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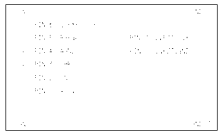
PZ 45E User Manual

E-660 Single-Channel LVPZT Amplifier

Release: 2.2.3 Date: 2005-01-31

This document describes the following product(s):

- **E-660.00**
  Single-Channel Amplifier for LVPZTs, desktop version
- **E-660.OE**
  Single-Channel Amplifier for LVPZTs, OEM version



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Declaration of Conformity

according to ISO / IEC Guide 22 and EN 45014

Manufacturer:	**Physik Instrumente (PI) GmbH & Co. KG**
Manufacturer´s Address:	Auf der Römerstrasse 1 D-76228 Karlsruhe, Germany

CE

The manufacturer hereby declares that the product

Product Name:	**High-Voltage Amplifier**
Model Numbers:	**E-660.00**
Product Options:	**none**

conforms to the following EMC Standards and normative documents:

Electromagnetic Emission:	EN 61000-6-3, EN 55011
Electromagnetic Immunity:	EN 61000-6-1
Safety (Low Voltage Directive) :	EN 61010-1

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Dr. Karl Spanner
President

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About this Document

Users of this Manual

This manual is designed to help the reader to install and operate the E-660 Single-Channel LVPZT Amplifier. It assumes that the reader has a fundamental understanding of basic electronics and applicable safety procedures.
Updated releases are available via FTP or email: contact your Physik Instrumente sales engineer or write info@pi.ws.

Conventions

The notes and symbols used in this manual have the following meanings:

DANGER

Indicates the presence of high voltage (> 50 V). Calls attention to a procedure, practice or condition which, if not correctly performed or adhered to, could result in injury or death.

Contents

1 Introduction

The E-660 LVPZT amplifier is a single-channel low-power voltage source and amplifier for driving *Low-Voltage Piezoelectric Translators (LVPZTs)*.

Many applications of *LVPZTs* require only low-power amplifiers. Because the power consumption of a piezoelectric translator depends on the operating frequency and the expansion amplitude, static or slow-motion movements can be accomplished by low-cost low-power amplifiers.

Both **E-660.00** and **E-660.OE** amplifiers are inexpensive drivers for LVPZTs having an average output power of about 2 W.

The E-660.OE is an OEM module for PCB mounting. The hermetically sealed metal casing has solderable pins and can be used as a single-component amplifier for LVPZTs.

The E-660 is a desktop device having some operating elements (on the front panel) and cable connectors for analog signal input and PZT output. Operating voltage is +12 V supplied by a wall-plug power supply.

1.1 Models:

E-660.OE	Single-channel LVPZT Amplifier module for OEM Applications
E-660.00	Single-channel LVPZT Amplifier as desktop device

1.2 Safety Precautions

DANGER

Be aware that both E-660 models are Voltage Amplifiers capable of outputting voltages up to 100 volts. This voltage may cause electric shock if the device is handled improperly.

To avoid danger, follow the instructions below:

Do not open the chassis while the line power cord is connected!

Do not touch any part that may be connected to the voltage output!

Make sure that the metal casings of all PZT elements connected to the voltage output are properly grounded.

2 E-660.00 Desktop Unit

2.1 Modes of Operation

- **Manual operation**

  Output voltage can be set by a 1-turn DC-offset potentiometer in the range of 5 to 100 V.

- **External operation**

  Output voltage is controlled by an analog signal varying in an 11-volt range applied to the BNC input.
  The DC-offset potentiometer can effectively add a positive DC bias (offset) of 0 to 10 V to this input, allowing shifting of the input range. Input plus bias must be between 0 and +11 V, which, multiplied by the gain factor of 10, gives an output voltage range of +5 to +110 V (outputs under +5 V are not useable).

2.2 Quick Start

1 The E-660 Amplifier is a desktop device with a stabilized external wall-plug AC-line power supply. Make sure the supply is compatible with the local AC line voltage and is set to output 12 V with the plug tip positive (see p. 9).

2 Connect the external power supply to the +12 V supply socket on the rear panel and plug it into the local line power.

3 Turn the DC Level potentiometer full counterclockwise (CCW) to set the output to zero.

4 Connect the *Low-Voltage Piezoelectric Translator* to the LVPZT-OUT socket at the front panel.

5 For manual operation, turn the DC Level potentiometer clockwise (CW) to increase the output voltage and to expand the LVPZT.

6 For external operation, apply an analog voltage to the INPUT socket. The input voltage can be biased (offset)

by up to 10 V by the DC LEVEL potentiometer. The result, bias plus Input must be in the 0 to 11 V range. The LVPZT output varies within the +5 to +110 V range. Outputs below 5 V are not useable.

2.3 Front and Rear Panel Elements

OUT	LEMO Socket to connect one low-voltage PZT Translator (LVPZT).
IN	BNC socket for control Input signal
DC OFFSET	Potentiometer for manual setting of the input voltage offset. Can be used in conjunction with a control signal applied at the IN connector.

Fig. 1: E-660.00 Front and Rear Panels

3 E-660.OE

The *E-660.OE Amplifier OEM* module is packaged in a metal case with solder pins for PCB mounting. The module requires single +12 to +15 VDC supply for operation.

