

INSTRUCTION MANUAL

EMX XY450 STAGE

Version 2

SERIAL # _____

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<u>XY 450 Series Precision Stage Instruction Manual</u> <u>Version 2.0</u>

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<u>Preface</u>

Congratulations! You have purchased a precision vacuum positioning device from Thermionics. This unit is capable of many years of use with minimal care and maintenance. This manual is a tool to aid you in obtaining this service. We at Thermionics encourage your comments and suggestions on this manual.

Product Description

The XY 450 series precision stages are a family of units which offer exceptional value per dollar. These units utilize all aluminum stage construction and hardened X & Y cross roller guides but differ from their EC series counterparts in the more robust construction of the travel stage and corresponding support structure. The XY 450 series utilize cross roller bearing sets that accommodate 1 or 2 inches of X-Y motion as our EMX line of manipulators. This series is available with 2.00," 2.50" and 3.00" ID bellows. The bearings used are stainless steel.

The XY 450 and EMX Series instruments have a 30# equipment payload for vertical operation. For applications which need different payloads and/or other operational orientations, please consult the factory. See "Installation" section below for complete payload considerations.

A full complement of options are available. Many are suitable for field retrofit. This allows the unit to be modified to suit changing requirements as the role for the manipulator changes through its life. These options include tilt, extended support shafts and other components. Motor drive is available, both DC stepping and AC synchronous.

Specifications

Bellows ID 2.00 inches up to 3.00 inches X motion +/- 0.5 inches; optional +/- 1.0 inches Y motion +/- 0.5 inches; optional +/- 1.0 inches X and Y axis specifications:

- Resolution < 0.0001 inches with large barrel micrometers
- o Repeatability < 0.0001 inches

o Backlash < 0.00015 inches Pavload 30 Pounds vertical Bellows size 2.00" ID up to 3.00" ID Base flange 4.50-inch standard Optional 6 or 8 Traveling flange 4.50 Inches Bakeable to 200 degrees C

Receiving, Inspection & Unpacking

Upon arrival of the shipment, inspect the outside of the box(s) for damage such as crushed corners and tears which would indicate the parcel was mishandled in shipping. If damage is noted, immediately notify the shipping company of the damage and that there may be hidden damage.

Unpack the equipment and check the contents to be sure everything shown on the packing list is identified and located. If something is later on is found missing it is difficult to establish responsibility.

Give particular attention to small parts such as cables and/or spare gaskets as they can be overlooked in the unpacking process and are then difficult to locate during the installation process. It is always good to save the packing material until the equipment is fully installed. Should anything be missing the original packing can be checked.

UNPACKING

XY stages are typically shipped in custom foam-in-place packing. The foam is separated approximately halfway inside the crate with thin plastic. The bellows assembly is shipped in place protected by plastic and a cardboard wrap about the bellows. This wrap should be left in place until the manipulator is fully mounted if practical. It is strongly recommended the packing be saved for possible future shipment or equipment storage.

WARNING

Shipping vibration can loosen screws. The user must check to verify the screw fasteners have not backed off on the unit during shipment. This is critical for safe operation.

Installation

The standard XY 450 can be installed directly from the crate. Care should be exercised to protect the knife edge seal on the mounting flange. The standard unit mounts to a 4.50" OD flange (other flanges, 6" or 8" OD are available). Proper tightening technique should be observed whenever tightening a metal seal flange. We recommend a small quantity of high temperature anti-seize lubricant be used on all mounting bolts. This is especially important if the unit will be subject to bakeouts.

PAYLOAD CONSIDERATIONS

The EMX Series instruments have a 30# equipment payload for standard vertical (NOT inverted) operation. This payload is based upon the total equipment load on the traveling flange with the base flange securely attached to the customer's chamber, providing a strong and stable mounting. The payload center of gravity must be within the diameter of the traveling flange OD (normally 4.50") and within 8" of the flange face.

