# DLRO2 and DLRO2X
## Ducter™ Low Resistance Ohmmeter 2 A




- **Noise Rejection mode with Confidence Meter™ (DLRO2X)**
- **Manual and auto save results for export via Bluetooth® or USB memory stick (DLRO2X)**
- **'Difference Meter' for quick data comparisons**
- **Use very long test leads at 1 A using dedicated test mode**
- **Safely test the resistance of inductive loads at 1 A**
- **<600 V active protection against inadvertent live connections without blowing a fuse**
- **Ideal for outdoor use with protection against dust and moisture to IP54**
- **Industry standard safety rated at CAT III 600 V/CAT IV 300**

## DESCRIPTION

The DLRO2 series are tough, hand-held 2 A low resistance ohmmeters. They are designed to provide fast, accurate, repeatable measurements, even in electrically noisy locations. The DLRO2 is the latest in a long line of instruments to proudly display the Ducter™ brand, the Ducter™ testers being as well-known and relied upon as Megger insulation resistance testers.

For the utility or industrial user, a high level of safety is provided with a CAT III 600 V/CAT IV 300 V rating to IEC61010. In addition, the instrument can protect itself from inadvertent connections to up to 600 V without blowing a fuse, thereby avoiding essential time lost due to repairs or finding a replacement fuse.

When working outside, the IP54 rating ensures that neither rain nor dust will prevent testing.

The DLRO2 measures low resistance values across a wide range of applications, from railways and aircraft, to the resistance of industry components.

Applications requiring long test leads are not a problem for the DLRO2 as it has a dedicated long lead test to optimise the output. The long test lead function is able to provide up to 1 A of test current into 3.2 ohms resistance. This makes the DLRO2, with its optional cable reel test leads, ideal for testing wind turbine and avionic lightning protection applications.

To allow testing of smaller inductive loads, the DLRO2 can apply 1 A for at least 15 seconds, made possible by the high-capacity built-in rechargeable batteries, together with a separate inductive load function. The batteries can be fully recharged in 2.5 hours, minimising downtime.

Note: The DLRO2 is not ATEX/intrinsically safe rated and must not be used in explosive gas environments.

## FEATURES

### Noise Rejection mode (DLRO2X)

If the high noise indicator appears on the display while using either the normal mode, long test lead mode, or the inductive mode, then the measurement is being affected by noise and the results may not be reliable.

To assist with this situation, the DLRO2X is equipped with a **noise rejection test mode**. In this test mode, the current is passed continuously and in one direction only.

The instrument then feeds a stream of measurements into our patented Confidence Meter™. The measurement is then refined until a stable, accurate measurement is obtained.

### Data storage (DLRO2X)

The DLRO2X can save results to the internal memory. Folders can be created to store results for each asset ID. When the test is complete, the results can be manually saved to a chosen asset ID or the Auto Save function can be set up so that all results will automatically be saved to a specified folder once the test has completed. These results can then be copied to a USB data stick or transferred via Bluetooth® to transfer to your PC or mobile device. The DLRO2X is compatible with CertSuite Asset or PowerDB software

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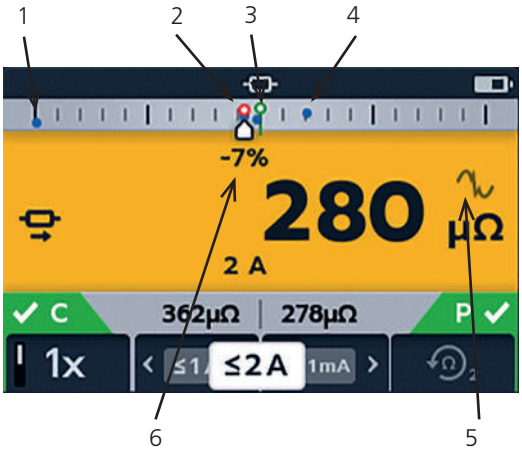
### Difference Meter

The DLRO2 is also equipped with a new innovative feature called a Difference Meter. This allows repetitive measurements to be easily compared with an initial reference measurement. The Difference Meter translates percentage difference to a needle/pointer movement to make it visually easy to see change.

New reference measurements can be set at the push of a button.




*DLRO2 colour display with new Difference Meter*

Key to Difference Meter screen:

1 Difference Meter scale.

2 Previous result markers in red indicates noise was present.

3 Reference measurement.

4 Previous result markers.

5 Electrical noise warning.

6 Percentage difference between current measurement and initial reference measurement.

### DLRO2 keeps you testing and produces reliable measurements

To ensure the DLRO2 is always ready to test, the supplied fitted as standard HR6 rechargeable NiMH batteries that can easily be swapped for non-rechargeable standard AA alkaline batteries to keep you testing.

