

## Precision Measurement Lead Set

## 2000LEAD



A comprehensive collection of test leads and adapters is provided to cover requirements from low level DC through to high current and high resistance measurements.

The leads and materials supplied in this measurement set have been carefully selected to minimise connection/lead errors. The safety of the leadset is ensured by the use of non-retractable shrouded connectors for the voltage test lead set.

The leads are stackable to allow connections to be commoned together where required

### Low Thermal Gold Plated Connections

The use of gold plated connectors is essential to reduce thermally generated EMFs caused by temperature differences across metal junctions (i.e. thermocouple type effects). Gold connections, which produce less than  $0.2\mu\text{V}/^\circ\text{C}$ , are used as opposed to nickel plated brass which can produce in excess of  $15\mu\text{V}/^\circ\text{C}$ . This allows typical uncertainty contributions from this type of leadset to be in the order of  $0.5\mu\text{V}$ .

### Low resistance 32A current leads

The leadset provided for high current measurement is manufactured using very low resistance cable and connectors. Low resistance is essential to carry current without excessive heating effects or voltage drop. As there are no errors introduced by thermal effects connectors are made from hard wearing nickel plated brass. Retractable shroud type connectors are used as there is no potential for shock.

### Low noise measurements using screened leadset








For high resistance and low level AC measurements a BNC to BNC screened lead complete with BNC to 4mm adapters is provided. This lead is essential for this type of measurement where unscreened leads can cause errors by introducing unwanted line frequency (mains) pickup, 'swamping' the measured signal.

The very high resistance of the lead supplied also avoids leakage errors caused by using inferior (leaky) test leads which can effectively shunt the value being measured (for example a leakage of only 100 GigaOhms on a measurement of 1 GigaOhm will give a 1% error).

### Flexible range of adapters, converters & terminators

For the ultimate in flexibility, a selection of adapters, converters and terminators are provided as standard to maximise the inter-connectivity of the leadset.

## Test Lead Set Specifications

<b>Voltage Measurement Leads</b>	<p>1 pair of Black &amp; White leads fitted each end with low thermal 4mm non-retractable shroud safety terminals.</p> <table border="0"> <tr> <td>Plating</td> <td>Gold</td> </tr> <tr> <td>Length</td> <td>1m</td> </tr> <tr> <td>Rating</td> <td>1000VAC / 16A</td> </tr> <tr> <td>Thermal Effect</td> <td>0.7uV</td> </tr> </table>	Plating	Gold	Length	1m	Rating	1000VAC / 16A	Thermal Effect	0.7uV
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<b>Voltage Measurement Adapters</b>									
<p>4mm plug to spade adapters</p> 	<p>2 pairs of low thermal (gold plated) Black &amp; Red 4mm plug to spade adapters suitable for connection to standard resistors etc.</p> <p> <b>1000VAC rating does not apply when using these spade adapters due to electric shock hazard</b></p>								
<p>4mm safety plug to unshrouded open end adapters</p> 	<p>1 pair of low thermal (gold plated) adapters suitable for use with high voltage safety leads when connecting to instruments without safety terminals.</p> <p> <b>1000VAC rating does not apply when using these adapters due to electric shock hazard</b></p>								
<p>4mm plug to cable adapters</p> 	<p>1 pair of low thermal (gold plated) adapters suitable for connecting bare-ended cables to 4mm terminals.</p> <p> <b>1000VAC rating does not apply when using these adapters due to electric shock hazard</b></p>								
<p><b>Recommended use of voltage measurement leads</b></p> <ul style="list-style-type: none"> <li>• DC voltage measurements up to 1000V.</li> <li>• Combine with low current leadset and spade adapters - ideal for 4-wire kelvin measurements.</li> </ul> <p>As these are unshielded, they are not suitable for high value resistance or low AC voltage &amp; current.</p> <p> It is important to remember that the terminals of mains powered instrument may be warm, or above ambient temperature. The test leads will almost certainly be at ambient (room) temperature and connecting these leads to a mains powered instrument will cause a significant 'cold-junction'. This will require a period of time before the temperature variation stabilises between the instrument terminals and the leadset.</p>									



# Precision Lead Set Option

For the 2000 Series Calibrators

<b>Current Measurement Leads</b>	1 pair of Black & Red leads fitted each end with 4mm retractable shroud safety terminals.	
	Plating	Nickel plated brass
	Length	1m
	Rating	150VAC / 16A

### Recommended use of current Measurement Lead

- AC/DC current measurements from 1mA up to 2A.

