



Cat. No. 247001

## **BIDDLE® DLRO®**

- Resolution to 0.1  $\mu\Omega$  on 599.9  $\mu\Omega$  range
- Standard accuracy of  $\pm 0.25\%$
- Digital readout

# Digital Low Resistance Ohmmeters

## DESCRIPTION

Biddle® Digital Low Resistance Ohmmeters (DLRO®) are a family of highly accurate instruments that provide a simple, practical and reliable means of making low-resistance tests in the field.

They also are ideal for production quality control.

They operate on the four-wire measurement principle, thus eliminating lead and contact resistances. With basic accuracies of  $\pm 0.25\%$  and resolution down to 0.1  $\mu\Omega$ , they are nonetheless designed to be rugged and portable for use at the job site.

A variety of optional test leads and calibration resistance standards are offered for use with DLROs.

## APPLICATIONS

Operation is simple: just connect the leads, turn the instrument on and read the measurement directly from the digital LED display. No warm-up is required.

Typical applications include measuring the resistance of:

- Switch and circuit breaker contacts
- Transformers and generators
- Motor windings
- Busbar and other joints
- Aircraft, rail and pipe bonds
- Cable splices, welds and fuses
- Metal alloys
- Graphite electrodes and other composites
- Wire and cable

## General-Purpose DLROs

Two models specially designed for general-purpose testing applications are available.

Each provides up to 10 amperes of test current for measuring resistances to 60 ohms with 1  $\mu\Omega$  resolution and  $\pm 0.25\%$  accuracy.

### Dual-Pak General-Purpose Model Cat. No. 247000

This battery-powered unit features separate measuring and charger modules for maximum portability. The charger can be left in the shop, and the measuring module taken to the job site.

It weighs less than 8 pounds (3.6 kg) and provides hours of testing.

### Single-Pak General-Purpose Model Cat. No. 247001

This compact instrument packages measuring circuits, rechargeable batteries and charger in one self-contained unit.

Ruggedly built to handle the most demanding field applications, the Single-Pak is housed in a tough Noryl® case with hinged, removable lid and carrying handle.

This model also includes captive wing nuts.

### Single-Pak/Low-Range Model Cat. No. 247002

This model provides an extra range, 0 to 599.9  $\mu\Omega$ , for applications requiring 0.1  $\mu\Omega$  resolution. It also features a current-reversing switch to average out any voltage offset in the test sample.

Captive wing nuts are also standard.

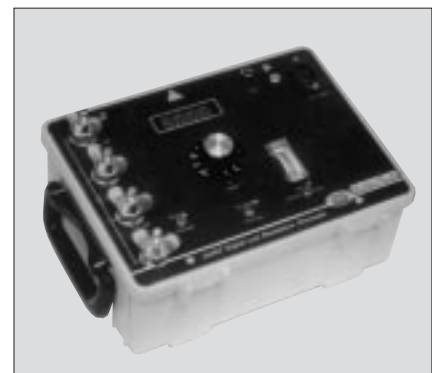
## Low-Range/High-Current Models

### Cat. No. 247100 and 247101

These instruments are used when a continuous test current of 100 amperes is required. These models include a separate 100 ampere current supply module with a modified standard battery-powered 10 ampere system.

These combinations provide a sixth range, 0 to 599.9  $\mu\Omega$ , with the 100 ampere current.

For 100 ampere measurements, an interconnecting cable from the 100 ampere current supply module is plugged into a special receptacle on the measuring module.



