



TEL-X-Ometer

\$12,957.00



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TEL-2580M/2581

- Designed for teaching.
- Computer or manual control
- Complete System fits on a laboratory table.
- Lab manual included.
- Complete set up and operating instructions.
- Complies with Federal radiation protection standards.
- Compact size, light-in-weight, easy to store.

The Tel-X-Ometer x-ray machine and accessories have been designed specifically for use in teaching physics. Over thirty separate x-ray experiments (which begin with basic concepts of x-ray through complex experiments) are included in the laboratory manual provided with each system.

The Tel-X-Ometer is a spectrometer which can easily be adapted to become:

1. A Broad Beam of X-rays for analysis of the General Properties of X-rays.
2. A Single Bragg Diffractometer having a scale accuracy of 5 minutes of arc.
3. A Powder Camera for Debye/Scherrer experiments to an accuracy of 30 minutes of arc.
4. A fluorescent Radiation Emitter for a study of the Moseley Theory that every element is characterized by its Atomic Number.
5. An Experimental region for the mounting of innovative studies of the teacher's choice.

The x-ray machine can be carried easily by one person and set up on a

laboratory table with all accessories conveniently at hand. Calibrations and scales on the x-ray machine and accessories are clear and easy to read, even when teaching to a group of students around the table. The TEL-X-Ometer now comes with the TEL-X-Driver which allows the unit to be controlled with a computer.

We have built user safety into each machine through a number of safety switches and protective x-ray absorbing shields. Safety switches prevent operation if all covers are not closed and in the operating position. In addition, a keyed master switch gives the instructor complete control over the machine's operation.

Choose one of our three TEL-X-Ometer Systems to get all of the accessories to perform a series of experiments. You may also put together an individualized system by starting with the basic x-ray machine and x-ray tube and adding accessories. The Tel-X-Ometer x-ray machine and accessory components are individually priced and can be purchased separately.

All systems come with a 1 year warranty.

The Electronic System

The Spectrometer Table is supported in the horizontal plane by the flanged metal cylinder in which is housed all electronic circuits. On the front is located the control panel. Fuses and power supply selector switch are accessible on the underside of the cylinder.

The Tel-X-Ometer is supplied preset to operate at 30kV and 50 μ A. A small slide switch on the surface of the spectrometer table permits an alternative voltage of 20kV to be selected. High Voltage is derived from a solid state inverter circuit, followed by a Cockcroft-Walton type multiplier to provide a smooth DC output.

The regulation is such that when the optional 20kV anode voltage is

selected the tube current will remain at $50\mu\text{A}$. Operational characteristics of the circuit have been chosen to ensure that at both settings of the anode voltage, the tube current can be continuously varied from 20 to $80\mu\text{A}$, with the high voltage remaining within 1 kV of the selected values, 30 or 20kV.

The control for varying the tube current is recessed in the control panel and should not be adjusted without monitoring the current using the jack-plug provided and an external 10 V DC meter.

The high voltage generator operates at high frequency which provides an audible indication that the instrument is operating. An external audible indicator can be connected if required by means of the jack-plug recessed in the control panel.

The Selector Switch on the underside of the flanged cylinder allows the Tel-X-Ometer to operate from 110, 220 or 240 volts $\pm 10\%$, 50 or 60 Hz single phase. Power is supplied to the unit by a grounded power cord 2 meters in length.

The Mechanical System

The rotary mechanism mounted at the axis of the spectrometer table is coupled by a planet-wheel 2:1 drive system to the spectrometer radial arm. A spring-loaded clutch permits the 2:1 drive to be disengaged.

The slide-carriage fixed to the radial arm accepts 50mm square slides, a Geiger-Muller tube holder and a variety of objects supplied in the accessory kits. The carriage arm can be rotated from 12° to 120° on either side of the beam axis — the spectrometer zero line. It can also be locked in the axis of the beam. The Manual Control for the arm and the Fine Adjustment Control are located at the extremity of the carriage arm and outside the radiation cover.

Computer Control

The TEL-X-Driver comes complete with everything you need to automate data taking with the TEL-X-Ometer. Take data from 12 to 120 degrees with a maximum resolution of 0.05 degrees. The time per step is also selectable from 0.5 sec to 20 seconds. Calibrate to an accuracy of 0.1 degrees using the known Bragg angle of LiF. Scans can be obtained for all 4 of the crystals — NaCl, LiF, KCl, and RbCl — available for use with the TEL-X-Ometer. An additional feature includes the ability to scan powders and foils.

The TEL-X-Driver powers the stepper motor. The GM tube can be connected directly to this unit, negating the need for an additional scalar or ratemeter. Software allows selection of scan angles, resolution, and time/step. Data is automatically saved every 30 seconds thus preventing the loss of data during a long scan in the event of a power failure. Once the experiment is completed the software permits zoom-in on the data and the facility to add comments to the file. Data can be exported to a spreadsheet for further analysis.

Safety Interlocks & Indicators

When the plastic radiation cover is raised, the voltage supply to the anode of the X-ray tube is interrupted. Only on closing the cover and operating the “X-rays ON” push-button can the high voltage supply to the anode be established.

As a further safeguard an electrically operated “TIME SWITCH” is built into the system. Lapsed times can be selected up to a maximum of 55 minutes. A friction override is provided to shorten or lengthen the lapsed time as required.

The “X-rays ON” lamp and the “POWER ON” lamp are located on the surface of the spectrometer table where they can be readily observed.

The special X-ray tube, TEL-2581 protrudes through the cast aluminum base of the spectrometer table and is mounted within a lead-glass

transparent dome. This thick lead-glass dome is held in position by a special interlock system which incorporates two micro-switches connected in series. The heater of the X-ray tube is activated by the “TIME SWITCH” and is visible through the lead-glass dome. This acts as a secondary indicator.

Radiation Protection for Students

The Tel-X-Ometer complies fully with safety standards established by the U.S. Department of Health, Education and Welfare in the 1968 “Radiation Control for Health and Safety Act.” Radiation dose rate at 0.1m from the accessible surface of the apparatus will not exceed 0.1mrem/hr. under normal operating conditions.

A card is included with each instrument for affixing to the door of the room where the Tel-X-Ometer is to be operated. This is a recommendation of the International Commission on Radiation Protection (ICRP).

A special lead-glass cover surrounds the X-ray tube itself, absorbing all X-rays, except those aimed at the experimental zone in a directed stream. A thick plastic transparent dome absorbs scattered radiation produced during system operation. The X-ray tube will only operate when both the lead-glass cover and plastic dome are closed, activating a three-contact-point interlock system. In addition, a lead backstop, attached to the dome, absorbs the X-rays that have passed through the experimental zone.

A Comprehensive X-Ray Curriculum

With a Tel-X-Ometer X-ray System students benefit from a complete X-ray physics curriculum—beginning with simple concepts and proceeding to the most complex. Over 30 different experiments can be performed with the Advanced Tel-X-Ometer X-ray System, all of which are detailed in the laboratory manual. Or you can choose one of two other specialized packages. Every System comes with detailed instructions on all

experimental procedures. All Systems can be upgraded by purchasing accessories separately.

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