Test instruments for the maintenance of electrical power systems

Megger

Power on

New products

Hand-held power quality analyser

MPQ1000

Unmatched capability in a smart easy to use package.

See page 49

MPQ1000

Test and diagnosis system for MV cables

MV DAC

A DAC (Damped AC) voltage test set with a peak voltage of 30 kV.

See page 34

MV DAC

Battery load tester

TORKEL900

For testing battery systems ranging from 12 to 300 V.

See page 53

TORKEL 900

Oil tan delta

OTD

An addition to Megger's extensive range transformer oil tests.

See page 28

OTD

Test system for MV cables

TDM45

High power test and diagnosis combination for MV cables.

See page 35

TDM45

UHF partial discharge detector

UHF PDD

Hand-held online substation PD surveying system.

See page 35

UHF PDD

Cable test van system

CENTRIX 2.0

Combining cable testing, cable diagnostics and cable fault techniques.

See page 39

CENTRIX 2.0

Megger

Power on

INSULATION TESTING AND CONTINUITY

POWER PROTECTION

Circuit breaker testing

Protective relay testing

POWER TRANSFORMER TESTING

POWER CABLE INFRASTRUCTURE

Diagnostic testing

CABLE FAULT LOCATION

GENERAL ELECTRICAL TEST

DC diagnostic insulation testers

Regular insulation resistance testing is one of the most cost effective, non-destructive methods of identifying ageing in electrical equipment. With over 60% of equipment failures being ascribed to insulation breakdown, it is a key area to monitor. Diagnostic DC testing is probably the easiest and most convenient method of achieving this due to the small size and weight of the equipment.

5 kV utility insulation resistance tester

S1-568

With exceptionally high noise rejection, the fast charging S1-568 offers the full gamut of automatic insulation tests with 8 mA of noise rejection, IR, timed IR, polarisation index (PI), dielectric absorption ratio (DAR), programmable Step Voltage (SS), Dielectric Discharge (DD) and ramp. The S1-568 allows the operator to control the test remotely from a computer using the 10 kV isolated USB port, to store the date and time stamped results on board or to download them in real time using Bluetooth. This is the perfect tester for the itinerant contractor as it will give results in any electrical environment.

10 kV utility insulation resistance tester

S1-1068

With a full 8 mA of noise rejection and 4 levels of filtering the fast charging S1-1068 obtains meaningful results in extremely hostile environments. Offering the full gamut of automatic insulation tests, IR, timed IR, polarisation index (PI), dielectric absorption ratio (DAR), Step Voltage, Dielectric Discharge and ramp, the S1-1068 allows the operator to control the test remotely from a computer using the 10 kV isolated USB port, to store the date and time stamped results on board or to download them is real time using Bluetooth. This is the perfect tester for the itinerant contractor as it will give results in any electrical environment.

15 kV utility insulation resistance tester

S1-1568

A maximum resistance measurement of 35 TΩ and 15 kV test voltage are additional features of this instrument, which displays the same exceptionally high noise rejection as the other testers in the series. Diagnostic tests available include IR, timed IR, polarisation index (PI), dielectric absorption ratio (DAR), Step Voltage, Dielectric Discharge and ramp testing as automatic tests. The results are time and date stamped and stored on board or they can be downloaded in real-time.

5 kV general purpose insulation resistance tester

MIT515

Offering CATIV safety and Megger's unique dual case design, MIT515 is an easy to operate insulation resistance tester that is very tough. Measuring up to 10 TΩ, it allows IR, timed IR, polarisation index (PI) and dielectric absorption ratio (DAR) to be measured automatically.

5 kV diagnostic insulation resistance tester

MIT525

The MIT525 performs all the insulation tests offered by MIT515 and extends the testing capabilities to include Step Voltage, Dielectric Discharge and ramp testing. Test data can be downloaded in real-time using the 10 kV isolated USB port, or stored in the instrument's advanced memory. Smaller and lighter than its predecessors these new testers are easier to store on a van, fit in an overhead locker on an aircraft and are more convenient to carry to the job.

10 kV diagnostic insulation resistance tester

MIT1025

The MIT1025 tests insulation to 20 TΩ at test voltages up to 10 kV. It has increased diagnostic potential over its predecessors by offering IR, timed IR, polarisation index (PI), dielectric absorption ratio (DAR), Step Voltage, Dielectric Discharge and ramp testing as automatic tests. The results are time and date stamped and stored on board or they can be downloaded in real-time.

15 kV diagnostic insulation tester

MIT1525

Offering test voltages up to 15 kV and a maximum insulation resistance reading of 30 TΩ the MIT1525 extends the users' ability to monitor the aging of insulation. Diagnostic tests available include IR, timed IR, polarisation index (PI), dielectric absorption ratio (DAR), Step Voltage, Dielectric Discharge and ramp testing as automatic tests. The results are time and date stamped and stored on board or they can be downloaded in real-time.

		MIT515	MIT525	S1-568	MIT1025	S1-1068	MIT1525	S1-1568
Test voltage	15.0 kV						■	■
	10.0 kV				■	■	■	■
	5.0 kV	■	■	■	■	■	■	■
	2.5 kV	■	■	■	■	■	■	■
	1.0 kV	■	■	■	■	■	■	■
	500 V	■	■	■	■	■		
	250 V	■	■	■				
	100 V to 1 kV in 10 V steps	■	■		■		■	
	1 kV to max test voltage in 25 V steps	■	■	■	■	■	■	■
	40 V to 1 kV in 10 V steps			■		■		■
	Max reading	10 TΩ	10 TΩ	15 TΩ	20 TΩ	35 TΩ	30 TΩ	35 TΩ
	Min reading	10 kΩ	10 kΩ	10 kΩ	10 kΩ	10 kΩ	10 kΩ	10 kΩ
	Voltage	■	■	■	■	■	■	■
	Capacitance	■	■	■	■	■	■	■
	Leakage current	■	■	■	■	■	■	■
Test types	Timed insulation resistance	■	■	■	■	■	■	■
	Polarisation index	■	■	■	■	■	■	■
	Dielectric absorption index	■	■	■	■	■	■	■
	Step voltage		■	■	■	■	■	■
	Dielectric discharge		■	■	■	■	■	■
	Ramp		■	■	■	■	■	■
Other feature	Analogue and digital display	■	■	■	■	■	■	■
	Short circuit current	3 mA	3 mA	6 mA	3 mA	6 mA	3 mA	6 mA
	Rechargeable	■	■	■	■	■	■	■
	Timer control and display	■	■	■	■	■	■	■
	Max noise rejection	3 mA	3 mA	8 mA	3 mA	8 mA	6 mA	8 mA
	Remote control via USB port			■		■		■
	USB output		■	■	■	■	■	■
	Bluetooth output			■		■		■
Software	PowerDB Lite		■	■	■	■	■	■

40 kV test unit

T99/1

The high voltage test unit is portable and powerful, able to generate a DC voltage of up to 40 kV. The T 99/1 is used for testing of cables, cable accessories, plant and installations. It can be powered from an external 12 V battery.

70 kV, 120 kV and 160 kV DC dielectric test set

220000 series

220000 series provides a dependable, safe, lightweight and portable DC voltage source for testing the quality and integrity of electrical power cables, cable installations, motors, switchgear, insulators, transformers and capacitors.

Each test set comes in two units, the HV unit and the controller.

220000 series has advanced performance with long-term reliability provided by filtered half-wave rectification

Model	HV tester 25 kV	T99/1	HV test set 50 kV	HPG70-K	220070	HV test set 80 kV	HV test set 110 kV
DC output	0 to -25 kV	0 to 40 kV	0 to 50 kV	0 to 70 kV	0 to 70 kV	0 to 80 kV	0 to 110 kV
Continuous output current	1.5 mA	2.5 mA	6 mA	10 mA	3.5 mA	5 mA	4 mA
Mains operation	■	■	■	■	■	■	■
Battery operation	optional	optional					
Weight	13.5 kg	15 kg	13 + 17 kg	18 + 20.5 kg	10.5 + 20 kg	13 + 18.5 kg	13 + 20 kg

Model	220123	220163	HVDC200	HVDC400	HVDC650	HVDC800
DC output	0 to 120 kV	0 to 160 kV	0 to -200 kV	0 to -400 kV	0 to -650 kV	0 to -800 kV
Continuous output current	2.5 mA	2 mA	9 mA	4 mA	3.5 mA	2 mA
Short circuit current output			300 mA	300 mA	290 mA	55 mA
Mains operation	■	■	■	■	■	■
Weight	10.5 + 30 kg	10.5 + 33 kg				

DC overvoltage or withstand testing

Portable high voltage test set for DC voltage testing of cable and cable installations

HV test set 50 kV, HV test set 80 kV and HV test set 110 kV

This range of three HV test sets is for the DC voltage testing of cables and cable installations in accordance with international standards. Each set consists of a control unit and HV unit. Because they are small and light the test sets can easily be transported and used on-site.

High voltage DC testers are sometimes known as pressure testers or Hi Pots. They are a convenient way to stress the insulation of cables other than XLPE using above-rated voltages to identify any weakness in the insulation and to measure current leakage.

Portable high voltage tester

HV tester 25 kV

This high-voltage generator offers a variable DC output voltage from 0 to 25 kV with an output current of 1.5 mA at the maximum voltage. It is mains or battery powered, and this combined with its low weight makes it ideal for field use. The ground safety circuit and integrated discharge enhance the operator's safety.

70 kV DC portable high voltage test system

HPG70-K

A fully insulated test set for DC testing up to 70 kV, this system is ideal for stand-alone applications. The DC voltage is obtained through a bridge rectifier which ensures a very low test voltage ripple. Moreover the DC voltage is measured on the output side thus ensuring a precise output voltage. Applications include testing of cables, switchgear, current-transformers, MV plant and components.

High voltage DC test systems

HVDC200, HVDC400, HVDC650 and HVDC800

HVDC test set systems are high-performance, portable testing systems that can be used to test all kinds of components of high voltage direct current transmission in line with the applicable regulations on the generation of HVDC voltages of up to 800 kV.

The modular construction permits test voltages up to 800 kV; there is a choice of polarity with a DC ripple of less than 3%.

The system is controlled by a single knob and large colour display. There is an automatic motor-driven discharge system with a manual back-up system. Illustrated is the HVDC200.

AC insulation testers

AC insulation testers most closely replicate the normal operating condition for a substation asset. Consequently they provide the most accurate indication of the insulation condition.

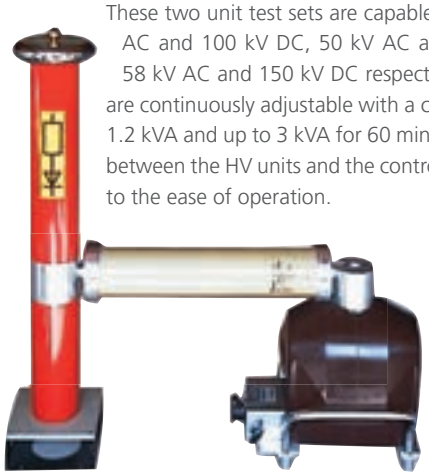
AC high voltage test system

T22/1

This system is of two piece design and offers continuously variable test voltages up to 75 kV. Its performance is expandable to 150 kV AC by the addition of a second transformer. It features built-in overload protection. The test set can be equipped with a rectifier accessory for DC testing up to 80 kV.

DC and AC high voltage test system

HPG50-D, HPG70-D and HPG80-D



These two unit test sets are capable of testing to 35 kV AC and 100 kV DC, 50 kV AC and 140 kV DC, and 58 kV AC and 150 kV DC respectively. These voltages are continuously adjustable with a continuous output of 1.2 kVA and up to 3 kVA for 60 minutes. The separation between the HV units and the controller units contribute to the ease of operation.

DC and AC high voltage test system

HPG50-H, HPG70-H, HPG80-H and HPG110-H

Designed on a two unit basis, these test sets are capable of testing to 35 kV AC and 50 kV DC, 50 kV AC and 70 kV DC, 58 kV AC and 80 kV d.c, and 78 kV AC and 110 kV d.c respectively. These voltages are continuously adjustable with a continuous output of 1.2 kVA and up to 3 kVA for 60 minutes.

100 kV 50 Hz test system

HPA100AC and HPA130DC

Offering continuous testing with AC voltages up to 100 kV at 5 kVA, this is a powerful test set. The unit has been designed for mounting in cable test vans and can be used for testing of cable systems and for burning down high-resistance cable faults with a high breakdown voltage. The test set can be equipped with a rectifier accessory for DC testing up to 130 kV.

The noise level of the test system is below 1%, so it is also suitable as a voltage source for PD-measurements.

AC insulation testers

12 kV AC Tan δ test system

Delta4000 series

Tough yet light and designed to work reliably in high-interference areas, like substation switchyards, Megger's DELTA4000 series diagnostic insulation systems offer time saving fully automatic power factor/tan delta measurement and tip-up testing. Also provided are facilities for full manual control –including the ability to vary the applied voltage up to 12 kV during testing – to cater for special testing requirements.

