




INSTRUMENTS

MEGGER®
Analog/Digital
Insulation Testers

Operating
Instructions

SAFETY WARNING

- * **The circuit MUST be de-energized and isolated BEFORE connections are made for any test.**
 - * **Do not touch the circuit during an insulation test.**
 - * **After insulation tests, capacitive circuits MUST be allowed to discharge BEFORE disconnecting the test leads.**
 - * **Test leads, including prods and crocodile clips, must be in good order, clean and having no broken or cracked insulation.**
 - * **Before use, switch to , short test leads and obtain "buzz".**
 - * **When making a voltage test or when the presence of a voltage is indicated, DO NOT press the 'Test' button. Instruments must not be used for voltage tests above 600V ac.**
 - * **In the interests of safety, it is not recommended that crocodile clips be connected to "live" conductors.**
 - * **Disconnect the test leads and set switch to "Off" BEFORE opening the rear cover.**
 - * **Replacement fuses MUST be of the correct type and rating.**
 - * **When replacing the battery cells, ensure no dust, moisture or foreign matter enters the casing.**
- The warnings must be read and understood before the instrument is used. They must be observed during use.**

NOTE

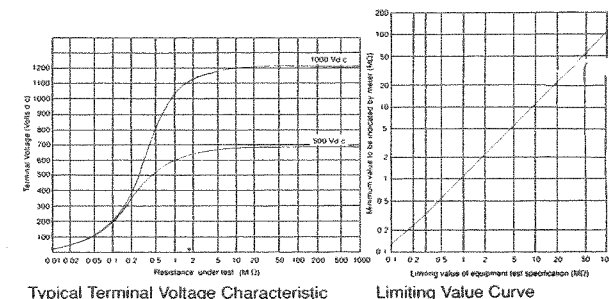
This instrument is only to be used by a suitably trained and qualified person.

SPECIFICATION

| | |
|---|--|
| Insulation Range | |
| Normal Test Voltage | Cat. No. 210200: 500 V dc and 1000 V dc Cat. No. 210201: 500 V dc |
| Insulation Resistance | |
| | 0.01 M Ω to 1000 M Ω at all test voltages |
| Loaded Terminal Voltage | |
| | 1000 V range: 1000 V dc minimum at 1 M Ω 500 V range: 500 V dc minimum at 0.5 M Ω |
| Short Circuit Current | |
| | 2 mA |
| Accuracy at 77°F (20°C) | |
| analog: | $\pm 1.5\%$ of scale length |
| digital: | $\pm 3\%$ of reading, ± 2 digits |
| Response Time | |
| | 1.5 seconds for full scale (i.e. 1000M Ω) |
| Resistance Range | |
| Resistance 0.01 k Ω to 1000 k Ω | |
| Open Circuit Terminal Voltage | |
| | 2 V dc maximum |
| Accuracy at 77°F (20°C) | |
| analog: | $\pm 2\%$ of scale length |
| digital: | $\pm 5\%$ of reading, ± 2 digits |
| Response Time | |
| | 1.5 seconds for full scale (i.e. 1000 K Ω) |
| Continuity Ranges | |
| Resistance | |
| (i) | 0.01 Ω to 5 Ω |
| (ii) | 0.1 Ω to 50 Ω |
| (iii) | Audible indicator up to 1 k Ω , with "Test" button not pressed. Auto shut-off after 45 minutes. |
| Open Circuit Terminal Voltage | |
| | 6 V dc maximum, 3 V dc minimum |
| Short Circuit Current | |
| | 40 mA nominal |
| Accuracy at 77°F (20°C) | |
| analog: | 5 Ω range, $\pm 3\%$ of reading $\pm 0.05 \Omega$ |
| digital: | 50 Ω range, $\pm 5\%$ of reading $\pm 0.5 \Omega$ |
| Response Time | |
| | 2 seconds for full scale |
| Safety Voltage Range | |
| Range | analog: 20 V ac - 500 V ac; 20 V dc - 350 V dc digital: 20 V ac - 600 V ac; 20 V dc - 350 V dc (above 350 V dc the display reads '>350') |
| Input Impedance | |
| | 500 k Ω nominal |
| Accuracy at 77°F (20°C) | |
| analog: | $\pm 3\%$ of reading $\pm 10 V$ |
| digital: | $\pm 3\%$ of reading $\pm 3 V$ |
| Alarm | |
| | Indicates the presence of voltage in excess of 20 V by both audible and visible warnings |

