



# **aixPES**

## Piezoelectric Evaluation System



## aixPES – piezo test system since 2002

Since the first system was delivered in 2002 as a customized testing solution for bulk ceramics, the aixPES system became the in-official industry standard for piezoelectric testing.

Initially, the system was used for comprehensive electrical and electro-mechanical characterization of piezoelectric bulk samples.

Today a broad variety of sample holders can be connected to the basic system. This enlarges the number of different material systems and devices that can be characterized.

It transforms a simple measurement tool into a complex multifunctional test system following the idea of a shared testing facility.

On the following pages you will find a selection of the most common sample holders that are used with our aixPES.



## Key Facts

### Flexible configurations

The system can be extended according to customers testing demands due to the field upgradeability.

### Proven accuracy and repeatability

aixACCT guarantees an overall accuracy of the customized setup and not only for each of the components.

### Unique temperature ranges

Depending on the sample holder it is possible to do automated measurements between -100°C and 600°C.

### High automation

The system can also be used for multiple sample testing using automated stages.

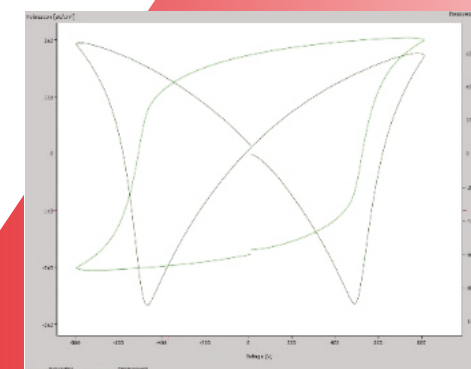
### Complete material characterization

The aixPES systems are able to follow research activities or product developments from prototype to product. There are examples for tests results performed by aixPES below .

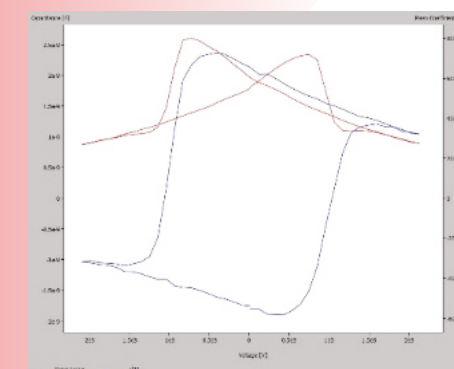


## Measurement Types

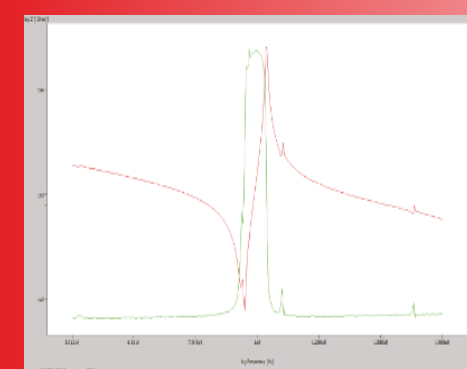
The aixPES enables complete electrical and electromechanical characterization of piezoelectric materials. Some example measurements are given on the right side.



