DET3 and 4 Contractor Series
Earth/Ground Resistance Testers

- **2, 3 and 4 point testing**
- **ART (Attached Rod Technique) testing capability and stakeless testing technique**
- **Choice of digital or analog display**
- **Warning indicators prevent test failure**
- **IP54 rated**
- **Complete with leads, stakes and rugged carry case**
- **Simple one button operation**
- **Calibration test certificate included (except DET3TA)**

DESCRIPTION

The already popular ground testing instrument family from Megger has grown to include 6 models. These instruments are:

Model	Description
DET3TD	For basic requirements it provides digital ground testing and bond testing capabilities
DET3TA	For those who prefer an analog display
DET3TC	The revolutionary new model with the capability of testing on-site grounds without disconnecting the utility connection
DET4TD	For the added feature of a fourth terminal (for the measurement of soil resistivity)
NEW DET4TC	For 4 pole testing as well as attached rod technique and stakeless techniques
NEW DET4TCR	Rechareable tester for 4 pole testing, attached rod technique and stakeless techniques

The two new models (DET4TC and DET4TCR) as well as the DET3TC all include a current measuring function for ART (Attached Rod Technique) testing capabilities.

With this added function, on-site grounds can be tested separately without having to remove the utility connection (as explained further in this document). The new DET4TC and 4TCR also provide stakeless testing capability. This method allows the operator to use the instrument like a clamp-on ground tester in applications where that method is viable, while also being able to operate as a fall of potential tester.

Using ART method with the DET3TC to test commercial ground without disconnecting the system

The complete kit of instrument, test leads, stakes, batteries and calibration certificate are delivered in a tough polypropylene carry case – everything you need to start testing in one package. (Certificate not included with analog model). Optional terminal adapters are available for acceptance of a variety of test leads.

All models are rated to IP54, making them truly outdoor instruments. They are designed to meet stringent safety standards and are rated CAT IV 100V. The ground testers have been designed to be easy to use – a large selector switch makes selection of 2, 3 or 4 pole tests easy with gloved hands – and the design makes the fitting of shorting links to perform 2-pole tests a thing of the past. A large, clear, easy to read LCD or analog (DET3TA) display and thumb sized test button also make the instruments particularly well suited to the outdoor conditions of ground testing. In addition to this ease of use feature, the ground tester automatically checks the connection and conditions of the P spike, C spike, and also the level of ground noise, indicating the status on the display. (The

SELECTION GUIDE	DET3TD	DET3TA	DET3TC	DET4TD	DET4TC	DET4TCR
2-wire Resistance	■	■	■	■	■	■
3-wire Resistance	■	■	■	■	■	■
4-wire Resistance				■	■	■
ART (Attached Rod Technique) Resistance Measurement			■		■	■
Stakeless (Clamp-on) Measurement					■	■
Resistance Range	0.01 to 2000 2% ± 3d	0.01 to 2000 2.5% of scale length	0.01 to 2000 2% ± 3d	0.01 to 2000 2% ± 3d	0.01 Ω to 20 kΩ 2% ± 3d	0.01 Ω to 20 kΩ 2% ± 3d
Ground Voltage Range	0 to 100V	0 to 100V	0 to 100V	0 to 100V	0 to 100 V	0 to 100 V
Ground Current Range (with optional current measuring clamp)			0.5mA to 19.9A		0.5mA to 19.9A	0.5mA to 19.9A
Display	Digital	Analog	Digital	Digital	Digital	Digital

Model DET4TCR shown performing the stakeless ground testing method using only clamps.

analog model allows the operator to check the condition of the spikes). The instruments also include a voltmeter to enable measurement of ground voltage. Four of the models (the DET3TD, 3TA, 3TC and 4TD) can measure resistance from 0.01 ohms to 2 kΩ, while the DET4TC and 4TCR can measure resistance from 0.01 ohms to 20 kΩ. Also, to allow accurate testing in noisy environments, the instruments are capable of rejecting noise up to 40V peak to peak.

