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Safety Ohmeter for use in Explosive and Volatile Atmospheres

Introduction

The 1681 Safety Ohm meter has been designed to operate in Atmospheres where there is an explosion risk from the presence of explosive vapour: Volatile chemicals in these environments mandate the use of an “Intrinsically Safe” meter.

Applications

- Low resistance measurements of semiconductor bonds
- Contact resistance of switches and connectors
- Metal component bonding & cable earthing
- Aircraft bonds

Features

- 3.5 digit LCD display
- AC measurement frequency 10Hz
- Offset adjustment 0-50mΩ
- Battery condition indication at 10% of battery charge
- Idle time Power off
- External earth point accessible within the carrying case
- Carry Case made from black padded flame retardant ,carbon impregnated, antistatic nylon
- Battery life one year(non operational)
- Tamperproof screws secure the battery compartment
- Drop tested from one meter onto a concrete surface on all major axes.
- Four wire resistance measurement

Description

The AGI 1681 safety ohmmeter is a portable intrinsically safe instrument with an integral battery compartment. It is encased in a rugged housing, made from sand cast aluminium with a magnesium content of less than 1%.

Internally the 1681 circuitry has fail safe protection. This ensures that it cannot cause sparks caused by externally applied faults. Other design features are, duplicating the 0v connection, using a fully encapsulated power supply, fitting insulating beads to the feed through connections for the battery wiring and sleeving the output connections with heat shrunk tubing to minimise potential short circuits that could occur between the output terminals.

Externally produced thermal emfs and contact potentials do not affect the resistance measurements since an AC measurement method is used.

Battery power is provided by four AA Manganese Alkaline batteries.

The 1681 is approved for use in zone 1 and zone 2 hazardous atmospheres. It is CE marked and meets the following standards;

- EU ATEX Directive 94/9/EC
- Intrinsically safe Ex 11 2G EEx-ib-IIC-T4
- Baseefa 03ATEX 0284 CE 1180
- DEF STAN59-41 (part 1) Class A requirement.

Resistance and Continuity Applications

The key attribute of the 1681 ohm meter is its ability to make 4 terminal Kelvin resistance measurements.
When measuring objects with low resistances, a two point measurement is not accurate since the resistance of the test leads and the connection contact resistance, become significant factors. The four point resistance measurement eliminates lead and connection contact resistance. This is illustrated in Fig1.

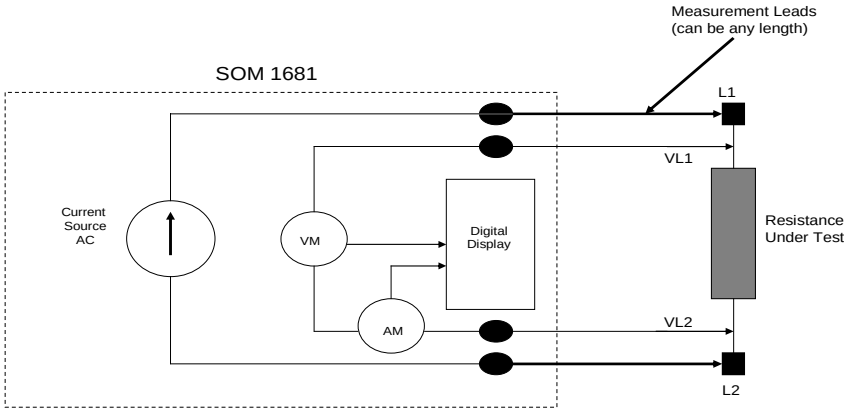

Figure 1

As shown in Fig 1 two current leads L1 and L2 make up a two wire current source that puts current through the resistor under test. The current source overcomes all the series resistance (within the instruments voltage limit) and provides a constant current. The two potential leads VL1 and VL2 provide a two wire voltage measurement circuit that measures the voltage drop across the resistor. No contact and lead resistance error occurs with the voltage measurement because there is no current flow in the high impedance voltage leads.
The SOM 1681 computes the value of the resistor from the values of VM voltage and AM current

Some examples of where four wire Kelvin measurements are of value:

- Winding resistance and shorted turns of motors, alternators, transformers, generators and coils etc.
- Contact resistance of switches, resistive trimmers, relay contacts etc
- Bonding or connection resistance measurements, metal to metal connections, Aircraft bonds, earth ground connections, weld joints, PCB to switch connections.

- semiconductor devices with low breakdown voltages

The 1681 is able to take measurements both within and without the case. The entire unit can be grounded by connecting the external ground lug on the case to the 1681 chassis ground. This ensures that the 1681 cannot generate an ESD "spark"

Low resistance measurements

The fundamental advantage of the 1681 over an intrinsically safe multi meter is the accuracy and resolution of its low resistance ranges of 200mΩ and 2Ω.

- The 1.999Ω range has a resolution of 0.001Ω and accuracy ± 1% of reading ± one digit
- The 200mΩ range has a resolution of 0.1Ω. and accuracy ± 1% of reading ± one digit

This far exceeds the resistance accuracy of a multifunction DMM at these low resistance values.

Test leads

The 1681 is available in a specific Aircraft bonding variant the 1681B and with a number of different test leads.
The standard range of test leads is shown in Fig 2 and these can be supplied either as a package with the instrument, or separately.

Figure 2

For applications requiring a long length of test cable a 50m length of cable is available as shown on Fig 3.

Figure 3

AGI can supply Specific Test leads with variable lengths to suit customer applications.

Specifications

For a full specification of the 1681 please refer to the AGI Product information sheet, (ref SOM 1681 Issue D), available on the AGI web site www.agiltd.co.uk or click on the following link www.agiltd.co.uk/1681.pdf