

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

PY004

High Load Pitch Yaw Platform

User Guide



Contents

Chaper 1 Safety 1
1.1 Safety Information 1
1.2 General Warnings 1

Chaper 2 Introduction 2
2.1 Description of the Pitch Yaw Platform 2
2.2 Micrometer Drives 3
2.2.1 Reading Micrometer Drives 3

Chaper 3 Installation and Operation 4
3.1 Unpacking 4
3.2 Attaching to a Work Surface 4
3.2.1 Mounting X and Y Axes In-Line with Hole Pattern 5
3.2.2 Mounting X Axis In-Line with Hole Pattern 5
3.2.3 Mounting Y Axis In-Line with Hole Pattern 6
3.3 Mounting Equipment to the Moving Platform 6
3.4 Transportation 6
3.5 Operation Using APT Software 7
3.5.1 Compatible Drivers and Software 7
3.5.2 System Setup 7
3.5.3 Homing Motors 9
3.5.4 Converting Linear to Rotational Units 11
3.6 Operation Using Kinesis Software 13
3.6.1 Compatible Drivers and Software 13
3.6.2 System Setup 13
3.6.3 Homing Motors 15
3.7 Maintenance 19
3.7.1 Regreasing 19
3.7.2 Replacing the Actuators 19

Chaper 4 Specification 20
4.1 Specifications 20

Chaper 5 Regulatory 22
5.1 Declarations Of Conformity 22
5.1.1 For Customers in Europe 22
5.1.2 For Customers In The USA 22
5.2 CE Declaration 23

Chaper 6 Thorlabs Worldwide Contacts 24

Chapter 1 Safety

1.1 Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings, Cautions** and **Notes** throughout this handbook and, where visible, on the product itself.

The following safety symbols may be used throughout the handbook and on the equipment itself.



Warning: Risk of Electrical Shock

Given when there is a risk of injury from electrical shock.



Warning

Given when there is a risk of injury to users.



Caution

Given when there is a risk of damage to the product.

Note

Clarification of an instruction or additional information.

1.2 General Warnings



Warning

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. In particular, excessive moisture may impair operation.

Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbant tissue. Do not allow spilled fluid to enter the internal mechanism.

Chapter 2 Introduction

2.1 Description of the Pitch Yaw Platform

The PY004 Pitch Yaw Platform provides ±2.5° of adjustment in pitch and ±4.05° in yaw. It was designed for use with up to 5 kg (11 lb) loads, such as lasers, cameras and 3-Axis stages (MBT6xx, MAX3xx).

The top platform features an array of 24 1/4"-20 (M6) threaded mounting holes on a 1” (25 mm) pitch.

The PY004(/M) stage is fitted with high-resolution micrometers that are marked with a vernier scale to provide positioning accuracy within 9 arcseconds in pitch and 16.2 arcseconds in yaw. Turning the micrometers gives 0.25° of pitch and 0.45° of yaw per revolution.

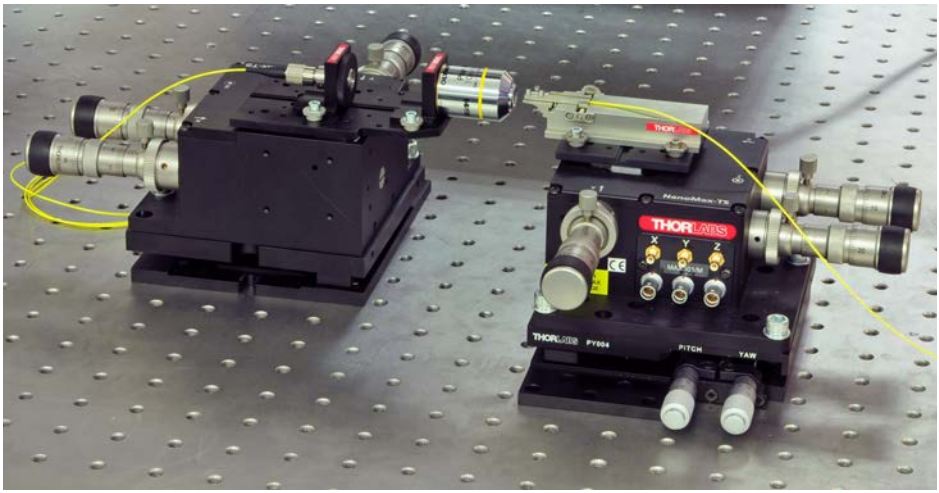


Fig. 2.1 PY004 Typical Application

The application above shows a pair of MAX301 Stages, each mounted to a PY004 stage. This arrangment gives pitch and yaw adjustment of the fiber to aid in optimising the fiber coupling.

Alternatively, the PY004Z8(/M) stage is fitted with a pair of Z812B DC motor actuators and should be driven by a pair of KDC101 motor controllers.