This leadset can be used at lower currents, however to reduce noise / pickup use the BNC to BNC lead.

<b>High Current Measurement Leads</b>	1 pair of low resistance Blue & Yellow leads fitted each end with 4mm retractable shroud safety terminals.	
	Plating	Nickel plated brass
	Length	1m
	Rating	150VAC / 32A

### Recommended use of current measurement Lead

- AC/DC current measurements from 2A up to 20A

This lead is not suitable for low DC measurements due to thermal EMFs created by the contact material used.


BNC Oscilloscope connection / AC measurements / High resistance measurements	1 coax lead fitted each end with BNC connectors	
	Plating	Silver
	Length	1m
	Rating	300VAC / 0.5A

### Recommended use of BNC lead

- Low AC voltage & current measurements
- High resistance (1Mohm and above) as shown below

This lead is not suitable for low DC measurements due to thermal EMFs created by the contact material used. Please note thermals do not affect the accuracy of AC voltage / current measurements

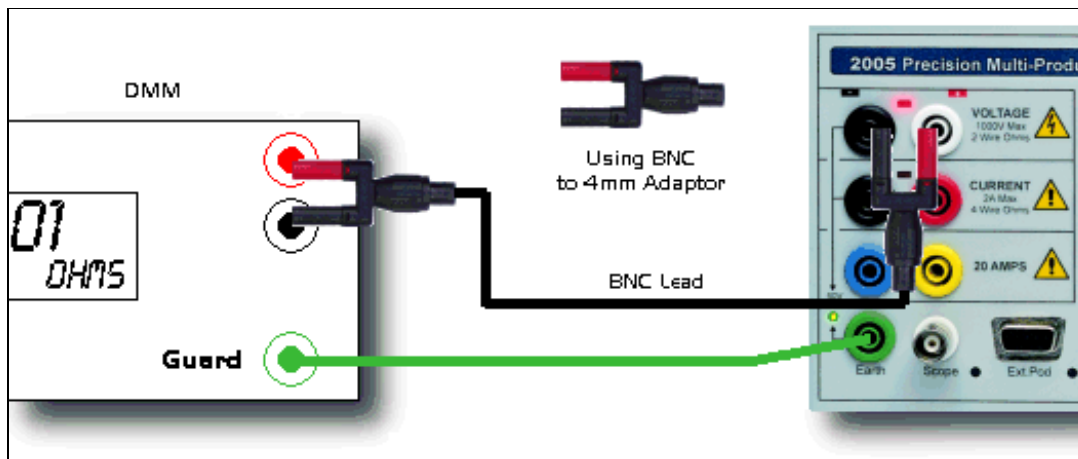


BNC Adapters	
<b>BNC to 4mm Adapter</b> 	2 BNC to 4mm shrouded adapters are supplied to allow connection to calibrators & multimeters
<b>BNC 50 Ohm Feed-through Adapter</b>	A 50 Ohm terminator for use with the bandwidth (levelled) sweep function of the oscilloscope calibration option.

