Established 1981
Advanced Test Equipment Rentals
www.atecorp.com 800-404-ATEC (2832)

DLRO 10 and DLRO 10X
Digital Microhmmeter

- **Auto current reversal cancels standing emfs**
- **Protected to 600 V**
- **Automatically detects continuity in potential and current connections**
- **Multiple operating modes including fully automatic**
- **Alpha-numeric keypad for entering test notes (DLRO 10X)**
- **User selectable high and low limits (DLRO 10X)**
- **Printer output and memory (DLRO 10X)**

DESCRIPTION

DLRO 10 and DLRO 10X set the standards for low resistance measurement. DLRO 10 and DLRO 10X are fully automatic instruments, selecting the most suitable test current up to 10 A d.c. to measure resistance from 0.1 $\mu\Omega$ to 2000 Ω, on one of seven ranges.

For users who desire more control over the measurement process, DLRO 10X uses a menu system controlled by a two-axis paddle to allow the user to manually select the maximum test current.

DLRO 10X also adds real time download of results and on board storage for later download to a PC.

Both instruments are built into a strong, lightweight case that is equally at home in the field or in the laboratory. Light enough to be worn around the neck, they are small enough to be taken into areas that were previously too small to access.

DLRO 10 uses a large, bright 4 1/2 -digit LED display while DLRO 10X has a large, backlit LCD display. Normally, measurements are made with forward and reverse currents to cancel the effects of any standing voltages across the test sample.

The average value is then displayed within 3 seconds, to a basic accuracy of 0.2%. DLRO 10X displays both forward and reverse measurements as well as the average of the two.

DLRO 10X allows the user to set high and low pass limits, thereby enabling simple go-no-go testing.

At the end of a test DLRO10X will store the test results, as well as any notes relevant to the test.

To assist operator safety and ease of use, both instruments are supplied complete with a pair of duplex handspikes with 1.2 m (4 ft) leads. One of the probes is fitted with LED's, which duplicate indicators on the instrument display indicating that all four contacts have been made, the presence of a high voltage across the load, and the presence of current flow while a load is discharging. A full range of test leads is available with probes, clamps and Kelvin clips.

Nickel Metal Hydride (NiMH) batteries power the instruments. The battery packs are interchange-able so that an exhausted battery may be recharged using the external charger supplied while testing continues using a spare pack. Although full charging will take 4 hours, a fast charge mode allows the battery to be 90% charged within 2 1/2 hours from a 12 volt battery or from a standard 120/230 V AC supply via the supplied charger. The battery pack contains its own battery state indicator, which allows the charge-state to be monitored, even without being connected to the instrument.

DLRO 10X is fitted with RS232 communications that will allow results to be downloaded in real time or stored for later retrieval.

Up to 700 sets of results may be stored within DLRO 10X complete with notes containing up to 200 characters which may be added using the on board keypad. These results can also be downloaded to a PC.

MEASUREMENT MODES:

A variety of measurement modes are available. Since the introduction of V2.0 firmware, Normal, Auto, Continuous and Inductive mode are available on both the DLRO 10 and the DLRO 10X.

DLRO 10 will display the average of the measurements achieved using forward and reverse current, while DLRO 10X displays both individual measurements and the average.

Normal mode initiates a test by pressing the Test button on the instrument front panel after connecting the test leads. Continuity of all four connections is checked, forward and reverse currents are applied.

Auto mode allows forward and reverse current measurements to be made and the average displayed simply by making contact with all four probes. This mode is ideal when working with the supplied handspikes. Each time the probes are removed and reconnected to the load another test will be performed without the need to press the test button on the instrument.

Continuous mode allows repeated measurements to be made on the same sample. Simply connect the test leads and press the test button. The measurement is updated every 3 seconds until the circuit is broken.

Inductive mode is intended for use when measuring inductive loads. When measuring inductive loads it is necessary to wait for the voltage to stabilise. This means that the measurement could take a few seconds or several minutes. The test leads are firmly connected to the item to be measured and the Test button is pressed. The instrument will pass a current through the sample and wait for the voltage to stabilise. If possible the current will be increased. This procedure will be repeated until the voltage detected falls into the range 15 mV to 200 mV. The instrument will then continue to take readings, which will gradually decrease to the true value as the voltage stabilises further. The operator decides when the result is stable and presses the test button to terminate the test. Measurement is made with forward current only.

