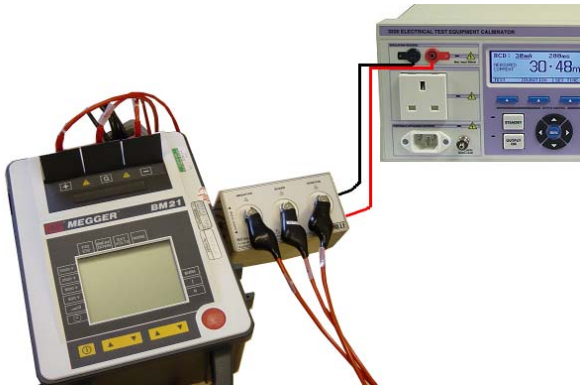
General

The 5kV option for the 3200 provides a low cost solution for the resistance calibration of some makes of high voltage, above 1kV, insulation testers avoiding the problem of obtaining calibrated high value, high voltage resistors.



Note the maximum voltage rating of 1kV on the 3200 does not allow 5kV testers to be directly calibrated with the 3200.

The 5kV option both increases the test voltage at which calibration can be performed, but also increases the resistance range of the 3200 by a factor of 10.

This allows the standard 3200 to be used for calibration of testers up to 10kV at up to 200 Gohms, with the 10G option fitted to the 3200 values up to 1Tohm can be simulated.

Principle of operation

The adapter uses the principle that most testers work by measuring the current flowing into their low terminal passing through. Then from ohms law V/I=R calculate the resistance, the test voltage being known.

A high voltage 100:1 resistive divider is connected between the tester High terminal and guard terminal to divide down the testers measurement voltage.

The divided down voltage is then connected to one side of the insulation decade resistance arm of the 3200. The other side of the decade arm is connected into the tester's low input.

The current at the tester input is now 1/100's of the current of a resistor connected directly to the 5kV output. Therefore the tester reads 100 times the value set of the 3200-decade arm.

The decade arm of the 3200 also only has 1/100 of the tester voltage applied across it.

Limitations

1: The tester must have a true guard terminal, which is the low, or ground of the testers circuit. Any internal resistance in the tester guard terminal will be added in series to the bottom end of the voltage divider in the 5kV adapter. This will change the ratio of the voltage divider, which will change the accuracy of the 5kV adapter.

2: The tester must be able to supply the current to drive the divider. The resistance of the divider is 10M which will requires 0.5mA @ 5kV.

3: The tester should be a true virtual earth current input; any protection resistance will be added to the resistance set on the 3200.

4: Low resistance values below 100Mohms set on the 3200 will affect the accuracy as they will effectively shunt the bottom end of the dividers resistance of 1Mohm, which will change the voltage division ratio.

To Check for correct operation.

1: Check the specification of the tester is able to drive the current required by the 5kV adapter.

To test this measure the test voltage using a high voltage probe, and ensure it is not collapsing under the load of the adapter.

2: That the Guard terminal is the earth of the instrument. Test this by measuring the tester output voltage from guard to HV output.
If the reading is low, or drops when the adapter is connected the guard may not be a low impedance, and the adapter will not work correctly.

3: That the input is a true virtual ground.
Check this using high impedance voltmeter to measure the voltage between guard and the low input is almost zero.

General Operation

The adaptor works by resistively dividing down the applied test voltage between the 'High Voltage' output and the 'guard' terminal. The test voltage is divided down by a factor of 100, reducing the 5kV to just 50 Volts.

The insulation resistance decade in the 3200 is then connected in series from this divided down voltage to the current input of the tester. As the voltage applied to the 3200 is 100 times smaller, the current to the tester is therefore a 100 times smaller which makes the displayed value of resistance on the tester 100 times the value of resistance set on the 3200.

This circuit provides a low cost solution to the calibration of high voltage, high ohm insulation tester at a number of points without the need for high voltage, high value resistances which are both expensive and difficult to obtain.

The disadvantages of this method are :

1: The tester must have an ***active guard*** terminal, which can be used for the low end of the voltage divider.

2: The tester must be able to supply the current required by the divider without collapsing. This can be checked by measuring the voltage between guard and output with an HV probe and check to insure it does not reduce when the divider is connected.

3: For linear multiplication of the resistance set on the 3200, the current flowing in the divider chain must be much greater than the current flowing into the tester input. This limits the lowest value that can be set.

4: The 'low' side of the 3200 decade is earthed which can give rise to earth loop problems if the tester is mains powered. It must be remembered that the testers input is working at nano-amp level and stray paths can easily be introduced.

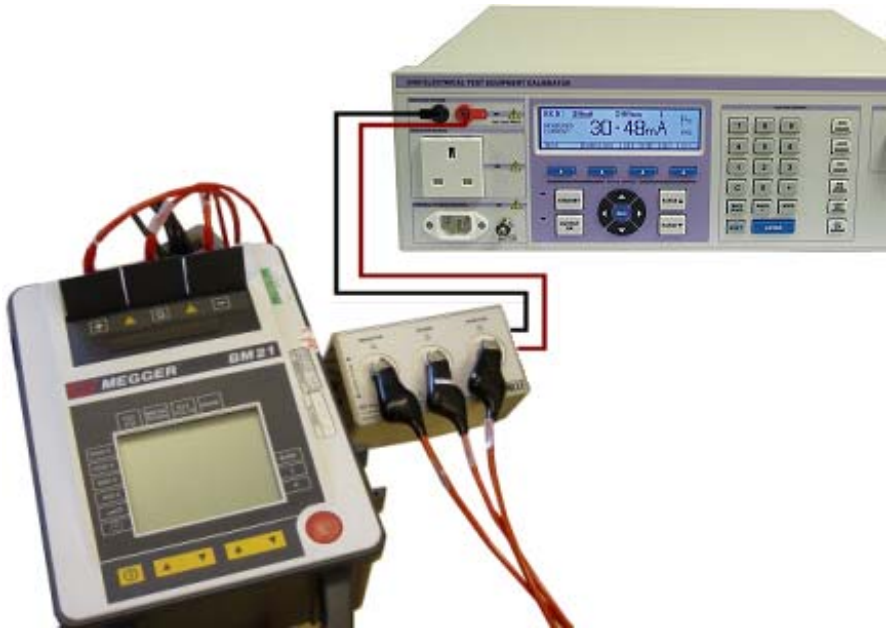


Fig 1 : Typical setup