AMP002
Strain Gauge Pre-Amp

User Guide



Table of Contents

Chapter 1 Overview 1

Chapter 2 Safety Information 1

2.1 General Warnings and Cautions 2

Chapter 3 Installation 2

3.1 Environmental Conditions 2

3.2 Adjustments 2

3.3 D-Type Connections 3

3.4 Strain Gauge Bridge Connections 4

Chapter 4 Thorlabs Worldwide Contacts 5

Chapter 1 Overview

This pre-amplification circuitry is designed to amplify resistance changes within a full Wheatstone bridge strain gauge, to produce a signal suitable for monitoring and interpretation by the Thorlabs strain gauge reader or other piezo electronics with feedback. This circuit can also be used in other custom applications.

The amplification circuitry uses a low power, general purpose instrumentation amplifier offering excellent accuracy suitable for strain gauge bridge amplification. Current-feedback input circuitry provides wide bandwidth even at high gain (200 kHz at G = 100). A single external resistor sets any gain from 1 to 10 000. The INA128 amplifier component provides an industry standard gain equation.

Under normal operating conditions the Thorlabs' closed-loop piezo controllers anticipate a voltage range of >0 V to 2 V Pk-Pk for minimum and maximum strain.

Note
There is no phase monitoring to determine bridge polarity. The bridge should only be used for positive strain, where the bridge does not cross the balance point during operation.

Chapter 2 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.



Warning: Risk of Electrical Shock
Given when there is a risk of electrical shock.



Warning
Given when there is a risk of injury to users.



Caution
Given when there is a possibility of damage to the product.

Note
Clarification of an instruction or additional information.

2.1 General Warnings and Cautions

Warning
If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Excessive moisture may impair operation. Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbent tissue. Do not allow spilled fluid to enter the internal mechanism.

Chapter 3 Installation

3.1 Environmental Conditions

Warning
Operation outside the following environmental limits may adversely affect operator safety.

The unit is designed for indoor use only.

To ensure reliable operation, the unit should not be exposed to corrosive agents or excessive moisture, heat or dust.

The unit is not designed to be used in explosive environments.

If the unit has been stored at a low temperature or in an environment of high humidity, it must be allowed to reach ambient conditions before being powered up.

3.2 Adjustments

Perform the following:

1. To obtain the required voltage range the offset (VR2) and gain (VR1) potentiometers may need to be adjusted.
2. For some applications the default gain range will need to be changed beyond the limit of VR2. In these cases, the resistor R3 can be exchanged for one with a different resistance value. The following equation can be used to determine the required resistance for the desired gain.

$$G = 1 + \frac{50\ k\Omega}{R_G} \qquad R_G = \frac{VR1\ *\ R3}{VR1\ +\ R3}$$

Figure 1 Gain Equation

Note
In order to avoid saturating piezo feedback electronics, under full strain conditions the output should not exceed 2 V Pk-Pk.

3.3 D-Type Connections

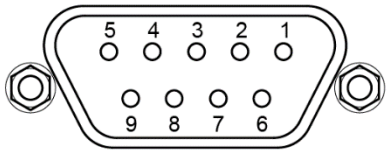


Figure 2 Pin Arrangement

Pin	Description
1	Oscillator Input
2	+15 V Input Supply
3	-15 V Input Supply
4	0 V Supply
5	Amplifier Output
6	0 V Supply
7	ID resistor Connection
8	Reserved for Future Use
9	Reserved for Future Use

Note
The pinout of the D-Type connector is such that the amplifier can be connected directly to Thorlabs' range of closed-loop controllers. The BPC301, BPC303, and KPC101 controllers are compatible with the AMP002 pre-amp. These controllers provide all the circuitry to convert the output of the preamplifier to a measure of displacement, allowing accurate position monitoring. In addition, the preamplifier can also be incorporated into other equipment.

