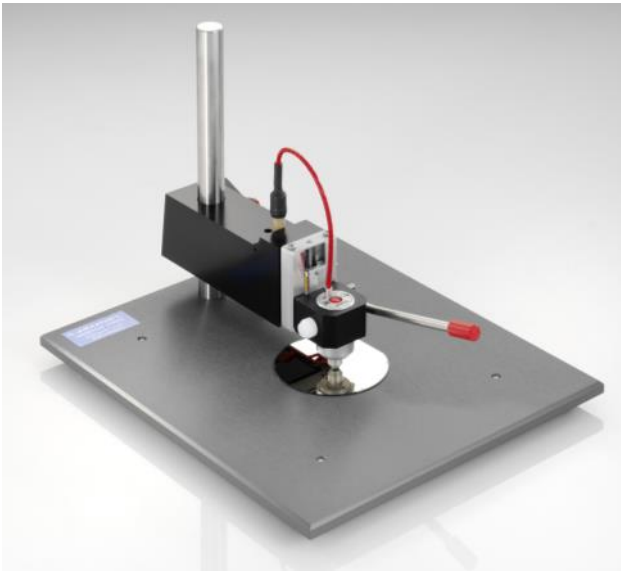


JANDEL ENGINEERING LTD.

Multi Height Probe with ResTest Meter Four-Point Probing System



The Multi Height Probe combined with the ResTest Meter is a popular combination for use in measuring a wide range of materials and sample sizes.

The probe portion of the system, the Multi Height Probe, comprises a hard anodized aluminum base 25cm wide, 29cm deep and 0.8cm thick. A 19mm diameter stainless steel column 20cm high screwed to the base supports the probe head raising and lowering mechanism incorporating the vertical slide, operating lever shaft, and micro-switch. The vertical slide carries the probe-head, secured by a clamp screw. The probe-head is positioned so that the micro-switch does not pass current until the probes have made contact, lost motion ensures that the current is switched off before the probes are raised. The probe arm can be easily positioned on the vertical shaft to various heights to allow probing onto either flat materials or large or thick materials. For example, a shallow dish containing LN₂ could be placed on the base plate and the arm could be positioned to allow the probe to be lowered onto a sample submerged in liquid nitrogen. Materials up to 10" x 10" x 6" tall (or 12" x 12" x 6" tall - same price) can be positioned under the probe arm. If necessary, a taller vertical post can be supplied for use in measuring taller items. The Multi Height Probe can withstand temperature up to 80°C. The Cylindrical probe head, one of which is included with the Multi Height Probe, can withstand temperatures from 77K up to 120°C in its standard configuration. A modification to the Cylindrical probe will allow it to withstand temperatures from 77K up to 200°C in an oven, somewhat higher if used on a hotplate. The Multi Height Probe is limited to an 80°C temperature limit in an oven, but can be used with a hot plate at higher temperatures if certain precautions are taken.

The Multi Height Probe is supplied with four mounting holes so that it can easily be upgraded in the future to add the 25mm travel X-Y sample stage with 76mm (~3") diameter vacuum hold-down sample chuck. The addition of the X-Y stage converts the Multi Height Probe into the Multi Height Microposition Probe.

The system incorporates the Jandel Cylindrical probe head which is built to high standards of quality and accuracy. A brochure regarding the Cylindrical probe can be found here:

<http://www.fourpointprobes.com/jandelcylindrical.pdf>

Information regarding the constructions and specifications of the Jandel Cylindrical probe can be seen here:

http://www.fourpointprobes.com/cylindrical_app_notes.pdf

The Jandel ResTest Meter is a specialty electronics instrument designed specifically for the four point probe measurement. It features high accuracy, an excellent range, and many features which simplify the four point probing measurement.

MEASUREMENT RANGE

10 milliohms-ohms-per-square to 10^6 ohms-per-square

FEATURES

- Large color display
- Fast response time
- Displays either sheet resistance, volume resistivity, wafer resistivity, or ohms
- Saves data using a PC connection
- Up to 99 measurements can be stored internally, thousands can be saved to the USB memory stick provided, or data can be saved to a PC using the provided software
- Settings for either linear or square array probes and 6 choices of probe tip spacings

SUPPORTS FOUR MEASUREMENT TYPES

- Sheet Resistance - Primary measurement value displayed in Ohms/Square
- Wafer Resistivity - Primary measurement value displayed in Ohms/Cm
- Volume Resistivity - Primary measurement value displayed in Ohms/Cm
- Ohms Resistance - Primary measurement value displayed in Ohms

Three available current ranges:

0.5mA to 10mA

10uA to 100uA

1uA to 10uA

Interfaces with Jandel four point probing units

Includes USB connection software for data logging

Can be controlled by a remote PC using command set



See next page for a comparison of the ResTest to the RM3000 Test Unit

Comparison of the Jandel ResTest Meter to the Jandel RM3000 Test Unit.

