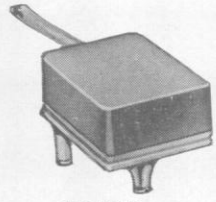
No. 3830A
DENSICHRON

Patent No. 2424933



PROBE

The Welch DENSICHRON®

ELECTRONIC DENSITOMETER

A Versatile Instrument for the Measurement of Reflectance and Transmittance

Makes Precision Light Measurements-Quickly-Accurately

The Welch Densichron is an electronic densitometer of good sensitivity and unusually high stability. It can be employed either for quantitative measurement of optical density, or as a sensing device for automatic control of various industrial processes in which constancy of transmitted or reflected light is a criterion of the quality or uniformity of the product.

It consists essentially of a probe unit containing a photoelectric tube for detecting light energy and an amplifier to which it is connected by a flexible cable. The amplifier incorporates a milliammeter calibrated to indicate either optical density on a "log" scale or percent transmission on a "linear" scale, depending upon the model.

The logarithmic optical-density scale extends from 0 to 1.5 and density is readable to 0.01. A three-step range switch increases the range to a maximum density of 4.5 with no loss in sensitivity or precision of readings. This range represents a linear response of the receiver to variations in light intensity of over 30,000 to 1.

The meter movement used in the log-scale model of the amplifier is designed in such a manner that the deflections are very nearly proportional to the logarithm of the reciprocal of the activating photoelectric current. This is advantageous in both densitometry and photometry inasmuch as optical density in both cases is this same function of photoelectric current and the scale can therefore be calibrated in essentially uniform increments of optical density. A lower scale on this meter is used for determining photographic exposure times.

The meter in the percent-transmission model uses a standard meter movement and indicates percent transmission on a linear scale. This may also be considered as percent reflectance or percent incident light upon the phototube. The full range of the scale for the first position of the range switch is from 0 to 100% transmission. Other positions of the switch provide ranges of 0 to 10%, 0 to 1% and 0 to 0.1%, respectively. The lower scale on this meter is calibrated to read directly the optical density corresponding to the percent transmission indicated on the upper scale.

The amplifier also produces an A.C. output signal, the voltage of which is a measure of the light intensity, and provision is made for utilizing the direct current of the ammeter circuit in an external circuit. The instrument therefore supplies a voltage which can be used to operate either a control mechanism or a standard ink recorder.

Principle of Operation

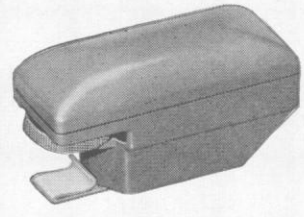
The outstanding feature of the Densichron is its patented system for magnetically modulating the space current in a phototube.* This is accomplished by applying a 60-cycle alternating magnetic field across the path of the electron beam, thereby deflecting the electrons from their path to the anode 120 times per second. The output current of the tube is thus changed from its normal steady value to a pulsating output with a frequency of 120 cycles per second. When the usual direct-current output of a phototube is amplified, the measuring instrument is subject to severe zero drift necessitating frequent recalibration, and its response is slow. The pulsating output from the Densichron phototube, however, is capable of stable, high-gain amplification with rapid response.

Although the Densichron can be used in a wide variety of ways it is a simple device to use and requires no special operator skill. It will perform satisfactorily in routine operations for long periods of time with little or no servicing, yet is readily adaptable to innumerable types of special measuring techniques.

* Henry P. Kalmus and George O. Striker, Rev. Sci. Inst., 19, 79 (1948).