General

| | |
|---------------------------|---|
| Display | Combined analog and digital LCD giving logarithmic and linear scales with dynamic pointer plus 3-digit display. |
| Overload Rating | |
| Catalog No. 210200: | 1200 V ac or dc for 10 seconds or 600 V ac or dc indefinitely. |
| Catalog No. 210201: | 600 V ac or dc indefinitely. |
| Temperature Range | |
| operating: | +23°F to +122°F (-5°C to +50°C) |
| storage: | -13°F to +149°F (-25°C to +65°C) |
| Operating Humidity | |
| | 90% RH at +104°F (+40°C) maximum one 100 mA, 250 V, (#216.100) one 500 mA, 250 V, (#314.500) (little fuse or equal) |
| Power Supply | |
| | Four "AA" size alkaline or carbon/zinc cells. (e.g. Duracell MN1500 or Ever-Ready R6B). Auto shut-off after 15 minutes. |
| Battery Life | |
| | Alkaline cells - 3000 tests at 500 V dc on 0.5 M Ω load; 500 tests at 1000 V dc on 1 M Ω load. Carbon zinc cells - 500 tests at 500 V dc on 0.5 M Ω load. |
| Dimensions | |
| | 7 $\frac{1}{2}$ in. x 3 $\frac{3}{8}$ in. x $\frac{1}{2}$ in. (195 mm x 98 mm x 40 mm) |
| Weight | |
| | $\frac{7}{8}$ lb. (397 g) |



Accessories for 210200CL and 210201CL: catalog numbers 210990 test lead set and 210835 carrying case are supplied with each complete instrument when ordered.



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WARRANTY

Products supplied by Biddle Instruments are warranted against defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair must be shipped prepaid and insured. This warranty does not include batteries, lamps or tubes, where the original manufacturer's warranty shall apply. We make no other warranty. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

OPERATION


FITTING NEW BATTERY CELLS

Warning: Set selector switch to "Off".

Disconnect test leads from terminals.

Precautions: The instrument circuit contains static sensitive devices; take appropriate care when handling opened instrument. During battery fitting ensure that no dust or moisture enters the casing to cause tracking on the printed circuit. Clean away any such foreign matter only with a blower brush.

1. Remove the screw at the bottom of the rear cover.
2. Lift up rear cover (from the bottom) and remove it.
3. Fit four new battery cells in the holder, observe the correct polarity.
4. Replace the rear cover and secure it with the screw BEFORE using the instrument. THIS IS IMPORTANT.

Note: (i)  symbol appearing on the display indicates that the battery power is low. The other ranges will continue to work to the full specification. When the battery is exhausted the buzzer will sound and a reading will not be possible. At low temperatures the display will fade as the battery voltage falls. (ii) After fitting new battery cells, random effects may occur on the display or buzzer. These can be eliminated by operating in the selector switch or "Test" button.

Battery Life:


Battery life will depend on the type of cells used, the function selected and, for insulation tests, the resistance (or load) being measured.

Alkaline cells are recommended, especially for heavy loads i.e., where the majority of tests at 500 V or 1000 V have readings < 10 M Ω .

Alkaline cells will survive better at low temperatures, generally have a longer life and will not leak when exhausted. Carbon cells usually leak when exhausted.

Note: It is recommended that battery cells be removed if the instrument will remain unused for more than a month.