3.1 Operating Modes

The E-660.OE amplifier module can be used for applications requiring potentiometer-, amplifier-, or combined-mode operation:

1 Manual operation via potentiometer. The necessary reference voltage is provided by the module. For sample application circuitry, see Fig. 2. The offset input is effectively doubled before being used to bias the control input.

2 Amplifier operation, using external control signal. See Fig. 3.

3 Combined-mode: amplifier operation with additional manual offset adjustment. An external potentiometer can be used to offset the output. See Fig. 4. The offset input is effectively doubled before being used to bias the control input.

3.2 E-660.OE Application Examples

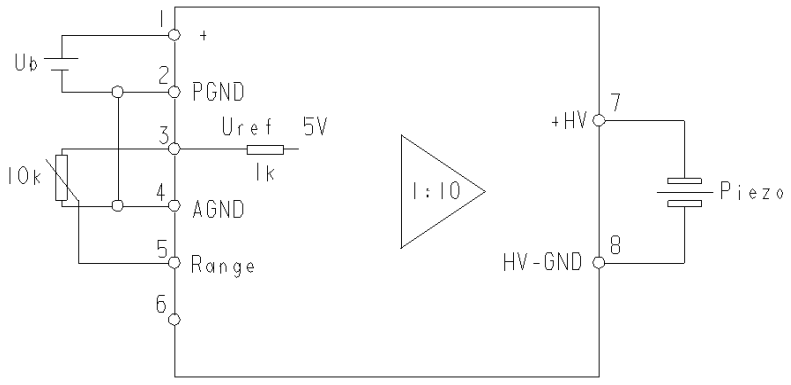

Fig. 2: E-660.OE Operation using external potentiometer

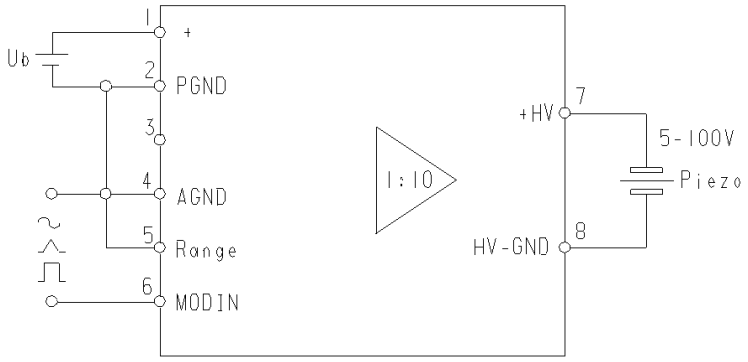

Fig. 3: E-660.OE : Amplifier mode

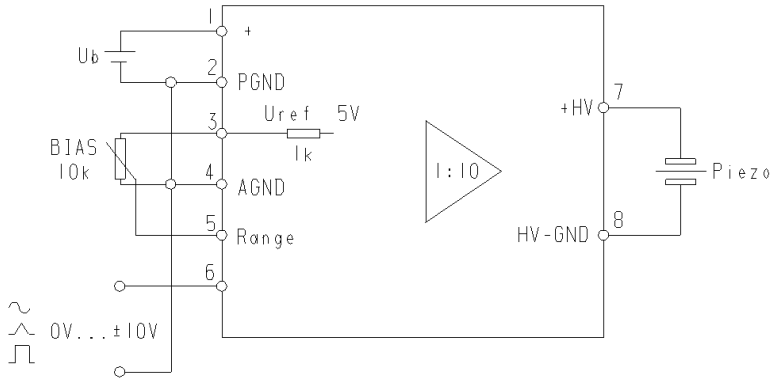

Fig. 4: E-660.OE: Amplifier mode with offset adjustment

4 Technical Data

4.1 Specifications

Models	E-660.00	E-660.OE
Channels	1	1
Output voltage range:*	+5 V to +110 V	+5 V to +110 V
Max. output current:	20 mA (sink/source)	20 mA (sink/source)
Output protection:	short circuit protected	short circuit protected
Max. output power:	2 W	2 W
DC-offset setting	Front panel 1-turn potentiometer adds 0 to +10 V to Control input**	Adds double value on pin 5 (0-5 V) to Control In, see p. 7 Fig. 4 ***
Control input range + DC offset:**	0 to 11 V	0 to 11 V
Input impedance:	100 k-ohm	10 k-ohm
Gain:	10	10
Reference output, see p. 6:	-	+5 V
Power supply	Wall-plug type w 3.5 mm jack	not included
Operating voltage:	+12 V to +15 V, stabilized	+12 V to +15 V, stabilized
Current requirements:	50 mA (idle), 150 mA max.	50 mA (idle), 150 mA max.
Cut-off frequency:	500 Hz, small signals	500 Hz, small signals
Ripple output:	<20mVpp (with 1 µF load at the output)	<20mVpp (with 1 µF load at the output)
Operating temperature range:	5° to +50° C (over 40°C, max. av. power derated 10%)	5° to +50° C (over 40°C, max. av. power derated 10%)
Case for:	Plastic box with aluminum front panel, size: 150 x 195 x 75 mm	Metal shielded casing, size: 93 x 45 x 28 mm
Weight	0.5 kg	0.25 kg
Control input socket:	BNC	Solder pins****
PZT voltage output socket	LEMO ERA.00.250.CTL	Solder pins****