*The Low-Range DLRO, Cat. No. 247002, features an extra range and rugged, Single-Pak design.*

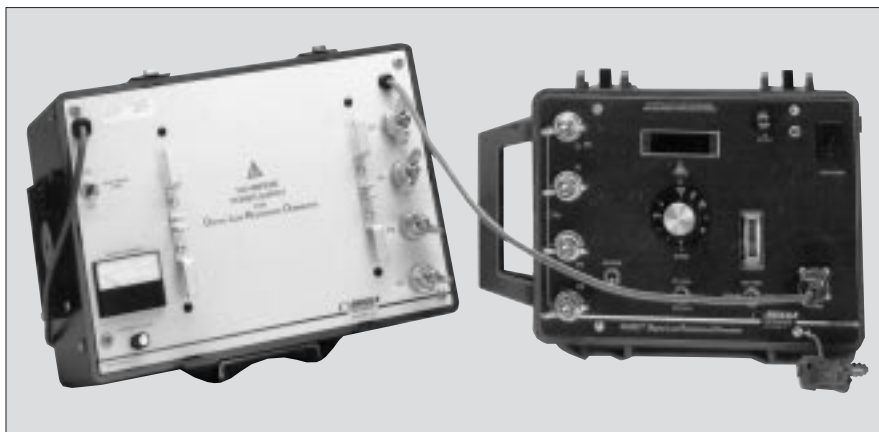
When the 100 ampere range is not used, a jumper plug is inserted in place of the interconnecting cable.

This feature allows the measuring module to be used as a standard battery-powered, 10 A instrument.

Cat. No. 247100 meets ANSI C37.09, Test Procedure for AC High Voltage Circuit Breakers.

### FEATURES AND BENEFITS

- Resolution as fine as 0.1  $\mu\Omega$
- Standard accuracy of  $\pm 0.25\%$
- Kelvin-type, four-wire measurement eliminates errors caused by lead and contact resistances.
- Digital readout with automatic zero circuit eliminates field test inaccuracies.
- Broad line of test leads is available to simplify and enhance data collection.



Low-Range/High-Current Model Cat. No. 247101 consists of a Single-Pak DLRO, Cat. No. 247001-3, and separate 100 ampere test current supply, Cat. No. 247120. The 100 ampere supply also may be ordered as an option.

### SPECIFICATIONS

Cat. No.	Model	Resistance Range	Resolution	Current	Accuracy	Power Source	Dimensions	Weight
247000	Dual-Pak	0-5.999m $\Omega$ 0-59.99m $\Omega$ 0-599.9m $\Omega$ 0-5.999 $\Omega$ 0-59.99 $\Omega$	1 $\mu\Omega$ 10 $\mu\Omega$ 0.1m $\Omega$ 1m $\Omega$ 10m $\Omega$	10A 1A 100mA 10mA 1mA	(0.25%rdgd + 1 lsd)	Rechargeable batteries with separate charger	8Hx9Wx8D in. (20 x 23 x 20 cm)	12.25 lb (5.6 kg)
247001	Single-Pak	0-5999 $\mu\Omega$ 0-59.99m $\Omega$ 0-599.9m $\Omega$ 0-5.999 $\Omega$ 0-59.99 $\Omega$	1 $\mu\Omega$ 10 $\mu\Omega$ 0.1m $\Omega$ 1m $\Omega$ 10m $\Omega$	10A 1A 100mA 10mA 1mA	(0.25%rdgd + 1 lsd)	Rechargeable batteries with internal charger	12Hx6Wx10D in. (30 x 16 x 25 cm)	12 lb (5.5 kg)
247002	Single-Pak Low Range	0-599.9 $\mu\Omega$ 0-5.999m $\Omega$ 0-59.99m $\Omega$ 0-599.9m $\Omega$ 0-5.999 $\Omega$ 0-59.99 $\Omega$	0.1 $\mu\Omega$ 1 $\mu\Omega$ 10 $\mu\Omega$ 0.1m $\Omega$ 1m $\Omega$ 10m $\Omega$	10A 10A 1A 100mA 10mA 1mA	(0.3%rdgd + 1 lsd)	Rechargeable batteries with internal charger	12Hx6Wx10D in. (30 x 16 x 25 cm)	12 lb (5.5 kg)
247100 247120	Low Range Power Pak	0-599.9m $\Omega$	0.1 $\mu\Omega$	100A	(0.5%rdgd + 2 lsd)	Line Operated Supply	13Hx8Wx10D in. (33x20x25 cm)	20 lb (9.3 kg)
247101	Higher Ranges Measuring Modules 247000-3 or 247001-3	0-5.999m $\Omega$ * 0-59.99m $\Omega$ 0-599.9m $\Omega$ 0-5.999 $\Omega$ 0-59.99 $\Omega$ or 0-5999 $\mu\Omega$ *	1 $\mu\Omega$ 10 $\mu\Omega$ 0.1m $\Omega$ 1m $\Omega$ 10m $\Omega$	10A 1A 100mA 10mA 1mA	(0.25%rdgd + 1 lsd)	Rechargeable batteries with separate charger or internal charger	Dual -Pak units 8Hx9Wx8D in. (20 x 23 x 20 cm)  Single-Pak 12Hx6Wx10D in. (30 x 16 x 25 cm)	12 lb (5.5 kg)

