

Sinoceramics
Piezo d33 Test System

Sinoceramics, Inc.

Sinoceramics Part Number YE2730
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1. DESCRIPTION

The Model YE2730 d33 meter is a special instrument for directly measuring the piezoelectric constant d33 values of piezoelectric ceramics, polymers, and single crystals. This meter can also measure the d33 values in various single crystal directions for crystals such as lithium niobate, quartz, and tourmaline. This meter is capable for measuring the d33 value over a very large range, at high resolution, and with a high degree of reliability. The measurement is quick, and easily made with a minimum of training required. Specimens of a variety of sizes and shapes can easily be accommodated and measured. For example, the d33 value of disks, blocks, rings, tubes and semispherical shells can be easily measured on the Model YE2730 d33 meter. The direct d33 value readout is displayed on a 3 1/2 inch digital meter. This instrument is invaluable as a tool for quality assurance of piezoelectric materials, production in-line inspection, or for research applications.

2. SPECIFICATIONS

D33 Range: x 1 range: 10 to 2000 pC/N
x 0.1 range: 1 to 200 pC/N

Accuracy: x 1 range: $\pm 2\%$ of the d33 value in 100 to 2000 pC/N
 $\pm 5\%$ of the d33 value in 10 to 200 pC/N
x 0.1 range: $\pm 2\%$ of the d33 value in 10 to 200 pC/N
 $\pm 5\%$ of the d33 value in 1 to 20 pC/N

Resolution: x 1 range: 1 pC/N
x 0.1 range: 0.1 pC/N

Force: Frequency: 110Hz Amplitude: 0.25N

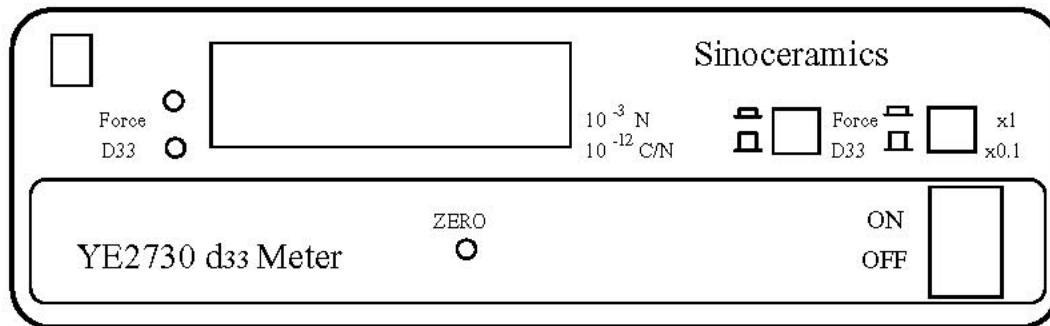
Polarity indication:
Indicates polarity on upper face of test element in compression.
(- sign means negative, no sign positive)

Shunt Capacitance: 1 pF (for x 1 range)
0.1 pF (for x 0.1 range)

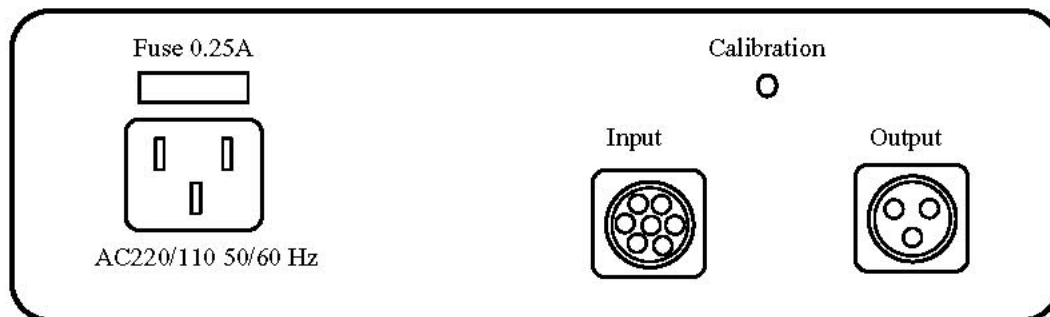
Dimensions: Force Head: 110x140mm Chassis: 280x200x90mm

