INSTRUCTION MANUAL

ZB SERIES PRECISION TRANSLATORS

Version 2

SERIAL # _____

10.2024
231 B Otto Street - Port Townsend, WA 98368 - (360)385-7707

ZB 200 Series Precision Translators

INSTRUCTION MANUAL

VERSION 2.0

TABLE OF CONTENTS

Preface

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 ZB series precision translators are a family of units which offer exceptional value per dollar. These units utilize all aluminum stage construction and hardened stainless steel guide rods but differ from their Z series counterparts in the construction of the Z travel stage and corresponding support structure. The ZB series utilize a stainless-steel back frame and feature longer linear Z bushings. This allows for longer Z strokes as well as larger bellows while maintaining linear and torsional stability. This change also allows for gearbox driven Z travel and simpler motor drive retrofit in the field. This series is available with 1.39", 1.88", 2.00", and 2.50" ID bellows. Gearbox drive is standard with .001" divisions. The ZB series utilizes 0.75" stainless steel Z guide rods and .50" acme drive screw. The bearings used are stainless steel.

The ZB Series instruments have a 20# 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 translator 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 1.39 inches up to 2.50 inches
Z motion 2 inches standard
Optional in 2-inch increments up to 24 inches
Z axis specifications:
- Resolution < 0.0005 inches
- Repeatability < 0.0005 inches
- Backlash < 0.0007 inches

Payload 20 Pounds vertical
Bellows size 1.39" ID up to 2.50" ID
Base flange 6-inch standard
Optional 2.75, 4.50, 6 or 8
Traveling flange 2.75-inch standard
Optional 4.50
Bakeable to 200° degrees C

RECEIVING, INSPECTION AND UNPACKING: RECEIVING & INSPECTION

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

ZB SERIES Translators are typically shipped with custom foam-in-place packing, bubble wrap, or dense foam. We have found this to provide adequate protection for shipment. The foam-in-place is separated approximately halfway inside the crate with thin plastic. The bellows assembly is shipped in place protected by a plastic wrap and cardboard or thick paper wrap about the bellows. This wrap should be left in place until the manipulator is fully mounted. We strongly recommend the packing crate with 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 ZB Translator 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 6" OD flange (other flanges from 2.75 to 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.

WARNING
It is necessary on long stroke translators to have an axis or tube down the axis of the Z travel. This will keep the bellows from "springing" out when the pressure is returned to atmosphere (usually when the unit is near its most compressed mode). This function is usually satisfied by a "theta" rotation shaft or support tube. Damage to the equipment can occur if this precaution is not observed.

PAYLOAD CONSIDERATIONS
The ZB Series instruments have a 20lbs. 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 2.75") 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 20 lbs.
- Center of gravity beyond above limits
- Mounting orientation other than standard vertical (angles, horizontal, inverted, etc.)

Adjustments

Your ZB SERIES translator is correctly adjusted prior to shipment. This section is included to aid the user in making changes in these settings if he so desired.

LINEAR BUSHINGS:
The linear bushings are not adjustable on the ZB SERIES translators.

TRAVEL LIMIT STOP COLLARS:
Some models may come equipped with stop collars clamped to the guide rods or the Z axis lead screw. These stops limit travel to the specifications of the device, such that the bellows is not extended beyond its operating parameters. If a need arises to move these stops, measure their locations prior to their removal, and replace them accurately upon re-assembly. Over extension of the bellows will cause premature failure of the bellows and/or mechanical damage to the manipulator or other equipment.

Z DRIVE:
The two main bearings in the gearbox assembly are pre-loaded at assembly via the main drive gear. This is locked into place by the main set screw in shear. Shimming should be used if adjustment is ever required. The spiral drive gear set is adjusted by positioning of the upper gearbox housing before locking down the two ¼-20 SHCS mounting bolts. A slight force toward engagement is usually best to minimize gear cogging. If smooth Z drive cranking is not obtained under load, this placement should be repeated. This alignment should not be disturbed unless necessary and is factory adjusted to have less than .0005" backlash.

BELLOWS ASSEMBLY REMOVAL:
The bellows assembly is removable in the ZB Series Translators via simple bolt and clamp removal. With all peripheral components removed and a bellows protector wrap in position around the bellows, the base bolts and or clamps can be removed, and the assembly can be lifted from the translator.

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 flanges to the stage, the screws should be securely tightened into place after rotating the flanges into proper orientation. 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.

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 ZB Translator can be baked with standard UHV bakeout procedures.

SEE SAFETY WARNINGS UNDER LUBRICATION SECTION.

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

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.

The Z drive gearbox should be locked in place prior to bakeout.

The design of the translator 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.

Motorized Operation

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

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

REMOVAL AND ADJUSTMENT PROCEDURES

Z DRIVE:

The Z drive motor is removed by first releasing the clamp screw on the drive shaft. This screw is accessed through a hole in the aluminum spacer between the motor mounting flange and the gearbox. Once this coupling is released, the four socket head screws holding the motor can be removed and then the motor.

LIMIT SWITCHES:

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

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.

WIRING COLOR CODE: Limit switches and Position indicators

Switches:

Common	Yellow
Normally closed	Green
Normally open	Red

LED Position Indicators: CLI870W

Pin # 1	Red
Pin # 2	Yellow
Pin # 3	Green
Pin # 4	Black

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, gears, gearboxes, and lead screws are lubricated with Thermionics GHT-2 high temperature lubricant. The user may need to add more lubricant from time to time, depending mostly on use, but also on the frequency and temperature of bakeouts and operating environment.