247100 consists of 247000-3 Dual-Pak & 247120 100 ampere Power Supply  
247101 consists of 247001-3 Single-Pak & 247120 100 ampere Power Supply

\* Alternate range ID for lower range.

## TEST LEADS

Biddle DLROs require test leads, two potential and two current, to make low-resistance measurements. In addition to individual current and potential lead sets, duplex leads that combine current

and potential connections in one set are offered. A variety of C-clamps, Kelvin clips, fixed-point and helical spring-point leads are available in various lengths.

### Individual Test Leads

Type	Termination	Maximum Test Current	Length	CAT. NO.
Potential	Hand Spikes	N/A	7 ft (2 m)	242021-7
			18 ft (5.5 m)	242021-18
			30 ft (9 m)	242021-30
Current	Terminal Clips	10 A	7 ft (1.5 m)	242041-7
			18 ft (5.5 m)	242041-18
			30 ft (9 m)	242041-30
	Heavy-Duty Clamps	100 A***	16 ft (5 m)	242144-16
			26 ft (8 m)	242144-26

### Duplex Test Leads

Termination	Maximum Test Current	Length	CAT. NO.
Helical Hand Spikes with Spring Points	20 A	7 ft (2 m)	242011-7
	10 A	18 ft (5.5 m)	242011-18
		30 ft (9 m)	242011-30
Helical Hand Spikes with Spring Points and Current Pushbutton Switch	10 A	18 ft (5.5 m)	242009-18
Heavy-Duty Fixed-Point Hand Spikes	10 A	7 ft (2 m)	242002-7
		18 ft (5.5 m)	242002-18
		30 ft (9 m)	242002-30
Replaceable Needle Points	10 A	7 ft (2 m)	242003-7
2 in. (5 cm) Heavy-Duty C-Clamps	10 A	7 ft (2 m)	242004-7
		18 ft (5.5 m)	242004-18
		30 ft (9 m)	242004-30
4 in. (10 cm) Heavy-Duty C-Clamps	100 A***	16 ft (5 m)	242104-2-16
		26 ft (8 m)	242104-2-26
0.5 in. (1.3 cm) Kelvin Clips	10 A	7 ft (2 m)	241005-7*
		7 ft (2 m)	242005-7**
1.5 in. (4 cm) Kelvin Clips	10 A	7 ft (2 m)	242006-7
		18 ft (5.5 m)	242006-18
		30 ft (9 m)	242006-30

\* Gold-plated

\*\* Silver-plated

\*\*\* With Cat. No. 247120 only

## DUPLEX TEST LEAD STYLES

**Kelvin Clips** — Feature spade lugs on outboard end and alligator clips with insulated, silver- or gold-plated jaws  
Cat. No. 241005-7, 242005-7, 242006-7, 242006-18, 242006-30



**Helical Spring Points** — Tips rotate and compress into the body of the probe to ensure accurate measurement.  
Cat. No. 242011-7, 242011-18, 242011-30, 242009-18



**Heavy-Duty Fixed Points** — Economical, lightweight and built for durability  
Cat. No. 242002-7, 242002-18, 242002-30



**Heavy-Duty C-Clamps** — Current passes through the C-clamp and screw thread; the potential passes through a four-point anvil insulated from the clamp metal. This set of leads is available in two widths and a variety of lengths.

