



Specifications and Operation Manual

PiezoClamping Calibration Kit



ATCP Physical Engineering

Rua Lêda Vassimon, n° 735-A - Ribeirão Preto - SP / Brazil - 14.026-567

Telephone: +55 (16) 3289-9481 / E-mail: ha@atcp-ndt.com

www.atcp-ndt.com

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1. Introduction

This installation and operation manual contain important and necessary information for the correct use and maintenance of the PiezoClamping Calibration Kit.



Read this manual carefully before using the equipment. Its misuse may compromise the results and cause damage.

PiezoClamping Calibration Kit provides standardized electrical charges (5.50, 11.00, 16.50 and 22.00 μC) for testing the instrument PiezoClamping® with regards electrical charge measurement. This functional test is recommended to guarantee the reliability of quality control processes employing PiezoClamping®.

This manual aim instructing the user on how to set and operate the PiezoClamping Calibration Kit.

2. Definitions and symbology

2.1. Definitions


Electrical charge: Charge is the fundamental property of forms of matter that exhibit electrostatic attraction or repulsion in the presence of other matter. The unit for electric charge is the Coulomb (C). The Coulomb is defined as the quantity of charge that passes through the cross section of an electrical conductor carrying one ampere for one second.

Voltage: Voltage is the difference in electric potential between two places. It is what makes electric charges move. The unit for electrical potential difference, or voltage, is the Volt (V).

Capacitor: The capacitor is a component which has the ability to store electrical charge producing a static voltage across its plates.

Capacitance: Capacitance is the measure of a capacitors ability to store an electrical charge onto its two plates. The unit for capacitance is the Farad (F). Capacitance is defined as being that a capacitor has the capacitance of one Farad when a charge of one Coulomb is stored on the plates by a voltage of one Volt.

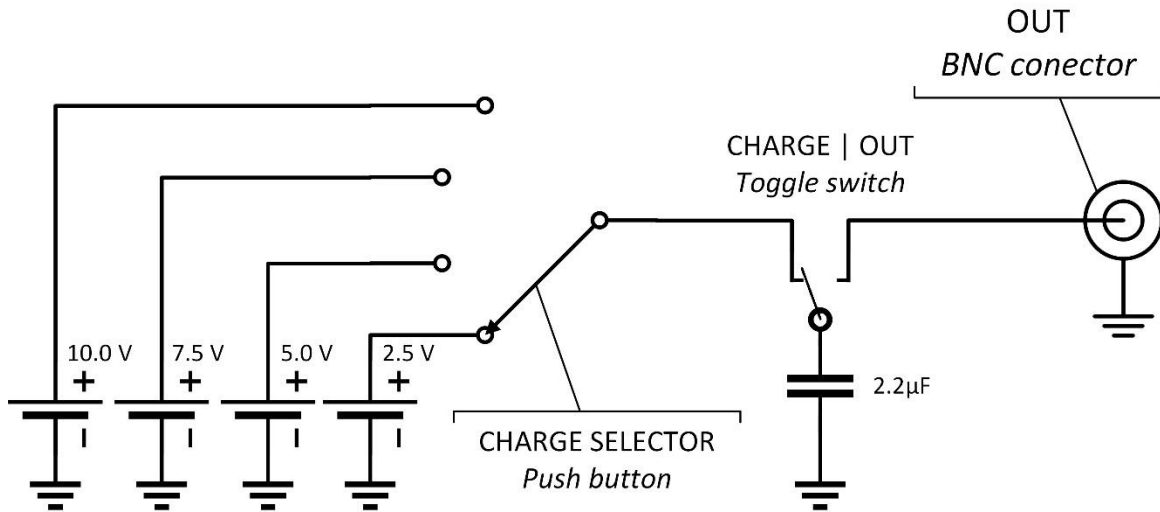
2.2. Symbology

	Attention! Danger!	V	Volts direct current
Q	Electrical charge	C	Capacitance

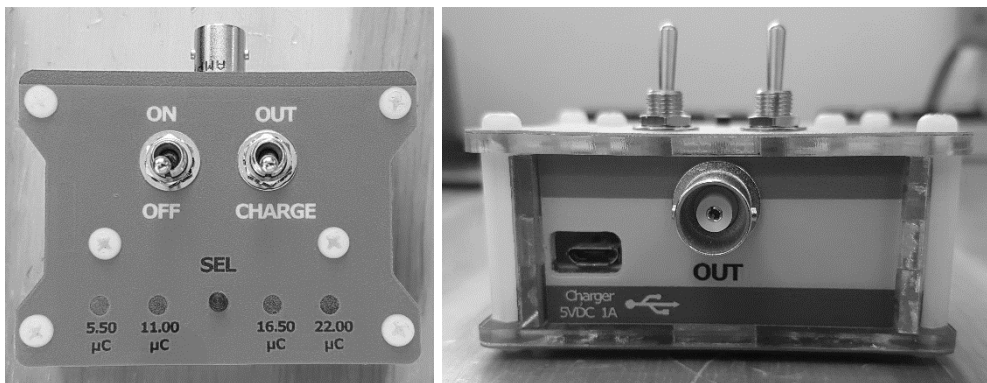
3. Operation principle, nominal charges and uncertainty