FUSES

A 100 mA fuse provides instrument circuit protection if the "Test" button is pressed while the leads are connected to a voltage up to 250 V. A blown 100 mA fuse affects only the '5 Ω ', '50 Ω ' and 'k Ω ' ranges. The  'M Ω ' and voltage functions still operate normally. The voltage functions operate even if the fuses have blown.

Fuse Check

1. Select the '50 Ω ' position.
2. Connect the test leads together.
3. A constant reading > 50.0 Ω indicates a blown 100 mA fuse.
4. If the buzzer sounds constantly with the switch in the '50 Ω ' position and the leads disconnected, both fuses have blown.

Note: With a blown fuse, the '5 Ω ' range can read > 5.00 Ω or 0.00 Ω irrespective of test lead connections.

Fuse Replacement:

1. Open the instrument by following the same procedure as for fitting battery cells.
2. The fuses are located in the bottom left hand corner of the circuit board. Replace with fuses of the correct type and rating.
3. Replace and secure the cover BEFORE using the instrument. THIS IS IMPORTANT.

Automatic Shut-Off

If the instrument is left on but unused, it will automatically turn itself off at 15 minutes (or 45 minutes for continuity buzzer). To conserve battery power switch off after use; do not rely on the auto shut-off.

Voltage Warning

To warn that the connection has been made to a "live" supply of > 20 V ac or dc, the instrument's buzzer will sound, and on the display 'V' will flash. DO NOT PRESS THE 'TEST' BUTTON if this happens. Switch the supply off before proceeding with an insulation or continuity test.

If the 'M Ω ' or 'k Ω ' ranges are selected the instrument will measure and display the voltage present.

Note: The voltage indication will always operate whatever function has been selected; even if a fuse has blown.

For operator and instrument protection always:

- (i) switch the supply off first
- (ii) then make the connections and check for voltage
- (iii) then press the 'Test' button.

TESTING

Insulation Testing

1. Set selector switch to 'M Ω ' as required.
2. Connect test leads, first to the instrument then to the isolated test item.
3. Press the 'Test' button. The analog pointer appears and moves up scale to the value to be indicated; the digital reading is then shown.
Note: For an analog ∞ reading the digital reading will be '> 999'.
4. Release the 'Test' button. Any capacitive circuits charged during a test will then automatically discharge. If significant voltage remains the voltage scale reappears and the discharge is monitored.
5. Remove the test leads only when no voltage is indicated.




Resistance Testing

1. Set the selector switch to 'k Ω '.
2. Perform steps (2) to (5) as for insulation testing.
Note: The test voltage applied is only 1 V approximately.

Continuity Testing

1. Set the selector switch to '50 Ω ' or '5 Ω ' as required.
2. Press the 'Test' button as for insulation testing.
Note: The first press of the 'Test' button initiates an automatic zero function prior to the measurement. This partially compensates for test lead resistance and reduces zero offset to typically 0.05 Ω . Deducting the reading with the leads short circuited from the original measurement gives a more accurate result on the 5 Ω range.

Continuity Buzzer

1. Set the selector switch to  (same position as '50 Ω ' range); the symbol  then appears on the display.
2. The continuity buzzer is engaged automatically without the need to press the 'Test' button. The buzzer sounds every time the test leads make contact with a low resistance.
Note: Pressing the 'Test' button disengages the buzzer facility and selects the '50 Ω ' measuring range. To reset the buzzer function simply move the selector switch to an adjacent position and then back to .

Voltage Indications

- A) Automatic indication of voltage. Refer to 'Voltage Warnings' above.
- B) Voltage range
On the 'M Ω ' insulation test range(s) and the 'k Ω ' range, the instrument functions as a voltmeter when the 'Test' button is not pressed and > 20 V is present on the circuit. Discharge monitor
After an insulation test on a capacitive circuit, when the 'Test' button is released, the instrument functions as a voltmeter after the pointer has returned to zero if > 20 V still exists on the tested circuit. The voltmeter will monitor the discharging voltage and show when it is safe to remove the test leads.
- C)