The Megger digital and analog ground testers are powered by eight AA batteries which are widely available and also give excellent testing time – the status of these batteries is given by a bar graph on the LCD display, allowing the operator to decide when to change the batteries before they expire. (On the analog model, battery status is indicated by selecting the function on the selector switch). Also, the new DET4TCR is powered from rechargeable AA cells. The battery charger is built in and the instrument is supplied with an AC/DC adapter. For all instruments, the battery status is displayed using a bar-graph.

The new DET4TC and DET4TCR also have additional capabilities. By using the optional ICLAMP the user can augment the traditional fall-of-potential measurement method with ART (Attached Rod Technique), which allows electrode testing without disconnection and also leakage current measurements down to 0.5 mA. A second optional clamp, the VCLAMP, enables true stakeless measurements to be made in situations where driving stakes is not practical.

The new DET4TC and DET4TCR also feature a backlit display, which extends the operational environment of the instrument to cable cellars and other dark locations. Finally, they also have selectable 25 V or 50 V output for compliance with IEC 61557-5.

Model DET3TD shown performing the classic fall-of-potential test method.

APPLICATIONS

The maintenance of an adequate low resistance ground connection is essential to both the protection and performance of any electrical system. Ground testing should be performed both upon installation, to meet design specification, and periodically thereafter in order to maintain service. All models can also perform bonding tests (using an ac signal), to determine that adequate connection has been made from equipment to the grounding system, while four-terminal models are necessary to perform soil resistivity tests. This additional function can be used in prospecting, locating, and designing new grounding electrodes and systems.

Furthermore, the addition of a built-in current clamp capability enables the testing of attached grounds (ART) without lifting the utility connection.

Selection among the six-model family is easy. For basic requirements, DET3TD affords ground testing and bond testing capabilities. For those who prefer an analog tester, DET3TA affords the same testing capabilities with a mechanical movement. The model's prime advantage is reliable performance in extremes of weather, either heat or cold, that stress the limits of digital capabilities. Applications to systems that have been connected to the utility feed is simplified with model DET3TC, DET4TC and DET4TCR where a built-in clamp input permits individual components of an expanded system to be separately measured without extra calculations. Finally, a fourth terminal feature on the DET4TD, 4TC and 4TCR also permits the measurement of soil resistivity.

Grounding electrodes from simple to complex systems can be tested, including:

- Primary and secondary electrical grounding systems
- Utility pole grounds
- Lightning protection systems
- Residential grounds
- Machinery safety grounds
- Computer and communication system grounds
- EMI/RFI system grounds
- Antenna and pedestal grounds
- CATV system grounds

FEATURES AND BENEFITS

- Microprocessor control for improved error detection
- Clear, unambiguous warnings and error indications ensure the reliability of the reading and reduce test time
- Simple to use, one touch operation improves efficiency
- Rugged, weatherproof case to IP54 makes the units truly outdoor instruments
- Large, clear LCD that can be read in ambient lighting
- Noise rejection to 40 V pk to pk allows accurate testing in noisy environments
- Testing kits and certificates supplied — everything needed to start testing immediately
- Accuracy of 2% of reading enhances reliability of measurements
- Clamp models for **Attached Rod Technique** allow the testing of the rod without the need for disconnection, and **stakeless testing** which allows the operator to use the instrument like a clamp-on ground tester in applications where that method is viable.
- Voltmeter function included allows you to measure the ground voltage and enhances operator safety
- CAT IV 100V provides increased operator safety

SPECIFICATIONS

Resistance range: 0.01 to 2000 autoranging (0.01 to 20kΩ for models DET4TC and 4TCR)
Resistance accuracy:
Analog model:
2.5% of scale length
Digital models:

2P measurements	2% ±3 digits
3P measurements	2% ±3 digits
4P measurements	2% ±3 digits
ART measurements	5% ±3 digits
Stakeless measurements	7% ±3 digits