Weight: Force Head: 3 kg Chassis: 2 kg

Power: 110/220V, 50/60Hz, 20W



Front



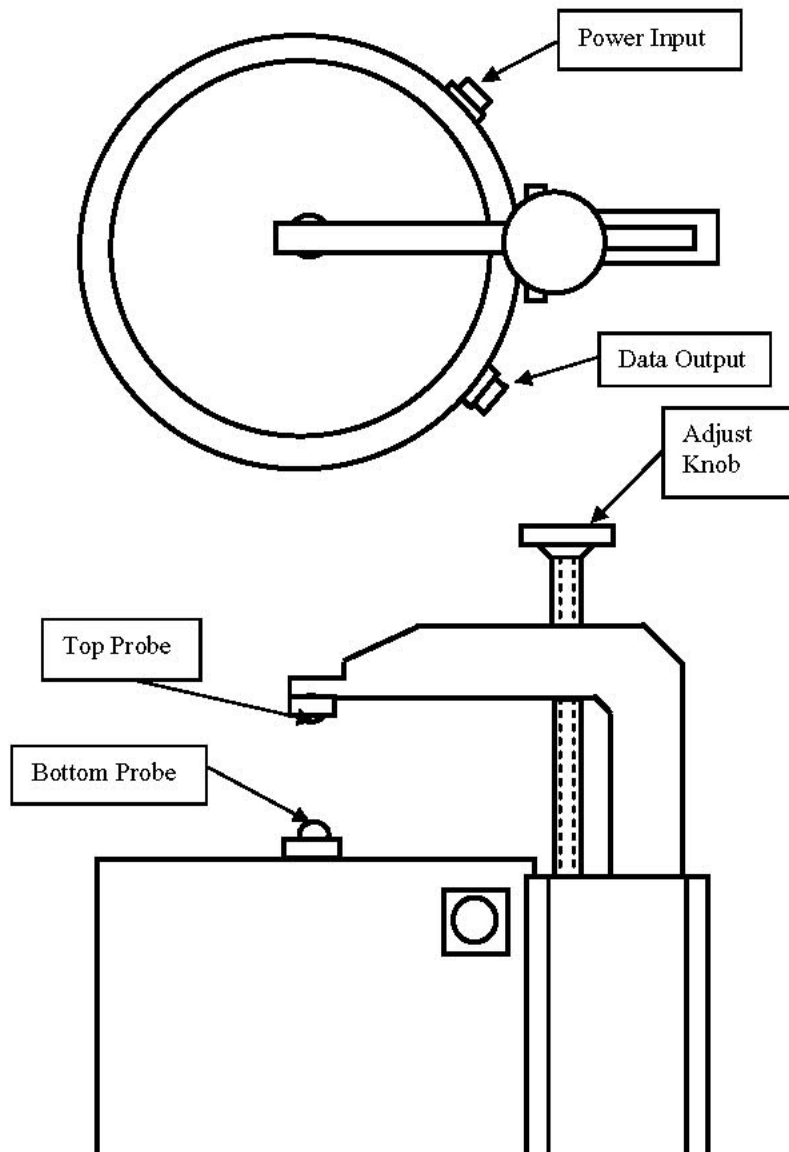
Back

3. FRONT PANEL OVERVIEW

1. D_{33} Range Key: Chose from x1 or x0.1. Pushing down (x 1), the measuring rang is from 10 to 2000 pC/N, resolution is 1pC/N for normal piezo material such as piezo ceramics. Pushing up (x0.1), the measuring rang is 1 to 200 pC/N, resolution is 0.1pC/N for low piezoelectric constant material such as piezo crystal.
2. Force and D_{33} Key: Pushing down the force light is on. The digital display show the force put on the simple by the shaker. The display should show at $(250 \pm 10) \times 10^{-3}$ N. If the force is too high or too low ($> 250 \pm 20$) $\times 10^{-3}$ N. You have to turn the knob of the shaker screw for adjusting the clamping force on the test sample.
3. 3 1/2 digital display show the force put on the test ample or the D_{33} value of the test sample. The display indicates polarity on upper face of test element in compression. (- sign means negative, no sign positive)
4. Power switch turn on the display and display light of force or D_{33} will turn on.
5. Zero adjust screw: adjust this screw can get system balance for high accuracy measuring result. (see **calibration**)

4. BACK PANEL OVERVIEW

1. Out put plug: Three pins plug is connected with the shaker to supply shaker power, let shaker can out put 110 Hz and 0.25 N force.
2. Input put plug: Eight pins plug is connected with the shaker pick up the signal from shaker.
3. AC power plug: AC 60/50 Hz, 110/220 Volt AC plug with 0.5A Fuse for 110V AC power, 0.25A for 220V AC power supply. Before plug in AC power Please check local AC power voltage, and meter AC voltage set up.