Fig. 2.2 PY004Z8 Motorized Stage

2.2 Micrometer Drives

2.2.1 Reading Micrometer Drives

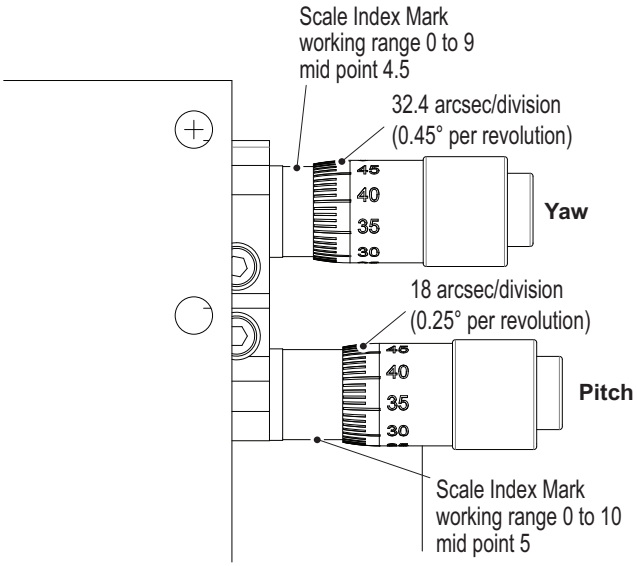


Fig. 2.3 Reading micrometer drives

Chapter 3 Installation and Operation

3.1 Unpacking



Caution

Once removed from its packaging, the pitch yaw platform is easily damaged by mishandling. The unit should only be handled by its base, not by the top platform or any attachments to the top platform.



Caution

The PM004Z8(/M) motorized units are shipped with transit inserts fitted which must be removed before use. These are clearly indicated by yellow stickers on the top surface of the stage.

Note

Retain the packing in which the unit was shipped, for use in future transportation.

3.2 Attaching to a Work Surface

The base of the pitch yaw platform is provided with a series of fixing holes for attachment to metric or inch optical tables and breadboards. These holes allow the unit to be mounted with the top platform mounting holes in line with the worksurface hole pattern or midway off the hole pattern center - see Fig. 3.1 to Fig. 3.3. The unit can also be secured off the worksurface hole pattern by using two CL series clamps, available from www.thorlabs.com.

When mounting the platform close to other equipment, ensure that the travel of the moving platform is not obstructed. If the moving platform is driven against a solid object, damage to the internal mechanism could occur. The range of travel on each axis is as follows:

Yaw ±4.05° about the nominal position.

Pitch ±2.5° about the nominal position.