Accurate and dependable temperature correction, based on the actual condition of the test object, can be applied to results using a novel technique, which works with data acquired from a separate dynamic frequency response (DFR) test. Automatic detection of non-linear response, which suggests the need for further (tip-up) testing and which is often a useful indicator of incipient insulation problems, is also provided. Despite their small size and low weight, Megger's DELTA4000 series test sets offer comprehensive facilities for assessing the condition of electrical insulation in all types of high-voltage equipment, including transformers, bushings, circuit breakers, cables, lightning arrestors and rotating machinery as well as measuring the excitation current of transformer windings.

The test sets generate their own test voltage, which is independent of supply quality. A further benefit of this approach is that it allows the test voltage to be varied in frequency from 1 Hz to 500 Hz, making the instruments even more versatile. There is the option of on-board computer or using an external computer to control the

AC high voltage test sets

HPA35, HPA50, HPA58 and HPA78

Capable of testing to 35 kV AC, 50 kV AC, 58 kV AC, and 78 kV AC respectively, these test sets are suitable for testing items with low capacity. They are a two piece design consisting of a control unit and a resin-cast HV unit.

AC and DC insulation test sets							
Model	**HPG50-D**	**HPG50-H**	**HPG80-D**	**HPG80-H**	**T22/1**	**HPG110-H**	**HPA100AC / HPA130DC**
AC output in kV_{RMS}	0 to 35	0 to 35	0 to 58	0 to 58	75	0 to 78	100
Expandable					150		
DC output in kV with accessories	100	50	160	80	80	110	130
Output in kVA	1.2	1.2	1.2	1.2	1	1.5	5
Weight in Kg	26 + 94	26 + 48	26 + 124	26 + 76	19 + 29	26 + 95	75 + 225

AC insulation test sets						
Model	**DELTA4310**	**DELTA4110**	**HPA35**	**HPA58**	**HPA78**	**HPA100AC**
AC output in kV_{RMS}	0 to 12	0 to 12	0 to 35	0 to 58	0 to 78	0 to 100
Output in kVA	1.2	1.2	1.2	1.2	1.2	5
On-board computer	■					
Individual temperature correction (ITC)	■	■				
Weight in Kg	15 + 22	14 + 22	26 + 48	26 + 76	26 + 95	75 + 225

Low resistance testing

Low resistance testers or micro ohmmeters have many applications. Most are used for testing the integrity of joints, as there can be serious consequences if there are bad connections in critical electrical systems, poor earths, heating in connections, broken rails on the railways, or on aircraft wings. Routine maintenance using low resistance testers, sometime known as Ducter low resistance ohmmeters, can highlight problems before they become catastrophic.

10 A micro-ohmmeter with test results storage and downloading

DLRO10X

The DLRO10X offers a 0.1 µΩ resolution with a maximum capability of 2 kΩ. Fast testing ability means users can achieve results in less than 3 seconds. At only 2.5 kg it is the smallest, lightest and most sophisticated 10 A low resistance ohmmeter available making it convenient for general testing.

The DLRO10X has the capability of measuring inductive loads such as transformers and motor windings. The DLRO10X has on-board memory, RS232 download capability, maximum setting and manual or automatic range control to the features of the DLRO10. Uses easily interchangeable batteries.

DLRO10X has real-time download of results and on-board storage for later download to a PC.

DLRO 10X has real-time download of results and on-board storage for later download to a PC

Why test for resistance?

Low resistance measurements are required to prevent long term damage to existing equipment and to minimize energy wasted as heat. They indicate any restrictions in current flow that might prevent a machine from generating its full power or allow insufficient current to flow to activate protective devices in the case of a fault. Periodic tests are made to evaluate an initial condition or to identify unexpected changes in the measured values, and the trending of this data helps indicate and may forecast possible failure conditions. Excessive changes in measured values point to the need for corrective action to prevent a major failure.

Dual power 10 A micro-ohmmeter with IP rating

DLRO10HD and DLRO10HDX

DLRO10HD is a tough low resistance ohmmeter which is designed to withstand the inclement conditions of real world testing. Rated at IP65 when the lid is closed and IP45 when operating under battery power, the DLRO10HD has a resolution of a 0.1 µΩ. There are also 2 power output levels to assist with condition diagnosis. One is limited to avoid heating the test sample while the other maintains a set high power output. The DLRO10HDX adds the benefit of results storage and downloading .

10 A Micro-ohmmeter

DLRO10

The DLRO10 series offers a 0.1 µΩ resolution with a maximum capability of 2 kΩ. Fast testing ability means users can achieve results in less than 3 seconds. At only 2.5 kg the smallest, lightest and simplest-to-use 10 A low resistance ohmmeter available. Uses easily interchangeable batteries.

DLRO10 has bright 4½ digit LED display making it easy to read under all lighting conditions

		DLRO10HDX	DLRO10HD	DLRO10X	DLRO10	BT51
Nominal current		Up to 10 A	Up to 10 A	Up to 10 A	Up to 10 A	Up to 2 A
No of ranges with power limited to 0.25 W		6	6	6	6	
No of higher power ranges		2	2			2
Display		LCD Backlit	LCD Backlit	LCD Backlit		
Results storage and Download		■		■		
Power supply	Mains	■	■	optional	optional	
	Rechargeable battery	■	■	■	■	■
Weight		6.7 kg	6.7 kg	2.6 kg	2.6 kg	4.5 kg

Low resistance testing

2 A bond tester

BT51

Low resistance ohmmeter ideally suited for bond testing applications, i.e. aircraft frames. Four terminal method of measurement ranges 0-20.00 mΩ and 0-2000 mΩ. Test current is 2A.

Wind turbine lightning protection test leads sets

KC

The KC series of test leads provide a complete and convenient solution to the problem of finding reliable test leads that are long enough for testing the continuity of lightning protection conductors in wind turbines.

KC-series wind turbine test leads are available in 100 m, 50 m and 30 m versions that are equally suitable for use on site or in the manufacturing plant. All lead set versions are 10 A rated.

Clips and leads for low resistance testing

Megger has launched a new range of duplex test leads making it possible to give customers more flexibility. One buys one set of tester end leads and attaches any of a selection of probes and clips to the tough duplex connector, one of which can house an LED indicator. Used with the DLRO10 series, the indicator will warn of connection to hazardous live voltages, indicate continuity, the completion of the test and passing or failing pre-set test limit.

FAR END	TESTER END	LENGTH	TEST CURRENT	SPECIAL FEATURE	USED WITH	PART NO.
Male duplex connector	2 hooks and plug	1.5 m	10 A	Indicator LED in connection	DLRO10, DLRO10X, DLRO10HD	1006-456
Male duplex connector	2 hooks and plug	3 m	10 A	Indicator LED in connection	DLRO10, DLRO10X, DLRO10HD	1006-458
Male duplex connector	2 hooks and plug	6 m	10 A	Indicator LED in connection	DLRO10, DLRO10X, DLRO10HD	1006-459
Male duplex connector	2 hooks	1.5 m	10 A		DLRO10, DLRO10X, DLRO10HD	1006-452
Male duplex connector	2 hooks	3 m	10 A		DLRO10, DLRO10X, DLRO10HD	1006-454
Male duplex connector	2 hooks	6 m	10 A		DLRO10, DLRO10X, DLRO10HD	1006-455
Male duplex connector	2 hooks	3 m	10 A		BT51	1007-023
Male duplex connector	2 hooks	6 m	10 A		BT51	1007-024
Male duplex connector	Female duplex connector with locking ring	6 m	10 A	Lead extension	DLRO10, DLRO10X, DLRO10HD	1006-460
Duplex probe	Female duplex connector with locking ring	0.4 m	10 A	P and C probe spacing 6 mm	DLRO10, DLRO10X, DLRO10HD, BT51	1006-450
Right angle duplex probe	Female duplex connector with locking ring	0.4 m	10 A	P and C probe spacing 10 mm	DLRO10, DLRO10X, DLRO10HD, BT51	1006-449
Concentric duplex probe	Female duplex connector with locking ring	0.4 m	10 A	P and C probe spacing 3.8 mm	DLRO10, DLRO10X, DLRO10HD, BT51	1006-448
Kelvin clip	Female duplex connector with locking ring	0.4 m	10 A	Clip capacity 40 mm	DLRO10, DLRO10X, DLRO10HD, BT51	1006-447
Kelvin clip touch proof insulated	Female duplex connector with locking ring	0.4 m	10 A	Clip capacity 52 to 75 mm	DLRO10, DLRO10X, DLRO10HD, BT52	1006-451
Right angle duplex probe	2 hooks	3 m	10 A	In-line duplex locking connectors	BT51	1006-442
Right angle duplex probe	2 hooks	6 m	10 A	In-line duplex locking connector	BT51	1006-443
Duplex probe	1 off 2 hooks and plug 1 off 2 hooks	1.5 m	10 A	In-line duplex locking connectors, 1 with indicator LED	DLRO10, DLRO10X, DLRO10HD	1006-444
Kelvin clip	1 off 2 hooks and plug 1 off 2 hooks	3 m	10 A	In-line duplex locking connectors, 1 with indicator LED	DLRO10, DLRO10X, DLRO10HD	1006-462
Kelvin clip touch proof insulated	1 off 2 hooks and plug 1 off 2 hooks	3 m	10 A	In-line duplex locking connectors, 1 with indicator LED	DLRO10, DLRO10X, DLRO10HD	1006-461
Heavy duty Kelvin 10 cm g-clamp	2 spades	5 m	100 A			242104-2-16
Heavy duty Kelvin 10 cm g-clamp	2 spades	8 m	100 A			242104-2-16
HD 60 mm current clips and 22 mm potential clips	2 hooks	5 m	600 A	25 mm2 csa	DLRO100, DLRO200, DLRO600	6220-787
HD 60 mm current clips and 22 mm potential clips	2 hooks	5 m	600 A	50 mm2 csa	DLRO100, DLRO200, DLRO600	6220-755
HD 60 mm current clips and 22 mm potential clips	2 hooks	10 m	600 A	70 mm2 csa	DLRO100, DLRO200, DLRO600	6220-756
HD 60 mm current clips and 22 mm potential clips	2 hooks	15 m	600 A	95 mm2 csa	DLRO100, DLRO200, DLRO600	6220-757

Contact resistance testing

For testing circuit breaker contact resistance in compliance with IEC62271-100, specialist low resistance testers are used with a high output current. For this and other applications that require a higher test current, Megger offers an extensive range of testers that will fit your testing regime.

Testing with DualGround™

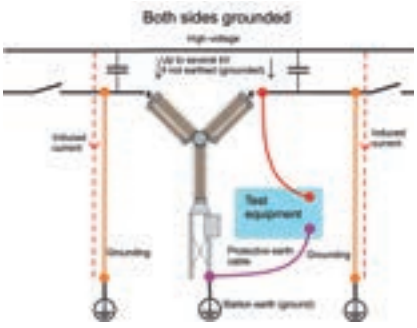
Deregulation changed the business environment for utilities, switchgear owners and their service companies. It has increased the emphasis on efficiency of operation, maintenance and service levels. Likewise the internationalisation of the business has brought new challenges by increasing the emphasis on health and safety and environmental compliance.

Experience has shown that the switch gear is less able to be taken out of service for testing. And when it is, it is available for shorter periods. Network operators and service companies are under continued pressure to maintain and improve their safety record. Safety organisations and labour organisations rightly increase their demands for safe working practices. Deregulation has led to the codification of safe working and the increasing tightening of regulation. Having a good safety record is a crucial asset to attract investment.

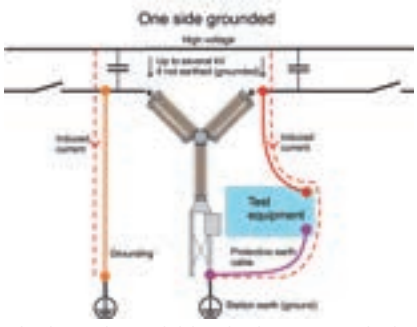
In all substations the capacitive coupling from live high voltage conductors induces dangerous currents in parallel conductors. Grounding both sides of the equipment under test will lead the induced currents to earth, providing a safe area for the test personnel.

Testing is much safer using the DCM module and DualGround.

With only one side grounded the induced current can reach values high enough to be harmful or lethal for humans.



Testing is much safer using the DCM module and DualGround.



With only one side grounded the induced current can reach values high enough to be harmful or lethal for humans.

100 A, highly portable micro-ohmmeter with DualGround safety

DLRO100E, DLRO100X and DLRO100H

Weighing only 7.9 kg this battery and, or mains powered units bring real portability for field measurement of contact resistance to IEC62271-100. Rated at CAT IV 600 V and weather and dust proofed to IP54, these ohmmeters are tough.