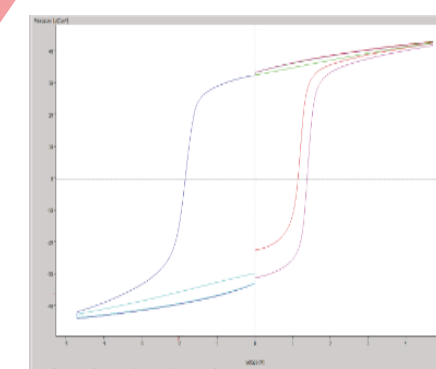
Large signal strain polarization



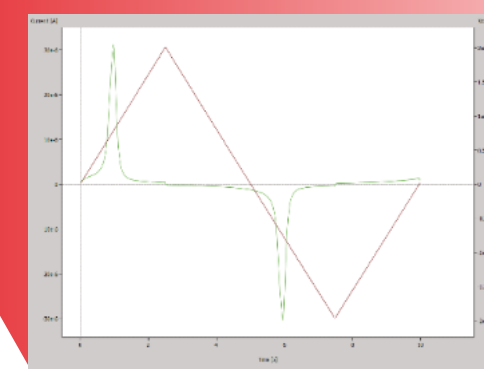
Small signal  $C(v)$  and  $d_{33}$



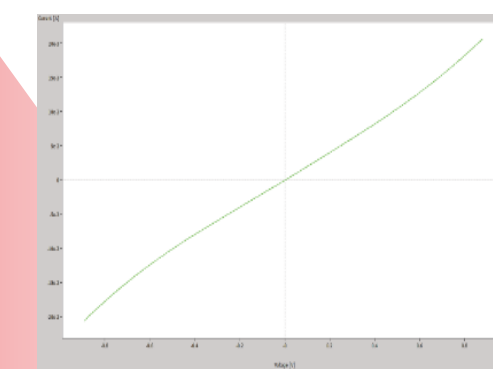
Impedance



PUND



Current vs voltage



IV measurements



## PSHU

### Piezo Sample Holder Unit

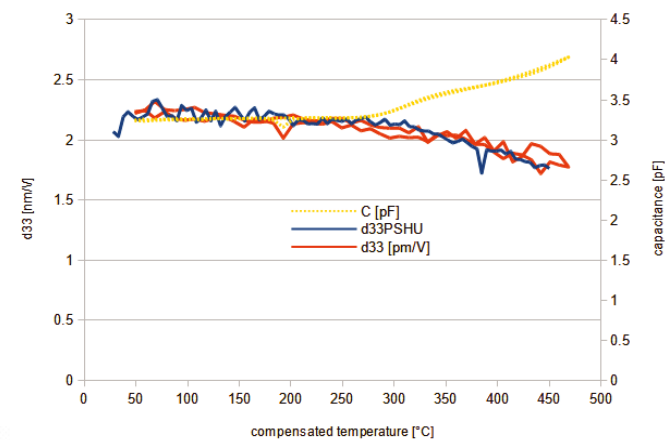
With the development of the first aixPES system, it was necessary to design a suitable sample holder for bulk ceramics. The aim was to design an easy to use setup that ensures a user independent acquirement of the sample characteristics and allows a reliable measurement within the complete temperature range.

The core development was a contacting system which covered two main functions: a proper contacting of the sample with applied voltages of up to 10kV that needs to be established and a reflection of the LASER beam to determine the deflection of the sample with a high accuracy.



### PSHU Kryo

The final expansion stage of the PSHU is the PSHU Kryo. It offers the widest temperature system for piezo electric testing on the market for piezoelectric bulk ceramic materials with a proven accuracy tested by x-cut quartz.



## aix4PB

The aix4PB measurement system utilizes a modified 4-point bending set up. This innovative set-up allows the application of homogeneous, well-defined mechanical stresses to the thin film, which guarantees a precise extraction of the piezoelectric coefficient with well defined boundary conditions.

This setup is now enhanced by a heating system which allows automated temperature dependent measurements. New automation functions like the measurement of electrical or mechanical fatigue are implemented. An integrated amplifier is able to apply DC bias voltages up to +/- 60V.





## TFSHU

### Thin Film Sample Holder Unit

The TFSHU is a sophisticated test fixture for electrical testing of thin film materials. The innovative concept has been proven on the market for several years.

During the last years we continuously improved and added new features to the basic concept.

This basic concept consists of a contacting system and heating unit that is integrated into the sample holder. It allows an electrical testing of thin film materials under different temperatures. These investigations are essential for the development of actuator or sensor materials.

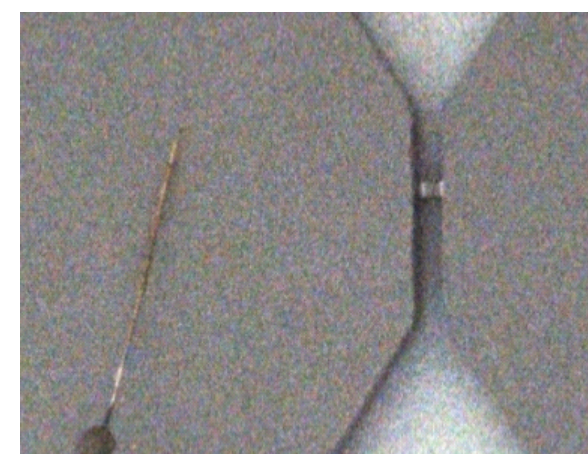
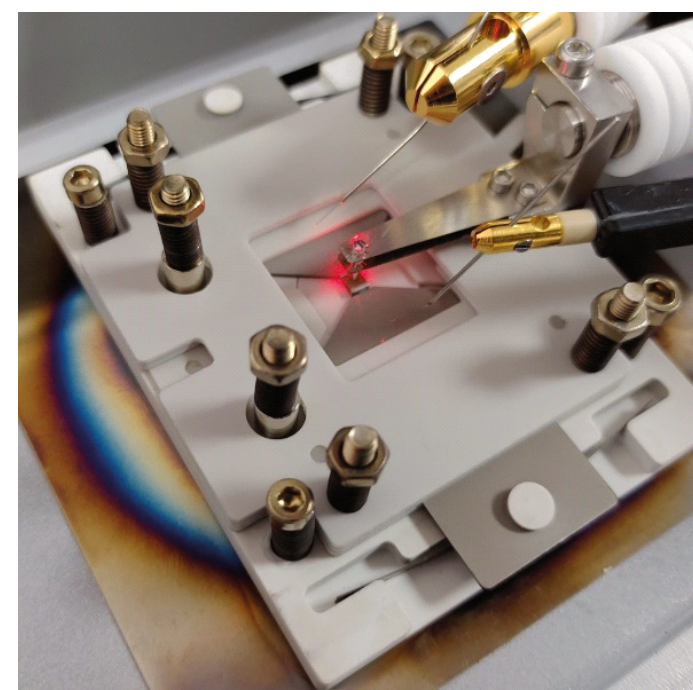
The basic system can be upgraded with several functions like the microscope camera system for contacting small electrodes, the LASER system for measurement of Mems structures or thick films, the HV options and much more. Additionally, a HT Kryo version extends the wide temperature range of the TFSHU even more.