3.2.1 Mounting X and Y Axes In-Line with Hole Pattern

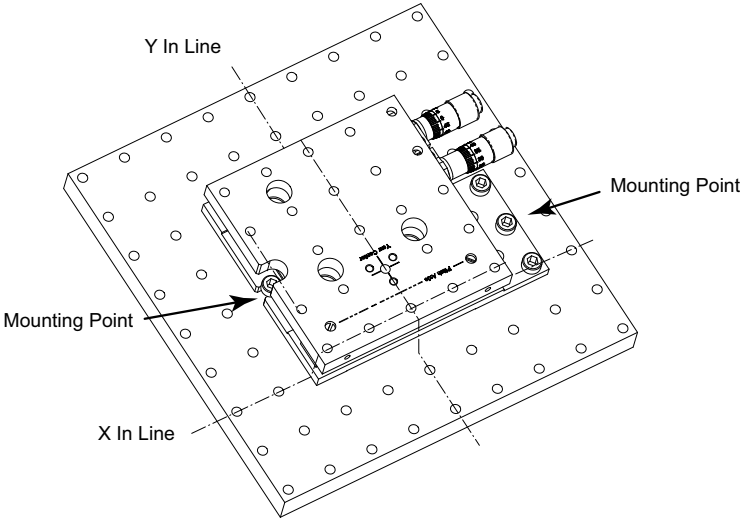


Fig. 3.1 Mounting Both Axes In-Line with Hole Pattern

3.2.2 Mounting X Axis In-Line with Hole Pattern

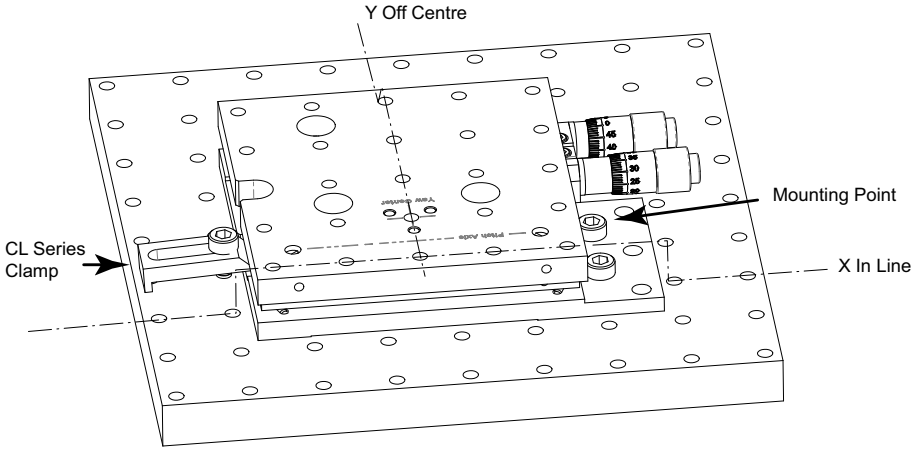


Fig. 3.2 Mounting X Axis In-Line with Hole Pattern

3.2.3 Mounting Y Axis In-Line with Hole Pattern

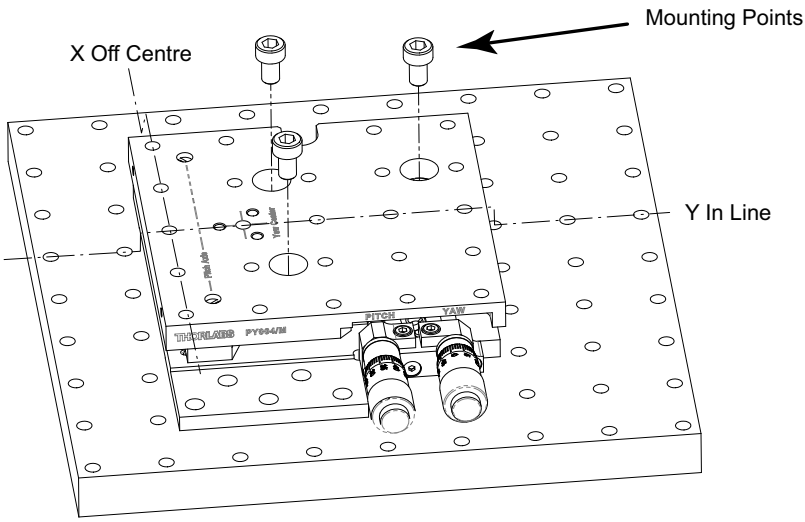


Fig. 3.3 Mounting Y Axis In-Line with Hole Pattern

3.3 Mounting Equipment to the Moving Platform

The top platform features an array of 24 1/4”-20 or M6 threaded holes on a standard 25 mm or 1” pitch.

Caution

To avoid damaging the internal mechanism:

The weight attached to the moving platform must not exceed 5 kg (11 lb) for manual stages and 2 kg (4.4 lb) for motorized stages.

Do not use bolts which extend beyond the bottom surface of the top plate.

Do not apply excessive forces to the moving platform.

3.4 Transportation

Caution

When packing the unit for shipping, use the original packing. If this is not available, use a strong box and surround the stage with shock absorbent material.

Fig. 3.4

3.5 Operation Using APT Software

This section is applicable only to the PY004Z8(/M) stages, or stages fitted with Z812B actuators, when being driven by the APT software.

3.5.1 Compatible Drivers and Software

The Thorlabs compatible controller for motorized PY004 stages is the K-Cube Single Channel DC Motor Controller KDC101.

3.5.2 System Setup

To ensure that a particular stage is driven properly by the system, a number of parameters must first be set. These parameters relate to the physical characteristics of the stage being driven (e.g. min and max positions, leadscrew pitch, homing direction etc.).

To assist in setting these parameters correctly, it is possible, using the APT Config utility, to associate a specific stage type and axis with the motor controller. Once this association has been made, the APT server applies automatically, suitable default parameter values on boot up of the software.

Note

If the APTConfig utility is not used to associate a particular stage, the software will associate a Z806 type actuator by default.

1) Install the electronic hardware and connect the controllers to the relevent axes of the associated stage/actuators (see the handbooks supplied with the KDC Controller). Two controllers are needed, one for each axis.
2) Shut down all applications using the APT server (e.g. APT User or your own custom application).
3) Run the APT Config utility - Start/All Programs/Thorlabs/APT Config/APT Config.

4) From the 'APT Configuration Utility' window, click the 'Stage' tab.

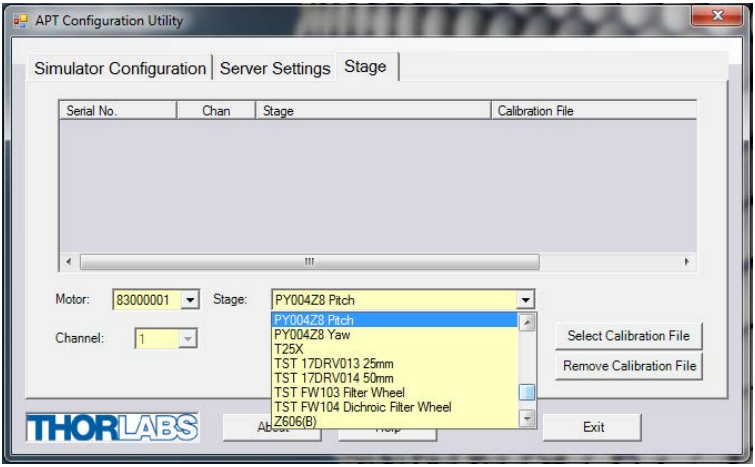


Fig. 3.5 APT Configuration Utility - Stage Tab

5) In the ‘Motor’ field, select the serial number of the KDC101 controller associated with the Pitch axis (this number can be found on the rear panel of the controller unit).
6) In the ‘Stage’ field, select the actuator ‘PY004Z8 Pitch’ from the list displayed.
7) Click the 'Add Stage Association' button.
8) In the ‘Motor’ field, select the serial number of the KDC101 controller associated with the Yaw axis (this number can be found on the rear panel of the controller unit).
9) In the ‘Stage’ field, select the actuator ‘PY004Z8 Yaw’ from the list displayed.
10) Click the 'Add Stage Association' button.
11) A default configuration is set at the factory and stored in the non-volatile memory of the motor controller. The server reads in the stage and controller information on start up. In particular, the ‘Home’ position for each axis is set in the middle of the range of motion. See the handbook supplied with the DC motor controller for further information.
12) Close down the APT Config utility.
13) Run the APTUser utility, and operate the stage as described in the handbook for the KDC101 driver.