With a measurement range from 0.1 µΩ to 2 Ω with a resolution of 0.1 µΩ, high noise immunity and smooth dc output, the DLRO100 series offers all the test modes you would expect from a true micro-ohmmeter. Additional facilities include DualGround safety, internal memory, downloading, asset labelling and remote operation, depending upon model.

Hand-held 200 A micro-ohmmeter

MOM2

Weighing just 1 kg, the MOM2 micro-ohmmeter from Megger is capable of carrying out tests at currents up to 220 A and can output 100 A for 3 s. With a measurement range of 1 µΩ to 1 Ω, this makes it a convenient and time saving alternative.

Operating from rechargeable batteries which give 2,000 measurements per charge, allows a full day's testing to be completed.

The MOM2 is suitable for a range of applications, including testing busbar and cable joints, and carrying out contact resistance measurements on low-, medium- and high-voltage circuit breakers. Circuit breaker tests performed with the instrument conform

Contact resistance testing

600 A and 200 A micro-ohmmeter

DLRO600 and DLRO200

Provides the operator with high resolution, 0.1 µΩ, portable method of performing on-site low resistance measurements. The test current is variable from 10 A to 600 A or 200 A respectively, in 1 A steps, enabling the user to perform all the required tests with a single instrument. The unit can be used to test circuit breaker contact resistance to IEC 62271-100, switch contacts, busbars, joints, splices, fuses and rail bonds. The full keyboard makes labelling and storing of results quick and easy.

A large liquid crystal display provides all the information needed to perform a test; all test parameters and measurement results are displayed.

DLRO600 measures resistances between 0.1 µΩ and 1 Ω, at high currents. It can provide test currents from 10 amps up to 600 amps subject to the load resistance and supply voltage. It is ideal for testing busbars

600 A low resistance ohmmeter

MOM690A

Offering a test current from 0 to 600 A DC the MOM690A has a measurement range up to 200 mΩ with a resolution of 1 µΩ. The MOM690A can programmed to perform an individual test or an entire series and store the results. There is an AC output for quick and easy demagnetization of CTs.

600 A and 200 A micro-ohmmeter with DualGround safety

MJÖLNER600 and MJÖLNER200

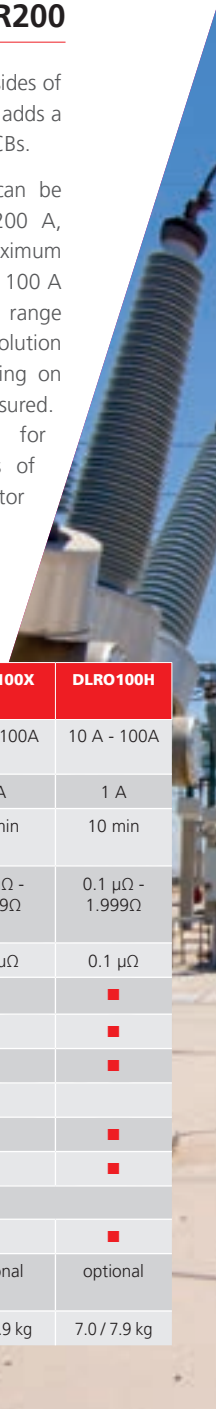
By being able to operate with both sides of the circuit breaker earthed, Mjölner adds a new level of safety to the tester of CBs.

The ripple free DC test current can be varied from 5 A to 600 A or 200 A, depending on model, with a maximum continuous current of 300 A or 100 A respectively. The measuring range is up to 1 Ω with a resolution as low as 0.1 µΩ depending on the resistance being measured. Equipped with a USB port for downloading of data the Mjölner series of products can add a further level of safety for the operator by being remotely controlled.

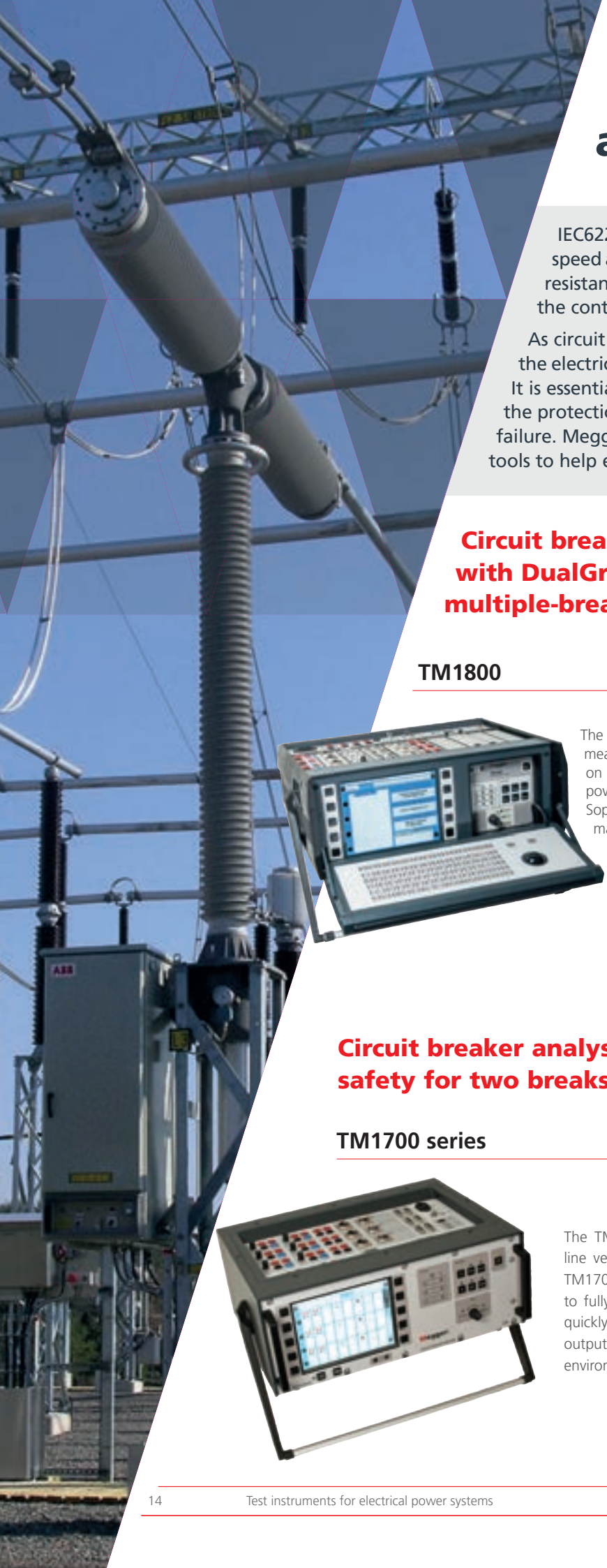
600 A and 200 A micro-ohmmeter

MOM600 and MOM200

Both these low resistance ohmmeters have a measurement range up to 2 mΩ with a resolution of 1 µΩ. They offer a choice of maximum current of 600 A and 200 A and the MOM200 weighs as little as 14 kg.



For measurement of	DLR0600	DLRO200	MOM 690A	MOM 600A	MOM 200A	MJÖLNER 600	MJÖLNER 200	MOM2	DLRO100E	DLRO100X	DLRO100H
Test currents	10 A-600 A	10 A-200 A	0-600 A	0-600 A	0-200 A	5 A-600 A	5 A-200 A	50 A -220 A	10 A - 100A	10 A - 100A	10 A - 100A
Current steps	1 A	1 A				1 A	1 A		1 A	1 A	1 A
Max. test time at continuous	>60 sec	>10 min	10 sec	15 sec	20 sec	15 sec	2 min	3 sec - discharging	10 min	10 min	10 min
Measurement range	0.1 µΩ-999.9 mΩ	0.1 µΩ-999.9 mΩ	0-200 mΩ	0-1999 µΩ	0-19.99 mΩ	0-999.9 mΩ	0-999.9 mΩ	0-1000 mΩ	0.1 µΩ - 1.999Ω	0.1 µΩ - 1.999Ω	0.1 µΩ - 1.999Ω
Best resolution	0.1 µΩ	0.1 µΩ	1.0 µΩ	1.0 µΩ	1.0 µΩ	0.1 µΩ	0.1 µΩ	1.0 µΩ	0.1 µΩ	0.1 µΩ	0.1 µΩ
Ripple free DC						■	■		■	■	■
DualGround						■	■			■	■
Remote control						■	■				■
Built-in printer						■	■				
Result storage	■	■						■		■	■
Downloading to PC	■	■	■			■	■	■		■	■
Power supply											
Mains		■	■	■	■	■	■	■	■	■	■
Rechargeable battery									optional	optional	optional
Weight	14.5 kg	14.5 kg	23.7 kg	24.7 kg	14.6 kg	13.8 kg	13.8 kg	1.0 kg	7.0 / 7.9 kg	7.0 / 7.9 kg	7.0 / 7.9 kg



Circuit breaker analyser systems

IEC62271-100 recommends that contact travel and speed are tested, as well as closing and opening times, resistance of the main contacts and synchronisation of the contact operation.

As circuit breakers are electro mechanical devices, both the electrical and mechanical operation should be tested. It is essential that circuit breakers operate correctly when the protection systems detect a fault to avoid catastrophic failure. Megger offers a full suite of circuit breaker analysis tools to help ensure they do.

Circuit breaker analyser system with DualGround safety for multiple-breaks-per-phase systems.

TM1800

The modular design makes it possible to configure the TM1800 for measurements on all known types of circuit breakers in operation on the world market. The robust design product contains powerful technology that stream- lines circuit breaker testing. Sophisticated measurement modules enable great time savings as many parameters can be measured simultaneously, eliminating the need for new setup each time. The circuit breaker can be grounded on both sides throughout all tests including timing due to the patented DCM module. DualGround™ testing makes the testing safe and time saving.

Circuit breaker analyser with DualGround safety for two breaks per phase systems.

TM1700 series

The TM1700 takes much of the technology from the top of the line version TM1800 and is limited to timing of 6 main contacts. TM1700 comes in five models starting from PC-remote controlled to fully stand-alone. One important feature is the test wizard that quickly guides the operator through the test setup. All inputs and outputs on the instrument are designed to withstand the challenging environment in high voltage substations and industrial environments.

Circuit breaker analyser systems

Load tap changer testing power supply

LTC135

An accessory to Megger's extensive range of circuit breaker analysers, LTC135 makes it possible to obtain a deeper knowledge of the working of tap changers by recording dynamic voltage and resistance.

Power supply voltage tester

B10E

A useful power supply unit providing a controllable DC power source to breaker coils and spring-charging motors. Since this power is unaffected by load and virtually ripple-free, it is ideal for minimum pick-up and under voltage tests that are stated in the international standard IEC 62271-1.

Vacuum interrupter tester

VIDAR

- **Low weight and small size**
- **Fast test and easy to use**
- **Immediate pass/fail feedback**
- **10-60 kV DC test voltage**

VIDAR tests vacuum in circuit breaker chambers using DC voltage. When AC is used, the capacitive component of the current flowing through the chamber must be tested. With DC, this is eliminated. The resistive component of the leakage current is very small compared with the capacitive component, because of the high dielectric strength of the chamber. The DC flashover voltage is equal to the peak AC voltage. Testing can be completed in a few minutes.

Accessories

Vibration kit

Includes SCA606, CABA Win vibration software and one vibration channel.

SSR kit

Synchronised switching relay test kit for TM1800 including accessories, software and cables.

Transducers

There is a range of linear and rotary transducers available, in both digital and analogue forms.

Current sensor

100 A AC/DC clamp for first trip analysis.

Circuit breaker analyser for single break per phase systems

EGIL

Designed using the experience gained from our larger instruments, the EGIL is intended for gang operated breakers with one break per phase. Its size and simplicity makes it attractive to smaller power plants and maintenance departments. Now can be used with SDRM.

Circuit breaker analyser systems

Static and Dynamic Resistance

SDRM202

- **Accurate DRM results through high current supply 2 x 200 A**
- **Fast charge – minimum waiting intervals**
- **Low weight, 4.3 kg incl. cables**

DRM was introduced by Megger to assess the condition of the contacts and the arcing contact length in SF_6 Circuit Breakers. The SDRM202 is the 3rd generation and is based on the Megger patented super cap technology which offers high current from an extremely light weight package. The capacitors charge from completely drained to full in about 2 minutes which practically removes waiting time between measurements. The SDRM202 is put close to the interrupters which saves a lot of cable weight.

SDRM is compatible with all Megger circuit breaker analysers and measures both the contact resistance during an operation (DRM) as well as the static contact resistance.

Static resistance measurement (SRM)

A static resistance value provides a reference value for all types of electrical contacts and joints. If the contact resistance is too high this will lead to power loss and temperature rise, which often leads to serious trouble. IEC 62271-1 states that this type of resistance is to be measured using a current ranging between 50 A and the breaker's nominal current. IEEE C 37.09 specifies a minimum test current of 100 A.