Unidirectional mode, on DLRO 10X only, applies a current in one direction only. This does not enable any standing emfs to be negated but speeds up the measurement process. Test starts automatically when probes are connected.

APPLICATIONS

The needs for accurate low resistance measurement are well known and very diverse. They range through Goods Receiving inspection of components to ground bonding and welded joints. Typical applications include, but are not limited to, making d.c. resistance measurements of:

- Switch and contact breaker resistance
- Busbar and cable joints
- Aircraft frame bonds and static control circuits
- Integrity of welded joints
- Inter-cell connections on battery systems up to 600 V peak
- Quality control of resistive components
- Transformer and motor winding resistance
- Rail and pipe bonds
- Metal alloys, welds and fuse resistance
- Graphite electrodes and other composites
- Wire and cable resistance
- Transmitter aerial and lightning conductor bonding

FEATURES AND BENEFITS

- Small, lightweight and portable - can be used in tight places, reduces the need for extra long leads and two person operation.
- Four terminal resistance method shows the true resistance of the item under test.
- Bright LED (DLRO 10) and LCD (DLRO 10X) displays are easily visible under all lighting conditions and reduce human error.
- Automatically applies forward and reverse currents which cancel out any standing voltages across the sample under test.
- Checks for undue noise during measurement, reducing the possibility of recording the incorrect result.
- Automatically detects continuity in P and C circuits, preventing erroneously high reading to be taken due to high resistance contact.
- Battery module has a battery condition indicator allowing the user to check the state of spare batteries without connecting to the instrument.
- RS232 connector on the DLRO 10X allows downloading of results in real time or stored for later retrieval.

Resistance ranges			Full scale volts		Test current	
Full Scale	**Resolution**	**Accuracy***	**Resistive**	**Inductive**	**Resistive**	**Inductive**
1.9999 mΩ	0.1 μΩ	±0.2% ±0.2μΩ	20 mV	n/a	10 A	n/a
19.999 mΩ	1 μΩ	±0.2% ±2 μΩ	20 mV	20 mV	1 A	1 A
199.99 mΩ	10 μΩ	±0.2% ±20 μΩ	20 mV	200 mV	100 mA	1 A
1.9999 Ω	100 μΩ	±0.2% ±0.2 mΩ	20 mV	200 mV	10 mA	100 mA
19.999 Ω	1 mΩ	±0.2% ±2 mΩ	20 mV	200 mV	1 mA	10 mA
199.99 Ω	10 mΩ	±0.2% ±20 mΩ	20 mV	200 mV	100 μA	1 mA
1999.9 Ω	100 mΩ	±0.2% ±0.2 Ω	200 mV	200 mV	100 μA	100 μA

		DLRO 10	DLRO 10X
Measurement:	Mode:	Manual, Auto, Continuous, Inductive	Manual, Auto, Continuous, Inductive, Undirectional
	Control:	Fully Automatic	Fully Automatic/Manual
	Speed:	<3s for forward & reverse current and to display average	
Display:	Measurement:	4 $^1/_2$ digit seven segment LED	
	Range and Safety:	LED indication	Large backlit LCD
Test Method:		Single cycle reversing d.c. ratiometric measurement -average result display.	
Test Current:	Accuracy:	±10%	
	Stability:	<10 ppm per second	
Maximum Lead Resistance:		100 mΩ total for 10 A operation irrespective of battery condition.	
Voltmeter input impedance:		> 200 kΩ	
Hum rejection:		Less than 1% ±20 digits additional error with 100 mV peak 50/60 Hz. on the potential leads. Warning will show if hum or noise exceeds this level.	
Data:	Transfer:		Real Time or from storage via RS232
	Storage:		700 tests
	Memo Field:		Up to 200 characters per test via integral alphanumeric keypad
Battery:	Capacity:	7 Ah NiMH rechargeable	
	Life:	Typically 1000 x 10 A tests before recharge	
	Recharge:	Via external 90 V - 260 V 50/60 Hz charger or from 12 to 15 V dc supply	
Charging Rate:	Standard:	2.5 hours to 90% capacity, 4 hrs for full charge	
Temperature:	Operation:	+5 °C to +45 °C (41 °F to 113 °F) at full specification -10 °C to +50 °C (14 °F to 122 °F) at reduced accuracy	
Storage	Co-efficient:	-30 °C to +70 °C (-22 °F to 158 °F)	
	Slow charging:	<0.01% per °C over range 5 °C to 40 °C (<0.006% per °F from 4 1°F to 104 °F)	
Humidity (max):		+10 °C to +45 °C (50 °F to 113 °F)	
Altitude (max):		90% RH @ 40 °C (104 °F) non-condensing	
Safety:		2000 m (6562 ft) to full safety specifications	
EMC:		In accordance with IEC61010-1 600 V Category III - only when DH6 leads are used. In accordance with IEC61326-1	
Dimensions:		220 x 100 x 237 mm (8.6 x 4 x 9.5 in)	
Weight:		2.6 kg (5 $^3/_4$ lb.) including battery module	