3.5.3 Homing Motors

Homing the motor moves the actuator to the home limit switch then to its central position (as dictated by the zero offset parameter in the settings panel). The internal position counter and the GUI display are then set to zero. The limit switch provides a fixed datum that can be found after the system has been powered up.



Fig. 3.6 DC Driver K-Cube APT Software GUI

1) Click the 'Home' button. Notice that the led in the button lights to indicate that homing is in progress and the displayed position for both channels counts down to 000.000, i.e the home position.

Note

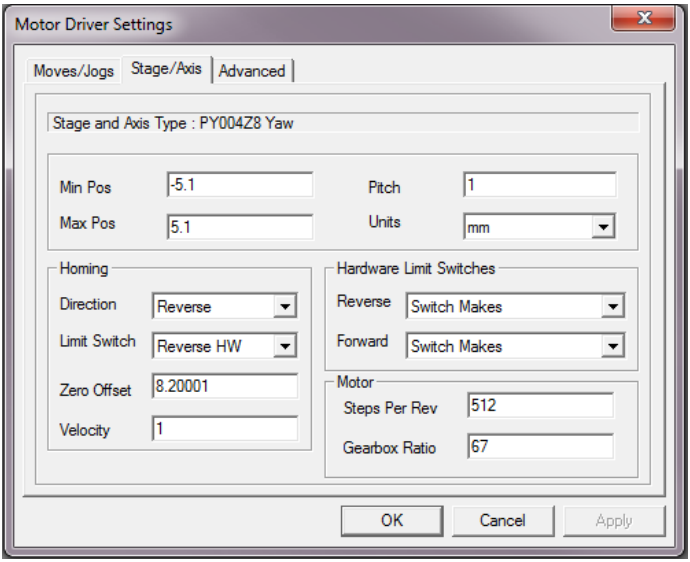
Homing can also be performed from the top panel settings menu, see the handbook for the KDC101 driver for more details.

2) When homing is complete, the 'Homed' LED is lit.

Note

Due to manufacturing tolerances, a small position offset (misalignment of the top and bottom platforms) may be visible after homing. This offset can be removed in the Settings panel as follows.

3) Click the jog buttons to align the stage as required.
4) Note the value shown in the GUI display.
5) Click the Settings button and select the Stage/Axis tab.



6) Add the value noted at item (4) to the value (e.g. 8.2) currently shown in the Zero Offset field, and enter this new value.
7) Click OK to save the new setting.
8) Repeat items (1) to (7) for the other axis of the stage.
9) Subsequent home moves should now move to the new aligned position.

3.5.4 Converting Linear to Rotational Units

The APT software for the Z812B motor actuator has been written to accept millimeters as the standard unit of translation. The relationship between movement of the motor lead screw in millimeters and movement of the stage platform in degrees (or arcseconds) is linear and the conversion factors are as follows:

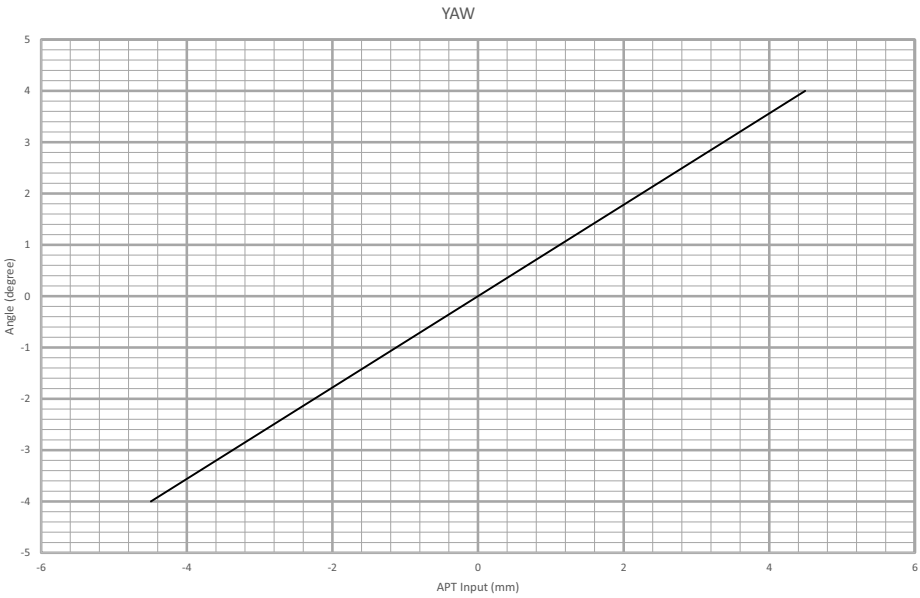
Pitch

Movement in mm	Angle (arcsec)	Angle (degree)
-5.02	-9000	-2.50
0.00	0	0
5.02	9000	2.50



Yaw

Movement in mm	Angle (arcsec)	Angle (degree)
-4.49	-14400	-4.0
0	0	0
4.49	14400	4.0



3.6 Operation Using Kinesis Software

This section is applicable only to the PY004Z8(/M) stages, or stages fitted with Z812B actuators, when being driven by the Kinesis software.

3.6.1 Compatible Drivers and Software

The Thorlabs compatible controller for motorized PY004 stages is the K-Cube Single Channel DC Motor Controller KDC101.

