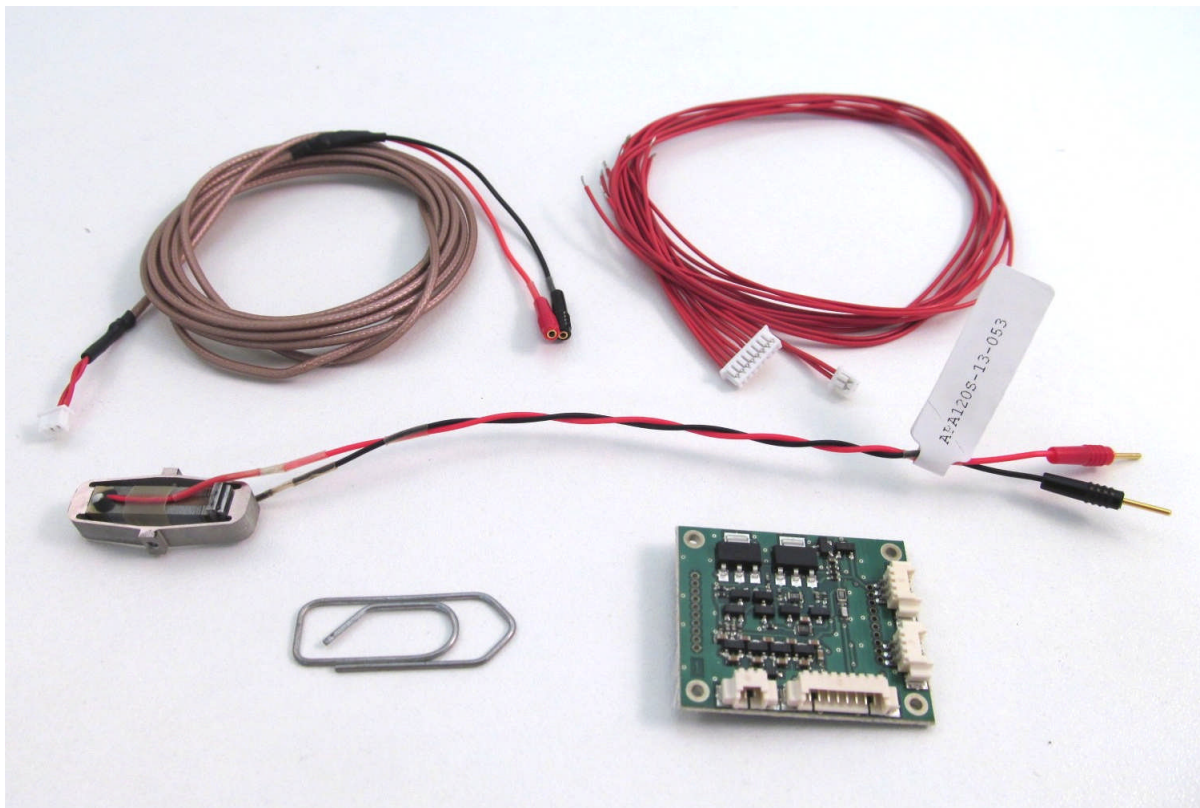


**Evaluation Pack EP120S
by Cedrat Technologies
PRODUCT INFORMATION**



CAUTION: READ BEFORE OPENING

For safety purposes these instructions must be read before use of this product.

Piezoelectric products are not warranted against mechanical damage resulting from improper use, wherein excessive forces or voltages that are outside specified ranges are applied.

High voltage is present in this product.

Only qualified personnel should work on or around this equipment and only after becoming thoroughly familiar with all warnings, safety notices, and procedures contained herein.

The successful and safe operation of this equipment is dependent on proper handling, installation and operation.

A "qualified person" is one who is familiar with the installation, construction and operation of the equipment and the hazards involved. In addition, he/she has the following qualifications :

- is trained and authorized to energize, de-energize, clean, and ground equipment in accordance with established practices,**
- is trained in the proper care and use of protective equipment in accordance with established safety practices.**

1. GENERAL

Piezoelectric Actuators from CEDRAT TECHNOLOGIES SA consists in a wide range of actuators, divided in three categories :

- Multilayer actuators, that are not mechanically prestressed,
- Parallel prestressed actuators, that are mechanically prestressed multilayer actuators and offer mechanical interfaces,
- Amplified piezo actuators, that use an elastic amplifier to both prestress the multilayer actuator and amplify the displacement.

Piezoelectric Actuators must be handled carefully. Lifetime of Piezoelectric Multilayer actuators is not limited by wear. They can perform millions of cycles without loss of performance provided they are operated under suitable conditions.