3830A. DENSICHRON WITH BLUE PROBE. This consists of the amplifier with logarithmic-scale meter, blue-sensitive probe, metal probe support, five different measuring apertures, a cone with ⅛-inch aperture, and a set of instructions. The amplifier operates on 115 volts, 60-cycle A.C. only. except on special order. **Each, $225.00**

3830B. DENSICHRON WITH RED PROBE. This is identical with No. 3830A except that a red-sensitive probe is furnished in place of the blue-sensitive probe. **Each, $225.00**



No. 3832A
REFLECTION UNIT

3832A. REFLECTION UNIT. When coupled to the Densichron amplifier, this unit becomes a convenient reflectance meter. It has a self-contained light source, filter wheel, and phototube. Power for the lamp is taken from the amplifier through the same connector normally used for the probe. A viewing port permits the head to be correctly placed over the area to be measured. The unit includes optics for both small and large spot work, a calibrated gray scale, and three vitrolite working standards. **Each, $110.00**

W. M. WELCH SCIENTIFIC COMPANY

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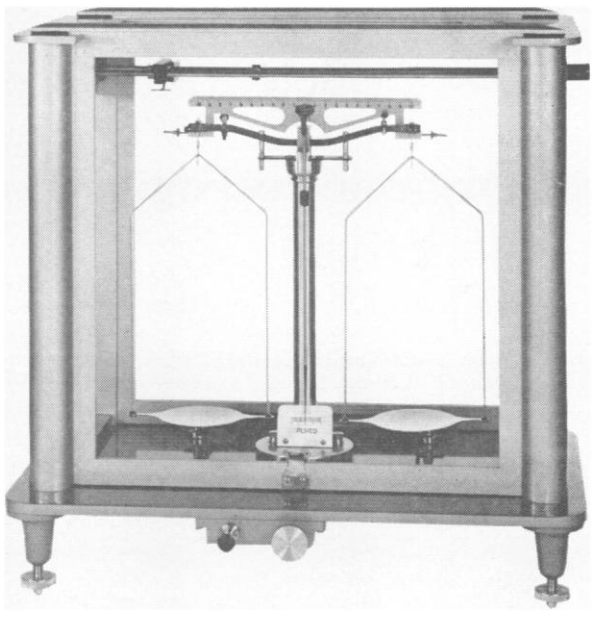
Manufacturers of Scientific Instruments and Laboratory Apparatus

AL·SI·CO(t)

analytical balance



THE AL - SI - CO(t) ANALYTICAL BALANCE is a rugged, grooved bearing balance, with an extruded aluminum cabinet. Many good features are incorporated in this low cost balance, recommended for use by students and industrial laboratories.

CAPACITY—200 grams on each pan.

SENSITIVITY—0.1 milligram with full load.

BEAM—Sawed from special aluminum and polished, 6½ inches long. Black graduations with center zero and 10 milligram range, each side of center.

KNIVES—Solid agate, triangular shape.

BEARINGS AND CENTERING DEVICE — Agate bearings with grooved ends and flat center. End knives of beam are always seated in the grooved bearings, to prevent side-slip and injury to knives or bearings.

RIDER CARRIER—Rider rod has two nickel-silver guide rails, and three oil-less bearings. One smooth motion carries rider over length of graduations.

RELEASING MECHANISM—Fallaway type, with three point suspension for beam.

PAN ARREST—Independent of main release, controlled by a self-locking button.

PANS—Stainless steel, 2½ inches diameter.

BOWS—Nickel-silver, 4 inches wide by 7⅞ inches high inside.

COLUMN—Brass, polished and lacquered.

INDEX PLATE—Double type with pointer swinging above, instead of in front of the graduations. Pointer forms a continuous line with each graduation. Parallax is reduced.

CABINET—Solid, extruded aluminum—not stamped or die cast—with upper part finished in bronze lacquer and lower part in hammertone. The smooth finish will not attract nor hold dust. Glass in top and sides. Counterpoised front sliding door. Removable rear sliding door. Dimensions: 17 inches high, 16¾ inches wide, 9¾ inches deep.

BASE—A solid aluminum slab with all working mechanism attached to the underside. Circular level and leveling screws.

2-444
AL-SI-CO Analytical Balance

Each **$105.00**

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