3.6.2 System Setup

To ensure that a particular stage is driven properly by the system, a number of parameters must first be set. These parameters relate to the physical characteristics of the stage being driven (e.g. min and max positions, leadscrew pitch, homing direction etc.).

To assist in setting these parameters correctly, a pop up window appears when the Kinesis software is first started, prompting the user to select specific stage type and axis being driven by the motor controller. Once this association has been made, the Kinesis server applies automatically, suitable default parameter values on boot up of the software.

Note

If the stage type is not associated on start up, the software will associate a Z806 type actuator by default.

1) Install the electronic hardware and connect the controllers to the relevent axes of the associated stage/actuators (see the handbooks supplied with the KDC Controller). Two controllers are needed, one for each axis.
2) Shut down all applications using the Kinesis server.
3) Run the Kinesis software - Start/All Programs/Thorlabs/Kinesis/Kinesis.

4) On startup, a window is displayed to select the stage being driven by the Z812 actuator.
5) Select PY004Z8 Pitch, or PY004Z8 Yaw as appropriate and click OK.

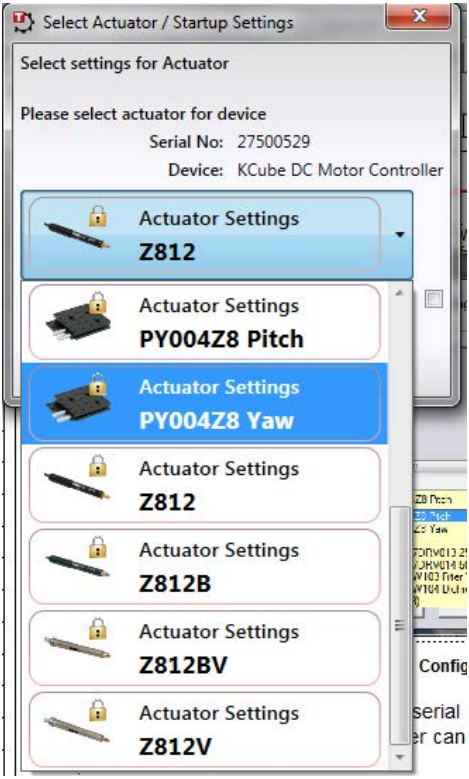


Fig. 3.7 APT Configuration Utility - Stage Tab

6) A default configuration is set at the factory and stored in the non-volatile memory of the motor controller. When the stage type is slected above, the server reads in this stage and controller information. In particular, the 'Home' position for each axis is set in the middle of the range of motion. See the handbook supplied with the DC motor controller for further information.

3.6.3 Homing Motors

Homing the motor moves the actuator to the home limit switch then to its central position (as dictated by the zero offset parameter in the settings panel). The internal position counter and the GUI display are then set to zero. The limit switch provides a fixed datum that can be found after the system has been powered up.

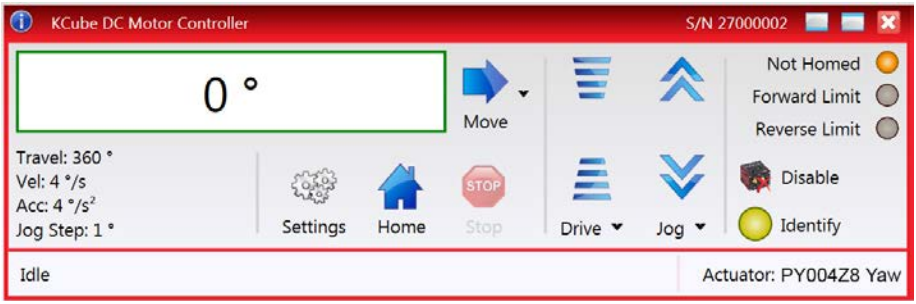


Fig. 3.8 DC Driver K-Cube Kinesis Software GUI

1) Click the 'Home' button. Notice that the 'Homed' led in the button lights to indicate that homing is in progress and the displayed position counts down to 0°, i.e the home position.

Note

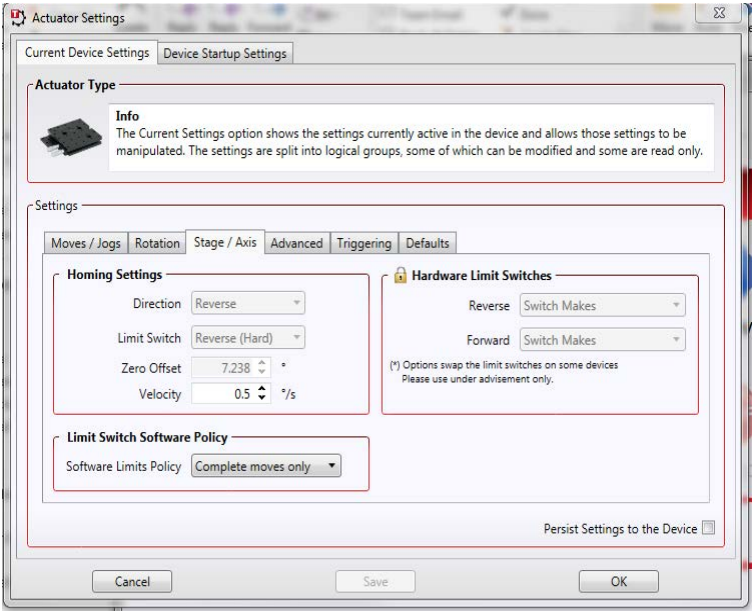
Homing can also be performed from the top panel settings menu, see the handbook for the KDC101 driver for more details.