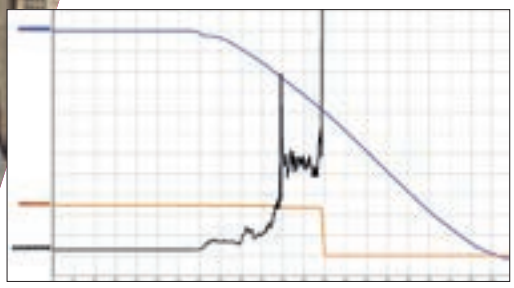
Other international and national standards set forth similar guidelines in order to eliminate the risk of obtaining erroneously high values if the test current is too low.

Dynamic resistance measurement (DRM)

A circuit breaker will have arcing contact wear by normal operation as well as when breaking short-circuit currents. If the arcing contact is too short or in bad condition, the main contact surfaces can be deteriorated by arching, resulting in increased resistance, excessive heating and, in the worst case, explosion.

In a Dynamic Resistance Measurement the main contact resistance is measured during an open or close operation. If contact movement is recorded simultaneously, you can read the resistance at each contact position, which is used to reliably estimate the arcing contact length. The only real alternative in finding the length of the arcing contact is dismantling the circuit breaker.

A reliable DRM interpretation requires high test current and good measurement resolution.

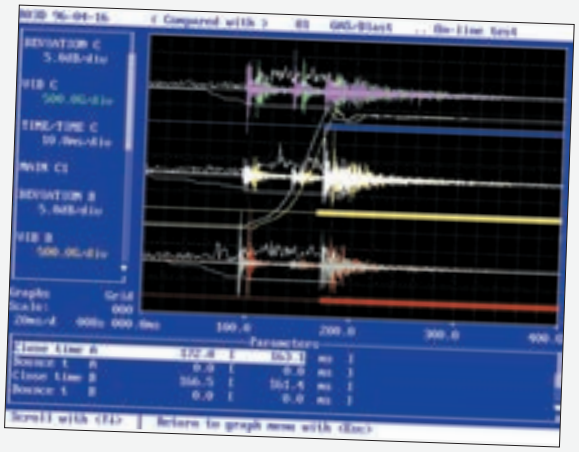


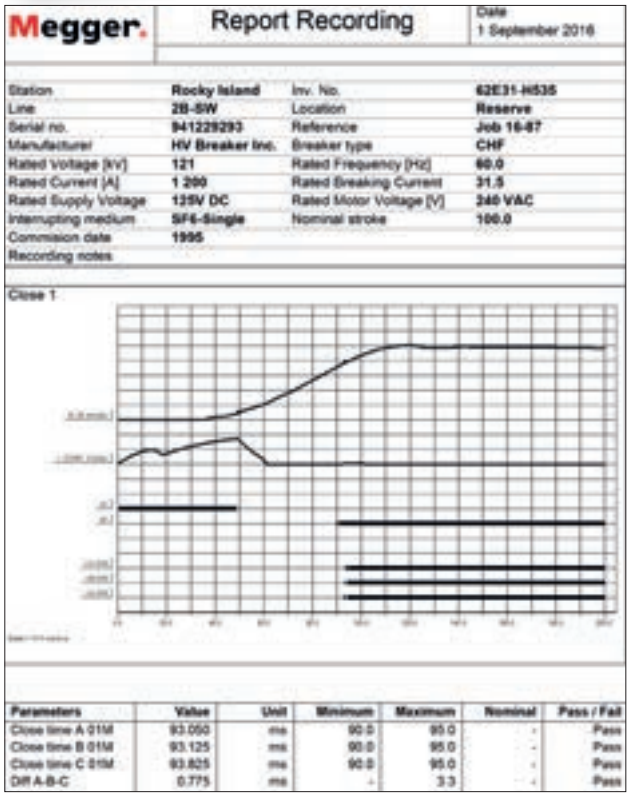
DRM is a reliable method to estimate the length/wear of arcing contact

Vibration testing direct method for mechanical function

A CIGRE study on the installed base of active circuit breakers shows that the reason for malfunction of HV CBs is mostly caused by mechanical faults. Vibration testing is a direct measurement of the mechanical behaviour of the circuit breaker. It is possible to distinguish a normal mechanical behaviour from an abnormal behaviour. If the circuit breaker behaves normally the mechanical system is in good order. Abnormal behaviour indicates that something is different from the expected and the circuit breaker is in need of overhaul or further investigation.

Interpretation is easy with CABA Win Vibration software, based on voice recognition algorithms that are adapted for circuit breaker vibrations. Based on the software analysis the interpretation is green, yellow or red. Green and red are straight forward, while yellow requires further investigation of the data. In the same way as with DRM measurement it is possible for the knowledgeable user to deduce very detailed information about the circuit breaker. The time shift and deviation curves from CABA Win Vibration are intuitive for someone with insight of the circuit breaker mechanics.





Breaker Analyser software

CABA Win

- **Pre-defined standard test plans enable quick and easy testing**
- **Test Plan Editor to easily create customized test plans**
- **Accurate comparison with historical test results**
- **Convenient report generation with Word, Excel or List and Label**
- **Over 300 predefined calculated parameters**

After connecting your breaker analyser to a computer, you can use the CABA Win software to speed up testing and improve repeatability. CABA can be used with the TM1800, TM1700 and EGIL. Results are presented on the display both graphically and in table form after each breaker operation so that you can make comparisons with limit values and previous test results.

The Test Plan Editor (TPE) lets you create individual test plans tailored to individual breakers. Timesaving conversion tables simplify the task of connecting and linking transducers to the breaker. Reports created in your own format can be obtained easily using standard field linking functions.

Primary injection testing

Primary injection testing requires the system to be taken out of service and consequently is usually conducted during commissioning. It does however test the complete system, the current transformer, conductors, connection points, relay protection and circuit breakers.

Primary current injection test system

ODEN AT

The ODEN AT primary current injection test system consists of a control unit together with one, two or three current units offering an maximum output of 13 kA for one second and 3800 A continuous. There are three versions of the current unit: S, X and H. The S and X current units are identical except that the X unit has an additional 30/60 V output. The H unit is rated for even higher current. This makes an ODEN AT system very flexible. Each component is portable, and ODEN AT can be quickly assembled and connected.

The control unit has many advanced features – a measurement section that can display turns ratio as well as time, voltage and current. A second measurement channel can be used to test an additional current or voltage. Current transformer turns ratio, impedance, resistance, power, power factor (cos ϕ) and phase angle are calculated and shown in the display. Current and voltage can be presented as percentages of nominal value. The fast-acting hold function freezes short-duration readings on the digital display; when the voltage or contact signal arrives at the stop input, the object under test interrupts the current or injection is stopped.

Timer unit

TM200

This timer unit, designed for use with ODEN A and CSU600A, has the precision that makes it ideal for many substation uses.

Primary current injection test system

INGVAR

This 5000 A 2 piece portable system is designed for primary injection testing of protective relay equipment and circuit breakers. It is also used to test the turns ratio of current transformers and for other applications that require high variable currents.

The control unit has many advanced features including a powerful measurement section that can display turns ratio as well as time, voltage and current.

A second measurement channel can be used to test an additional current or voltage. Current transformer turns ratio, impedance, power, power factor (cos ϕ) and phase angle are calculated and shown in the display. Current and voltage can be presented as percentages of nominal value.

Current transformer switchbox

For use with ODEN AT the switchbox facilitates CT testing. The secondary windings of the CT are connected to the switchbox inputs and the outputs are connected to ammeter 2 of the ODEN AT. It can handle up to 5 secondary windings.

Primary injection testing

Primary injection test Systems

SPI225

The SPI225 is a high current primary injection test unit with the ability to perform high current commissioning test as well as test low-voltage moulded-case circuit breakers.

A single SPI225 is designed to test low-voltage moulded-case circuit breakers up to a rating of 225 A.

The Smart Touch View Interface, STVI, permits users to manually control the SPI and to perform automated testing. The SPI unit can also be controlled by a PC for testing and report generation.

Current supply units

CSU600A and CSU600AT

These high-current supply units have two main fields of application. The first is to conduct primary tests on protective relays. The second field of application involves conducting current tests on low-voltage circuit breakers and overcurrent devices.

Both outputting 600 A, the CSU60A requires the use of an external timer and ammeter, while the CSU600AT comes with built in timer and analogue ammeter that provides rough current settings quickly and easily, reducing connection time to a minimum.

Multi-cable high current cable sets for use with ODEN

LENGTH	IMPEDANCE (TWISTED-PAIR CABLES)	
Cross section area: 240 mm² (2x120)		
2 x 0.5 m (1.6 ft)	0.21 mΩ	GA-12205
2 x 1 m 3.3 ft)	0.32 mΩ	GA-12210
2 x 1.5 m (4.9 ft)	0.42 mΩ	GA-12215
2 x 2 m (6.6 ft)	0.53 mΩ	GA-12220
Cross section area: 360 mm² (3x120)		
2 x 0.5 m (1.6 ft)	0.18 mΩ	GA-12305
2 x 1 m (3.3 ft)	0.25 mΩ	GA-12310
2 x 1.5 m (4.9 ft)	0.32 mΩ	GA-12315
2 x 2 m (6.6 ft)	0.39 mΩ	GA-12320
Cross section area: 480 mm² (4x120)		
2 x 0.5 m (1.6 ft)	0.16 mΩ	GA-12405
2 x 1 m (3.3 ft)	0.21 mΩ	GA-12410
2 x 1.5 m (4.9 ft)	0.27 mΩ	GA-12415
2 x 2 m (6.6 ft)	0.32 mΩ	GA-12420
Cross section area: 720 mm² (6x120)		
2 x 0.5 m (1.6 ft)	0.14 mΩ	GA-12605
2 x 1 m (3.3 ft)	0.18 mΩ	GA-12610
2 x 1.5 m (4.9 ft)	0.21 mΩ	GA-12615
2 x 2 m (6.56 ft)	0.25 mΩ	GA-12620
Cable set, 2 x 5 m (16 ft), 120 mm² Cross section area: 120 mm² Weight: 15.2 kg (33.5 lbs) Impedance: 2.2 mΩ	GA-12052	
Cable set, 2 x 5 m (16 ft), 25 mm² Cross section area: 25 mm² For the 30/60 V output of current unit X Weight: 4 kg (8.8 lbs)	GA-02052	

Primary current injection test set

PCITS2000/2

PCITS2000/2 enables you to test relay protection systems and their CTs together. Its built-in timer records protection relay operation. Tough and self- contained with a hand-held controller, the operator can work close to the relay. The maximum output current is 2000 A AC. By simply changing the range switch, half the rated output can be obtained at twice the voltage. Additionally, a separate auxiliary voltage output of 250 V, 2 A AC or 125 V, 2 A AC is available for testing voltage operated relay coils or checking the magnetisation characteristics of current transformers. All outputs are fully variable and each test set has a nominal duty cycle when delivering full current and voltage. Continuous operation is possible at 40% of maximum current.

Relay testing

Distribution systems are protected by increasingly complex relays which require testing. Since the 1970s the Sverker series of relay testers has been class leaders, being small, light and simple to operate. Over the years more features have been added to enable the testing of more complex relays resulting in the variable phase shift and frequency features of the Sverker 780. Now new technology pushes the boundaries even further with the SMRT1, a revolutionary new concept in automatic relay testing, which makes high power complex testing available in a very small, extraordinarily light package.

Relay and substation test system

SVERKER900

SVERKER900 is the engineer's ultimate test box that addresses the increasing need for three-phase testing capability in electrical distribution substations, renewable power generation stations and industrial applications. The intuitive user interface is presented on the LCD touch screen. It has a powerful combination of current and voltage sources and a versatility of measurement possibilities.

The SVERKER900 is specifically designed for basic, manual three-phase secondary testing of protection devices. In addition, various primary testing can be performed, since the current and voltage sources can be series- and, or parallel connected to allow for up to 105 A AC or 900 V AC output. All three current and four voltage sources can be individually adjusted with respect to amplitude, phase angle and frequency. The fourth voltage source allows for testing of numerical relays that needs a reference voltage simulating the busbar.

Multifunction single phase relay test system

SVERKER750 and SVERKER780

The SVERKER750 and SVERKER780 feature many functions that make relay testing more efficient. The measurement section can display, in addition to time, voltage and current Z, R, X, S, P, Q, phase angle and cos ϕ. The voltmeter can also be used as a 2nd ammeter when testing differential relays. All values are presented on a single easy-to-read display. Directional protective equipment can be tested efficiently by means of the built-in variable voltage source.

The SVERKER780 has a continuous phase shift function and adjustable frequency. Automatic reclosing devices can also be tested.

Both units are available in an optional impact resistant and waterproof (IP65) high density plastic-case with wheels and retractable handle.

Single phase relay testing unit

SVERKER650

The SVERKER650 enjoys a well-earned reputation for reliability and convenience. Compact and powerful, it provides all of the functions needed for secondary testing of any types of single-phase protection now available. It features logical design, and it is extraordinarily easy to learn and use. Its compact design and low weight makes it extremely portable. Accessories for SVERKER650 includes a test lead set and a rugged transport case and the ACA120 voltage source which makes it easier to test directional relays.