Special models are available for special mounting and payload requirements. If your unit is such a special one, verify the unit you have is correct for the application. If not, consult the factory if your application requires:

- Payload greater than 30#
- Center of gravity beyond above limits
- Mounting orientation other than standard vertical (angles, horizontal, inverted, etc.
- /HMP models have a pre-determined payload range set at the time of order.

*******DANGER*** Overloading the stage may result in premature micrometer failure, and or physical damage. Use due care and caution when working on or around these spring-loaded devices.

<u>Adjustments</u>

Your EMX manipulator is correctly adjusted prior to shipment. This section is included to aid the user in making changes in these settings if so desired.

LINEAR CROSS ROLLER BEARINGS:

Liner cross roller bearing sets are adjustable on the XY 450 stages and EMX manipulators. If play is noticed first check to see that hardware has not become loose. It is best to make adjustments on a bench, and not under vacuum. Vacuum load will remove a gross amount of play but some instability in precise motion may be apparent. Loosen the mounting bolts of the rail adjacent to the adjustment set screws along the side of the axis in question. Tighten the set screws evenly and gently until a light and even drag is felt across the travel of the rail set. Retighten the rail mounting screws. Double check movement.

MICROMETERS:

Micrometer play is affected by two micrometer adjustments.

- 1. Micrometer thread engagement is adjustable by removing the micrometer handle and tightening or loosening a knurled nut on the barrel. This adjustment normally does not need to be adjusted in the field.
- 2. The micrometer to stage coupling is adjustable via the approx. 1" diameter knurled cylinder around the end of the micrometer spindle. This loads the micrometer and bearing to the stage and needs to be finger tight only.

When re-installing the micrometer / micrometer block assemblies, the following procedure will assure the best alignment.

- Install and snug the two ¼-20 SHCS (Socket head cap screws). Back each screw off 1/8 to1/4 turn.
- Assemble knurled collar/bearing at end of micrometer spindle into receiver on stage. Tighten firmly finger tight. This will align the micrometer assembly.
- Tighten the two ¼-20 SHCS. Back off the knurled adjustment collar to a light tension without axial play. Test operation for smoothness.

BELLOWS ASSEMBLY REMOVAL

The bellows assembly is held by its flanges in the traveling and base stages.

The base is held by socket head bolts or clamp arrangement, depending on base flange size. Six socket head cap screws (SHCS) installed at 90 degrees to the X and Y axis hold the top flange receiver flange halves. The manipulator should be placed on a clear work surface, and the Z drive adjusted to free the bellows of spring tension within its travel. With a bellows protector wrapping in position around the bellows, the base bolts can be removed, leaving one installed loosely for control. The SHCSs can then be unthreaded from the traveling flange and the two flange halves removed. The bellows/flange assembly can then slide along the Z axis, out of the driving stages.

RE-ASSEMBLY

Be careful not to over flex the bellows during re-assembly. This is especially true of the longer stroke units. When re-fitting the top flange to the X-Y stage, the screws should be securely tightened into place. Position the 4.50" OD flange both in orientation and axial position to align the screws. We recommend you double check the base flange for perpendicularity to the Z channel before securely tightening the attachment screws.

Bakeout Procedure:

We recommend limiting the temperature of the device to a maximum bakeout temperature of 200 C. Bakeouts of long duration (12 hours or more) should be limited to lower temperatures. We recommend 180 C. maximum for long bakeouts.

Units supplied with /HMP horizontal mount package should also be baked at lower temperatures if possible.

Our bakeout temperatures are conservative, and lead to long service life and high reliability. Tear-down and re-lubrication is held to a minimum. Operation outside these parameters cannot be guaranteed.

SUMMARY

The XY 450 can be baked with standard UHV bakeout procedures.

See safety warnings under Lubrication section.

Do not run uncontrolled bakeouts or bakeouts over 200°C.

It is not necessary to remove the micrometers prior to standard bakeout. For high temperature bakeout, or repeated bakeouts of long duration, we do recommend removing the micrometers. Use caution when doing this for the stage and all that it supports will be free to move without control and may cause other equipment damage.

All motors and limit switches / position indicators must be removed during bakeout. Limit the temperature of the lubricant and the bakeout temperature to 200° C. or less.