2) When homing is complete, the 'Homed' LED is lit.

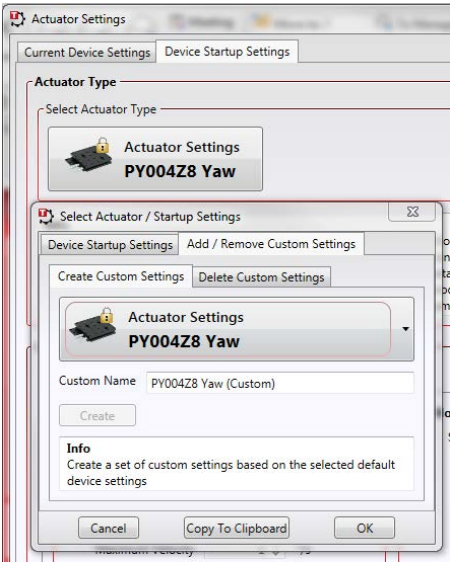
Note

Due to manufacturing tolerances, a small position offset (misalignment of the top and bottom platforms) may be visible after homing. This offset can be removed in the Settings panel by creating a set of custom device startup settings as follows.

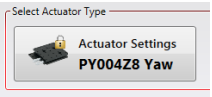
3) Click the jog buttons to align the stage as required.
4) Note the value shown in the GUI display.
5) Click the Settings button and select the Stage/Axis tab.



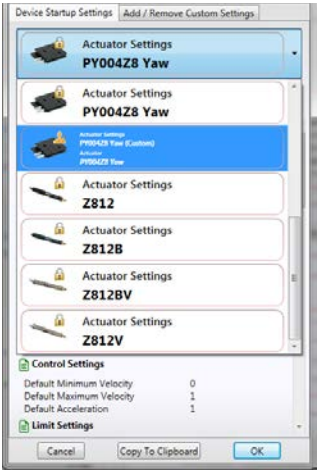
6) In the Device Startup Settings tab, click the ‘Select Actuator Type’ button and then select the ‘Add/Remove Custom Settings’ tab.



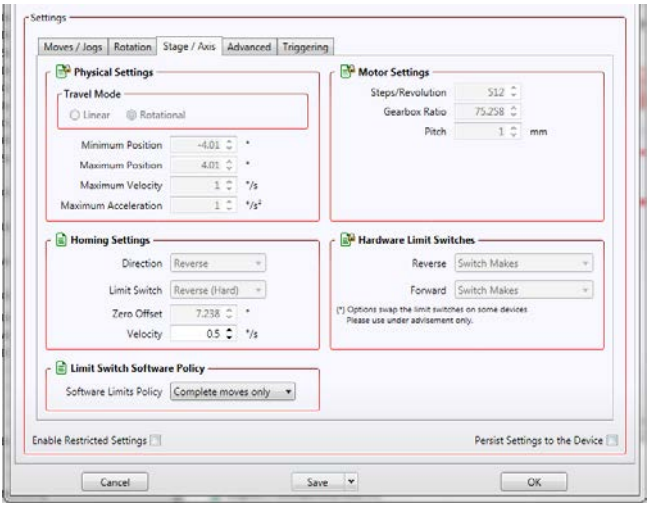
7) Enter a suitable name in the Custom Name field, e.g. PY004Z8 Yaw (Custom) and click the Create Button.
8) Then click OK. The custom settings have been saved.
9) Click the Actuator Settings button.



10) Click the small black arrow next to the button to display the custom settings drop down box.

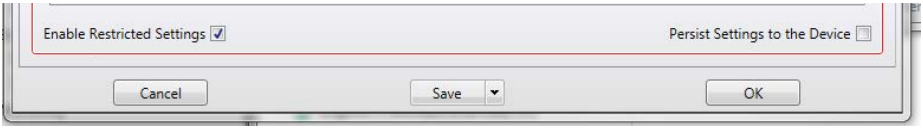


11) Select the custom settings created at item (7), then click OK.



12) Select the Stage/Axis tab.

13) Select the Enable Restricted settings checkbox. This must be checked to enable editing of the Restricted Parameters. This is a safeguard against accidentally editing Restricted Parameters in the Custom Device Startup Settings mode.



14) The Zero Offset field is now editable. Add the value noted at item (4) to the value currently shown in the Zero Offset field, and enter this new value.

15) Click Save, then click OK to save the new setting.

16) Repeat items (1) to (15) for the other axis of the stage.

17) Subsequent home moves should now move to the new aligned position.

3.7 Maintenance

3.7.1 Regreasing

Note

Regreasing should be performed whenever the leadscrew thread appears dry or the motor is noisy. Periodic greasing is advised in applications with a high duty cycle, typically after 4000 cycles in pitch and/or 1800 cycles in yaw.

1) Drive both motors to extend the leadscrews to their full extent.
2) Apply a thin bead of high load, silicon free lubricant (e.g. Apiezon 100) as shown below.



Fig. 3.9 Greasing the Leadscrew

3) Drive the motor to retract the lead screw and distribute the grease.
4) Remove access grease using a lint free cloth.