Relay testing accessories

Voltage and current source

CSU20A

Small and light this power source is primarily intended for use with Sverker750 and Sverker780 but is in essence a multipurpose AC and DC source featuring one AC current and voltage output, a fully rectified DC output and a half wave rectified output for harmonic restraint testing.

Variable voltage source

ACA120

Powered by 110 V AC the ACA120 provides a variable voltage output from 0 V to 120 V for directional protection testing.

Timer unit

TM200

This timer unit, designed for use with SVERKER, has the precision that makes it ideal for many substation uses.

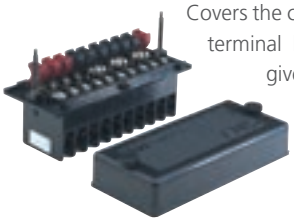
Phase selector switch

PSS750

Because it is a passive design, the PSS750 has many applications, any of the inputs may be used for current or voltage. It simplifies phase switching and select fault type, phase reversing and facilitates creating variable phase shift.

Test terminal blocks

States switches



Covers the complete area of panel connections from terminal blocks to knife switches. All products give long-term connection quality and mechanical stability. States switches are UL listed, and CSA certified.

States switches are UL listed, and CSA certified

Automatic single phase relay test set

SMRT1

Weighing in at only 3.2 kg the SMRT1 is an amazingly powerful relay test set. With a single current and voltage generators, the current channel outputs 60 A at 300 VA while the voltage channel outputs up to 300 V or can be converted to a current channel outputting 15 A maximum up to 150 VA

Should you want more channels the instrument can be daisy chained together to give more channels or more power. Three SMRT1 connected together will make a fully automatic 3-phase set.

All this power can be controlled with STVI manual controller or by use of a laptop and RTMS relay testing software using an Ethernet connection.

Phase angle meter

PAM410 and PAM420

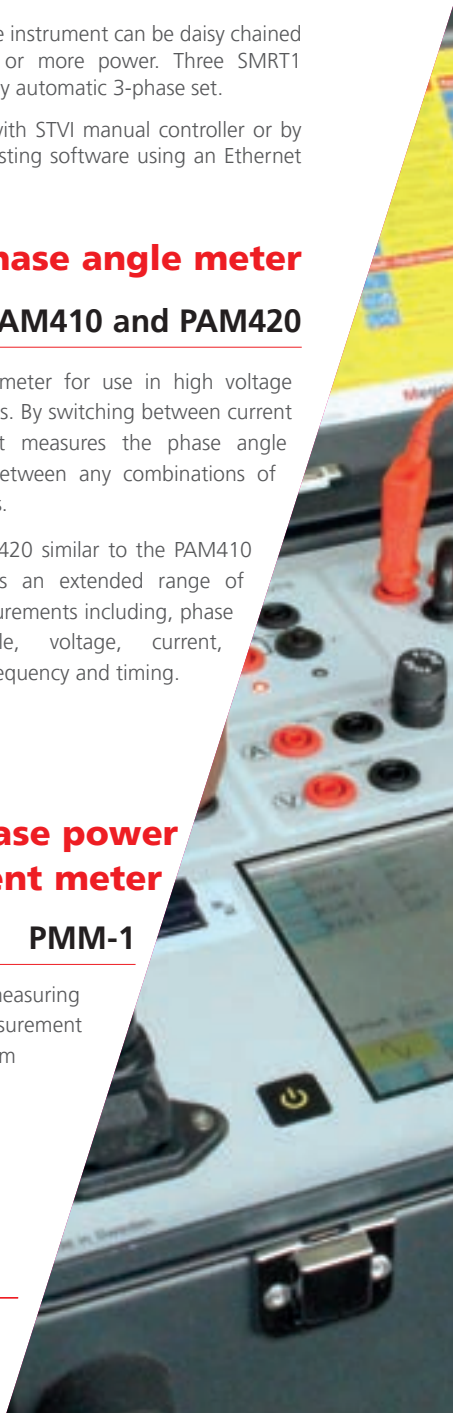
The PAM410 is a phase angle meter for use in high voltage substations and industrial locations. By switching between current and voltage, it measures the phase angle relationship between any combinations of two signals.

The PAM420 similar to the PAM410 it offers an extended range of measurements including, phase angle, voltage, current, frequency and timing.

3-phase power measurement meter

PMM-1

Power multimeter multi-function measuring instrument with simultaneous measurement and display of all three-phase system parameters.



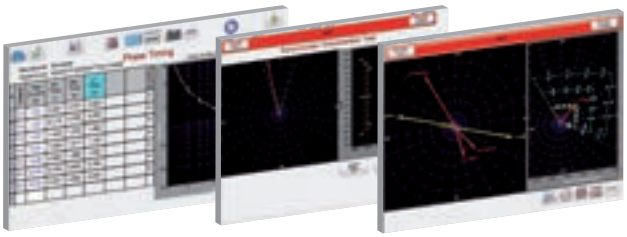
Multi-phase protective relay testing

Complex relays require a more flexible testing solution and Megger has a wide variety of units for these applications. The 3 channel SMRT36 has a class leading constant power output in a field portable case the size of a 5 kV insulation tester! It can be manually controlled from a touch screen interface or by using PC control running RTMS software. This software is a full relay database management system allowing you to manage your assets effectively. 3 SMRT1s can also be connected together to make a 3 channel unit or more, however many channels you want. For those who prefer to have their control screen built in to the test set there is the FREJA series.

Relay and test management software

RTMS

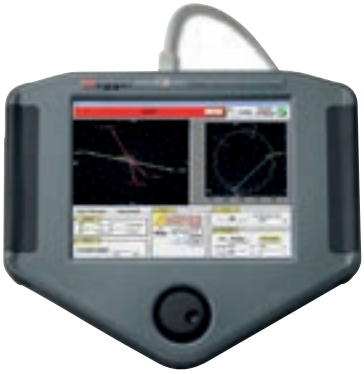
RTMS is not only the go-to software platform for all relay testing requirements, but is compatible across the entire Megger SMRT family of relay test systems. This powerful software runs on the Smart Touch View Interface hand-held controller, as well as the built-in Smart Touch View Interface in the SMRT36D and SMRT410D units, and also runs on your PC.



Hand-held controller for SMRT and MRCT

STVI

Megger's second generation of handheld controllers for the SMRT relay test systems, STVI has a large, full colour, high resolution, and high definition TFT LCD touch screen which allows the user to perform manual, steady-state and dynamic testing quickly and easily using the manual or sequencer test screens, as well as using built-in preset test routines for most popular relays. Designed for ambidextrous operation, the rubber cushion grips, centrally located control knob, and touch screen, make STVI extremely easy to use. The STVI includes non-volatile built-in data storage for saving tests and test results. A USB port is provided for transferring test results to your PC.



Relay test system

SMRT series

Powerful, tough and light are the words that characterise the SMRT series. Housed in rugged plastic case and based on the modular design, the VIGEN (volt and current generator) give SMRT relay test system a flexibility not seen in run-of-the-mill systems. The VIGEN output a unique flat profiled power curve and can be configured in parallel or series to produce the power required to test electromechanical relays as well as more modern ones.

SMRT series testers can be operated using the touch view interface STVI which allows users to perform manual, steady-state and dynamic tests using the screen and to use built-in preloaded test routines for most popular relays or it is possible to run a fully automatic test protocol using a computer running RTMS software. They offer IEC 61850 testing capabilities.

SMRT33 – Weighing just over 11 kg this model offers 3 voltage channels and 3 current channels.

SMRT43 – Offers 3 current channels and 4 voltage channels.

SMRT46 – The most popular of the products, offers 3 voltage channels and 3 current channels with the option of 6 current channels if the application requires. It weighs less than 13 kg.

SMRT410 – The most flexible of the range, offers 4 voltage channels and 6 current channels with the option of up to 10 current sources. At less than 18 kg this test set adds greatly increased testing flexibility.

Protective relay testing

Relay test system

SMRT D series

Housed in a conventional laboratory case this series of relay test systems is distinguished by the integrated touch screen which runs RTMS software, megger's second generation of automatic, semi-automatic or manual user interface software. Alternatively testing using a D series can be fully controlled by a computer running RTMS software. It offers IEC61850 testing capabilities.

The voltage and current generating modules are capable of being connected in series or parallel to generate the required power. With 3 current channels in parallel it can provide up to 180 A at 900 VA for testing instantaneous overcurrent relays.

For testing relays panels or electromechanical relays, it has a unique flat power curve from 4 to 30 A which ensures maximum compliance voltage to the load at all times.

SMRT43D - offering 4 voltage channels and 3 current channels the SMRT43D weighs a touch over 13 kg.

SMRT46D - offers 3 voltage channels and 3 current channels with the option of 6 current channels if the application requires yet it is the same weight as the SMRT43D.

SMRT410D – offers 4 voltage channels and 6 current channels with the option of up to 10 current sources and weighs 19 kg.

FREJA500 series

The FREJA500 series of relay test systems is distinguished by the built-in touch screen which runs FREJA Win Local software. Alternatively testing using FREJA500 series can be fully controlled by a computer running the well accepted FREJA Win software. It offers IEC61850 testing capabilities. The voltage and current generating modules are capable of being connected in series or parallel to generate the required power. With 3 current channels in parallel it can provide up to 180 A at 900 VA for testing instantaneous overcurrent relays.

For testing relays panels or electromechanical relays, it has a unique flat power curve from 4 to 30 A which ensures maximum compliance voltage to the load at all times.

FREJA543 – at only 13 kg it offers 4 voltage channels and 3 current channels.

FREJA546 – offers 4 voltage and 3 current channels with the option of 6 current and 1 voltage channel.

FREJA549 – A heavy-weight test system that offers 4 voltage channels and 6 current channels with the option of up to 10 current sources and weighs less than 20 kg.

	SMRT33	SMRT43	SMRT 43D	FREJA 543	SMRT 46	SMRT 46D	FREJA 546	SMRT 410	SMRT 410D	FREJA 549
Instantaneous Current per channel	45 A @ 300 VA_{RMS}	45 A @ 300 VA_{RMS}	45 A @ 300 VA_{RMS}	45 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}	60 A @ 300 VA_{RMS}
Continuous Current per channel	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}	30 A @ 200 VA_{RMS}
Max Voltage per channel	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}	300 V @ 150 VA_{RMS}
Number of Current channels	3	3	3	3	6	6	6	10	10	9
Number of Voltage channels	3	4	4	4	4	3	4	4	4	4
Number of Convertible Voltage channels	0	0	0	0	3	3	3	4	4	3
Control	STVI or PC	STVI or PC	Touchscreen or PC	Touchscreen or PC	STVI or PC	Touchscreen or PC	Touchscreen or PC	STVI or PC	Touchscreen or PC	Touchscreen or PC
Case style	Tough	Tough	Lab style	Lab style	Tough	Lab style	Lab style	Tough	Lab style	Lab style
Control software	RTMS	RTMS	RTMS	FREJA Win	RTMS	RTMS	FREJA Win	RTMS	RTMS	FREJA Win

Transformers are one of the most critical and expensive assets in a substation. If a large transformer fails it will be a major problem for the asset owner. It will be expensive to repair or replace and there may not be a replacement of the required type available at short notice. Extending transformer life and predicting failure is becoming increasingly important to asset owners and managers. Luckily, Megger can help.

Megger's transformer test equipment is tough, light and with all the functionality you need.

Tan δ test system

DELTA4000

Accurate and dependable temperature correction, based on the actual condition of the test object, can be applied to results using a novel technique, which works with data acquired from a separate dynamic frequency response (DFR) test. Automatic detection of non-linear response, which suggests the need for further (tip-up) testing and which is often a useful indicator of incipient insulation problems, is also provided. Despite their small size and low weight, Megger's DELTA4000 series test sets offer comprehensive facilities for assessing the condition of electrical insulation in all types of high-voltage equipment, including transformers, bushings, circuit breakers, cables, lightning arrestors and rotating machinery as well as measuring the excitation current of transformer windings.

The test sets generate their own test voltage, which is independent of supply quality. A further benefit of this approach is that it allows the test voltage to be varied in frequency from 1 Hz to 500 Hz, making the instruments even more versatile. There is the option of on-board computer or using an external computer to control the DELTA4000.

The intelligent temperature correction allows users to estimate the actual temperature dependence of the test object by measuring tan delta over a frequency range. It then calculates accurate individual temperature corrections resulting in a more accurate measurement of the insulating material's condition. DELTA4000 can automatically detect voltage dependence: when the Tan δ is dependent on the test voltage and tip-up testing is recommended (i.e. the dissipation factor is pending test voltage). Dynamic noise suppression minimizes actual test time. For multiple frequency tan delta measurement see IDAX on page 33.

Capacitance and dissipation factor bridge

CDAX605

CDAX605 can be used as part of a customised tan δ solution with an external power source or generator. It is a precision instrument using a combination of bridge and direct (vector) measurements and is capable of measuring capacitive, resistive and inductive loads.