* The accuracy stated assumes forward and reverse measurements.
Inductive mode or undirectional mode will introduce an undefined error if an external EMF is present.

ORDERING INFORMATION

Item (Qty)		Order No.
DLRO 10 Digital Low Resistance Ohmmeter		6111-428
DLRO10X Digital Low Resistance Ohmmeter		6111-429
Complete with		
7 Ah NiMH battery module.		6121-492
DH4 Duplex handspikes (2), one with indicator lights. 1.2m / 4 ft		6111-503
Battery charger for operation from 115/230 V 50/60Hz supply.		6280-333
Cigar lighter adapter for battery charging.		6280-332
User guide.		6172-473
Warranty book.		6170-618
Optional Accessories at extra cost		
Carrying case for DLRO10/10X and all standard accessories.		6380-138
Carrying case for optional lead sets.		18313
Calibration Shunt,10 Ω, current rating 1 mA.		249000
Calibration Shunt, 1 Ω, current rating 10 mA.		249001
Calibration Shunt, 100 mΩ current rating 1A.		249002
Calibration Shunt, 10 mΩ current rating 10 A.		249003
Certificate of Calibration for Shunts, NIST		CERT-NIST
Replacement tips for DH4, DH5 and DH6 hand-spikes.		
Needle point		25940-012
Serrated end		25940-014
Optional Test Leads at extra cost		
Duplex Leads		
DH5 straight duplex handspikes (2). One has indicator lights.	2.5m/8ft	6111-517
DH6 Duplex handspikes (2) suitable for working on 600 V. systems.	2.5m/8ft	6111-518
Duplex Handspikes (2) with spring loaded helical contacts.	2m/7ft	242011-7
	2.5m/8ft	6111-022
	5.5m/18ft	242011-18
only 1 lead supplied	6m/20ft	6111-023
	9m/30ft	242011-30

Item (Qty)		Order No.
Straight Duplex Handspikes (2) Heavy Duty with fixed contacts.	2m/7ft	242002-7
	5.5m/18ft	242002-18
	9m/30ft	242002-30
Duplex Heavy Duty 5cm (2”) C-Clamps. (2)	2m/7ft	242004-7
	5.5m/18ft	242004-18
	9m/30ft	242004-30
Duplex handspikes with replaceable Needle Points	2m/7ft	242003-7
Duplex 1.27 cm (1/2 ”) Kelvin Clips. (2) gold plated	2m/7ft	241005-7
silver plated	2m/7ft	242005-7
Duplex 3.8 cm (11/2”) Kelvin Clips. (2)	2m/7ft	242006-7
	5.5m/18ft	242006-18
	9m/30ft	242006-30
Single Leads		
Single handspike (1) for potential measurement.	2m/7ft	242021-7
	5.5m/18ft	242021-18
	9m/30ft	242021-30
Current clip (1) for current connections.	2m/7ft	242041-7
	5.5m/18ft	242041-18
	9m/30ft	242041-30

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