## Precision Measurement Lead Set - Applications

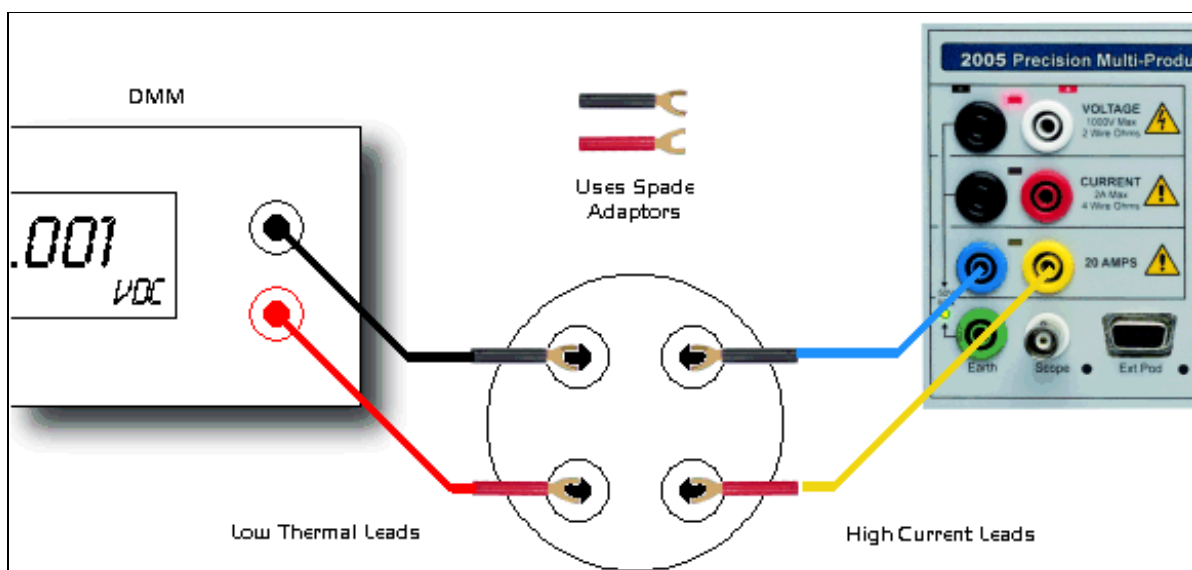
### High Resistance Connection

Using the BNC lead with 4mm to BNC adapters



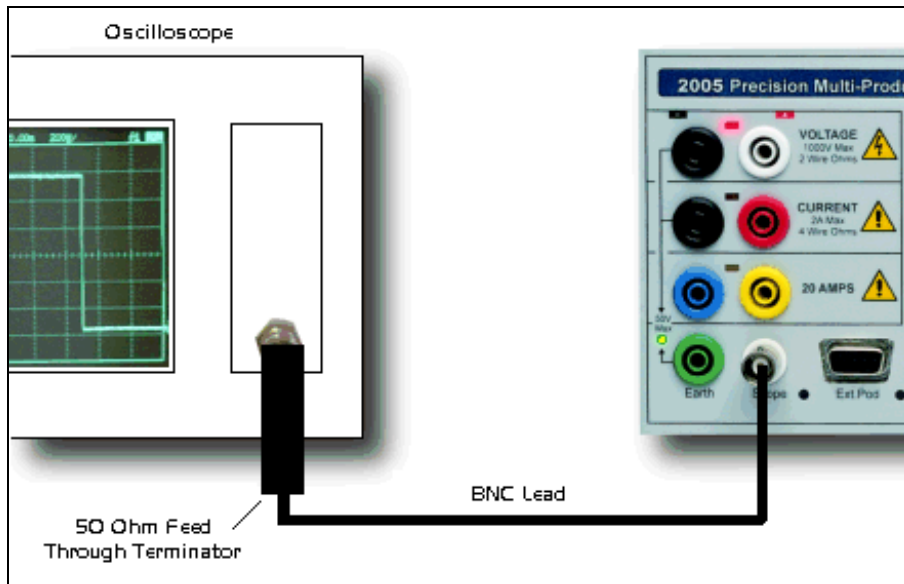
### 4-Wire High Current Shunt Connection

Using the Low Thermal Voltage & High Current leads with 4mm plug to spade adapters



