



# **DM200**

*Digital micro-ohmmeter*

***User's Guide***

# DM200

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200 A digital micro-ohmmeter

## User guide





## Safety Precautions

- This equipment should be operated only by qualified and duly trained people, closely observing the corresponding safety regulations and instructions contained in the present User Guide.
- It should be checked that the item to be measured is voltage free.
- Before starting with the measurements, be sure that the battery is well charged and that the line voltage is between specified limits.
- Do not connect or disconnect the test leads during the measurement.
- There are no adjustable parts or parts that can be replaced by the user within the equipment. Taking out the Control Panel in order to have an access to the internal parts may be dangerous as there are high voltages inside, capable of causing fatal accidents.
- Cleanig of this instrument should be carried out using a soft cleaning liquid, after verifying that it doesn't attack the plastic parts used in the case and in the Control Panel of this equipment.

*This equipment should be used only by a trained and competent person, strictly applying suitable safety rules.*

## Used symbols

 Caution, refer to User Guide.

 Equipment complies with current EU Directives.

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## 1. Description

The NEUPATH DM200 high-current micro-ohmmeter is a portable, microprocessor-controlled instrument, used to accurately measure very low contact resistances of breakers and switches, busbars, transformers winding and engines, etc, with test currents from 1 mA to 200 A.

- Kelvin architecture (four-terminal method).
- Digital reading, alphanumeric display.
- Up to 4½ digits readings.
- Powered by rechargeable battery or mains supply.
- 0.1  $\mu\Omega$  resolution.
- 200  $\Omega$  maximum reading.
- Overheating protection.

## 2. Operating principle

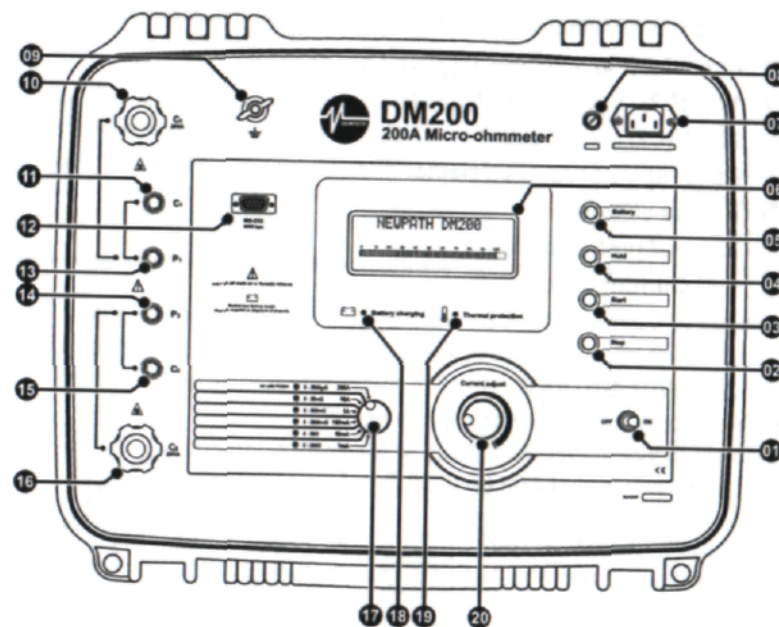
This device uses the Kelvin Bridge architecture, with four terminals, avoiding testing leads resistance to cause error during measurement. Test current may be chosen by the operator and the reading is obtained by comparison through internal high-stability standards. The result appears in the alphanumeric display which is very easy to read.

## 3. Operating instructions

### 3.1. Use of test probes

Select the suitable test probes for the measurement you intend to perform taking into account the current chosen for the test (Cables for up to 10 A or 200 A). If you use the cables corresponding to 200 A, please verify that the test probes are tightly fit in their corresponding connectors.