Cat. No. 242004-7, 242004-18, 242004-30, 242104-2-16, 242104-2-26



**OPTIONAL ACCESSORIES****Input Voltage Protection**

To protect the instrument when testing battery straps, this option provides input protection against accidental overvoltage up to 30 volts.

The option should not be specified when the instrument will be used to test transformers and other inductive components. This option is available on Cat. No. 247000, 247001 and 247002 only. To order, add **-11** to instrument Cat. No.

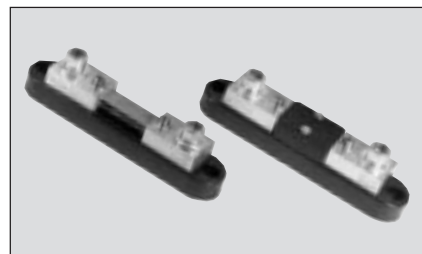
**100-Ampere Adapter Plug**

Cat. No. 247000 and 247001 can be ordered with an adapter plug to allow use with the 100 ampere current supply, Cat. No. 247120.

This capability is required by some standard methods of testing large switchgear. ANSI C37.09, Test Procedure for AC High Voltage Circuit Breakers, and IEC Recommendation, Publication 56-4, High Voltage Alternating Current Circuit Breakers Cat. No. 247101, are two such standards. Cat. No. 247100 comes standard with this option. This option is not available with Cat. No. 247002. To order, add **-3** to instrument Cat. No.

**Calibration Shunts**

These four-terminal calibrating resistance standards feature a conservative current rating to ensure against overheating.



Each shunt provides two current terminals with knurled Allen-head cap screws and two potential terminals with slotted screw heads. Accuracy is  $\pm 0.25\%$ .

**ORDERING INFORMATION**

<b>Item</b>	<b>Cat. No.</b>
DLRO® Digital Low Resistance Ohmmeters	
Dual-Pak, battery-operated .....	247000
Single-Pak, battery-operated .....	247001
Single-Pak/Low-Range, battery-operated .....	247002
Low-Range/High-Current, line- and battery-operated .....	247100 or 247101
<b>Included Accessories</b>	
Line cord, where applicable .....	17032
Instruction manual .....	AVTM24-1J
<b>Optional Accessories</b>	
Test leads .....	See previous chart
100 ampere current supply for	
Cat. No. 247000-3 and 247001-3 .....	247120
100 A adapter plug for Cat. No. 247000 and 247001 only .....	Add <b>-3</b>
Input voltage protection for Cat. No. 247000, 247001 and 247002 only .....	Add <b>-11</b>
230 V (nominal), 50/60-Hz operation .....	Add <b>-47</b>
Instrument carrying case for Cat. No. 247000 .....	218746
Instrument carrying case for Cat. No. 247001, 247002 .....	218748
Lead carrying case .....	18313
Field test shunt, 10 $\Omega$ , current rating 0.001 A .....	249000*
Field test shunt, 1 $\Omega$ , current rating 0.01 A .....	249001*
Field test shunt, 0.1 $\Omega$ , current rating 1 A .....	249002*
Field test shunt, 0.01 $\Omega$ , current rating 10 A .....	249003
Field test shunt, 0.001 $\Omega$ , current rating 100 A .....	249004
Field test, 0.0001 $\Omega$ , current rating 500 A .....	249005
Certificate of Calibration, NIST .....	CERT-NIST

\*Furnished with protective shield