CDAX605 is designed for laboratory, production line or field testing of electrical equipment insulation and insulating materials as well as e.g. calibration of CCVTs and other ratio devices. A test set with unique high accuracy for the most demanding applications.

Power transformer testing

One time connection principle – Megger 3-phase turns ratio and winding resistance testers allow the connections to be made once and all the tests to be carried out without having to swap the leads and re-connect each time you want to test another winding. This speeds up the testing substantially, especially on large power transformers with multiple taps. The leads are compatible with both the TTR300 and MTO300 series.

3-phase turns ratio testers

TTR300, TTR310E and TTR330

The TTR300 series allows an operator to set up and run automated tests on difficult three-phase transformers (with multiple tap changers and bushing CTs) in a fraction of the time. It also measures the phase deviation of the transformer primary versus secondary. This quickly indicates problems in the transformer such as partial shorted turns and core faults. It also verifies phase errors in all types of PTs and CTs.

Because each unit has a remote-control switch for single person testing, this allows the operator to test transformers with LTCs very quickly.

TTR300 series test leads are the same as MTO300 series of three-phase transformer ohmmeters eliminating additional connecting time for the additional measurements.

TTR330: Fully automatic TTR can be controlled using the on-screen computer that offers customisable test forms from the integrated Power DB Onboard software. Test results can be stored in the memory or downloaded via the USB port.

TTR310E: Stand alone or remote controlled with display for set up and testing, on-board data storage in open format for download to EXCEL® or XML format via Power DB. There is the option of a printer to record the results while in the field.

TTR300: Basic 3-phase TTR requires a PC running the supplied spftware Power DB Lite, or a Megger transformer product with on-board computer.

Current transformer testing

Step-up transformer

MAGNUS

MAGNUS permits the preparation of excitation curves for CTs, to demagnetize their cores and turns ratio tests on voltage transformers. It can deliver 1 A at 2.2 kV. for rapid testing.

Current transformer tester

MRCT

This tough, portable unit is used to perform demagnetization, ratio, saturation, winding resistance, polarity, phase deviation, and insulation tests on current transformers. The MRCT automatically calculates ratio errors, saturation curves, and knee points. The MRCT provides automatic testing of single and multi ratio CTs, reducing testing time and increasing productivity. The MRCT will directly connect to multi ratio CT's and perform all tests – saturation, ratio and polarity, winding resistance and insulation – on all taps with the push of a button and without changing leads.

Their are the options of DC excitation techniques for CT with knee points up to 30 kV and an integrated VT/CVT tester.

The MRCT can be controlled via Megger's Smart Touch View Interface (STVI) controller or from a PC running Power DB software.

3-phase ratio and winding resistance analyser

MWA300 series

The MWA 300 transformer winding analyser is an advanced test system that can test all sizes and types of transformer, with and without OLTC tap changers. It delivers greater productivity by reducing set up time and its portability MWA300 will perform the following tests, ratio, winding resistance, demagnetization, polarity, excitation current and make/break transition and phase. Built to test transformers in the harshest of environments MWA performs well in high noise conditions.

The MWA300 outputs to PowerDB as a single software platform saving time with a single set-up and one easy-to-read report.

PowerDB OnBoard – consistent and repeatable

PowerDB OnBoard comprises the powerful PowerDB asset management software embedded within the instrument, running on a Windows operating system. Without the need for an external computer, PowerDB OnBoard brings field based users consistent, repeatable tests across instruments, unprecedented data analysis (including historical trend charting) and asset management tools, all from on-screen 'forms based' views.

Also included are a number of new communication technologies, providing a near seamless interface between the instrument and optional peripheral equipment, such as an "in-lid" USB full-sheet thermal paper printer, USB flash drive, and external PC (via Ethernet port). For advanced users, a USB router can be connected to the instrument to provide simultaneous access to other equipment, such as a mouse or a keyboard. Storage space is provided by either the internal flash memory or external USB flash drive – sufficient to save literally tens of thousands of test data sets.

Reduced training time

A common user interface reduces the training time needed to understand the different instruments that a busy test engineer has to use. New instruments with PowerDB OnBoard such as TTR330 are truly forms-based, have a large 8.4" full-VGA bright colour display, and let you set up and control the instruments through on-screen test form views. On-screen test forms are exact replicas of the test forms which are printed as a permanent test form record once testing is complete. They are secure reports and generated directly from instrument so no human interface is needed.

		MTO210	MTO250	MTO300	MTO330
Windings tested simultaneously		2	2	6	6
Max DC test current in A		10	50	10	10
Interface	Direct digital read out	■	■		
	External PC			■	
	PC on-board				■

Power transformer testing

Automated six-winding transformer ohmmeter

MTO300 and MTO330

The MTO300 series saves time by testing all six windings without having to disconnect and reconnect leads; combined with the simultaneous winding magnetization method this gives fast and reliable measurements even on large transformers with delta configuration on the low voltage side. A built-in circuit restores the transformer core to a demagnetised state after testing, before being returned to service or can be used to prepare the transformer for SFRA.

Safety is maintained by the discharge function which automatically discharges the item under test should a lead disconnect, the power fail or at the end of the test.

MTO300 series test leads are the same as TTR300 series of three-phase turns ratio instrument thus eliminating additional connecting time for the additional measurements.

MTO330: This fully automatic transformer ohmmeter has an on-board computer running Power DB Onboard. This permits test result storage and certification as well as the opportunity control other Megger transformer test products.

MTO300: Basic 3-phase transformer ohmmeter requires a PC running Power DB Lite (supplied), or Megger transformer product with on-board computer.

Universal lead sets

For use with MTO300 and TTR300 series products (up to 10 A DC max) 3-phase shielded test lead set, X and H windings. Two length options 18 m or 9 m and 10 m extension.

10 A two winding transformer ohmmeter

MTO210

A two channel transformer ohmmeter MTO210 outputs a dc test current of up to 10 A. With a range from 1 µΩ to 2 kΩ, it offers a measurement accuracy of 0.25 %. Test results can be stored on board and downloaded for analysis. A built-in circuit restores the transformer core to a demagnetised state after testing, before being returned to service or can be used to prepare the transformer for SFRA. The high speed discharge circuit protects the operator.

50 A two winding transformer ohmmeter

MTO250

Designed for larger transformers up to 1000 MVA, MTO250, 2 channel transformer ohmmeter, outputs a test current up to 50 A. This makes the testing of larger transformers significantly faster. It can be used to assess the performance of make-before-break transitions in load tap changers too. Test results can be stored on board and downloaded for analysis. A built-in circuit restores the transformer core to a demagnetised state after testing, before being returned to service or can be used to prepare the transformer for SFRA. The high speed discharge circuit protects the operator.

Power transformer testing

Dielectric strength testing

Oil is an efficient coolant with a high flash point and high dielectric strength when used as an insulator in transformers. The insulation properties can change due to oxidation, acids, sludge, gas and water absorption. These changes can be monitored using a dielectric Megger OTS test set.

60 kV, 80 kV and 100 kV automatic laboratory oil test sets

OTS60AF, OTS80AF and OTS100AF

Designed for Laboratory use, these instruments measure the dielectric strength of mineral, ester and silicon insulating oils. With re-thought out ergonomics, the vessels and chambers are particularly easy to drain and clean out. The screw adjusted electrodes have a unique mechanism to lock precisely the electrode gap. The detection circuit offers direct measurement of both voltage and current and the system has an ultra fast HV switch off time of less than 10 µs to reduce oil deterioration.

Each instrument has a large, bright, coloured screen to make user interface intuitive. To assist with the labelling of results files and recording of comments there is a phone-like 12 key alphanumeric pad.

The products can be configured to meet the testing requirements of the laboratory.

Oil tan δ test set

OTD

A new addition to the comprehensive range of Megger Oil Test Sets, the OTD measures Tan Delta, resistivity and relative permittivity of insulating oils. As well as international set of standards, the OTD supports up to six customer configurable test sequences.

Productivity in the laboratory is maximised, with the focus on reducing the test cycle time by fan cooling and inductive heating, together with an oil drain facility, negating the need to move the oil vessel.

Karl Fischer testing

Karl Fischer testing uses the titration method to measure the amount of water in fluids such as insulating oil. It has become a standard test done on transformer insulating oil.

Variable specific gravity moisture in oil test set

KF-LAB

Easy to use test set that titrates for specific gravities between 0.60 and 1.40. Designed specifically for laboratory use, the KF-LAB is mains powered only.

Portable moisture in insulating oil test set

KF875

Optimised for oils with an SG of 0.875, the KF875 is easy to use, portable one button test set with integral printer. Can be powered from mains, internal rechargeable battery or car battery. Ideal for on site use.

60 kV and 80 kV portable automatic oil test sets

OTS60PB and OTS80PB

Weighing in at only 16 kg the OTS60PB is the lightest, most portable oil test set available. Meanwhile the OTS80PB is the most flexible test set because it offers more power in a test set which weighs less than 21 kg. Featuring the same easy-empty vessel and quick-drain chamber design as the laboratory models, the large, bright, colour screens are easy to read in sun light. Features like the electrode precision lock and ultra fast HV switch off time are particularly important for instruments that may not be used in the ideal environment. The OTSPBs can be configured to match the users needs.
60 kV manual oil test set.

60 kV semi automatic oil test set

OTS60SX

Light semi-automatic 60 kV oil dielectric strength test set which is simple to use and can be powered from a range of mains supplies.

Digital voltage checker for oil test sets up to 80 kV and 100 kV

VCM80D and VCM100D

Designed for checking the output voltage of the OTS AF and OTS PB test sets, these checkers show the output voltage in digital read out and this can be compared with the instrument reading.

OTS super-user kit

Offer 2 sizes of test chamber and a selection of electrode and impeller types.

Power transformer testing

Multifunction test system for transformers and substations

TRAX280 and TRAX220

- Power transformers
- Load tap-changers
- Reactors
- Instrument transformers
- Bushings
- Circuit-breakers
- Protection relays
- Grounding systems

Automatic testing of transformers is facilitated by using the App based operating system.

A multifunction system for testing transformers and other major components of the electrical supply system, TRAX is capable of providing 800A and 2.2 kV, (2000 A and 12 kV with accessories) with an adjustable frequency range from 1 to 500 Hz. The variable voltage and current levels can be generated and measure with high precision, allowing TRAX to test turns ratio, excitation current, winding and contact resistance, impedance, tan ∂ or power factor and various primary tests for LV, MV and HV assets.

The user interface gives full manual control; alternatively there is a selection of apps to automate testing procedures such as winding resistance, turns ratio, impedance, relay testing, circuit breaker analysis etc. Tests can be reported separately or as a combined report for the asset. TRAX can be operated using the integrated touch screen or an external computer with a web browser.

TRAX software

It is the software that makes the TRAX the flexible user friendly system it is. All systems are supplied with the basic software package; customers can then opt for additional packages which increase the versatility of the system by adding instrument apps.

Advanced transformer will add the ability to make dynamic OLTC measurements (DRM), frequency response of stray losses (FRSL) and magnetic balance.

CT / VT, this package will enable ratio, burden and polarity measurement and withstand tests for CTs and VTs, other CT tests include excitation curve, ratio with voltage, ratio Rogowski and low power, and winding resistance measurement.

Substation, this package adds circuit breaker analyser capabilities to low voltage CB timing, single-phase relay testing, phase angle measurement, earth impedance, line impedance and power measurement.

2000 A current accessory for TRAX

TCX200

When the high-current output of TRAX219 and TRAX220 (max 200 A) or TRAX280 (max 800 A) is not sufficient, the optional accessory TCX offers currents up to 2000 A. Because it is small, the TCX unit can be placed close to the test object, thus reducing the need for long heavy current cables.

Tan δ and capacitance accessory for TRAX

TDX120

With the use of the TDX accessory, the TRAX becomes a fully automatic 12 kV tan delta or power factor test set for the condition assessment of electrical insulation in high voltage apparatus.

3-phase switch accessory for TRAX

TSX300

This accessory permits the user to connect the transformer to the TRAX for testing and to manually switch manually between phases, making the testing more efficient.

Power transformer testing

Test van for maintenance and diagnostic testing of power transformers

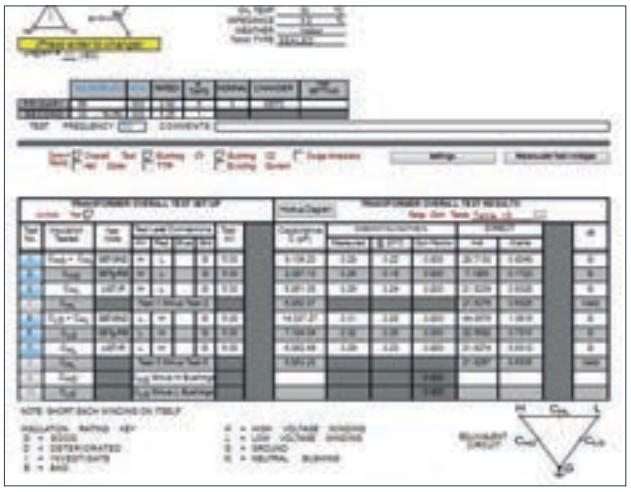
Power transformer test van

An integrated test van for the commissioning and maintenance or condition monitoring of power transformers. The heart of the system is a switch box that enables automated software-driven testing, including selection of HV and LV methods and test scheme. The results of each measurement are recorded in a report. This allows comparison with the nameplate and previous results to facilitate trending.