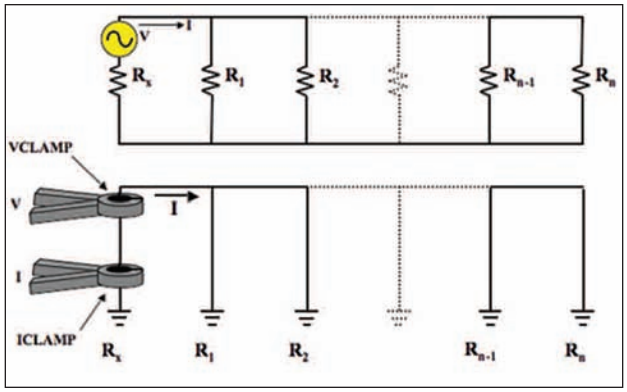
Maximum probe resistance
Rp limit: 100kΩ (50V output voltage)
Rc limit: 100kΩ (50V output voltage)
Limits reduced to 50kΩ for 25V output voltage
Limits reduced to 5kΩ for 0.01 Ω resolution
Earth voltage range: 0 – 100 V
Earth voltage accuracy: 2% ±2 V
2-wire test: Yes, all models
3-wire test: Yes, all models
4-wire test: DET4TD, DET4TC, DET4TCR
ART (Attached Rod Technique): DET3TC, DET4TC and DET4TCR
Ground current range (with current measuring clamp): 0.5 mA to 19.9 A
Ground current accuracy: 5% ±3 digits
Display: LCD (moving coil meter for analog model)
Test frequency: 128 Hz
Test voltage: 25 V or 50 V, user selectable (factory setting 50 V)
Test current: 450 micro-amps at 25 V or 50 V (selectable), 4.5 mA at 25 V
Noise rejection: 40V pk to pk
Noise check: Automatic (by selector switch DET3TA)
C spike check: Automatic (by pushbutton DET3TA)
P spike check: Automatic (by pushbutton DET3TA)
Maximum current loop resistance: 100 k-ohms at 50V, 50 k-ohms at 25 V and 5 k-ohms for 0.01 ohm resolution for readings below 19 ohms
Maximum voltage probe resistance: 100 k-ohms at 50V, 50 k-ohms at 25 V and 5 k-ohms for 0.01 ohm resolution for readings below 19 ohms
Battery type: 8 1.5 V AA cells (8 1.5 V AA NiMH rechargeable cells – DET4TCR)
Battery life: 3 hours, 700 consecutive tests
Safety: EN61010-1 CAT IV 100 V
Terminals: 4 mm plug type (test leads)
Ingress protection: IP54
EMC: Meets the requirements of EN61326-1:1998 for use in heavy industrial areas
Dimensions: 8 x 5.7 x 3.2 in. (203 x 148 x 78 mm)
Weight: 2.2 lb (1 kg)
Operating temperature range: -.5° to +131° F (-15° to +55° C); DET3TA: -4° to +122° F (-20° to +50° C)
Storage temperature range: -40° to +158° F (-40° to +70° C)
Humidity: 95% RH non-condensing at 104° F (40° C)

Standards Compliance

Complies with the requirements of KEMA K85B.
Complies with the following parts of EN61557, "Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. - Equipment for testing, measuring or monitoring of protective measures".
Part 1 - General requirements
Part 5 - Resistance to earth

STAKELESS (CLAMP-ON) TESTING

The DET4TC and DET4TCR include stakeless, or clamp-on testing capability. In effect, these models can be operated in the same way as a clamp-on ground tester, eliminating the need to disconnect the ground under test and drive test probes in certain ground system testing applications. This method is also useful when there is insufficient space to perform a classic fall-of-potential measurement. In addition the units can be used to measure ground leakage or phase current.