The lifetime of a Piezoelectric Multilayer Actuators is a function of many combined parameters ; the most influencing being the applied voltage, the temperature and the humidity. For maximum lifetime, operating voltage should be minimized, especially when they are used in static conditions.

Tests have shown that the lifetime is reduced significantly, if the actuator is maintained continuously at the maximal operating voltage. For instance, a Piezoelectric Multilayer Actuator can be definitively damaged, if submitted to the maximal operating voltage (e.g. : high electrical field up to 1.5 kV/mm) during more than one hour.

A high self heating of the piezo ceramic may occur during a long use in dynamic (high frequency) operation. This can lead to depolarization or electrical breakdown of the piezo ceramic.

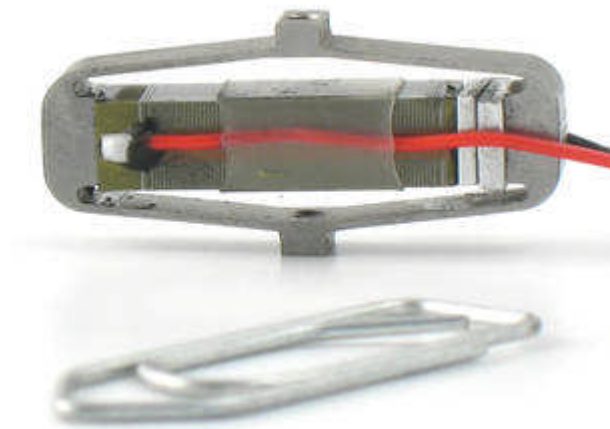
When driving the piezo actuator, it is important not to create over voltages through improper drivers or parasitic inductances.

The mechanical installation or the induced moments under operation by the mechanism are the main sources of failure.

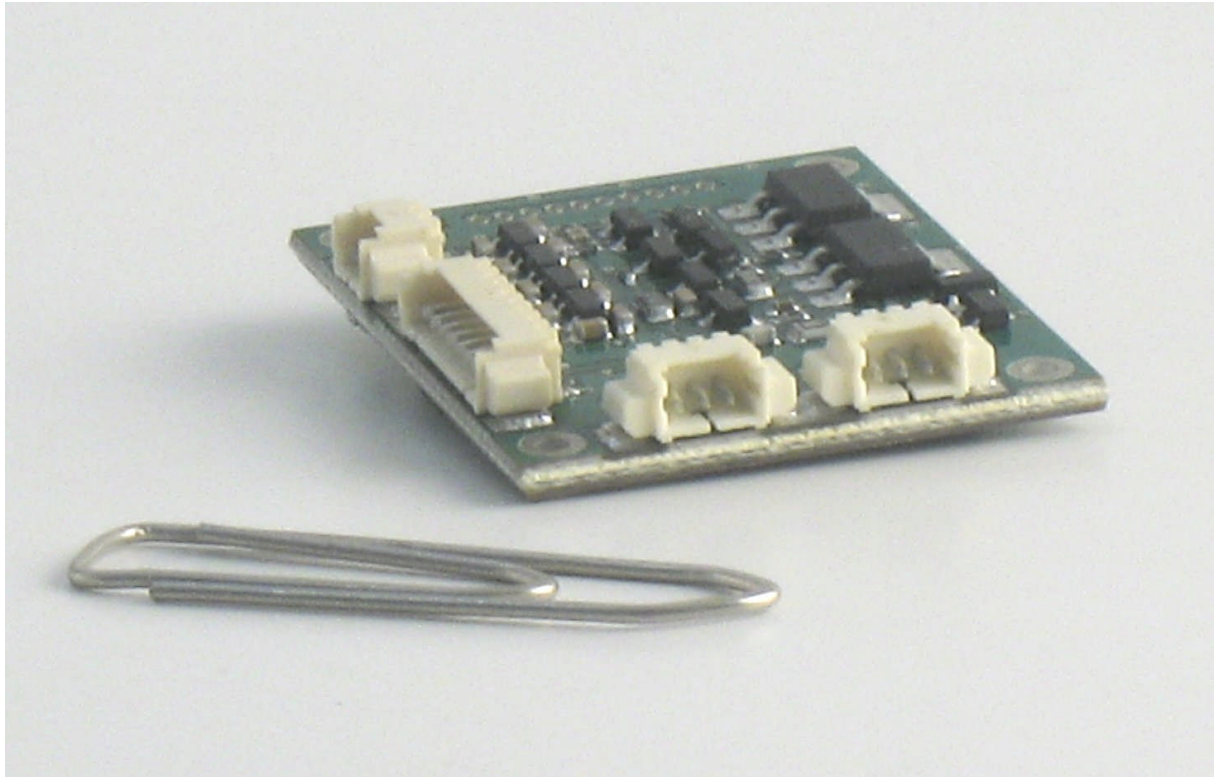
2. DESCRIPTION OF THE EVALUATION PACK

The evaluation pack is made of different sub-systems:

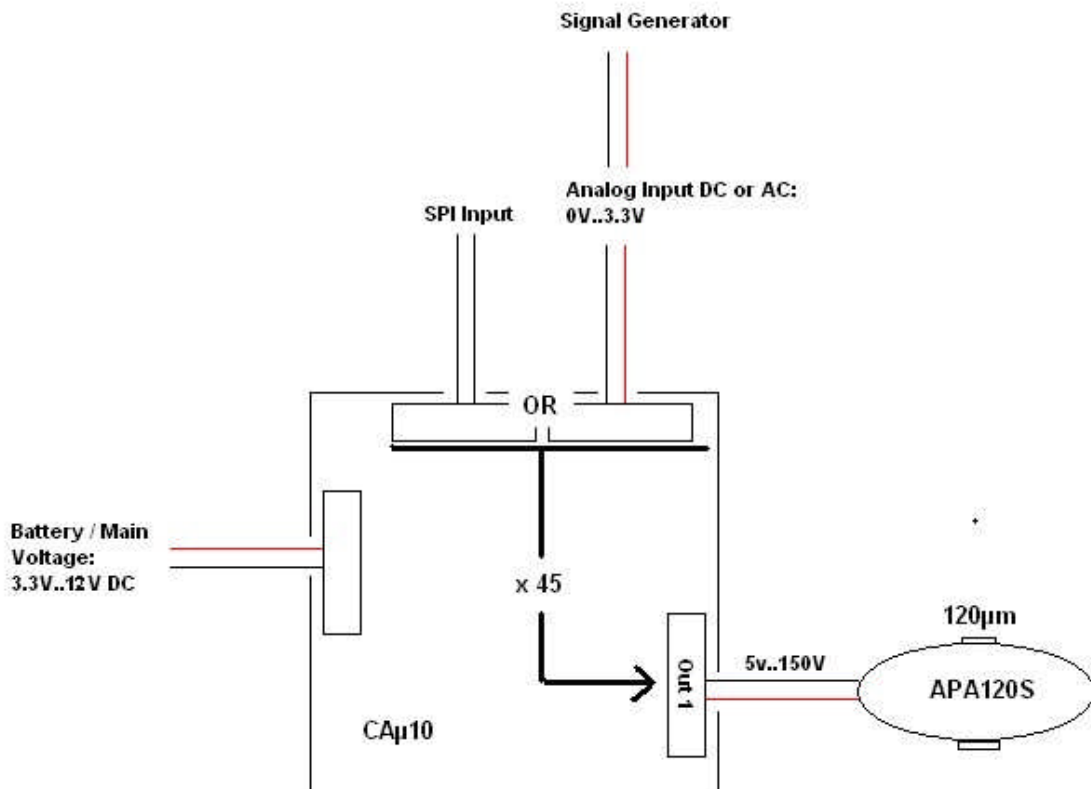
- An amplified piezoelectric actuator APA120S (140 μ m, 39N)



- A linear micro amplifier Ca μ 10: converts a voltage from [0; 3.3V] to [5; 150V]



- **Cabling:**
 - Analog Input cable and connectors
 - SPI Input cable and connectors
 - Battery Cable and connectors
 - 5V-150V Output cable and connectors

