

JANDEL ENGINEERING LTD.
CYL-HM21 Four Point Probe
General Purpose Portable Four Point
Probing System for Measuring
Sheet Resistance or Volume Resistivity



About the HM21 Hand Held Meter

The Jandel HM21 Hand Held Meter is a battery powered four point probe meter which includes a universal AC power adaptor so that it does not have to run on batteries when portability is not important. The Jandel HM21 is a portable current source / meter specifically designed for the four point probe measurement technique. For successful measurements the HM21 supplies a constant current and displays either the resultant voltage or the sheet resistance in ohms/square depending which function has been chosen. The sheet resistance measurement range is 1 ohm/square up to 10 Megohms/square (in practice you can measure down to around 0.01 ohms/square, but the accuracy may be compromised slightly). This equates to a bulk (or volume) resistivity range of approx. 0.01 ohm.cm to 100 Kohm.cm. The current is changeable in 6 steps - 100nA, 1uA, 10uA, 100uA, 1mA, 10mA. The compliance voltage is above 8.5V but slightly reduces to 7.5V at 10mA, however 10mA would usually only be used with more conductive samples where the compliance voltage is not so critical. Overall accuracy is better than 0.5% where the DVM receives greater than 1mV. For the mid ranges the accuracy is better than 0.3% The DVM has two ranges - high sensitivity up to 150mV and low range up to 1.25V. The unit is push button operated. The current is increased with the 'INC' button and decreased with the 'DEC' button. Forward and reverse current

can be selected using the 'FWD' and 'REV' buttons, which is a common way to check the validity of a measurement by checking the forward and reverse voltage values for consistency. When the battery mode is used, the unit returns to standby automatically to save power and turns off altogether after some period of inactivity. The automatic time to return to standby is 70 seconds with low current and with the 3 highest currents 40 seconds. This is because the lower current ranges are used with higher impedance which can take longer to settle, and the higher currents drain the power faster. The unit can be zeroed to remove any offset by pressing the Standby button when the unit is already in Standby. The HM21 includes on-board non-volatile memory so that fifty measurements can be stored in the unit and then downloaded to a PC later. When connected to a PC using the included software, the HM21 can save the data, or bulk resistivity values (ohms-cm) can be calculated. If the HM21 is connected to a PC using the software, the unit can be operated via the user interface which is an illustration of the HM21 on the computer screen. Clicking the "save" button on the computer screen saves the data to the PC. Files are stored in the CSV format which opens automatically in Excel. The HM21 reads-out directly in sheet resistance (ohms-per-square) without using a PC or the software. The **instruction manual for the HM21 software** can be downloaded here: http://www.fourpointprobes.com/hm20_software.pdf

About the Jandel Cylindrical Probe

The Jandel Cylindrical probe is built to a high level of mechanical accuracy as are all Jandel four point probe heads. Specifications for radii, spacing, planarity, and spring load are verified by calibrated instruments including a video inspection system, an optical interferometer, and an electronic force gauge. Each probe tip is guided by upper and lower jeweled needle guides. Additional information about probe quality can be found in the [Jandel probe head application notes](#).



PROBE SPACING	25 to 50 mils (0.635mm to 1.27mm) in 5 mil (127 micron) increments, also 1.0mm and 1.59mm. 20
TOLERANCE	+/-0.01 mm
ARRANGEMENT	Linear or Square array
NEEDLES	Solid Tungsten carbide Ø 0.40 mm (Ø 0.30 mm for close-spacing) 45 degree included angle, phosphor-bronze connecting ligament
OTHER MATERIALS	50% osmium alloy tips available
RADII	12.5 µm min. to 500 µm max. polished with 2 µm diamond
RETRACTION TO INSULATING PAD	0.5 mm
PLANARITY	+/- 0.025 mm or better
LOADS	Low: 10-30g, Medium: 30-60g High: 60-150g
LEADS	4-way cable Teflon insulated (screened on cylindrical)
ELECTRICAL LEAKAGE	10 ¹³ ohms resistance between needles at 500 volts

Jandel Engineering Ltd.
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Portable Four Point Probe Meter



The HM21 Hand Held Meter reads out directly in ohms-per-square (or millivolts), and it includes a USB connection and PC software to save the data as either sheet resistance or as volume resistivity. Information regarding the PC software can be found here:

http://www.fourpointprobes.com/hm20_software.pdf



The Cylindrical Probe has spring loads which are user adjustable within one of three ranges. The probe shown here has been factory set to 100 grams per tip, however, the user can increase the load to as high as 150 grams per tip or as low as 60 gram per tip by moving the red Teflon knob towards either the "H" for higher or towards the "L" for lower.