The Jandel **ResTest Meter** is a specialty electronics instrument designed specifically for the four point probe measurement. It features high accuracy, an excellent range, and many features which simplify the four point probing measurement. The following are features of the features ResTest Meter:

- 1) The measurement range of the ResTest Meter is from 10 milliohms-per-square up to 1 megohm-per-square with better than 0.1% accuracy. The volume resistivity range is from 10 milliohms-cm up to 5 Kohms-cm, however, the resistivity range refers to measuring a bulk material directly as opposed to measuring a thin film and converting to volume resistivity using the software. For example, a thin layer of copper up to about 1.6 microns can be measured and the bulk resistivity can be determined if one knows the thickness, which can be entered into the software to calculate the volume resistivity.
- 2) The ResTest includes PC control software which can be used for data logging (storing data in the CSV format) and measurement conversion to ohms-per-square or ohms-cm. The ResTest can also be controlled via a remote PC by issuing commands via USB or RS-232
- 3) The ResTest reads-out directly in ohms-per-square, ohms-cm, or ohms on its display (or one can toggle to reading out in millivolts) without requiring the use of the software or a PC. The ohms-cm value can be for a thin film / wafer if one enters the sample thickness, or for a bulk sample if the tip spacing is entered.
- 4) The ResTest has onboard non-volatile memory so that up to 99 measurements can be stored internally and then downloaded and saved using the software. Alternately, each measurement can be saved to a PC as it is made, in which case the amount of saved data depends on the disk drive space.
- 5) Measured values can be stored directly to the included USB memory stick which can store thousands of measurements
- 6) The ResTest has a "zero" button as well as "forward" (FWD) and "reverse" (REV) buttons as the RM3000 has, however, the zero function it is not really needed as it zeros itself prior to any measurements (fast enough to not be noticed). The zero was added in case there WERE offset measurements just to check that the offset was definitely being caused by something external (such as light sensitivity or poor contact). For this reason it is also not necessary to check forward and reverse readings too often although it is a useful function to have confidence in the readings.
- 7) The ResTest allows the input of correction factor for samples that need to be corrected for size.
- 8) The ResTest has a date and time stamp feature
- 9) The ResTest has a large color display

The Jandel **RM3000 Test Unit** is a specialty electronics instrument designed specifically for the four point probe measurement. It features high accuracy, an excellent range, and many features which simplify the four point probing measurement. The following are features of the RM3000 Test Unit:

- 1) The measurement range of the RM3000 Test Unit is from 1 milliohm-per-square (10^{-3}) up to 5×10^8 ohms-per-square with 0.3% accuracy. The volume resistivity range is from 1 milliohm-cm (10^{-3}) up to 10^6 ohms-cm, however, the resistivity range refers to measuring a bulk material directly as opposed to measuring a thin film and converting to volume resistivity using the software. For example, a thin layer of copper up to about 16 microns thick can be measured and the bulk resistivity can be determined if one knows the thickness, which can be entered into the software to calculate the volume resistivity.
- 2) The RM3000 includes PC control software which can be used for data logging (storing data in the CSV format) and measurement conversion to ohms-per-square or ohms-cm. The RM3000 can also be controlled via a remote PC by issuing commands via USB or RS-232
- 3) The RM3000 reads-out directly in ohms-per-square or ohms-cm on its display (or one can toggle to reading out in millivolts) without requiring the use of the software or a PC. The ohms-cm value can be for a thin film / wafer if one enters the sample thickness, or for a bulk sample if the tip spacing is entered.
- 4) The RM3000 has onboard non-volatile memory so that up to 50 measurements can be stored internally and then downloaded and saved using the software. Alternately, each measurement can be saved to a PC as it is made, in which case the amount of saved data depends on the disk drive space.
- 5) The RM3000 has an auto-range button that can be used to automatically determine the optimum input current for a given material without using the trial and error method.
- 6) The RM3000 has forward (FWD) and reverse (REV) buttons to reverse the direction of current flow. A common way to determine if a measurement is valid is to reverse the direction of current flow and then check to see if the forward and reverse voltage readings correlate well, i.e., the values should be similar, but with the reverse current voltage being a negative value.
- 7) The RM3000 allows the input of correction factor for samples that need to be corrected for size.
- 8) The RM3000 has a date and time stamp feature
- 9) The RM3000 interfaces with optional AFPP motorized Z-motion arm which is an available option on some Jandel models.

Comparing the ResTest to the RM3000:

The ResTest can store internally 99 measurements instead of 50

The ResTest has a large color screen

The ResTest has settings for linear & square array so when using a square array probe you read values corrected

The ResTest has a somewhat easier to use dial control which also acts as a pushbutton.

The ResTest can save data to a USB thumb-drive

The ResTest performs measurements somewhat quicker

The ResTest automatically "zeros" itself before each measurement

The ResTest is lower in cost

In addition to reading out in ohms-per-square, ohms-cm, and mV, the ResTest will read-out in ohms.