5. SHARKER OVERVIEW

1. Adjust knob: Turn the adjusting knob drive the top probe up or down. The test sample will be clamped between the top probe and bottom probe. Do not crew the sample too tight.
2. Top and Bottom probe transfer signal from the test sample to measuring system, and hold the sample driving the sample vibration.
3. Output and Input connector: Three input pins plug is connected with the meter to supply shaker power. Eight pins output plug is connected with the meter sent the signal to meter.

6. SETUP AND CALIBRATION

1. Connected the meter input and output plug with shaker output and input plug by the two cables supplied with the system.
2. Turn on the meter for 15 minutes, Put the standard test sample between the up and bottom probes.
3. Turn the Force and D_{33} switch to Force. The meter read out should be $(250 \pm 10) \times 10^{-3}$ N. If not just the probes knob. Keep the meter read out is $(250 \pm 10) \times 10^{-3}$ N.
4. Turn the Force and D_{33} switch to D_{33} . The meter read out should be close the D_{33} value of the standard test sample. Write down the value of meter displayed for D1. Then turn the test sample 180° , measure the sample again. The meter will show opposite polarization and the D_{33} value for D2. If the two value are different $D1 \neq D2$, calculate the D3 by $(D1 + D2) \times 0.5$. Using the Zero point adjust knob get the meter display show the D3 value. Now the test sample negative and positive value should be same.
5. Adjust back panel calibration screw, let the meter display show same value as the standard test marked.
6. The manufacture already calibrates before the meter shipping out. But you need recalibrate begin to use or every month at lest.

7. OPERATION

1. Put the test parts between the two probes. The probes clamp as close the parts center as possible. Turn the probes adjust knob lightly clamp the test parts. Do not too tight clamp the parts. When the meter display is stable show the value good enough. If clamp too tight too loose will impact the test result.
2. If you want measure same thickness parts, you can just push lightly down the bottom probe then change the test parts. Do not need adjust the knob.
3. Two different shape probe heads are supplied with the meter. We recommend using the com shape probe head to measure most samples. Only measuring big size with flat suffice sample, one of flat probe head can be put on bottom probe.
4. When measuring large capacitance sample, the meter read out value need modification. If not, the accuracy will be more then 1%. Following equation be used to calculate the true value.

$$D_{33}(\text{modified}) = D_{33}(\text{Display}) \times (1 + C_o) \text{ For switch on " x1 "}$$

$$D_{33}(\text{modified}) = D_{33}(\text{Display}) \times (1 + 10C_o) \text{ For switch on " x0.1 "}$$

C_o = capacitor of sample (μF)

8. CALCULATE ϵ_{33} AND G_{33}

The relative dielectric constant $\epsilon_{33} = (T \times C) \div (\epsilon_0 \times S)$

T = The thickness of the sample (m)

S = The area of simple electrode (m^2)

C = The capacitance of the sample (F)

$\epsilon_0 = 8.85 \times 10^{-12}$ F/m

The Piezo voltage $G_{33} = D_{33} \div \epsilon_{33}$

9. MAINTENANCE

This system is maintenance free. If you find any trouble please sent back to us for fix.
Please read the menu carefully before turn on the meter.

Thank you for your interesting our D_{33} meter.

10. ACCESSORIES

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|--------------------------------------|----------|
| 1. Three wires cable with connectors | 1 piece |
| 2. Seven wires cable with connectors | 1 piece |
| 3. Power cord | 1 piece |
| 4. Core shape Probe head | 2 pieces |
| 5. Plate shape probe head | 2 pieces |
| 6. Standard test sample | 1 piece |
| 7. Fuse | 1 piece |
| 8. Operating manual | 1 piece |