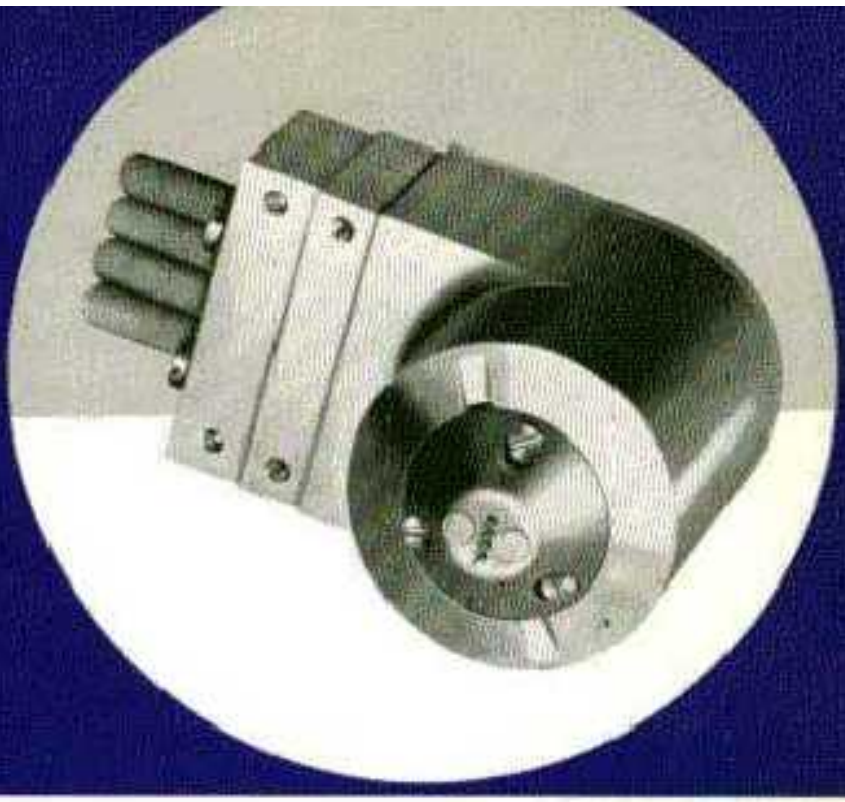
Linear 4-point probe

Spacing: 0-035in. max.



APPLICATIONS

(a) The determination of homogenous bulk and slice resistivity

(b) Epitaxial or diffused layer resistivity where the layer is of the opposite conductivity type to the substrate

(c) Thin film resistivity

PRINCIPAL FEATURES

- Ruby guides for maximum permanent accuracy
- Tungsten carbide tips for maximum life
- Jig bored for accurate geometry
- Needle pressures independently adjustable
- Individually ground tip radii
- High breakdown voltage—low leakage
- Thickness measuring needle optional
- World wide servicing

OPERATION

We recommend that the probe head is utilised in a Fell mounting—specifically designed to eliminate abrasion of the points by 'scrubbing'. The probe head should be tightly clamped in the bracket and the spade terminals connected to the terminal board on the mounting or directly to the associated electrical supply and readout equipment.

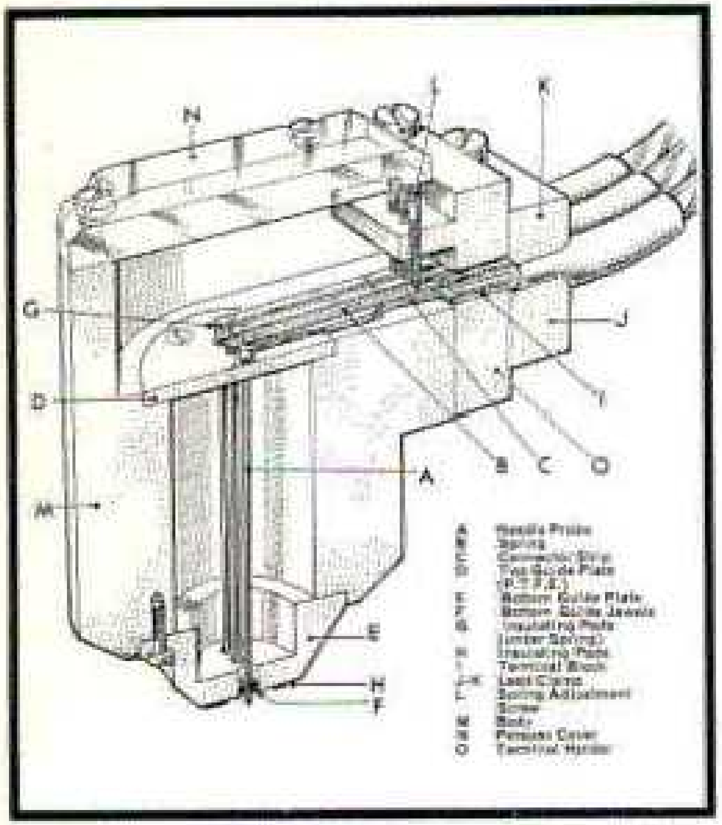
The raising and lowering unit should be set so that when the probe needles are just clear of the specimen the spring-hinged motion is approximately 2mm. above the horizontal.