3.1. Operation principle

The operation principle of PiezoClamping Calibration Kit consists in charging a capacitor of 2.2 μF applying a selectable precision voltage and then discharge it to the PiezoClamping® equipment. The internal voltage options are 2.0, 5.0, 7.5, and 10.0 Volts. This approach provides a progressive charge and voltage levels.



PiezoClamping Calibration Kit simplified schematics.



PiezoClamping Calibration Kit top and side view.

3.2. Nominal charges and uncertainty

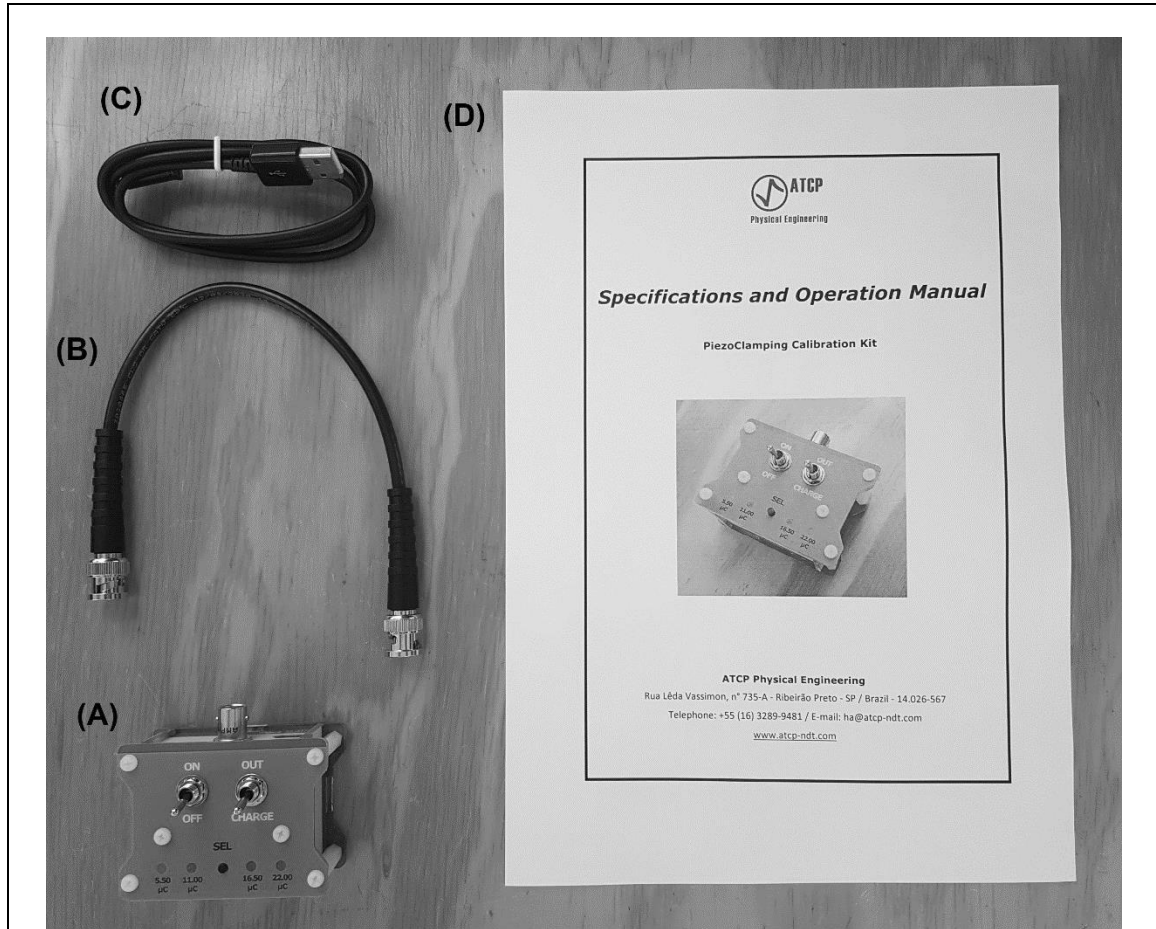
PiezoClamping Calibration Kit is able to provide 04 charge options at progressive voltage levels as shown below.

Table 1 - PiezoClamping Calibration Kit charge options.