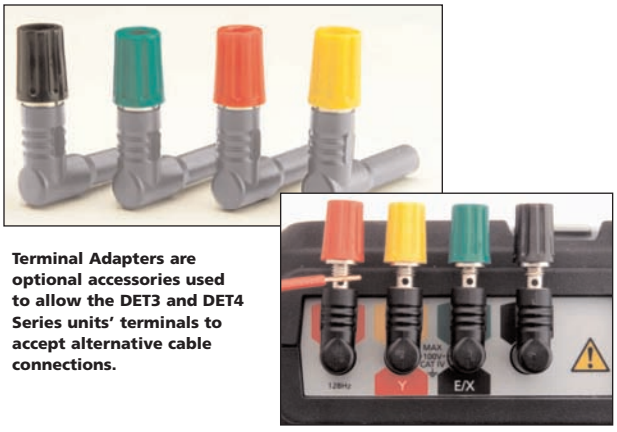


Current measuring clamp (inset) for ART testing capability

The user simply clamps the optional ICLAMP (current clamp) and VCLAMP (voltage clamp) around the ground under test in the manner prescribed in the operator's manual and takes the reading. A defined test voltage is injected into the system using the VCLAMP, inducing a current, I, to flow and be measured by the ICLAMP. The instrument then calculates the approximate resistance of the ground under test.

The stakeless method is subject to the same limitations faced by the traditional clamp-on ground tester. It is effective only in situations with multiple grounds in parallel and cannot be proofed like a fall-of-potential test. In situations where the stakeless method reading is questionable, a full fall-of-potential test is recommended. The advantage of the DET4TC and DET4TCR is that the units include both test methods in a single instrument, making them the most versatile units available.

Each instrument comes complete with three sets of leads, two test spikes, instruction manual CD, and a rugged carrying case, (current measuring clamp, shown, is an optional accessory for performing the ART testing capability using the DET3TC, DET4TC and DET4TCR only.)



Terminal Adapters are optional accessories used to allow the DET3 and DET4 Series units' terminals to accept alternative cable connections.

OPTIONAL ACCESSORY KITS

Standard Kit, Cat. No. 250579
Set of three color-coded test leads, 25, 50, 100 ft. (8, 15, 30 m); two 20-in. (51 cm) ground rods; canvas accessory case for leads and rods only

Soil Resistivity Kit Cat. No. 250586
Set of four test leads, 50 ft. (15 m); two pair of 20 in. (51 cm) ground rods; padded case to hold instrument, leads and rods

Deluxe Kit, Cat. No. 250581
Set of three color-coded test leads, 25, 50, 100 ft. (8, 15, 30 m); two 20-in. (51 cm) ground rods; padded case to hold instrument, leads and rods

Standard Kit Cat. No. EV6310-755
Hammer, 2.5 lb (1.13 kg); four galvanized steel spikes, 0.5 in. (12 mm); two spike extractors; four leads in carrying case

ART (ATTACHED ROD TECHNIQUE) TESTING CAPABILITY

Models **DET3TC, DET4TC and DET4TCR** include the additional testing capability that we have termed **ART**, for **Attached Rod Technique**. A nagging problem with traditional ground testing has been the requirement to "lift" (i.e., disconnect) the utility connection. Once the grounding conductor (the main conductor that connects the facility to the ground rod or grid) has been attached to the grounding electrode, the utility ground becomes a parallel resistance. The utility neutral is typically bonded to the ground bus at the service entrance and this connection, during a ground test, causes test current to flow back through the utility ground as well as through the test electrode. Test current divides according to Law of Parallel Resistance, but the tester makes its measurement based on total current flow. The reading is the combined parallel resistance of the on-site ground and the utility protection. This is a valid measurement, but not of the test electrode exclusively.

This poses a considerable problem in many common testing situations. If a commissioning test were required to determine if design specifications had been met for a new facility, such a reading would be insufficient. Lightning protection requiring a short, straight path into the earth, could also not be properly validated. But lifting the utility connection poses several problems, not the least of which is the breaking of what is often a welded bond, in addition to the temporary loss of protection.

Clamp-on ground testers, which measure ground resistance by clamping around the rod and inducing a test current onto it, are only a limited solution. They can accurately measure resistance of a single rod in a parallel system by inducing the test current onto the clamped rod and utilizing all the parallel grounds as the return. Collectively, these returns, typically the multiple grounds of the utility, contribute little to the loop measurement. This is essentially the reverse of the operation of a traditional tester, which uses the current probe as the return while current "goes to ground" through all parallels collectively. This technique solves the problem of separately measuring an attached rod, but leaves the problem that it cannot be proven.