Hand-held is not a compromise in quality of measurement. The DLRO2 provides 1% accuracy with a focus on repeatability making it ideal for repeated quality tests in production environments.

## FEATURES AND BENEFITS

- Easily select functions using the rotary dial.
- Option to run the test in bidirectional mode or in unidirectional mode to save time and battery power.
- The ability to view 3 results on the screen at any time makes it ideal for 3-phase systems.
- Overcome the effects of standing EMF voltages using the bidirectional test mode. Forward and reverse results can be viewed on the secondary display.
- For stability of results, the instrument will warn you when electrical noise, or noise from poor clip/probe connections, is present.
- Keeps testing as long as you can, with as many as 500 x 2 A – 3 second tests from a full charge.
- Supplied with compact CAT III 600 V/CAT IV 300 V rated kelvin clip test leads.
- Noise rejection range with Confidence Meter™ (DLRO2X only)

## EXAMPLE APPLICATIONS

- Aviation – Lightning protection testing measuring mΩ resistance between receptors, wing tip to wing tip etc., using long test leads. Optional long cable reel test leads are available, can be used for assembly of components, interconnection of equipment, repair, and maintenance.
- Wind turbines – Lightning protection, measuring mΩ resistance between wing tip to ground connection at base using long test leads. Optional long cable reel test leads are available.
- Rail, tram and underground – Rolling stock and infrastructure, track high current joints, signalling systems.
- Marine – Power wiring systems, protection systems, ship-to-shore bonding, cathode protection system testing, and cable laying applications.
- Oil and gas pipelines – Bonding between welded joints and grounding systems.
- Automotive and EV – Battery connections, weld quality, crimped connections quality, assembly robot welding cables.
- Cable manufacturers – Quality control, cable length.
- Component manufacturers – Quality control.
- Space exploration and engineering – Structural metal to metal, ground network metal to metal, carbon fibre to metal, carbon fibre to carbon fibre.
- Data centres – During electrical installation of main panel, generator, and UPS systems. Verification of protective device contact resistance, busbar parallel feeds, busbar lapped joints, optimum resistance over torque, and cable lug to busbar connections. During maintenance using trending data for all aspects of the above, verification after repair.
- Medical hand-held opportunity – Earthing and bonding systems for protection against microshock and macroshock.

- Panel/switchgear manufacturers – End of production line testing, site commissioning, maintenance, and fault finding.
- Robotics – Wiring systems and connections which are subject to stress/movement/vibration, bonding of component parts to minimise static, grounding of machine, welding leads of robot spot welder.
- Electrical infrastructure – Cable resistance from one end, cable length, identification of parallel supplies while connected, cable to lug to connection fault finding. Checking assembled connections main supply cables and panels, switchgear and protective devices, UPS and changeover panels, interlinking busbars, interlinking cables, distribution and PDU boards, lightning protection systems, final circuits.

### Test modes/options:

The DLRO2 has three main test modes, as listed below.

The DLRO2X also includes a fourth: Noise Rejection mode.

- Normal resistance mode (µΩ)
- Fast/long leads test mode (mΩ)
- Inductive resistance mode (µΩ)

**Normal resistance mode:** gives the most flexibility. The user can set any maximum test current range up to 2 A and the instrument will auto range to suit the measured resistance up to that value. This is useful if the test piece has a limit to the current it can withstand. The user has full control of the instrument's test features that are suitable for many applications, as listed above.

**Fast/long leads test mode:** only has one user option, which is manual/auto. 'Manual' starts the test when the TEST button is pressed, 'auto' starts the test automatically when the instrument detects continuity. In this mode, the instrument settings are optimised for speed and, if needed, the use of very long test leads. The test current is only in one direction for speed, 1 A and above, resistance is only displayed in mΩ. This test mode is ideal for many applications but is focused for applications where:

- The user is not technically trained. Use is simple, there are no settings to change. Where test procedures need to be very simple, 'switch on, select this range and press TEST' for example.
- The required minimum test current will be 1 A.
- The measurement will only be in mΩ. Non-technical users can simply read a number and compare it with a predetermined value.
- May need the use of very long test leads.

Example applications include:

- Wind turbine lightning protection (wing tip to ground at base resistance)
- Subsea cable laying, checking cable resistance, and ground connections
- Manufacturing, including cable resistance, large cable looms, or assemblies etc.

