Nazwa urządzenia do zakupu	System for the characterization of ferroelectric properties of thin films and nanoelectronic devices
Charakterystyka	An integrated measurement system with a modular structure based on a personal computer enabling static and dynamic hysteresis measurements (S/DHM), PUND characterization (Positive-Up-Negative-Down), pulse measurements (PM), retention time (RM), leakage currents (LC), small-signal capacitance (Css) and fatigue (FM). The device must be equipped with software that controls the measurement mode and sequence and enables the acquisition and graphical representation of measurement results. The device is generally intended to directly measure a material's polarization (P) due to an applied external electric field (E). The P-E(V) hysteresis measurement is a representative method confirming the occurrence of the ferroelectric effect and characterizing the degree of polarization of the examined material. The remanent polarization (Pr) and the coercive field (Ec) will be extracted based on this type of measurement.

Parametry techniczne	Hysteresis measurements (HM): • Frequency range: in the minimum range from 10 mHz up to 1 MHz with the possibility to set any value within this range • Arbitrary waveform for dynamic hysteresis measurement, triangle, and sine wave • Accuracy of polarization measurement: minimum 10 fC Pulse measurements (PM): • Frequency/write pulse width: down to 50 ns • Read pulse width: down to 300 ns • Possibility to set the parameter shape (rise/fall time) and pulse duration • Delay of pulse read time: minimum in the range from 1 s up to 100 s Retention time (RM): • Frequency/pulse width: down to 50 ns • Retention time range: minimum from 1 up to 10^8 s • Number of measurement points within one decade: in the minimum range from 1 up to 10 Leakage current measurements (LC): • Current measurement range: minimum from 1 pA up to 100 mA • Measurement using staircase signal, step duration in the minimum range from 2 s up to 100 s Small-signal capacitance measurement (Css): • Bias voltage range: minimum from -30 V up to +30 V • Small-signal frequency: in the minimum range from 1 Hz up to 1 MHz • Arbitrary waveform generator: triangular or step bias • The area resolution minimum in the range from 0.05 μm^2 up to 1 m^2 Fatigue measurements (FM): • Frequency range: minimum up to 16 MHz • Number of pulses: in the minimum range from 1 up to 10^{16} • Number of measurement points within one decade: in the minimum range from 1 up to 10 Control and data Analysis software: • Possibility to present measurement results in a graph with various coordinates, e.g., current-voltage, capacity-voltage, polarization-voltage, polarization-time, etc. • Possibility to compare measured data in one graph • Possibility to define the shapes and measurement pulses • Possibility to export measurement results in ASCII and to a Word file Steering computer: • Processor: minimum 3 GHz, minimum two cores • Memory: minimum 4 GB • Hard disk: minimum 160 GB • Operating system: Windows minimum 10

	• Equipped with a keyboard, mouse, and a complete set of cables and other elements, enabling to start working with the measuring device immediately
	• Equipped in analog card allowing the implementation of measurements as mentioned above:
	  ○ Sample rate: up to 20 Ms/s, resolution 16 bit at the minimum voltage range from -10V up to +10V
	  ○ Minimum four input channels, capture rate minimum 30 ns
	  ○ Arbitrary waveform generator: sample rate up to 100 Ms/s
	  ○ Output channel: minimum range of pulse widths from 50 ns up to 1000 s; power bandwidth 1 MHz at 10 V