### 3.2. Control panel



- 01 On/Off switch.
- 02 Stop button.
- 03 Start button.
- 04 Hold button. It retains the last measurement in the display.
- 05 Button to measure the **Battery charge condition**.
- 06 **Alphanumeric display** that shows both the measured resistance value and messages to the operator.
- 07 **Power cord** connector.
- 08 **Fuse**.
- 09 **Ground**.
- 10 **200 A (C1)** current output terminal.
- 11 **10 A (C1)** current output terminal.



- 12 RS232 data output.
- 13 Potential (P1) terminal.
- 14 Potential (P2) terminal.
- 15 10 A (C2) current output terminal.
- 16 200 A (C2) current output terminal.
- 17 Range and test current Selector
- 18 Battery charge led.
- 19 Thermal protection led.
- 20 Test Current control.

### 3.3. Power supply

Mains supply or internal battery powered

Battery: rechargeable, 12 V.

Internal battery is useful for up to 10 A.

Mains: 220 - 240 V~ 50 Hz

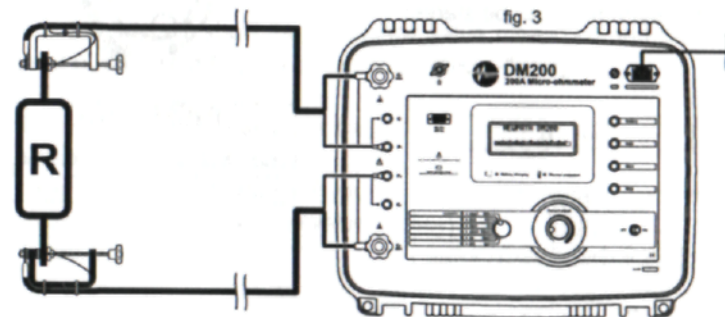
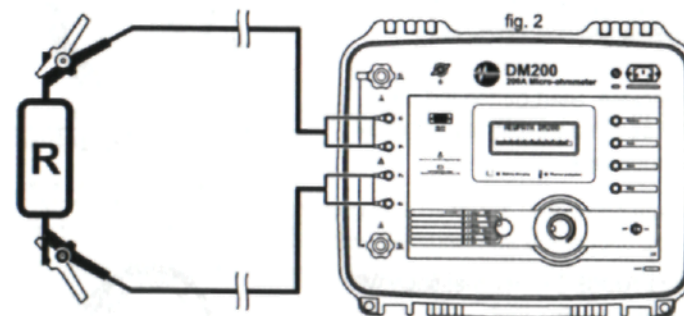
Mains power is useful for any test current, including 200 A.

### 3.4. Measurement

#### Warning

- Before to use this instrument the User guide and Safety warnings must be read and understood.
- Safety procedures and rules for working near high voltage energized systems must be observed during the use of this equipment. The generated voltages and currents may be dangerous.

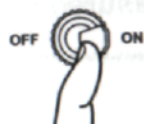
1. Before power-on the equipment, connect the test probes to the item to be measured and to the front panel terminals, as shown in figure 2 for current up to 10 A or in figure 3, for the 200 A range.



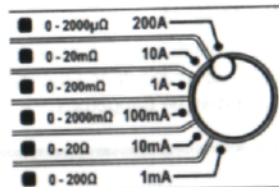
The clamps in the drawings are only for illustration.



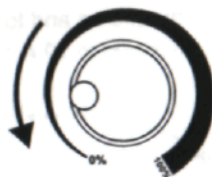
- Switch the equipment On using the **On/Off** switch.



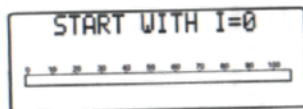
- Using the **Range selector**, choose the range and the current to use



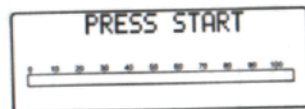
- Be sure that the **Test current control** is at the start position (counter-clockwise completely rotated).



Otherwise, Start button will be inhibited and the display will show the message:



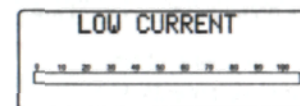
- The **PRESS START** message will appear showing that measurement can be started.