**Inductive resistance mode:** tests with the test current set to 1 A to speed up the charge time. The test current will be auto ranged up as the inductance is charged. Additional convenience is added with a clever 'auto stop' feature. The instrument will monitor the rate of change and automatically stop the test as soon as the result is stable.

Example applications include:

- Electric motors, small to medium in size, including railway traction motor stator winding resistance
- Small power distribution transformers
- Continuity detection at less than 2000 Ω

**Noise rejection range with Confidence Meter™ (DLRO2X only**), as mentioned previously.

### DLRO2X compatible software

CertSuite Asset is available as a monthly or yearly subscription package for Asset testing management, taking results directly from the DLRO2X whilst testing. For use on mobile, tablet or PC.

**Visit Certsuite.info for your FREE 30 day trial →**

PowerDB software for PC is available for DLRO2X from megger.com.

**For more information about PowerDB →**

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## SPECIFICATIONS

### PHYSICAL

**Dimensions:** 228 x 105 x 75 mm (8.98 x 4.1 x 2.95 in)

**Display:** Full LCD colour screen with user configurable backlight.

**Weight:** 905 grams

### SAFETY AND ELECTRICAL PROTECTION

**Safety rating:** CAT III 600 V / CAT IV 300 V to EN 61010, IEC 61010-031 : 2015, IEC 61010-030.

Safety category rating valid to altitude of 3000 m.

**Live voltage:** Active live voltage protection to 600 V between any test terminals without blowing a fuse. Live voltage warning on display and audible when >5 V is applied between any test terminals. Fuse protected to 1000 V, fuses are not user changeable.

### TEST CURRENT OUTPUT

**Normal resistance test mode:**

**Current ranges:** 2 A, 1 A, 100 mA, 10 mA, and 1 mA

**Maximum compliance output voltage:** 3.24 V (1 A mode) 2.2 V (2 A mode)

**Current output accuracy:** Normal and inductive mode: ±10 % Long lead test mode: +10 % -0 % at all battery conditions except with low battery indication.

**Thermal EMF/Seebeck effect compensation:** Yes, average of forward and reverse test current measurements.

### LOW RESISTANCE MEASUREMENT

**Resistance measurement test modes:** Normal test mode, fast mΩ/long test lead mode and inductive test mode (resistance of inductive loads).

**Overall resistance range:** 1 µΩ – 2000 Ω

**Max resistance across C terminals:** 2 A with up to 1.1 Ω total resistance and 1 A with up to 3.2 Ω total resistance.

**Basic accuracy:** Bi-directional test current mode: ±1 % ±2 digits. Uni-directional test current mode: ±1 % ±10 digits. Inductive mode or unidirectional mode will introduce an undefined error if an external EMF is present.

### ENVIRONMENT

**Noise immunity:** Less than 1 % ±20 digits additional error with 80 mV peak 50/60 Hz with on screen noise limit indicator.

Less than 1 % ±20 digits additional error with 80 mV peak 400 Hz with on screen noise limit indicator.

**Noise rejection range (DLRO2X only)** 60 mV peak random noise

**EMC:** IEC61326-1, industrial specification IEC61326-2-2.

**Dust and moisture ingress:** IP54 to IEC60529 in use

**Altitude:** Operational to 3000 m

**Temperature:** Operational range 0 °C to 50 °C Storage range -20 °C to 50 °C

**Humidity:** Operational to 95 % Storage to 90 %

### DATA STORAGE (DLRO2X only):

**Data transfer:** USB memory stick or Bluetooth®

**Total maximum test measurement records:** 8 million

**Maximum asset ID references:** 256

**Maximum test measurement records:** 256 per asset, per day.

Note: continuous tests will contain multiple test measurements.

### POWER SUPPLY

Rechargeable 6 x HR6 NiMH batteries with built-in fast charge (also has the ability to use non-rechargeable alkaline AA batteries (LR6)).