The probe head needles should be lowered gently on to the specimen until the needles are fully recoiled and the insulating pads rest on it.

Jerky lowering may cause damage to the delicate material and for the same reason it is desirable that the voltage should not be applied until the needles have made contact.

A & M FELL (MANUFACTURING) LIMITED

SECTION OF TYPICAL PROBE HEAD



CONSTRUCTION

Four high-speed steel needles each 0.45mm, diameter provided with a precision burnished cylindrical end 0.30 [illegible] mm. dia. slide in ruby bearings 0.30 [illegible] mm. dia. at the nose of the probe where constraint is critical. To achieve the miniumum spacing of [illegible]cm = 0.636mm, the jewels are inserted on a sub-plate jig-bored from opposite sides so that the jewels are located in two planes.

The downward motion of each needle is limited by the radial shoulder between the precision burnished diameter and the 0·45mm, diameter of the high-speed steel shank. Owing to the axial displacement of the jewels the needles are alternately long and short so that their tips lie in a plane in the rest position.

Electrical connection is effected from the lead which enters the probe through a P.T.F.E. terminal block via a phosphor-bronze ligament soldered to the needle. Downward pressure is applied by an adjustable blade-spring acting on the burnished top of the needle through a polished ruby insulating pad.

In 5-point heads a fifth steel needle capped at each end by a ruby is fitted; its tip lies in the same plane as the electrical probes at the nose, while the upper portion projects through the perspex cover. The purpose of the fifth probe is to operate a thickness comparator on Model D (q.v.)

CALCULATION OF RESISTIVITY

The theory related to the electrical supply and readout apparatus is beyond the scope of this leaflet: a great variety of methods and equipment exist. We recommend the study of a paper, 'Measuring the properties of Semi-conductor Grade Materials' by E. Earlywine, L. P. Hilton and D. Townley of the Dow Corning Corporation, Henlock, Michigan U.S.A. which was published in the Journal 'Semiconductor Products and Solid State Technology', October, 1965.

This paper has an extensive bibliography including a number of articles concerned with resistivity measurement.

SPECIFICATION

PROBE SPACINGS: Three are available: [illegible]cm; 0·030in; 0·035in

SPACING TOLERANCE: ±0·010mm

LINEARITY TOLERANCE: ±0·010mm

MAXIMUM GUIDE CLEARANCE: 0·0065mm

NEEDLE TIPS:
MATERIAL: Tungsten carbide or 50% osmium alloy (specify). Osmium alloys i preferred by some who believe lower contact resistance may be achieved; it is not as hard as tungsten carbide.

RADIUS: for Silicon 0·04mm ±10%, for Germanium 0·10mm ±5%, (specify)

LOAD: 200gm. is standard ±2%
N.B. Thin epitaxial or diffused layers may require lower pressures (minimum load 20gm)

LEAKAGE RESISTANCE: at 500 volts: Lead to Lead 1×10^5MΩ Leads to Earth 5×10^4MΩ

A & M FELL (MANUFACTURING) LIMITED

F.G.A. WORKS □ DENTON □ NEWHAVEN
SUSSEX □ ENGLAND

Cables: DUKANUS Newhaven Telex: 87437 Phone: Newhaven 3583-4-5-6

PRINTED IN ENGLAND