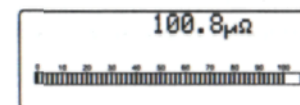
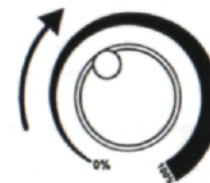
- Press the **Start** button.



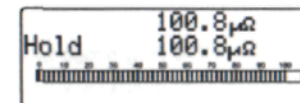
The **LOW CURRENT** message will turn up:



- Turning the **Test current control** clockwise, increase current until obtaining the desired value or until the current bargraph reads 100 divisions. The bargraph will show the test current value as the percentage of the nominal value selected by using the **Range selector**.



- The equipment should be connected to the mains supply in order to work with 200 A.
- The lowest current for measuring is 10% of the range nominal value. It is important to consider that the measurement errors increase while test current decreases. The error is specified for test currents higher than 80%.
- The **Display** will show the resistance value measured and the unit used ( $\Omega$  [ohms], m $\Omega$  [milli-ohms] or  $\mu\Omega$  [micro-ohms]).
- The value can be retained in the second line of the display by pressing the button **Hold**. If you press this button again, the value will be erased.





12. Press the red button **Stop** in order to finish the measurement.



13. Finally, when finishing measurements, turn the equipment off using the **On/Off** switch.

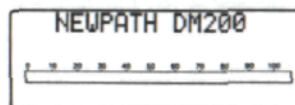


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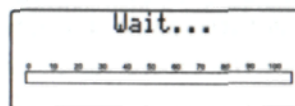
**Precaution:** Do not connect or disconnect the test leads during the measurement.

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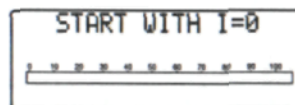
### 3.5. Display messages



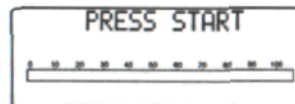
When turning the equipment On using the On/Off switch, this introduction message appears for a while.



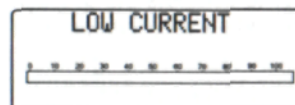
This message appears each time the equipment needs to adjust any parameter in order to optimize the readings.



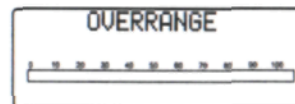
Warns the operator that to be able to start a test, the **Test current control** must be at the zero position (fully counter-clockwise). Otherwise, Start button will be inhibited.



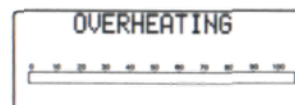
The equipment is ready to start a measurement, thus the operator has to press the **Start** button.



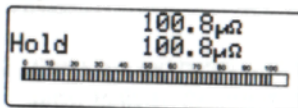
Indicates that the test current is not enough to carry out the reading. It appears at the beginning of each test and it keeps on being there up to the operator rotates the **Test current control** clockwise.



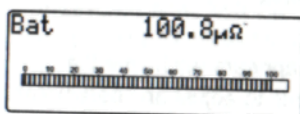
Indicates that the measured resistance is higher than the maximum value readable in the selected range.



Indicates that some part of the equipment has achieved the critical temperature. Thus the system will cut the high current generation.



It appears at the second line of the display, showing that the value is the one retained in the display when pressing the **Hold** button.



It shows that the battery is quite discharged. It is necessary to recharge the battery.

#### 4. Some notes about accuracy

In order to obtain the specified accuracy, the operator has to adjust the test current to a value higher than the 80% of the nominal value. If it were necessary, it is possible to use a lower current, but by doing this the accuracy will be affected.

**DM200** has an auto-compensation system that automatically eliminates the error produced by internal offset. Thus, it is not necessary to carry out measurements by reversing the polarity in order to compute the average value. Nevertheless, if the operator suspects that there is a difference of temperature between the contact points that would generate thermoelectric voltages, it is necessary to carry out two measurements by reversing the current cables and so, the circulation sense of the current through the resistance under measurement. The resistance value to be measured will be the average between the values in one sense and in the contrary (direct and inverse current).