Thus the TFSHU is one of the most flexible sample holders for thin film testing on the market.



### aixDUST

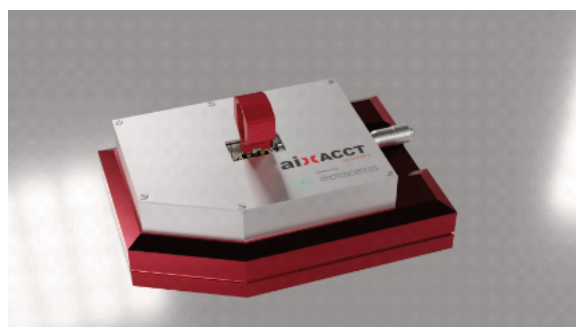
The aixDUST extension (Dielectric Universal Sample Tester) is the newest of multiple available extensions for the TFSHU. With the aixDUST, it is possible to contact and characterize MLCCs with sample sizes down to metric 0402 (400  $\mu\text{m}$  x 200  $\mu\text{m}$ ).



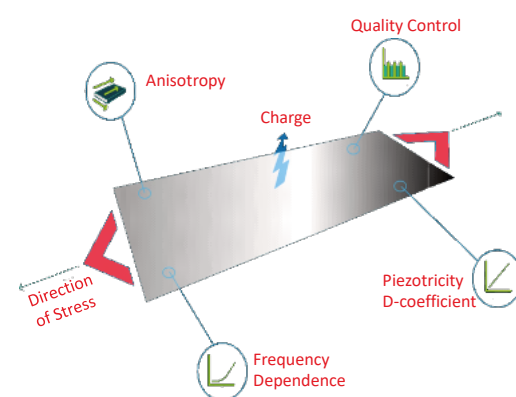


## The ESPY31

### Piezoelectric Meter for Polymer Sheet



The ESPY31 enables quick and precise measurement of the piezoelectric  $d_{31}$  and  $d_{32}$  coefficients of piezoelectric polymer films or other soft piezoelectric materials such as fibres or membranes. It contains an integrated force measurement cell. It is a highly sensitive measuring device that can also be used to measure other electric properties, like P-E hysteresis or capacitance.



### ESPY31 - Key Facts

#### Flexible configurations

The setup can be ordered with a new aixPES or as upgrade to existing systems.

#### Proven accuracy and repeatability

aixACCT guarantees an overall accuracy of the setup

#### Easy to use sample preparation

The systems comes with a separate mounting and cutting aid for easy preparation of the sample and a transfer tool to place the sample in the device.

#### Complete material characterisation

In combination with our aixPES tools, it covers the entire range of piezoelectric polymer characterisation.

## Scanning systems

The scanning systems are used for comprehensive electrical and electro-mechanical characterization of piezoelectric materials like Cantilever or membranes processed on up to 8 inch wafers or arrays of bulk materials.

Large and small signal material characteristics of these piezo electric materials and devices can be evaluated over a wide temperature range. For electrical excitation signals, a various number of high voltage amplifiers are available.

The automation assistant is able to control up to 8 inch automatic stages with a semi-automatic alignment system. These enables the user to create a wafer map of the characteristic values.



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