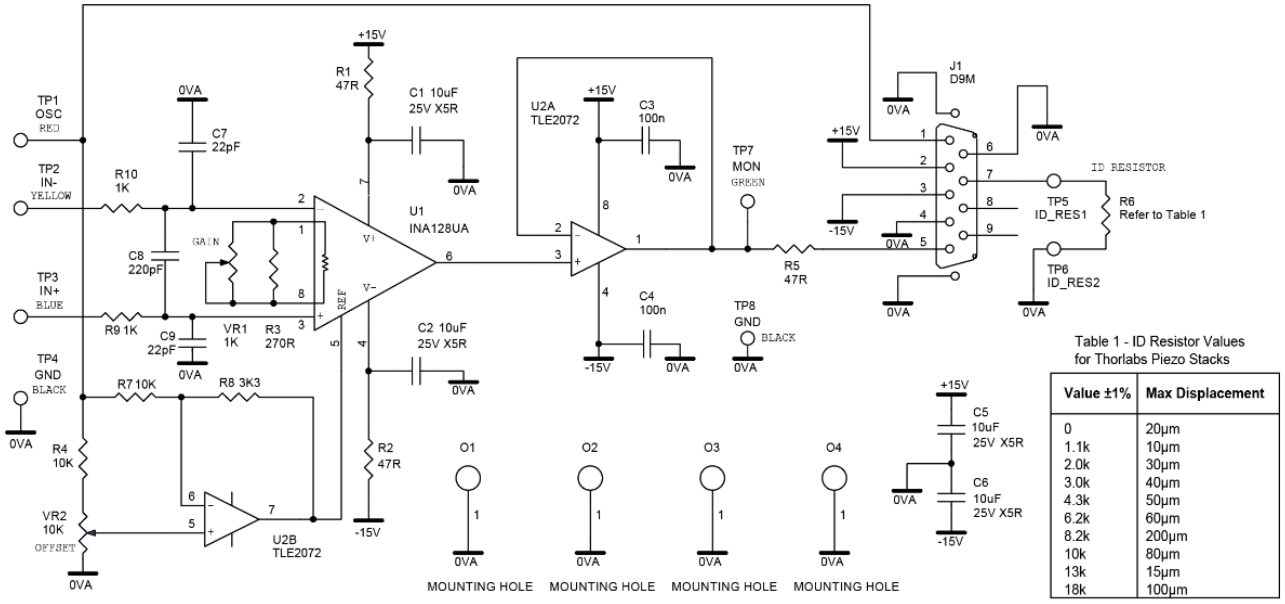


Figure 3 AMP002 Circuit Diagram

3.4 Strain Gauge Bridge Connections

Caution

When used with the BPC series controllers, connections to the bridge amplifier circuit are as detailed in Figure 3 above. When used with the KPC101 controller, the TP2 and TP3 connections must be swapped as follows:

TP1 (Red) Oscillator output to strain gauge bridge

TP2 (Blue) Positive input for differential amplifier

TP3 (Yellow) Negative input for differential amplifier

TP4 (Black) Ground.

For correct operation, the value of the ID resistor (R6) must be chosen to match the travel of the piezo stack being driven - see Table 1 in Figure 3 above.

Use a standard 1% 0.25 W resistor.

Thorlabs' piezo actuators with feedback are each fitted with a full Wheatstone bridge strain gauge that can be monitored by this circuitry. Refer to Figure 4 for connection details wherever necessary.

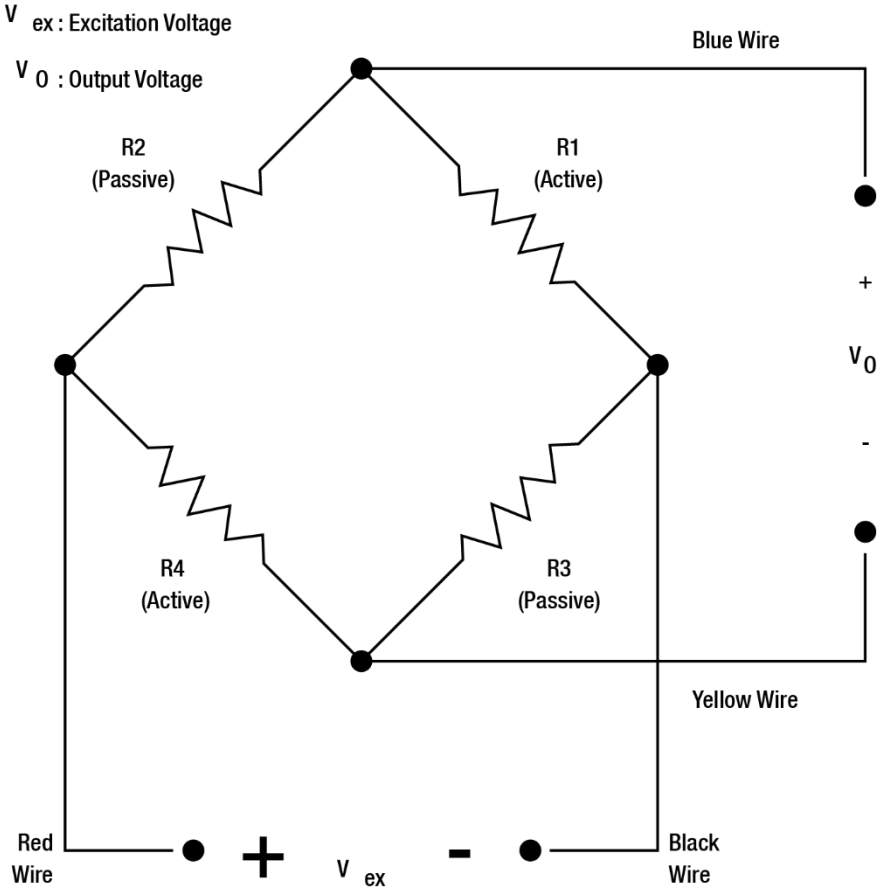


Figure 4 Bridge Connections (-V_{ex} is White on the PZS001 Actuator)

Chapter 4 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.



Corporate Headquarters
Thorlabs, Inc.
43 Sparta Ave
Newton, New Jersey 07860
United States

sales@thorlabs.com
techsupport@thorlabs.com

Product Manufacturer
Thorlabs Ltd.
204 Lancaster Way Business Park
Ely CB6 3NX
United Kingdom

sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

EU Importer
Thorlabs GmbH
Münchner Weg 1
D-85232 Bergkirchen
Germany

sales.de@thorlabs.com
europe@thorlabs.com

UK Importer
Thorlabs Ltd.
204 Lancaster Way Business Park
Ely CB6 3NX
United Kingdom

sales.uk@thorlabs.com
techsupport.uk@thorlabs.com



THORLABS

www.thorlabs.com