**Battery charge time** < 4 hours

**Battery life** >1000 bi-directional tests at 2 A auto into a 1 Ω load.

### BATTERY CHARGER ADAPTOR

**Mains/line input voltage:** 100 to 240 V

**Mains/line input frequency:** 47 to 63 Hz

**Output:** 12 V DC 1.2 A 14.4 W max

**Type:** Travel adaptor/interchangeable plug adaptor.

**Plug types:** Australia, USA, Europe and UK plugs.

### CONNECTIONS

**Test terminals:** 4 X 4 mm shrouded sockets.

**Data:** USB (For firmware updates only), the user may update instrument firmware to latest version themselves.

**Battery charger:** 2.5 mm DC jack connector

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**Resistance measurement ranges:**

| Full Scale Resistance | Test Current | Resolution | Normal Resistance Mode | Inductive Mode | Long Test Lead Mode (1 A only) |
|---|---|---|---|---|---|
| 15000 µΩ | 2.00 A | 1 µΩ | ■ | | |
| 120.00 mΩ | 2.00 A | 0.01 mΩ | ■ | | |
| 1000.0 mΩ | 2.00 A | 0.1 mΩ | ■ | | |
| 30.000 mΩ | 1.00 A | 0.001 mΩ | ■ | ■ | ■ |
| 240.00 mΩ | 1.00 A | 0.01 mΩ | ■ | ■ | ■ |
| 2200.0 mΩ | 1.00 A | 0.1 mΩ | ■ | ■ | ■ |
| 300.00 mΩ | 100 mA | 0.01 mΩ | ■ | | |
| 2500.0 mΩ | 100 mA | 0.1 mΩ | ■ | | |
| 20.000 Ω | 100 mA | 0.001 Ω | ■ | ■ | |
| 3000.0 mΩ | 10.0 mA | 0.1 mΩ | ■ | | |
| 24.000 Ω | 10.0 mA | 0.001 Ω | ■ | | |
| 200.00 Ω | 10.0 mA | 0.01 Ω | ■ | ■ | |
| 30.000 Ω | 1.00 mA | 0.001 Ω | ■ | | |
| 240.00 Ω | 1.00 mA | 0.01 Ω | ■ | | |
| 2000.0 Ω | 1.00 mA | 0.1 Ω | ■ | ■ | |

## WIND TURBINE LIGHTNING PROTECTION LOW CURRENT TEST LEAD SETS (2 A)

The KC-C long test leads are updated versions of the popular KC series test leads that are taking advantage of the long test lead mode on the new DLRO2. The DLRO2s ability to test with up to 3.2 Ω total resistance at 1 A means the new KC-C series of leads can be much smaller and lighter, a distinct safety enhancement when working at height. The new KC100C cable reel weighs in at a low 7.6 kg, compared to the nearly 15 kg weight of the KC100 cable reel.

The KC100C and KC50C lead sets consist of two leads, a short one 3 m long, and a long one on a cable drum. On each end of each test lead there is an IP68 rated (when connected), click locking connector. This allows the terminations to be fitted on either end of the test leads, and the instrument connections are interchangeable with the test connections.



# DLRO2 and DLRO2X
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## ORDERING INFORMATION

| Description | Part number |
|---|---|
| DLRO2, Ducter Low Resistance Ohmmeter 2 A | 1012-280 |
| DLRO2X, Ducter Low Resistance Ohmmeter 2 A with data storage | 1013-795 |
| **Included accessories** | |
| Kelvin clip lead set 2 m CAT IV 300 10 A | 1011-928 |
| Kelvin probe lead set 2 m CAT IV 300 10 A | 1011-929 |
| Charger power supply (with plug adaptors) | 1002-736 |
| Six Batteries: 1.2 V NiMH AA 2000 mAHR | 1002-735 |
| USB memory stick | |
| Hanging hook and strap | 1012-068 |
| Soft pouch | 1012-063 |

| Description | Part number |
|---|---|
| **Optional accessories** | |
| Set of 4 Kelvin probe pins. Replacement probe tips. | 1012-064 |
| 4 right angled adaptors to allow hook terminated (e.g., KC100) leads to fit DLRO2X | 1012-511 |
| 10 A Fused test probe and clip lead set | 1013-224 |
| DLRO2 current and potential leadset 2 m. 2 x red lead, 2 x blk lead, 2 x grabber clip, 2 x probe | 1011-673 |
| Full calibration certificate DLRO2 | 1013-170 |
| UKAS calibration certificate DLRO2 | 1013-169 |
| Full calibration certificate DLRO2X | 1014-436 |
| UKAS calibration certificate DLRO2X | 1014-437 |
| KC50C-KIT Kelvin clamp/probe reel (50 m) | 1013-211 |
| KC100C-KIT Kelvin clamp/probe reel (100 m) | 1013-212 |
| KC50E Extension reel (50 m) | 1013-213 |
| KC lead spare Kelvin clamp termination | 1013-794 |
| KC lead spare Kelvin probe termination | 1013-793 |
| KC spare 3m test lead female to female terminations | 1013-791 |
| KC spare 4mm plug termination lead (1 off) | 1013-792 |
| Straight hook termination for DLRO10 range | 1007-036 |

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