3.7.2 Replacing the Actuators

Note

When replacing/changing the actuators, the tightening torque of the barrel clamps must be more than 22 cNm and must not exceed 25 cNm

Chapter 4 Specification

4.1 Specifications

Parameter	Value
Adjustment Range	Yaw ±4.05°, Pitch ±2.5°
Minimum Repeatable Incremental Movement[a]	**PY004(/M)** Pitch: 9 arcsec, Yaw: 16.2 arcsec **PY004Z8(/M)** Pitch: 7.13 arcsec, Yaw: 15.71 arcsec
Bi-directional Repeatability[b]	Pitch: 27.85 arcsec, Yaw: 4.75 arcsec
Max Velocity[b]	Pitch 1781 arcsec/s, Yaw 3142 arcsec/s
Max Acceleration[b]	Pitch 1781 arcsec/s^2, Yaw 3142 arcsec/s^2
Crosstalk	<0.05° (3 arcmin)
Weight (including drives and fixings)	**PY004(/M)** 780 g (1.72 lb) **PY004Z8(/M)** 870 g (1.91 lb)
Horizontal Load capacity[c, d]	**PY004(/M)** 5.0 kg (11.0 lb) Max **PY004Z8(/M)** 2.0 kg (4.4.0 lb) Max
Vertical Load capacity[e] (Load positioned centrally)	**Distance from Top Platform — Load** 30 mm — 1.8 kg (4 lbs) 50 mm — 1.1 kg (2.4 lbs) 80 mm — 0.7 kg (1.5 lbs
Deck Height	0.98” (25.0 mm)
Construction	Black Anodized Aluminum

[a] The minimum incremental movement for manual stages is based on half a graduation of the micrometer scale.

[b] Motorized stages only.

[c] The load capacity when the stage's base is mounted on a horizontal surface. The max load capacity is different at certain points of the platform. See spatial drawing Fig. 4.1 for specific load capacity information.

[d] For motorized stages, the pitch axis actuator could wear out after approximately 5000 cycles if used continuously at the max load.

[e] The load capacity when the stage's base is mounted on a vertical surface. The vertical max load will depend on the stage orientation, the positioning of the load on the top platform, and the distance of the load from the platform. The load data provided is approximate and meant as a guide only - see Fig. 4.1. overleaf.

