PIEZOELECTRIC DEMONSTRATOR & CELL

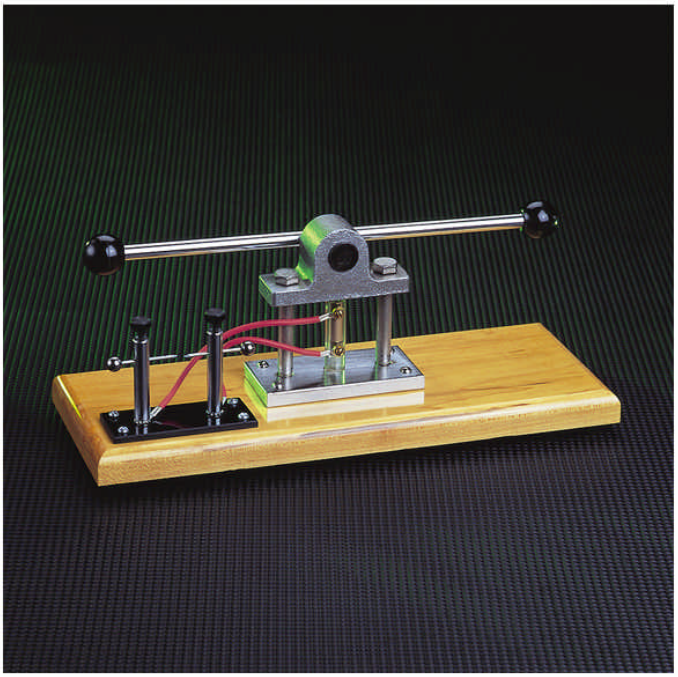
MODELS GS-710-A & GS-711

Piezoelectricity is an electric charge that is generated across certain crystals when subjected to stress. It is also true that when an electric field is applied to such a crystal, it will change shape. This property of many natural crystals such as quartz, Rochelle salt, barium titanate and tourmaline was discovered by Pierre and Jacques Curie in the 1880s. A clear understanding of the phenomena has made possible and practical the fabrication of ceramic materials that, with special processing, exhibit a high degree of piezoelectricity. The crystal in this unit is an example, being compounded of lead zirconate and lead titanate. It is mounted in a specially designed plastic case for visibility, protection and ease of demonstration.

The apparatus should be operated by pushing down on the lever with both hands. the lever should be centered; unbalance the downward force to one side or the other. With the spark gap set at 1/4" or less, movement of the lever up or down by a few inches will produce a spark. If, after many operations, the lever seems to travel too far before a spark occurs, the crown of the apparatus may be tightened by turning the two large nuts underneath the base. Tighten both nuts the same amount so as to keep the crown block parallel to the base. The lever should be horizontal during this adjustment. BE SURE TO OPERATE ON A STURDY TABLE OR BENCH.

Potentials in excess of 6,000 volts can easily be developed, as shown by the spark gap with the electrodes set at about 1/4". A rule of thumb for breakdown potential of air is about 25,000 volts per inch. It will be noted that there is a spark when pressure is applied as well as when it is released. Careful observation will show that they are of reverse polarities. A small neon lamp such as the standard NE-57 connected across the terminals is helpful in showing this reversal. If the terminals of the cell are connected to a high voltage AC (60 Hz) power supply (5 to 10 KV), the vibration of the crystal can be heard and felt at the crown block. CAUTION: BE VERY CAREFUL NOT TO GET YOUR FINGERS ACROSS THE HIGH VOLTAGE.

If the cell is stressed enough to generate a voltage, but not enough to jump the spark gap, it can be shown that the charge leaks off with time. Stress the cell and touch your



fingers across the terminals – you will feel a harmless tickle. Do this several times to assure yourself that you are generating a voltage, but on the last compression, do not touch the terminals. After a time lapse of 3 to 5 minutes, the charge will have dissipated. A final significant point is that piezoelectricity is a form of direct conversion of energy, from stress to electricity.

The GS-711 Piezoelectric Cell used in the GS-710A Demonstrator is available for purchase as a separate item. In use, pressure should be applied to the ends of the cell by means of a small vise. CAUTION: It is important that the pressure be applied by reasonably flat and parallel surfaces against the ends of the cell to avoid cracking the crystal. Obviously, you must be careful not to over-stress the crystal. With a little care, you can determine how hard to crank the vise by testing the output with your fingers touching the two terminals.

When using either the GS-710A or the GS-711, DO NOT attempt to measure the voltage with a voltmeter. Connecting across the terminals will dissipate the charge and may damage the instrument. Do not attempt to connect it to an oscilliscope. The high voltage will destroy the probes.

Wabash Instrument Corporation 300 Olive St., Wabash, IN 46992 Tel: 260.563.8406 www.winsco.com
For more information, please contact us: info@winsco.com