#### 5. Protections

##### 5.1. Start with I = 0

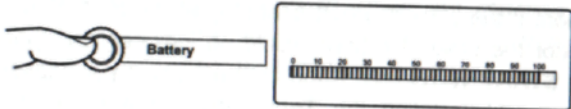
Very quick variations of the current may cause damages to sensible items. In order to avoid them, the equipment has a protection that imposes to start the test with zero current. You can only start the measurement if the current adjust control is at the start of its course. If this were not the case, the **Start** would be inhibited and the message would say **START WITH I=0**. If the operator sharply increases the test current by quickly rotating the **Test current control** clockwise, the equipment will impose a slow current growth, in order the current to softly come to the selected value.

##### 5.2. Temperature protection

The time of **DM200** continuous use is limited by thermal considerations. Some internal sensors measure the temperature of the sensitive parts and trigger the protection that will cut the current circulation, if any of them exceeds the limit temperature, thus avoiding any damage. The **Thermal protection** led will light on and the **OVERHEATING** message will appear in the display. Under these conditions, measurements will be inhibited in the 200 A range. Measurements in other scales may be carried out normally, though the LED indicator keeps on being displayed up to the temperature decreases sufficiently.

## 6. Battery condition

The charge condition of the battery can be verified before or during the resistance measurement. In order to achieve that, the operator has to press the **battery** button while the equipment is turned on. The bargraph shows remaining charge as a percentile value.



If during measurement the charge of the battery achieves a critical level, the display will show the **BAT** message notifying that the charge level is low. After a few minutes the measurement will be automatically interrupted in order to preserve the battery from a deep discharge that is prejudicial for its expected useful life.

### 6.1. Battery and charger

#### Battery description

The NEWPATH DM200 micro-ohmmeter uses a rechargeable 12 V battery.

#### Charging procedure:

- Check that the **On/Off** key is OFF.
- Connect the equipment to the mains supply.
- The **Battery charging** indicator ( ● Battery charging) will keep on lighting with a red light up to completing the charge. At that point, it will change to a green light, being like this up to the equipment disconnection from the mains supply.

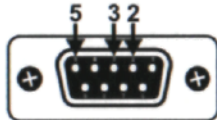


At the end of battery useful life, the battery must be recycled or disposed of properly, in order to protect the environment.

The rechargeable battery does not show the "memory effect" and there are no restrictions to start charging it as many times as is needed. However the battery could be damaged if remains in deep discharge for a while.

To avoid this effect, charge the battery before left the equipment in storage and don't let pass more than 30 days without recharge, even if the instrument wasn't used (under storage, the battery loses part of its charge).

## 7. RS232 output



The equipment has an RS232 output in the control panel that can be used to register measurements in a serial printer or data collector. The outputs are the following ones:

- Pin 2: Rx ; Pin 3: Tx ; Pin 5: Gnd;
- Rate: 4800 bps
- 8 bits - no parity - 1 stop bit (8,n,1)

**Note:** In order to assure the compatibility with most printers available in the market, the resistance units are shown with the following symbols:

- uR = micro-ohm
- mR = milli-ohm
- R = ohm



## 8. Replacement fuse

To check the instrument fuse, remove it with a screwdriver. If the fuse is ruptured replace it by another with the following specifications:

*Fuse Schurter, model SPT 5 x 20 (Time-lag) 8A/250V.  
High breaking capacity.*

## 9. Cleaning

Cleaning of this instrument should be carried out using a soft cleaning liquid, after verifying that it doesn't affect the plastic parts used in the case and in the Control Panel of this equipment.