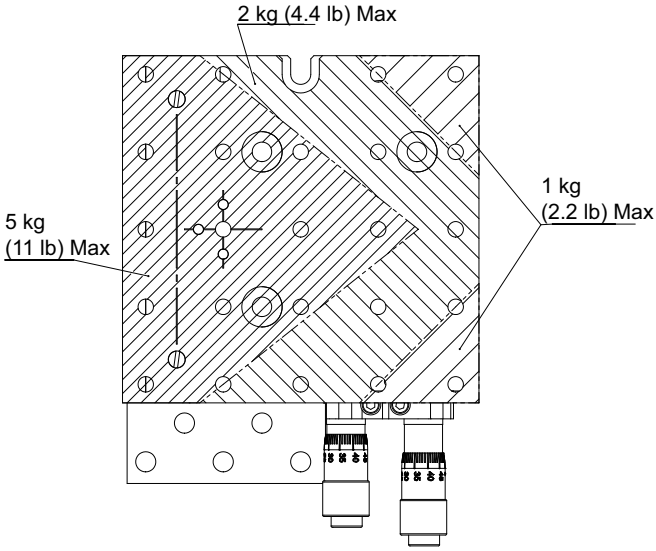


Fig. 4.1 Spatial Load Specifications - Manual Stages

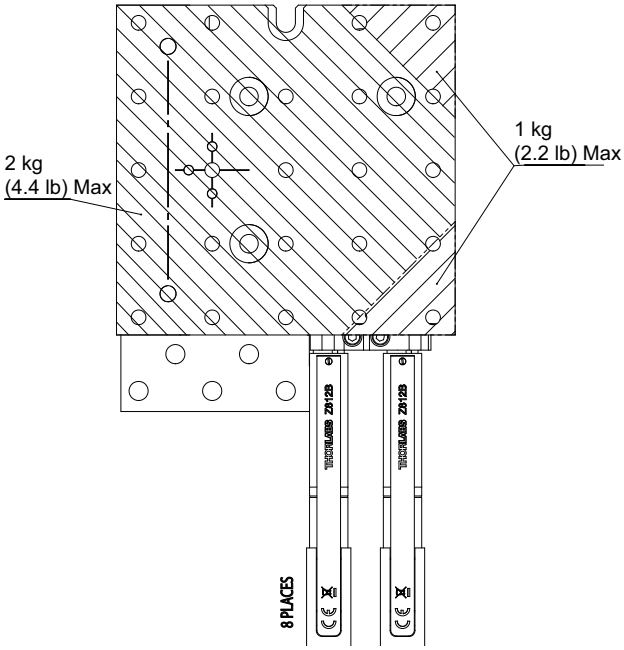


Fig. 4.2 Spatial Load Specifications - Motorized Stages

Chapter 5 Regulatory

5.1 Declarations Of Conformity

5.1.1 For Customers in Europe

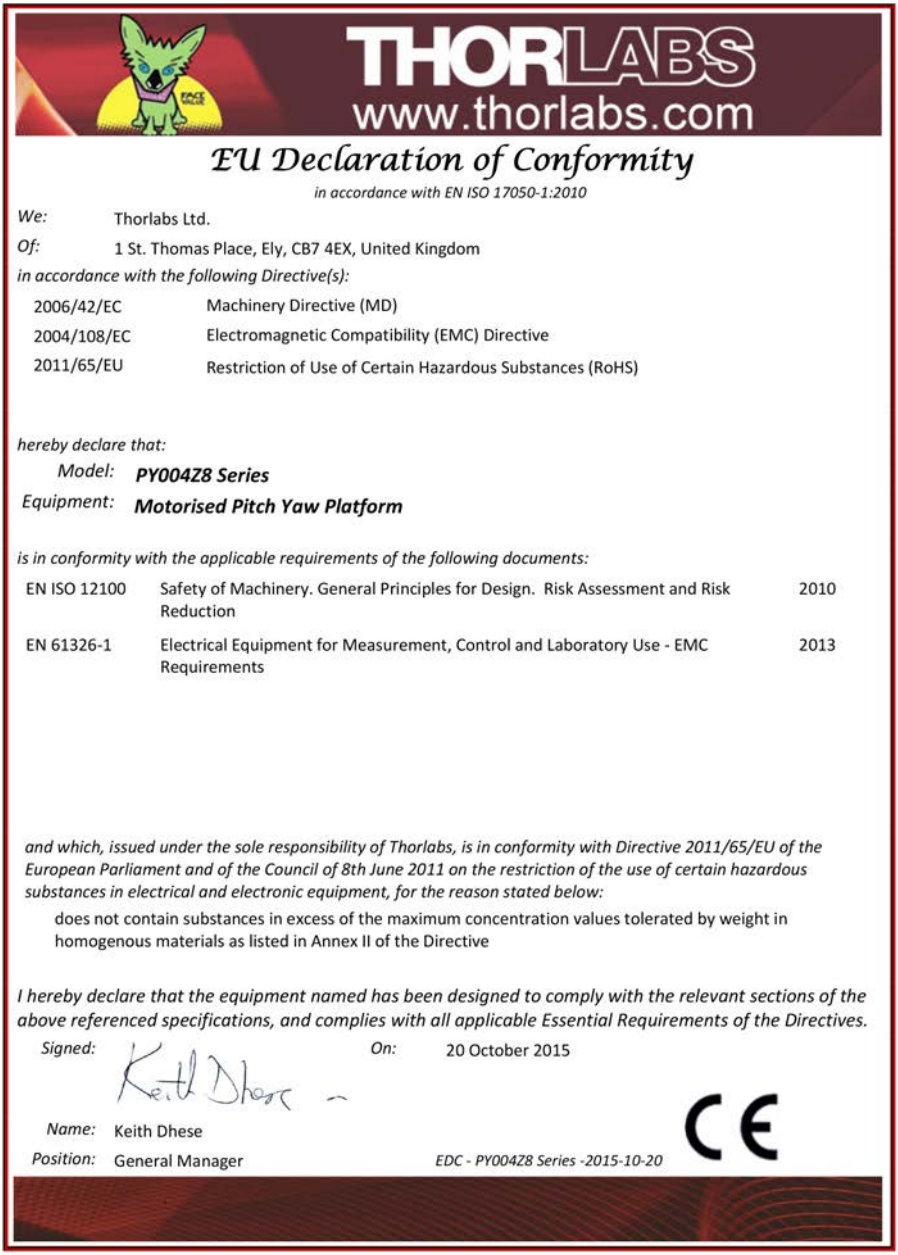
See Section 5.2.

5.1.2 For Customers In The USA

This equipment has been tested and found to comply with the limits for a Class A digital device, persuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the company could void the user's authority to operate the equipment.

5.2 CE Declaration



THORLABS
www.thorlabs.com

EU Declaration of Conformity

in accordance with EN ISO 17050-1:2010

We: Thorlabs Ltd.

Of: 1 St. Thomas Place, Ely, CB7 4EX, United Kingdom

in accordance with the following Directive(s):

2006/42/EC	Machinery Directive (MD)
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)

hereby declare that:

Model: ***PY004Z8 Series***

Equipment: ***Motorised Pitch Yaw Platform***

is in conformity with the applicable requirements of the following documents:

EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction	2010
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013

and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:

does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.

Signed: Keith Dhese *On:* 20 October 2015

Name: Keith Dhese

Position: General Manager

EDC - PY004Z8 Series -2015-10-20

CE

Chapter 6 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



USA, Canada, and South America
Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland
Thorlabs Ltd.
sales@uk.thorlabs.com
techsupport.uk@thorlabs.com

Europe
Thorlabs GmbH
europe@thorlabs.com

Scandinavia
Thorlabs Sweden AB
scandinavia@thorlabs.com

France
Thorlabs SAS
sales.fr@thorlabs.com

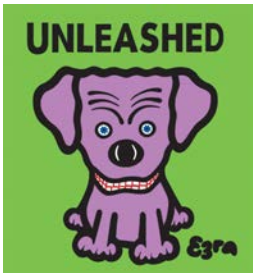
Brazil
Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan
Thorlabs Japan Inc.
sales@thorlabs.jp

China
Thorlabs China
chinasales@thorlabs.com

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.





THORLABS
www.thorlabs.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP