Purpose Customized MASCOT-LR with Ellipsometer Mount

Customer Request: A loadlock or intermediate chamber to provide a mount for and allow film thickness measuring using ellipsometry while maintaining vacuum.

Provided: A dual purpose loadlock was configured using the 300mm MASCOT chamber body with the lid (door) modified to allow the mounting of an ellipsometer for measuring film thickness, and sealing details for a 200mm door. On the floor of the loadlock chamber is a stage that can be adjusted so the ellipsometer angle requirement (laser on one side, detector on the other) can be met. (The wafer needs to be flat with respect to the laser and detector). The Dynamic End Effector of the MASCOT-LR allows the wafer to be set onto this stage.

Brief process description:

- A 200mm wafer is inserted into the loadlock and the loadlock brought under vacuum.
- The wafer is taken from the process module and returned to the stage in the loadlock.
- A film thickness is measured.
- The process is repeated as necessary.



Custom Chamber with XY and Rotational Stage

Customer Request: Addition to an existing deposition system for raster and rotation of a sample holder that holds 4" wafers and allow mounting of an existing heater.

Provided: The sample faces downward in this "sputter up" geometry system that was added to the top of an existing vacuum deposition system. The chamber contains a very robust XY and rotational stage which rasters and rotates a sample holder for 4" wafers. The stages are all motor driven through the wall with magnetically coupled manipulators. The system was designed to allow the mounting of an existing heater and power and thermocouple feedthroughs and lines were provided for power and to monitor the temperature during heating.

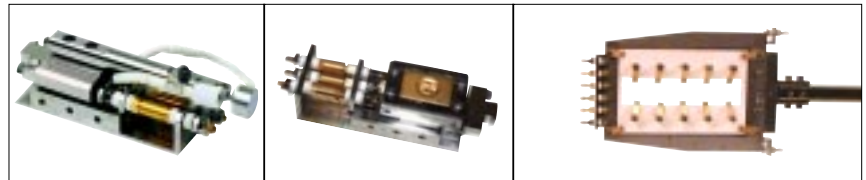


Modified 300MM TEAM-Mate Loadlock with Pre-Treatment

Customer Request: Customer wanted to "de-gas" wafers by radiation energy onto the wafer prior to insertion into a process chamber to assist in the removal of water vapor.

Provided: This manually operated 300mm TEAM-Mate Loadlock has a large quartz viewport. The loadlock system delivers 300mm wafers into a process chamber. The quartz window allows a lamp array to be mounted above the wafer within the loadlock to radiate energy onto the wafer prior to transfer. This assists in the removal of water vapor (pre-cleaning) to maintain a lower vacuum within the process chamber and obtain more consistent process results. The system is easily upgradeable for motorization.

HEATING/COOLING SYSTEMS



A wide range of custom heating and heating and cooling units have been provided to perform to meet customer specifications. Shown at the left, the resistive heater has a rotational shutter. Variations of custom Model VMTEX, Transferable Experimental Station heaters are shown above. The VMTEX utilizes Transfer Engineering's UHV-compatible Banana Plugs for reliable electrical connections under ultra-high vacuum conditions.

UNIQUE CUSTOM SYSTEMS



UHV Linear Guide

Designed as a part of our TEAM-Mate Loadlock system, this is a truly UHV linear guide, bakeable, and clean. It can be used as a guide for stages or any other linear motion in a vacuum system. Other high vacuum, linear guides are available but this is a guide that is UHV compatible.



Modified SMIF Pod Openers

Customer Request: A small systems company developed and sold lower cost wafer etch systems for wafer fabs where SMIF pod capability was not required. Our customer needed to outfit these etch-instruments with SMIF pod openers that would work with the existing wafer transfer and loadlock system.

Provided: The existing Versaport SMIF pod opening system provided by Asyst Technologies was modified by Transfer

Engineering to allow the pod to be opened using the existing control system. To accomplish this, a rotational table and lift and protection arms were added to match the operation of non-SMIF compatible system. All motions are pneumatically driven and cleanliness of operation is key. These modified openers were installed on high duty cycle production tools delivered to a wafer fab in the Far East.



High Precision, Five-Axis Goniometer with Heating and Cooling Capability

Customer Request: A five-axis, fully motorized, high precision goniometer with heating and cooling.

Provided: This system was designed for

very high precision motion in all five axes (X,Y,Z, azimuthal rotation, and polar rotation) and has a wide temperature range. The unique part about this goniometer in comparison to the typical manufacturers unit is that most systems handle little chips of materials. This unit handles an entire 2" substrate.

CONTACT US TO DISCUSS YOUR APPLICATION

The systems provided in this brochure are examples of Transfer Engineering capabilities. We do not define our products or services by a catalog of items, but by a process of taking a concept to hardware.

Our engineering staff will gladly propose unique configurations of our standard products or invent something new to meet very specific technical requirements. We gladly encourage our potential customers to e-mail or fax concepts that we will layout on advanced modelling systems providing useful technical representations to scale that help turn a technical "wish list" into functional hardware prior to the placement of an order. Continued two-way technical discussions will often uncover unique solutions or potential problems prior to quoting and then providing a finished product.

You will find that an experienced engineering/design staff and a close partnership with an on-site machine shop, TE Machining, can offer a unique, cost-effective system designed to fill *your* needs. Give us a call to discuss your application.

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 TEAM-Mate and MASCOT MESC- compatible wafer transport systems
- ➔ 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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