MICROMETER REMOVAL:

The micrometers should be removed prior to long term bakeout.

- 1. Position both X & Y micrometers at mid travel.
- 2. The pre-load coupling to the stage removes by simply un-threading the knurled collar. The same procedure is used on both the X & Y axis micrometers. Refer to section 4.0 Adjustments for correct instructions for re-assembly after bakeout.
- 3. The micrometers are bolted to the frames with two 1/4-20 SHCS each. On large drum micrometer, it may be necessary to loosen a set screw and slide the inner drum into the micrometer handle in order to remove the socket head mounting screws. Remove each micrometer.
- 4. The Z drive gearbox should be locked in place prior to bakeout.

The design of the manipulator allows room around the bellows for thermal insulation, making possible greater bellows temperatures while not exceeding our recommendations. Under no condition should heater tapes be used directly on a welded bellows. An electrical short would not only create a safety hazard, but possibly destroy the vacuum integrity of the thin bellows wall.

- 5. After bake and cool-down, re-attach micrometers. When reinstalling the micrometer / micrometer block assemblies, the following procedure will assure the best alignment.
- Install and snug the two1/4-20 SHCS. Back each screw off 1/8 to 1/4 turn.
- Assemble knurled collar/bearing at end of micrometer spindle into receiver on guide rod. Tighten firmly finger tight. This will align the micrometer assembly.
- Tighten two 1/4-20 SHCS. Back off the knurled adjustment collar to a light tension, without axial play. Test operation for smoothness.

Motorized Operation

All axes of your manipulator can be motorized. When purchased without a controller the wiring comes un-terminated. Retrofit kits are available for field installation. It is the customer's responsibility to be sure the wiring is properly strain-relieved mechanically. Please consult the factory for further information.

All motors and limit switches / position indicators must be removed before bakeout.

REMOVE AND ADJUSTMENT PROCEDURES

1. X & Y DRIVE (MICROMETER DRIVE):

Loosen and remove the two bolts holding the motor mount plate to the micrometer block and remove the motor-gear assembly.

2. LIMIT SWITCHES:

The Z limit switches are mounted in removable assemblies. Simply remove the associated mounting screws and remove the plate (typically the Z scale).

On the X & Y limit switch assembly, note the switch orientation. Loosen the screw in the clamp that is just below the switch pod. Slide the switch pod off

the "joystick" actuator and mount. Be sure to re-align the two mating halves of the assembly carefully during re-assembly.

3. POSITION INDICATORS:

Position indicators may be removed with limit switch mounting plates or individually as required. Care should be used upon re-assembly to dress the wires so as not to interfere with stage motion.

4. WIRING COLOR CODE FOR LIMIT SWITCHES AND POSITION INDICATORS:

(motor wiring diagrams are supplied separately with motors)

	<u>Switches</u>
Common	
Normally closed	
Normally open	

Yellow Green Red

Zero Position Connectors

SIGNAL	SENSOR WIRE COLOR
Detector Ground	Green
Detector Output	Blue
Detector Vcc	White
Anode (3.3 V)	Red
Ground	Black

Maintenance

LUBRICATION

All exterior bearings, micrometers, gears, gearboxes, and lead screws are lubricated with Thermionics GHT-2 high temperature lubricant. More lubricant may be needed to be added from time to time, depending mostly on use, but also on the frequency and temperature of bake-outs and operating environment.

GHT-2 high temperature lubricant

WARNING

This lubricant has been tested to 230 C. We recommend limiting the temperature to 200° C. or less. It does have a VAC3 rating.

Avoid inhalation of decomposition products formed above 300° C. This material may give off toxic gasses at elevated temperatures.

Avoid and or be conscientious of migration of this grease.

PARTS AND SERVICE

Consult the factory if parts or service other than re-greasing is needed. The robust design of this manipulator should provide years of trouble-free service.

We at Thermionics have a large stake in your new equipment operating up to your expectations. If you experience difficulty with this unit, or any other aspect of your endeavor where our experience might be of value, we want to hear from you. We want to be part of your success.

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