Selection	Nominal charge Q	Uncertainty	Voltage
1	5.50 μC	±5 % (±0.27 μC)	2.5 V
2	11.00 μC	±5 % (±0.55 μC)	5.0 V
3	16.50 μC	±5 % (±0.82 μC)	7.5 V
4	22.00 μC	±5 % (±1.10 μC)	10.0 V

4. Parts, accessories and optional items

PiezoClamping Calibration Kit is provided with the items described next.

**Parts:**

- PiezoClamping Calibration Kit (A).

Accessories:

- BNC-BNC cable (B).
- USB cable (C).
- Specifications and Operation Manual (D).

Optional items:

- Calibration certificate (not shown).

5. Technical specifications and elements identification

5.1. Technical specifications

Range

Electrical charge	5.50 - 22.00 μC
Accuracy	$\pm 5 \%$
Precision	$\pm 0.05 \%$

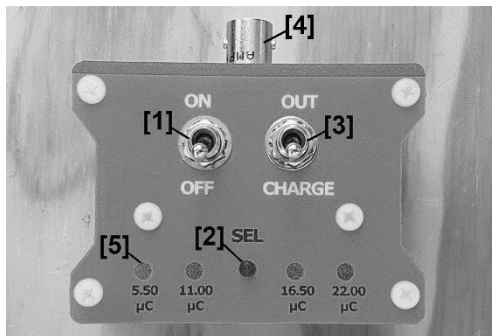
Setting parameters

Electrical charge	5.50, 11.0, 16.50 and 22.00 μC
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Other specifications

Electrical shock protection	Class I
Protection level IP	IP40
Battery run time	40 hours
Charger DC input	5 VDC / 0.5 A
Equipment dimensions (W x L x H)	70 x 62 x 50 mm
Equipment weight without packaging	85 g
Working temperature range	From -10 to +45 °C

5.2. Elements identification



[1] ON/OFF toggle switch

Switch to turn the equipment ON and OFF.

[2] Charge selector push button

Press and hold briefly to change the charge selection.

[3] OUT/CHARGE toggle switch

Switch the internal capacitor between "CHARGE" and the BNC connector "OUT".

[4] BNC connector "OUT"

Connect the PiezoClamping® here using a BNC-BNC cable.

[5] LEDs

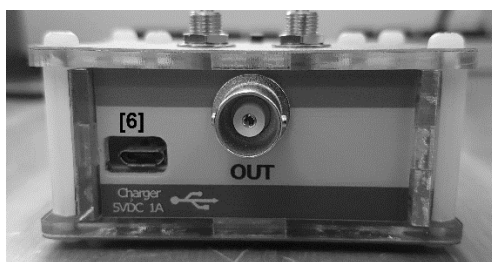
Indicates the selected charge.

[6] USB charger entry

Connect to a cell phone charger (5VDC/0.5A) to charge the internal battery.

[7] TAGs

Code, model and serial number.

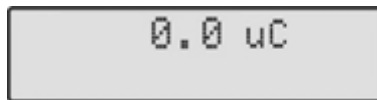


6. Configuration and use

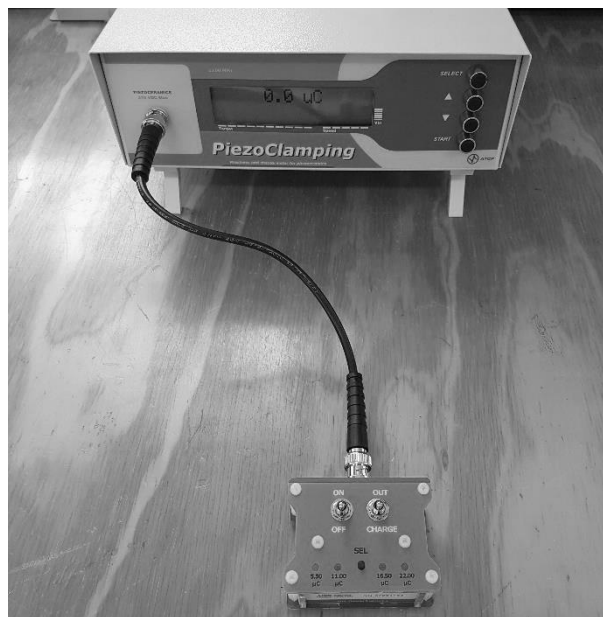
This section describes how to configure and use the PiezoClamping Calibration Kit to calibrate the PiezoClamping® equipment.