A clamp-on measurement has to be accepted on faith and its reliability is based squarely on the knowledge and experience of the operator, leaving a large margin for "human error." In complex, multiply connected grids and other grounding schemes, return paths may exist that are entirely metallic, not including earth at all. The clamp-on test current will circulate through such paths and give a reading, essentially a continuity reading of the grid structure having nothing to do with soil resistance. Such readings will be low, and appear to the uninformed as acceptable grounds. The responsibility for making these determinations falls squarely on the operator. But even when properly addressed, there is no way of demonstrating the competence of the readings to a third party, such as a client. They must simply be accepted.

The **ART** testing capability combines the advantages of both of these technologies to produce a method that can reliably measure an attached ground, and prove it! A built-in clamp input, used in conjunction with the optional ICLAMP accessory, connected below the point of separation of the parallel test currents, measures only the current flowing through the test ground, not that going back through the utility. This current value is then used by the microprocessor to calculate ground resistance, strictly in accordance with **Fall of Potential** or its derivative procedures, supported by IEEE Standard 81 for proper ground testing, and subject to the appropriate proofs.

The **ART** method employs leads and probes just as does any traditional tester. Ground resistance can be profiled and graphed by moving the potential probe against the position of the current probe, and a Fall of Potential graph, Slope Method mathematical proof, or any of the other proven methods utilized to demonstrate the accuracy of the test. The only thing different from the operation of a familiar, traditional ground tester is that the clamp permits separation of the test currents in an attached or otherwise parallel-grounded system. This technique enables local grounds to be tested without lifting the utility connection, yet with the ease, reliability and confidence of a separate commissioning test.

Current measuring clamp (inset) for ART testing capability

ORDERING INFORMATION

Item (Qty)	Cat. No.
Analog ground tester, 2 and 3 terminal	DET3TA
Digital ground tester, 2 and 3 terminal, ART capability	DET3TC
Digital ground tester, 2 and 3 terminal	DET3TD
Digital ground tester, 2, 3 and 4 terminal	DET4TD
Digital ground tester, 2, 3 and 4 terminal	DET4TC
Rechargeable digital 2, 3 and 4 terminal ground tester and External AC/DC adaptor	DET4TCR
Professional digital ground tester kit (DET4TC, VCLAMP and ICLAMP, field calibration check for instrument and CLAMPS, right angled adaptor kit)	DET4TC+KIT
Professional digital ground tester kit (DET4TCR, VCLAMP and ICLAMP, field calibration check for instrument and CLAMPS, right angled adaptor kit)	DET4TCR+KIT

Included Accessories

Hard carry case	EV5410-409
Replacement 3-wire lead set for DET3 Series (15m red wire, 10m yellow wire, 4m green wire)	6220-805
External AC/DC adaptor (DET4TCR only)	6280-370

Item (Qty)	Cat. No.
Optional Accessories	
Current measuring clamp and connecting lead for ART testing method	ICLAMP
Voltage inducing clamp, calibration check PCB (two-clamp measurements) and connecting lead	VCLAMP
Calibration check box	6220-824
Right angled terminal adaptor set	6220-803
Black crocodile clip (1)	6280-850
Professional ground testing kit (2 x 50m, 2 x 30m, 4 auger stakes, carry case)	6320-245
Auxiliary 12V socket charger (DET4TCR only)	6280-375
"Getting Down to Earth" a Megger guide to earth testing	AVTM25-TA
Replacement hard carry case	5410-429
Replacement calibration check PCB (two-clamp measurements)	6220-831
Replacement ground test stakes (x2) for included kit (200mm, 8mm dia)	6220-804
Replacement ground test leads (x4) for included kit (15m, 10m, 10m, 3m)	6220-806
Replacement auger stakes (x2) for professional kit	6220-839
Replacement cable reel (50m, red cable) for professional kit	6220-840
Replacement cable reel (50m, black cable) for professional kit	6220-841
Replacement cable reel (30m, green cable) for professional kit	6220-843
Replacement cable reel (30m, yellow cable) for professional kit	6220-842

ISO STATEMENT
Registered to ISO 9001:2000 Reg no. Q 09250
Registered to ISO 14001 Reg no. EMS 61597
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