## 10. Technical specifications

<b>Test currents</b>	: 1 mA, 10 mA, 100 mA, 1 A, 10 A, 200 A. Each current may be continuously adjustable from 0 to 100%																					
<b>Resistance ranges</b>	<table><thead><tr><th>: Currents</th><th>Range</th><th>Resolution</th></tr></thead><tbody><tr><td>200 A</td><td>0-2000 <math>\mu\Omega</math></td><td>0,1 <math>\mu\Omega</math></td></tr><tr><td>10 A</td><td>0-20 m<math>\Omega</math></td><td>1 <math>\mu\Omega</math></td></tr><tr><td>1 A</td><td>0-200 m<math>\Omega</math></td><td>10 <math>\mu\Omega</math></td></tr><tr><td>100 mA</td><td>0-2000 m<math>\Omega</math></td><td>100 <math>\mu\Omega</math></td></tr><tr><td>10 mA</td><td>0-20 <math>\Omega</math></td><td>1 m<math>\Omega</math></td></tr><tr><td>1 mA</td><td>0-200 <math>\Omega</math></td><td>10 m<math>\Omega</math></td></tr></tbody></table>	: Currents	Range	Resolution	200 A	0-2000 $\mu\Omega$	0,1 $\mu\Omega$	10 A	0-20 m $\Omega$	1 $\mu\Omega$	1 A	0-200 m $\Omega$	10 $\mu\Omega$	100 mA	0-2000 m $\Omega$	100 $\mu\Omega$	10 mA	0-20 $\Omega$	1 m $\Omega$	1 mA	0-200 $\Omega$	10 m $\Omega$
: Currents	Range	Resolution																				
200 A	0-2000 $\mu\Omega$	0,1 $\mu\Omega$																				
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100 mA	0-2000 m $\Omega$	100 $\mu\Omega$																				
10 mA	0-20 $\Omega$	1 m $\Omega$																				
1 mA	0-200 $\Omega$	10 m $\Omega$																				
<b>Output voltage</b>	: Up to 10 Vd.c. @ 1 A (open circuit).																					
<b>Measurement principle</b>	: Four-terminal, Kelvin-type.																					
<b>Continuous operation time</b>	: At 200 A this equipment may be used continuously for approx. 3 minutes before the thermal protection activates. At 10 A or less, there is not a limited time for continuous operation.																					
<b>Thermal protection</b>	: Protects all sensitive components, avoiding any damage due to overheating.																					
<b>Basic accuracy</b>	: $R < 0.5 \text{ m}\Omega$ : $\pm (0.50\% \text{ of reading} + 2 \text{ ULSD}^*)$  $R \geq 0.5 \text{ m}\Omega$ : $\pm (0.20\% \text{ of reading} + 2 \text{ ULSD}^*)$  <i>* Units of the Least Significant Digit.</i>																					
<b>Advanced features</b>	: Digital direct reading of very low resistances in the alphanumerical display, with up to 4½ digits. Very fast and accurate measurements.																					
<b>Test current measurement</b>	: The current is digitally measured and a bargraph shows the result. The bargraph indication is specially useful when measuring inductive loads, so that the operator can verify easily when the test current has been stabilized.																					
<b>Serial data output</b>	: RS232 @ 4800 bps. Suitable for data collection in an external serial printer, computer or data-logger.																					
<b>Environmental protection</b>	: IP54 with closed lid.																					



<b>Safety class</b>	: Meets the requirements of IEC 61010-1:1990, IEC 61010-1:1992 amendment 2.
<b>Power supply</b>	: Mains or internal battery powered <b>Battery:</b> rechargeable, 12 V. Internal battery is useful for up to 10 A.  <b>Mains:</b> 220 - 240 V~ 50 Hz Mains power is useful for any test current, including 200 A.
<b>Battery charger</b>	: 220 - 240 V~ 50 Hz
<b>Operating temperature range</b>	: -5°C to 50°C
<b>Storage temperature range</b>	: -25°C to 65°C
<b>Humidity range</b>	: 95% RH (non condensing)
<b>Equipment weight</b>	: Approx. 16 kg.
<b>Dimensions</b>	: 502 x 394 x 190 mm
<b>Accessories</b>	: 2 Combined current and potential leads for 10 A (1.8 m). ○ 2 Combined current and potential leads for 200 A (6 m). 1 Communication cable (RS232). 1 Power cord. 1 User guide. 1 Case for the accessories.

*Subject to technical change without notice.*

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**Notes**

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