The software allows comparison between current measurements, previous measurements and the nameplate for trending.

Routine and advanced diagnostic techniques in accordance with IEC 60060-3, IEC 60067, IEEE C57.12.00, GOST 11677-85 and CIGRE 445 can be performed.

- **Software control and reporting**
- **High voltage and low voltage leads are shared among different instruments**
- **DC Winding resistance / Tap Changer Test**
- **Turns ratio and vector group verification**
- **Capacitance and dissipation factor / power factor**
- **Excitation current**
- **Insulation Resistance**



Power transformer testing

Frequency domain spectroscopy (FDS) and frequency response analysis

FDS, also known as dielectric frequency response (DFR) is the most powerful tool for assessing the moisture in the oil and cellulose components of power transformers. Because it scans the dielectric losses in the system across a spectrum of frequencies and then compares them to a modelled curve, results are independent of temperature.

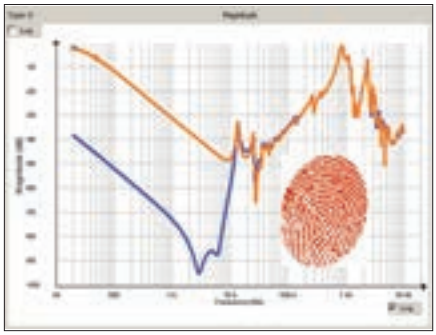
FRA applies a variable signal to the transformer and monitors its response. This can be compared to a reference which can reveal a wide range of faults.

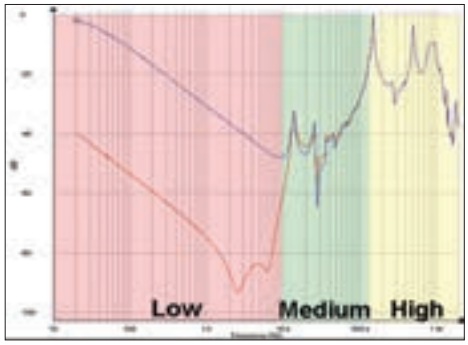
Sweep frequency response analyser

FRAX150

- **Highest accuracy and dynamic range in the industry**
- **Complies with and exceeds international standards for sweep frequency measurements**
- **Smallest and most rugged sweep frequency analyser on the market**
- **Extensive file import-export capabilities including CIGRE and xml formats**

Like FRAX101 the FRAX150 offers all the benefits of SFRA for diagnosis of damage to transformers, but it is built into a tough carry case which includes an on-board computer making it even more transportable. There is a large bright screen to make it comfortable to use even in bright sun light. Data can be stored on the hard-drive and can be downloaded using the galvanically isolated USB port.





Collecting fingerprint data using Frequency response analysis (FRA) is an easy way to detect electro-mechanical problems in power transformers and an investment that will save time and money

Sweep frequency response analyser controlled by PC

FRAX101

SFRA is a method for assessing whether or not a transformer has been subject to mechanical damage, for example when moved or from a lightning strike. FRAX101 and its software on a PC allows repeatable fingerprinting of transformers so that a scan can be run whenever it experiences a traumatic event such as transportation, severe fault or overhaul, allowing it to go back on line faster. Ideally a transformer is fingerprinted at birth, but now is a good time so any future problems can be diagnosed. Compatible with all international standards for SFRA, FRAX101 can be battery powered and has wireless communication with a computer.

Power transformer testing

Insulation diagnostic analyser

IDAX300 and IDAX350

- **Automated measurement and analysis of moisture content, oil conductivity and tan delta/ power factor**
- **Individual temperature correction (ITC) of tan delta/power factor and oil conductivity**
- **DFR measurements with AC test signals for reliable measurements in high - interference environments**
- **New multi-frequency technique performs a complete insulation assessment in 22 minutes**

A reliable and accurate method for assessment of the condition of the insulating components of transformers and bushings, IDAX300 exploits FDS techniques and state-of-the-art software to make a transformer moisture assessment in less than 18 minutes. It measures capacitances and tanð or power factor of the insulation between the transformer windings at multiple frequencies and plots the resultant curve. Comparing this measured curve with a modelled one allows calculate the moisture content.

The IDAX350 incorporates an on-board PC for results analysis and reporting with-in the enclosure.

High voltage amplifier for IDAX300

VAX020

- **High voltage amplifier enables IDAX measurements at 2 kV test voltage**
- **Large frequency range, DC to 1 kHz**
- **Compact design, weight only 4.4 kg**

Adding the VAX020 to the IDAX300 expands the test voltage range from 200 V to 2 kV. This improves IDAX's test performance in terms of accuracy in environments with extremely high interference such as HVDC substations.

Partial discharge detection and mapping

The new range of partial discharge detection and mapping systems add even greater breadth to Megger's cable testing portfolio. A powerful technique for diagnosis of the condition of a cable network and to predict where faults are likely to occur. By allowing the replacement of damaged cable in advance of failure, it prevents power users losing supply unexpectedly.

Combined cable test and diagnosis systems

TDS NT40 and TDS NT60

Network operators can now get faster and significantly more reliable information about the quality and the condition of cables.

TDS NT uses 50 Hz slope technology. To make it possible to locate faults in underground cables during the actual PD measurement. The TDS test voltage source offers withstand testing using VLF cosine-rectangular voltage (VLF CR) and PD diagnosis with damped alternating voltage (DAC) is combined in the same unit. When used in combination with the PDS60, PD testing can be achieved simultaneously.

This allows an efficient solution for precise assessment of cables in the network infrastructure. Importantly the PD measurement data, gained with the VLF CR or with the DAC test voltage, can be related directly to the 50 Hz network voltage. This facilitates reliable decision making. It tests cables according to the international standards (e.g. IEC 60502-2 and IEEE 400.2) with VLF-CR. In addition, a PD diagnosis can be performed simultaneously with the help of the PD detector. Alternatively, the TDS NT can be used for PD diagnosis employing the proven damped AC voltage (DAC) technique. PD is especially useful for commissioning testing, as it is the only way to check to reliably check the quality of workmanship of the accessories.

Partial discharge pin-pointing system

PD LOC

The PD LOC system solves the problem of pinpointing for mixed cables (XLPE/PILC) and for PD in joints of single core cables. In the field the exact location of the joints is not generally known, and these joints cannot be localised using audio frequency methods. The system consists of a PD TX impulse transmitter and receiving and evaluating unit Teleflex SX (can also be ordered without Teleflex SX). The receiving and evaluating unit consists of an input amplifier for processing the signal and a control unit in a rugged case. The visualisation, which shows the distance of the transmitting unit of the system, is shown on the reflectometer.

Test and diagnostic system for high-voltage cables

HV DAC200 and HV DAC300

The HV DAC-300 and HV DAC-200 apply damped AC voltage techniques to the cable installation, as part of a maintenance regime or the commissioning of new high voltage cables up to 230 kV. HV DAC systems can easily identify, evaluate and locate partial discharges faults in cable insulation and cable accessories of all types in both new and aged high voltage power cables.

The DAC frequency of the test voltage is close to nominal AC voltage service condition, therefore all PD measurements are evaluated and comparable to the power frequency. PD inception voltage (PDIV) and PD extinction voltage (PDEV) also can be easily determined.

Test and diagnostic system for medium voltage cables

MV DAC-30

The Damped AC (DAC) Voltage unit can identify, evaluate and locate partial discharge in both cable insulation and accessories according to IEC 60270 and IEEE 400.3/4. One of the major benefits of the DAC waveform is the similarity between DAC slope and the 50/60 Hz power frequency, as it partially replicates operational conditions.

One of the unique features of the MV DAC-30 is that the HV unit consists of a voltage source with an internal PD detector, making it the safest unit on the market.

Handheld online PD substation surveying system

UHF PD Detector

The UHF PD Detector is the ideal tool for quick, non-invasive surveys in MV and HV substations and should be part of the toolkit for all maintenance and service teams. Due to its high measurement bandwidth, the UHF method provides accurate local online partial discharge (PD) measurements on HV components such as cable end-terminations, surge arrestors, voltage transformers and isolators.

MV switchgear surveys can also be carried out using radio frequencies in combination with TEV and HFCT sensors. The phase resolved PD pattern (PRPD) display helps to identify type of defect and, importantly, differentiate the noise from the PD signal. Noise can affect PD readings, leading to a false interpretation of the results and unnecessary component replacement. The noise handling capability of the Megger UHF PDD ensures a true reading of PD, eliminating false positives, so that only failing components are identified for replacement.

The handheld unit can either be operated using a keypad or using the large 6" colour touchscreen. It has a battery life of over 10 hours. Its features and performance make the UHF detector the most unique and cost-effective unit of its kind.

High power test and diagnostics combination for MV cables

TDM 45 series

The new TDM 45 series is a breakthrough in testing and diagnostics of MV cables. The patented concept addresses the utilities' increasing need for test and measuring equipment that can adapt to different types of application. The system includes VLF Sine, VLF CR and HV DAC testing methods up to 60kV, providing the ultimate flexible solution for cable testing.

The modular concept allows the engineer to individually set-up the unit based on the type of job that needs to be executed. For example; if withstand testing on short cable lengths needs to be performed then only one module is needed. When part of the task requires a partial discharge diagnostics, then an additional module is needed.

Partial Discharge Diagnostics

PDS60

The PDS60 PD module works together with the VLF 45 Sinus as well the TDS60 VLF Rectangular and 50Hz Slope voltage sources to perform PD diagnostics on cables using the latest automatic analysis algorithms.

VLF insulation testing of cables

Very Low Frequency (VLF) 0.1 Hz testing is used on XLPE cables as an alternative to DC testing to prevent polarisation and premature damage to the insulation. It is designed to identify weak spots due to electrical trees in the insulation.

Cosine rectangular 0.1 Hz systems have been developed to meet international standards such as IEC HD 620/621 and IEEE 400. The benefit of the cosine rectangular waveform is that you can test longer cables to the standards of 0.1 Hz.

Many of our VLF test systems also feature dc and pulsed dc outputs to enable sheath testing, and sheath fault pin-pointing using the ESG NT. See page 41.

VLF and DC cable 20 kV post repair cable tester

Easytest 20 kV

The Easytest is a simplified version of the standard cosine rectangular VLF test.

Typically, a test is performed in accordance with company specifications after repairs or after a new cable has been installed.

28 kV, 40 kV and to 60 kV VLF cosine rectangular waveform test systems

VLFCR 28 kV, VLFCR 40 kV Basis, VLFCR 40 kV Plus, VLFCR 60 kV Basis and VLFCR 60 kV Plus

This range of insulation testers combine VLF, DC and sheath fault testing. The cosine rectangular waveform at 0.1 Hz is ideal for longer cable runs where true sine wave VLF sets may have to reduce the test frequency to levels not compliant with the standards (<0.1 Hz). With a range of up to 22 km depending on model, these testers have a high test capacitance capability, an integrated discharge system and benefit from two part design. Cosine rectangular waveform also allows leakage current measurement. Using Winkis VLF allows all test results to be logged. There is a tough transit case option for off-shore use.

High power VLF test systems

VLFCR 60 HP, VLFCR 80 Base and VLFCR 80 Plus

A trio of powerful Cosine rectangular wave form 0.1 Hz testers, testing to 60 kV and 80 kV. With built–in breakdown detection and leakage current measurement these systems are ideal for use in off-shore situations or for long underground cables.

VLF test system with 50 Hz slope technology

TDS40 and TDS60

Offering 40 or 60 kV output at 0.1 Hz with rising and falling edge shape equivalent to the 50 Hz slope, these test systems are built in two parts to make them more transportable. They also output damped ac and dc to the nominal voltage and can be used for sheath testing. See page 29 for more information.

VLF insulation testing of cables

34 kV sine wave VLF test system

VLF sinus 34 kV

For those who want to test at 0.1 Hz sine wave voltage the tough and portable, the VLF Sinus 34 kV is an ideal test system for medium voltage cables. It is air cooled, so it can be used continuously. The system is easy to use, thanks to its single-button operation and clear, simple menu structure and colour display. In addition to sine wave AC, its output voltage shapes also include positive and negative DC, square wave and pulsed DC for sheath-fault pinpointing. There is a tan ∂ accessory available.

Tan ∂ attachment

This allows the precise determination of the condition of a cable, identifying aging effects such as the degree of humidity and water treeing. It is used in combination with the VLF sine systems listed above.