*Because outputs below 5 V cannot be reliably generated, corresponding control levels should not be used.
** If, for example, the DC-offset pot on the E-660.00 is set to 5.5, the voltage on the Control In terminal can range from -5.5 to +5.5.
***Note that in the E-660.OE, DC-offset is set by applying a voltage to pin 5. That voltage is effectively doubled before being added to Control In. See p. 6 for wiring examples.
****1 mm diameter, 4 mm length

4.2 Wall-Plug Power Supply

The E-660.00 comes with a wall-plug power supply which may have switches for setting the output polarity and (stabilized) voltage.

Set the switches on the power supply to the indicated positions:

Voltage (*Spannung*): 12 V
Polarity (*Polaritaet*): tip positive

Fig. 5: Set wall-plug power supply to tip positive, 12 V. Switch arrangement and labeling may differ or be absent.

4.3 E-660.OE Dimensions

Decimal places separated by commas in drawings

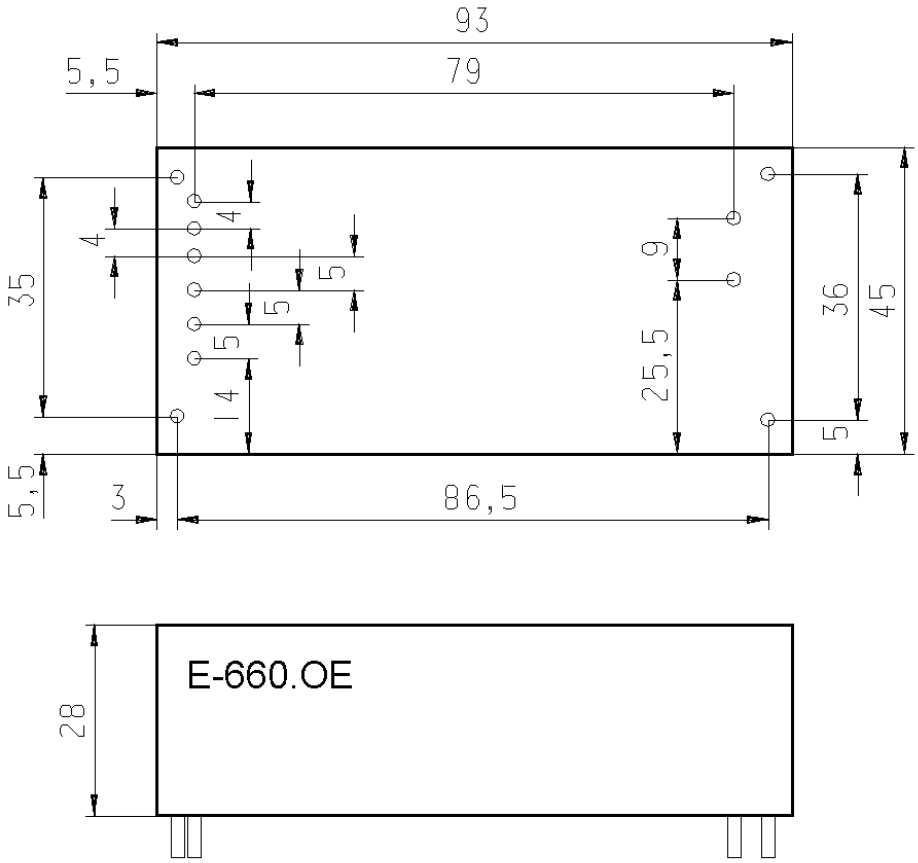

Fig. 6: E-660.OE Dimensions

4.4 E-660.OE Pin Locations and Assignments

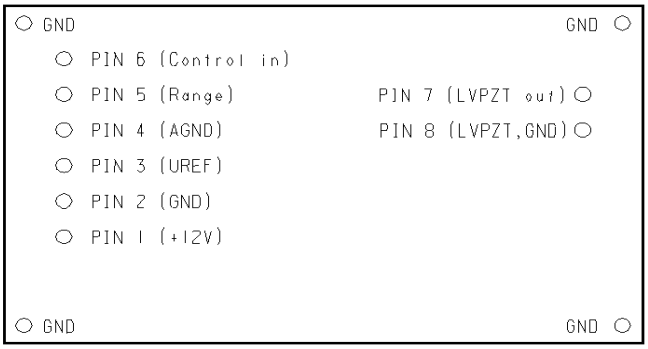

Fig. 7: View from solder side

Pin	Function
1	Operating voltage Input, +12 to +15 VDC
2	Operating voltage GND
3	Reference voltage: +5 V, output
4	GND
5	DC-Offset*, 0-5 V, see p. 6 for wiring examples
6	Control input*
7	LVPZT voltage output, hot side (5 to 110 V)
8	LVPZT voltage output, GND

* Control input + 2 x DC-Offset must be in 0 to 11 V range