This lubricant has been tested to 230°C. We recommend limiting the temperature to 200°C. or less.

*** WARNING ***

This lubricant has been tested to 230°C. We recommend limiting the temperature of the lubricant to 200°C or less.

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

*** WARNING ***

Additional lubricant must be added to the lead screw and Z bushings as the use and environment requires. The standard lifting mechanism is a bronze acme thread on a burnished steel acme lead screw. This is a sliding contact, requiring lubrication. Equipment overloading, heavy use, high temperature bakeouts, environmental conditions, etc. can and will remove the lubricant from this interface. THIS WILL CAUSE PREMATURE WEAR. If this is continued to an extreme, the nut will fail and allow the stage to suddenly drop. THIS SITUATION IS DANGEROUS TO EQUIPMENT AND PERSONNEL AND MUST BE AVOIDED. Inspect this mechanism and re-lubricate as needed. The mechanism should have 0.002" to 0.006" vertical (axial) backlash maximum. If more is detected, consult the factory for suitable repair.

PARTS AND SERVICE

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

GHT-2 high temperature lubricant is available from the factory in 10 or 100 grams.

Appendix A

DOCUMENT CONTROL and APPROVAL

ZB Series Precision Translators
Instruction Manual

Document Control Number

Version 2

October 2024

Appendix B

Revision A.01 | 2020
Standard and Tailored Products are guaranteed to be free of material and workmanship defects for a period of one (1) year. Custom Projects and electronic components are guaranteed for a period of one (1) year. Expendable component parts are guaranteed for their expected service life. If, for any reason, you are not completely satisfied with our products, let us know. We want to address your concerns.
Our relationship with the user does not end with the delivery of the equipment. We have a large stake in your equipment operating up to your expectations. Our goal is to be part of your success.

Warranty
1.0. THERMIONICS VACUUM PRODUCTS (HEREIN CALLED THERMIONICS) WARRANTS TO THE ORIGINAL PURCHASER:
1.1. Standard catalog products manufactured by Thermionics against defects in workmanship for a period of one (1) year from the date goods are received at the customer's facility.

1.2. Special products and electronic components are covered for one (1) year from the date goods are received at the customer's facility.

2.0. SCOPE

2.1. Liability under this warranty is expressly limited to repair or replacement of defective parts. THERMIONICS, at its sole option, may at any time discharge its warranty as to any of its products by refunding the purchase price and taking back the product(s).

2.2. This warranty applies only to parts manufactured and labor provided by THERMIONICS.

2.3. Valid warranty claims must be received by THERMIONICS within the warranty period and are subject to the terms and conditions hereon.

2.4. All warranty replacement or repair of parts shall be limited to equipment malfunctions, which, at the sole discretion of THERMIONICS, are due or traceable to defects in original materials or workmanship.

2.5. Malfunctions, which in the sole opinion of THERMIONICS, are caused by abnormal wear and tear, lack of maintenance, abuse, operation, maintenance or care inconsistent with the product manual, accident, or neglect of equipment are expressly not covered by this warranty. It is the responsibility

of the user to operate the equipment in a reasonable and prudent manner, consistent with the stated intended use.

2.6. In-warranty repaired, or replaceable parts are warranted only for the remaining portion of the original warranty period, applicable to the parts which have been repaired or replaced, and the total equipment is warranted for the balance of the five (5) year period. After expiration of the applicable warranty period, the buyer shall be charged at THERMIONICS' current prices for parts and labor, plus freight and per diem, when applicable.

2.7. Expendable component parts, including, but not limited to, pump elements, cold cathode gauges, bellows, thermocouple gauges, hot cathode gauges, sublimator filaments, emissive filaments, heater, elastomers, bearings, and gaskets, etc., are guaranteed for their expected service life. If the expendable component parts fail to give reasonable service, as determined solely by THERMIONICS, they will be repaired or replaced at our discretion.

2.8. CONDITIONS

2.9. THERMIONICS expressly disclaims responsibility for any loss or damage caused by the use of its products, when not used in accordance with proper operating and safety procedures in accordance with specifications, or if the equipment is used without the proper recommended maintenance. Reasonable care must be taken by the user to avoid hazards.

3.0. Except as stated herein, THERMIONICS makes no warranty, express or implied, either in fact or by operation of law; and, as stated herein, THERMIONICS shall have no liability under any warranty, express or implied, either in fact or by operation of law.

3.1. THERMIONICS shall have no liability for special or consequential damages of any kind, or from any cause arising out of the sale, installation, or use of any of its products. Statements made by any person, including representatives of THERMIONICS, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon THERMIONICS unless reduced to writing and approved by an authorized officer of THERMIONICS.

3.2. This warranty does not cover normal maintenance requirements, which are the customer's responsibility.

3.3. This warranty does not extend to equipment that (1) someone other than Thermionics approved personnel have disassembled or attempted to repair, (2) has been modified or altered, or (3) has been contaminated with hazardous material or induced activation.

3.4. PROCEDURES

3.5. If you wish to return equipment for repair, contact the THERMIONICS DIVISION which sold you the product in question. You will be given an RMA Authorization Number and instructions on how and by what means to ship the product to the factory. NO SHIPMENT WILL BE ACCEPTED WITHOUT PRIOR APPROVAL and completed RMA Authorization Form.

3.6. In the first year, goods must be returned, freight prepaid, to the factory and will be returned prepaid, to the customer. After the first year, the customer must pay all freight costs.

Thermionics Laboratory, Inc.
3118 Depot Rd.,
Hayward, CA 94545
E-mail: sales@thermionics.com
www.thermionics.com

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.

END