Comparing the RM3000 to the ResTest:

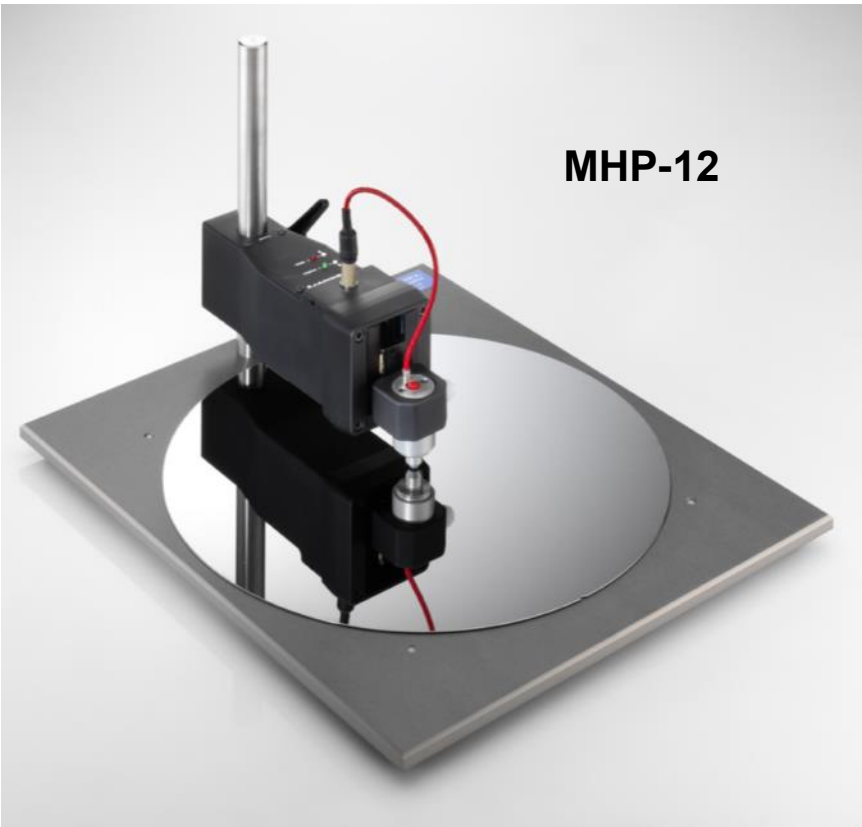
The RM3000 has a greater measurement range on both ends of the spectrum

The RM3000 can control Jandel's AFPP motorized Z motion probe arm (optional for some Jandel Probe models)

The RM3000 has an auto-range feature to determine the best choice of input current for a given material

The RM3000 has four preset buttons for storing commonly use input currents

MHP-12



Multi Height Probe with Optional Large Base Plate for Probing Substrates up to 12" x 12"

Same Price as 10" x 10" sample Base Plate.

Shown with Optional AFPP Motorized Z Motion Arm

To have the AFPP centered over the baseplate, the 12" baseplate must be purchased.

Downloads:

<http://www.fourpointprobes.com/restest-user-manual.pdf> ResTest Manual

[A high resolution image of the Multi Height Probe](#)

Cylindrical Probe



One Jandel Cylindrical probe is included with the Multi Height Probe



The Jandel Cylindrical four point probe has a user adjustable tip pressure that can be adjusted within one of three available pressure ranges by turning the small red knob on the top of the probe.

Multi Height Probe Sample Stage Options

Micro-PT Stage Option

Jandel offers the Micro-PT 25mm (1") travel X-Y stage with a 3" diameter wafer chuck for use when positioning small samples under the four point probe needles. Included is the facility for vacuum hold-down. The baseplate is pre-drilled to accept this option as a future upgrade for either the 10" area baseplate or the 12" area baseplate. The smaller baseplate might be preferred if bench space is limited.

Shown with optional AFPP Automatic Z Motion Arm, however, the AFPP is not triggered by the ResTest and requires that a button on the AFPP is pressed to activate the motorized Z-Motion of the AFPP arm.

Shown with Optional
Micro-PT 25mm x 25mm
X-Y Stage

Shown with Optional
AFPP Automatic
Z Motion Arm

Shown with Optional
AFPP Automatic Z
Motion Arm which is
manually activated
when used with
the ResTest
Meter

Multi-PT6 & Multi-PT8 Wafer Stage Options

Jandel offers the Multi-PT6 and Multi-PT8 (6" or 8") wafer stages as options for use with the Multi Height Probe. The wafer stage has 360° rotation with detents at each 90 degree position. User defined detents are set along the Y axis so that measurements can be made at 1, 5, 9, or more positions with 1mm repeatability from wafer to wafer. A light shield is not built into the system, however, Jandel offers a black cloth light shroud if required. The probe Z motion arm can be either the motorized version as shown here (which is controlled by a push button on the arm since the ResTest does not interface with the AFPP arm), or manually raised and lowered using the standard arm as shown on page one. The Multi-PT6 and Multi-PT8 wafer stages include facility for vacuum hold-down for the wafer.

Shown with the
optional Multi-PT8
8" Wafer Stage

6" Wafer Stage
also available

12" baseplate
required for future
upgrade

Future addition of the Multi-PT wafer stage requires that the 12" baseplate model was purchased initially. The price of the Multi Height Probe is the same whether it has the 10" or 12" area baseplate. The Multi Height Probe with the 12" base plate is pre-drilled to future accept the Multi-PT wafer stages.