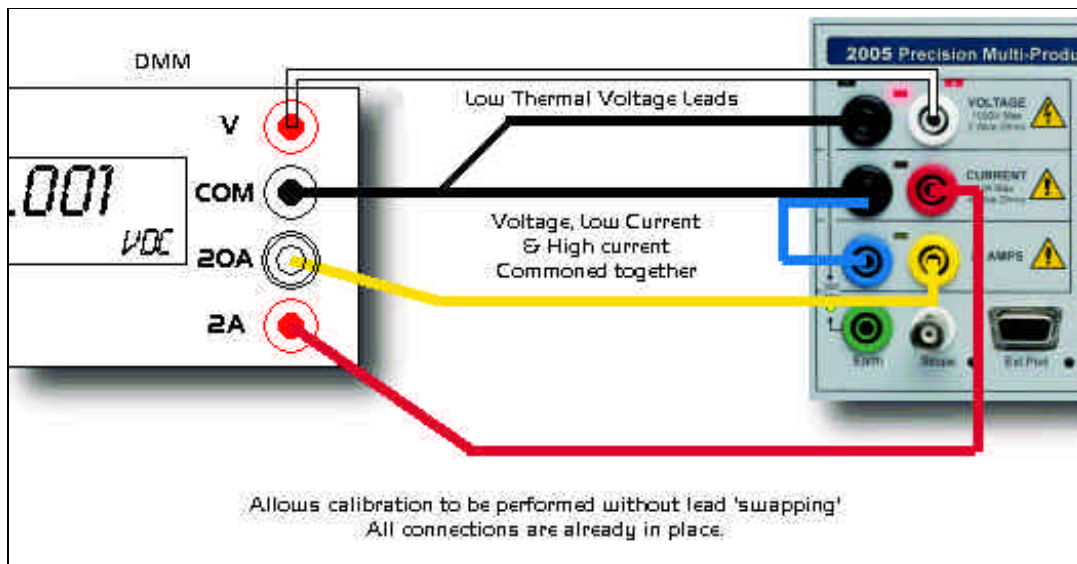
## Bandwidth Connection

To Oscilloscope Using 50 Ohm Feed Through Terminator.



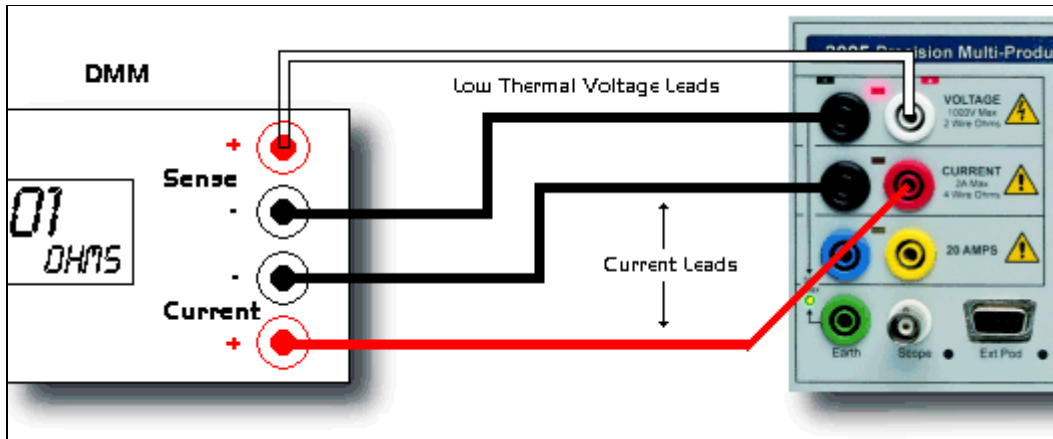
## Connection to 4 Terminal DMM

Using Low Thermal Voltage, Current & High Current Leads to Eliminate Lead Swapping



### 4-Wire Resistance Connection

Using the Low Thermal Voltage & Current leads.



### 4-Wire DMM to 2-Wire Calibrator Resistance Connection

Using the Low Thermal Voltage & Current leads.