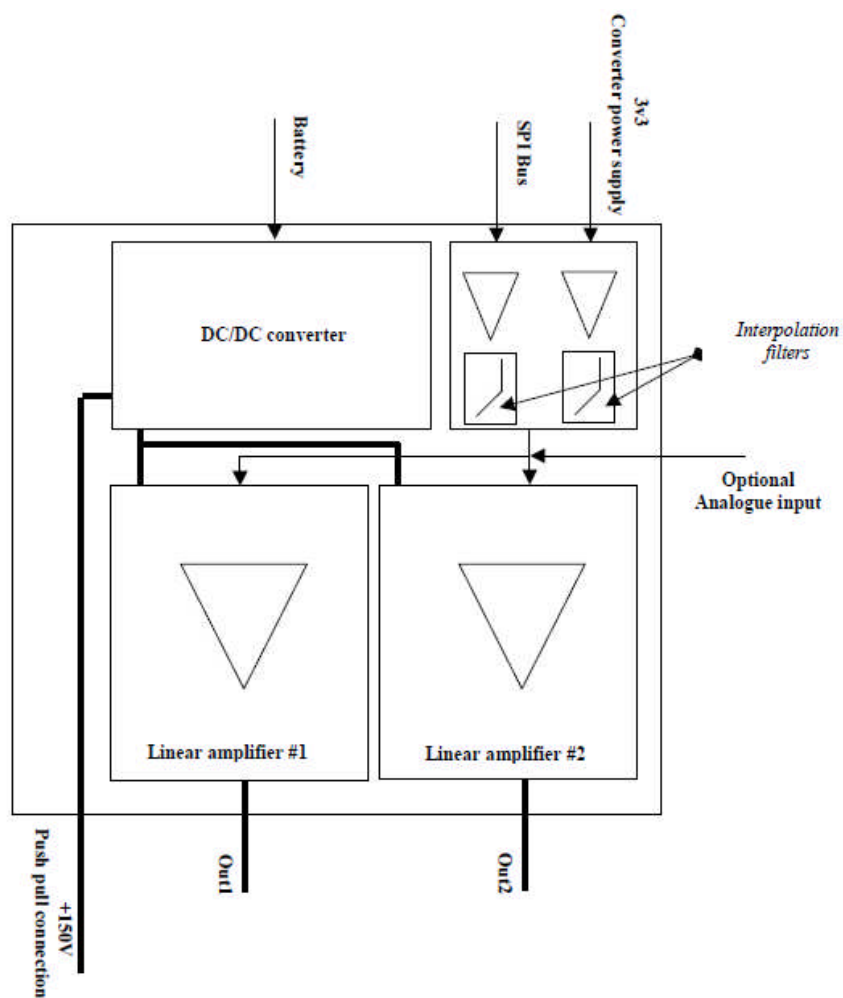


Synoptic of the EP120S

The miniature drive electronic CAu10 is dedicated to the supply of piezoelectric actuators based on multi-layers piezoelectric ceramics such as APA or PPA from CEDRAT TECHNOLOGIES, or benders. The CAu10 consists in a drive electronic with a maximal power given in the attached technical data sheet, including (Figure 2):

- A DC/DC converter, based on a capacitive multiplier,
- Two linear amplifiers dedicated to capacitive load allowing excitation of piezoelectric actuators between 5 and 150 V. In the evaluation pack, only 1 cable for 1 channel is delivered. For using 2 channels, please ask for the optional cabling.
- A SPI link, able to read a digital command.

The miniature CAu10 driver amplifier can also operate in push-pull mode to drive XY stages or DTT mechanisms from CEDRAT TECHNOLOGIES. Please ask for the optional cabling.



Synoptic of the Caμ10

The Datasheet of the Caμ10 can be found below:

PROPERTIES CA μ 10	STANDARD TECHNICAL CONDITIONS	UNIT	NOMINAL VALUES	MIN. VALUES	MAX. VALUES
Notes			-		
Number of channel			2 + push-pull		
Function			Standalone voltage amplifier board		
Cooling			Natural convection		
Protection			None		
Main voltage	Standard main supply	VDC	5 ... 12		
Control input voltage	Standard environment	V	0 ... 3,3		
Min. output voltage	Standard environment	V	5		
Max. output voltage	Standard environment	V	150	145.0	160.0
Gain	Standard environment	V/V	45	42.8	47.3
Max. output current		A	5.00E-03	3.70E-03	6.30E-03
Max. output load capacitance		μ F	40	36.0	44.0
Signal to noise ratio	Noise measurement conditions	dB	70	80.0	90.0
Unloaded output bandwidth (-3dB)		Hz	1000	900	1100
Loaded Output bandwidth (-3dB)	Standard load	Hz	9	8.6	9.4
Input impedance		kOhms	10	9.5	10.5
Mass		g	2.20E+00	-	-
Dimensions		mm	27*25*7		
Connectors	Hirose 2, 5, 8 pts, pitch 1,25 mm				

2.1 Main connections

Connect the CA μ 10 driver with the following AWG30 cable on the different soldering pads:

- Battery & its return line (Main voltage) : To supply the high voltage amplifier
- SPI bus or optional analogue signals: \sync, din and sclk are the main signals. however, if synchronization between the channels is required, connect \ldac to synchronise the output dac with \ldac signal.
- 3v3 signal & its return line (Control Input Voltage): to supply the da converter
- out1 (output Voltage)

2.2 Analogue connections

In the case where the order is an analogue signal, its possible to send directly this signal (if its range is in the range of the input driver- See datasheet) on the input of the high power amplifier. The following instruction must be apply to avoid damage: the input tension must be lower than 3.3V.

2.4. Protocol for SPI transfer

The protocol to control the Digital to Analogue converter is based on the SPI protocol. A same circuit provides the 2 output analogue signals from only one serial data transfer.

See Ca μ 10 instruction manual for more information.