Step-by-step procedure:

Step 01 Turn the PiezoClamping® equipment on. Then press [▲] or [▼] to access the charge display screen, as shown in the figure below:



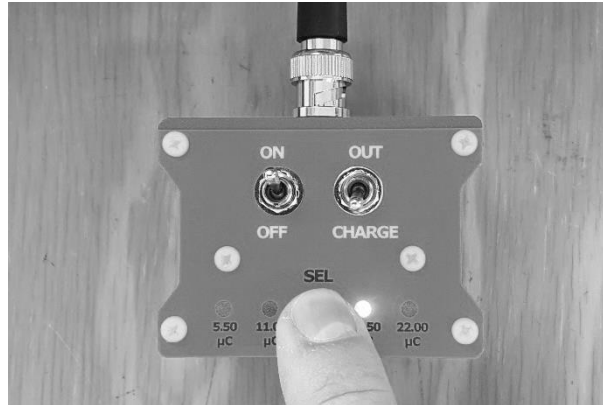
Step 02 Connect the Calibration Kit connector "OUT" [4] to the PiezoClamping® panel using the BNC-BNC (A) cable.



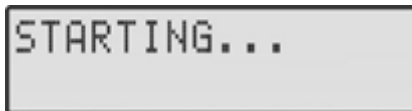
Step 03 Switch the Calibration Kit ON using the toggle switch ON/OFF [1], one of the charge indicator LEDs [5] should light up. Then ensure the toggle switch OUT/CHARGE is in "CHARGE" position.



Step 04 Press the charge selector [2] to select the charge (5.50, 11.0, 16.50 or 22.00 μC).



Step 05 Press [START] on PiezoClamping® to tare the equipment and start a new charge measurement.



Step 06 Change the toggle switch OUT/CHARGE to "OUT" in order to discharge the selected charge in the PiezoClamping®.



Step 07 Read the result on the PiezoClamping® display, the result should match the selected charge with $\pm 5\%$ tolerance.



To perform additional charge measurements, repeat steps 04 to 07.

Table 2 – Measurement acceptance intervals.

Selection	Nominal charge Q	Minimum	Maximum
1	5.50 $\mu\text{C} \pm 5 \%$	5,22 μC	5.77 μC
2	11.00 $\mu\text{C} \pm 5 \%$	10.45 μC	11.55 μC
3	16.50 $\mu\text{C} \pm 5 \%$	15.67 μC	17.32 μC
4	22.00 $\mu\text{C} \pm 5 \%$	20.90 μC	23.10 μC

As the values measured by PiezoClamping are within Table 2 acceptance ranges, the PiezoClamping® equipment is calibrated and no action is needed. If any the results were out of range, the PiezoClamping® must be sent for service.



Turn the Calibration Kit off after use it to avoid battery depletion.

7. Battery charging

Follow these steps to charge the PiezoClamping Calibration Kit battery:

Step 01 Switch the Calibration Kit OFF using the toggle switch ON/OFF [1].



Step 02 Connect a smartphone charger (not included) to the USB charger entry [6] using the USB cable (B). The charge is complete when the charging LED goes out.



8. Troubleshooting

Problem	Possible cause	Solution
The PiezoClamping Calibration Kit does not turn on.	The ON/OFF toggle switch is on the "OFF" position.	Move the toggle switch to the "ON" position.
	The battery is depleted.	Charge the battery (see topic 7).
PiezoClamping cannot do the charge measurement, or The measurements are not reproducible.	The BNC-BNC cable is not connected.	Connect the BNC-BNC cable.
	The BNC-BNC cable presents poor contact or one of the internal wires has been interrupted.	Replace the BNC-BNC cable.
	The PiezoClamping Calibration Kit is faulty.	Send the unit for service.
The PiezoClamping Calibration battery does not charge.	The USB cable is not connected.	Connect the USB cable.
	The USB cable presents poor contact or one of the internal wires has been interrupted.	Replace the USB cable.
	The smartphone charger is faulty.	Replace the smartphone charger.

9. Technical support, warranty terms and statement of responsibility

If the equipment is defective or malfunctioning, check if the problem is related to any of those listed in topic 8 and follow the troubleshooting instructions. If the problem remains or is not listed in topic 8, please contact the ATCP Physical Engineering for further analysis and possible repairs.

ATCP Physical Engineering offers two-year warranty from the date of purchase. The warranty covers material and/or manufacturing defects. After the end of the warranty period, services, parts and other expenses will be charged. Factors that may invalidate the warranty agreement:

- Lack of care as recommended by this manual in what regards the installation and operation of the equipment.
- Accident, fall, inadequate installation or any other damage caused by incorrect use or action of natural agents.
- Violation, repair or any other modification or alteration performed in the equipment or in its parts by ATCP Physical Engineering non-authorized personnel.

ATCP Physical Engineering takes full technical and legal responsibility for the PiezoClamping Calibration Kit guarantees that all the information contained in this Installation and Operation Manual is true.

- ▲ Reading all the information contained in this installation and operation manual is indispensable for the correct use of the equipment.
- ▲ Do not use the equipment for any other purposes other than the ones that have been indicated by this manual.