54 kV sine wave VLF test system

VLF sinus 54

VLF Sinus 54 kV is a ideal system for all those who need to test with a 0.1 Hz sine wave voltage. The VLF system can be integrated into a fault location system or with the optional tan ∂ test attachment as part of a diagnostic test van. The system is designed for continuous operation for increased test efficiency.

As with the Sinus 34 kV sheath fault location can be carried out using the ESG NT pin-pointer. See page 41.

45 kV sine wave VLF test system

VLF sinus 45

This 45 kV tester will perform VLF and DC testing, as well as sheath testing and sheath fault pinpointing (in combination with the step voltage probe ESG NT). The optional internal tan Delta expands the system to assess both cable integrity and condition.

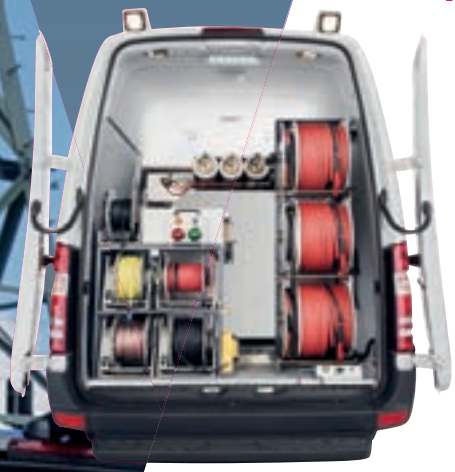
MODEL		EASYTEST 20 KV	VLFCR 28 KV	VLFCR 40 KV BASIS	VLFCR 40 KV PLUS	VLFCR 60 KV BASIS	VLFCR 60 KV PLUS	VLFCR 60 KV HP
Test voltage	Vlf Test Voltage	0 … 20 kV peak	0 … 28 kV eff	0 to 40 kV eff	0 to 40 kV eff	0 to 60 kV eff	0 to 60 kV eff	0 to 60 kV rms
	Frequency	0.01 to 0.1 Hz	0.1 Hz	0.1 Hz	0.1 Hz	0.1 Hz	0.1 Hz	0.1 Hz
	Wave Form	Simplified Cosine Rectangular	Cosine Rectangular	Cosine Rectangular	Cosine Rectangular	Cosine Rectangular	Cosine Rectangular	Cosine Rectangular
Testing cable capacitance (at max. voltage)		0,5µF (0.1 Hz)/	5µF (0.01 Hz)	2.4 µF	4.8 µF	1 µF	2 µF	6.5 µF
	DC	0 … 20 kV	0 to -28 kV	0 to -40 kV	0 to ±40 kV	0 to -60 kV	± 0 to ±60 kV	0 to ±60 kV
Output current measurement		0 … 50 mA	0 to 12 mA	0 to 7 mA	0 to 7 mA	0 to 5 mA	0 to 5 mA	0 to 17 mA
Sheath testing		0 to 5 kV or 0 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	0 to 10 kV
Sheath pinpointing	Test voltage	0 to 5 kV or 0 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	2 to 10 kV	0 to 10 kV
	Pulse rate	01:03	1:3, 1:4 or 1:9	1:3, 1:4 or 1:9	1:3, 1:4 or 1:9	1:3, 1:4 or 1:9	1:3, 1:4 or 1:9	1:3, 1:5 or 1:9
Weight		17 kg	25 + 25 kg	55 + 48 kg	55 + 48 kg	85 + 48 kg	85 + 48 kg	380 kg

MODEL		VLFCR 80 KV BASE	VLFCR 80 KV PLUS	TDS40	TDS60	VLF SINUS 34 KV	VLF SINUS 45 KV	VLF SINUS 54 KV
Test voltage	Vlf Test Voltage	0 To 80 Kv Rms	0 To 80 Kv Rms	3 to 40 kV rms	3 to 60 kV rms	0 to 34 kV peak	0 to 45 kV peak	to 54 kV peak
	Frequency	0.1 Hz	0.1 Hz	VLF 0.1 Hz DAC 50 to 300 Hz	VLF 0.1 Hz DAC 50 to 300 Hz	0.01 to 0.1 Hz	0.01 to 0.1 Hz	0.01 to 0.1 Hz
	Wave Form	Cosine Rectangular	Cosine Rectangular	50 Hz slope	50 Hz slope	Sine	Sine	Sine
Testing cable capacitance (at max. voltage)		2.0 µF	2.5 µF	up to 4.8 µF	50 Hz slope	0.6 µF(0.1 Hz)/	0.6 µF	1 µF(0.1 Hz)/ 5 µF(0.01 Hz)
	DC	0 to - 80 kV	0 to ± 80 kV	DAC 5 µF	DAC 2 µF	0 to ± 34 kV	0 to ± 45 kV	0 to ± 54 kV
Output current measurement		-12.5 mA	±12.5 mA	7 mA	5 mA	0 to 14 mA	0 to 20 mA	0 to 35 mA
Sheath testing		0 to 10 kV	0 to 10 kV	3 to 10 kV	3 to 10 kV	0 to 5 kV or 0 to 10 kV	0 to 5 kV, 10 kV, 20 kV	0 to 5 kV or 10 kV
Sheath pinpointing	Test voltage	0 to 10 kV	0 to 10 kV	3 to 10 kV	3 to 10 kV	0 to 5 kV or 0 to 10 kV	0 to 5 kV, 10 kV, 20 kV	0 to 5 kV or 10 kV
	Pulse rate	1:3, 1:5 or 1:9	1:3, 1:5 or 1:9	1:3, 1:5 or 1:9	1:3, 1:5 or 1:9	1:3 or 1:4	1:3 or 1:4	1:3 or 1:4
Weight		380 kg	380 kg	55 + 48 kg	85 + 48 kg	25 kg	50 kg	110 kg

Cable test vans

Megger is the world leader in van-mounted cable fault, test and diagnostic systems.

Modular single or three-phase cable fault location van



Variant

The Variant and Classic are modular three or single phase systems for testing and fault location on power cables in low and medium voltage networks. They offer a maximum variability in the equipment options and features of a cable test and fault location system.

The flexibility of both formats permits a very specific customer suited adaptation of the system for cable testing, surge energy for the pinpointing, burning and sheath fault location.

Compact City

The Compact City is a complete test and fault location system suitable for installation into very small vehicles. It consists of the SPG 40, a mobile, multifunctional system for testing, prelocation, pinpointing and burning of cable faults in low and medium voltage networks and a pin-pointing device. The system is controlled directly via the connected Teleflex SX reflectometer or the control panel, either integrated or as 19" version. All functions of the system are easily managed by the rotary encoder in the control panel. The system supports easy and clear handling, even for inexperienced users.

Centrix D- Diagnostic

With the Centrix Diagnose, SebaKMT offers a combination of the Centrix cable fault location system and a cable testing and diagnosis system. The base unit is a Centrix system either in a single or three phased version up to 80 kV. This system can be equipped with 0.1 Hz VLF sinusoidal testing in combination with tan delta diagnosis or the 0.1 Hz cosine rectangular VLF technology. A fully integrated partial discharge diagnosis unit is also available.

Cable test vans

Fully integrated single or three-phase cable fault location van

Centrix 2.0 system

The Centrix system is an all-in-one, multi-function cable fault location solution mounted in a test van. It has a single, easy to use controller that operates the whole system from the comport of the operators cabin. All functions are accessed via the central, jog dial operated control unit, from insulation tests, to VLF, TDR reference traces to the various cable fault methods such Arc Reflection and ICE. All tests and system status are shown on a high resolution colour display allowing instant analysis of fault traces which can be saved into the memory or a USB stick and called back for comparison later. Each system is configured to customer requirements, including options for cable test and diagnosis.

The simple single jog dial operation makes the Centrix system easy to use and to understand which reduces the training time and effort required learning the operation of the system. It also allows users to quickly start operating the system if it is not used regularly by the same engineers.

System R 30 fault location system for all applications

The System R 30 is the largest most powerful test van system within the product range. All functions and voltage ranges are fully integrated.

DC test voltage levels, including the well-known decay travelling wave prelocation method are available up to 110 kV in the standard version (400 kV optional), thus matching the worldwide standards.

A PLC operated central control unit monitors the safety and all vital functions of the system. The integrated safety system concept and the separation transformer for defined potentials, guarantees high safety standards for the user and the equipment.

With its standard 110 kV/290 mA DC testing, its widely approved and well known Arc Reflection Method up to 50 kV ARM prelocation and 3 kV to 50 kV surging with up to 2500 J, the R 30 Systems covers all requirements in the range of low voltage up to high voltage without any difficulty.

The system offers the option of 0,1 Hz cosine rectangular VLF test systems up to 70 kVrms and test capacity of 5 µF @ 0,1 Hz. Burning with 15 kV / 25 A and surging with 80 kV and 3200 J. For higher voltages the R 30 system can be equipped with up to 400 kV DC and 400 kV Decay.

All operational modes controlled by a central system control panel which selects the operation via motor driven HV switches, like all SebaKMT systems, the R 30 includes an extensive safety system, which provides the maximum safety for operator, personal and equipment during the operation of the system.

Flexible solution to integrate portable equipment into a combined system

NSF E

The NSF E system control panel provides the possibility to combine up to four separate units into one single system and to manage their operation via a central control while providing the best of operational comfort and safety.

The NSF E system control panel has an integrated, adaptable control with rotary encoder. This control can be configured for almost any device. The control includes power switches, HV on/off, emergency off and an integrated FU/EP safety system. The display shows the input voltage and current, the messages of the safety system and the selection menu for the connected devices. All messages appear in full text in user language.

Test van equipment

Surge wave generators, active filters and burn down units for mounting in vans, or stand-alone usage.

16 kV surge wave generator

SWG500

SWG500 operates in the mid-voltage range, with output voltages of 4 to 16 kV while its surge energy is in the lower range up to 500 J. The three voltage ranges are switchable and allow at each voltage stage the full surge energy of 500 Joule to be used.

High powered surge wave generator

SWG1750

SWG generates surge energies of 1750 J or 3500 J in 3 voltage steps. The output voltages are 0 to 8 /16/32 kV. A special version provides 0.4 kV in addition to the 1750 J unit.

Burn and proof test system for MV cables

BPS5000-C

Normally installed in a van system BPS5000-C can be used as a portable device for fault conversion. The digital control allows easy operation as a burn unit for the conversion of difficult to locate cable faults and permits the operation of a connected HV DC test system and a VLF cosine rectangular test system.

It offers an AC current up to 110 A and a DC current of 6 A.

5 kV surge wave generator

SWG505

SWG505 is used, where high voltages and high surge energies are not the deciding factor but where price, portability and value for money are important. It outputs voltages 3 - 5 kV.

When used with the digiPHONE+, the 500 Joule surge energy is more than sufficient for most of the applications.

12 kV surge wave generator

T18/5

The switchable voltage levels of 0 - 3, 6 and 12 kV are primarily intended for the lower voltage ranges but cover also medium voltage application up to 11 kV.

In most cases the T18/5 is an integrated part of a fault location system. It is possible to double the surge energy from 1000 Joule to 2000 Joule.

Arc stabilisation filter for cable fault prelocation with the ARM method

ARM300

High resistive faults and intermittent faults can easily be located with the ARM Method. Typically the fault resistance is too high for direct measurement with a TDR. A surge generator combined with the LSG 300 creates a stable low resistance arc at the fault, which is then clearly located by a TDR like a low resistance fault.

This compact and easy to use Arc Stabilisation Filter is suitable for use in a modular system or installed in a cable test van. The LSG 300 is an effective aid to prelocate the majority of cable faults, quickly and accurately and is suitable for use by operators of all experience levels.

Arc stabilisation unit

LSG3-E

The LSG3-E operates with an active prelocation technology. It contains an own HV source and a surge capacitor. It discharges a surge voltage discharge of up to 2 kV with 640 Joule surge energy into the arc ignited before, which then automatically followed by the reflectometer measuring pulse, showing the fault as a negative reflection. Additionally the 2 kV surge generator can also be used for LV fault prelocation and pinpointing without the need for an additional surge generator.

Test van equipment

Arc reflection energy separation filter

ETF3

ETF3 kV was developed for the fault location on symmetrical communication and pilot cables. The combination of burn unit, ETF3 and a reflectometer permits fast fault prelocation on high resistive and humid cable faults. The ETF3 provides a solution for applications where cable type and their permitted test voltage is limited to a level which prevents the use of the standard burn and fault location technologies.

The burn procedure can be directly observed on the display of the connected reflectometer. As soon as the fault becomes low resistive, the fault distance is visible. This permits a "cable preserving" limitation of the burn time to the minimal required duration.

15 kV Burn-down unit

T22/13B

The unit acts as a current source for locating faults in power and control cables. It is primarily used for burning down high impedance and intermittent cable faults in low and medium voltage power supply networks. In addition, it can be used in conjunction with the appropriate connecting devices and a time domain reflectometer (TDR) for prelocation with the Decay/Arc Reflection Method.

With a maximum burn-down current of 25 A and a continuously variable voltage between 0 and 5 kV, the T22/13 B output can be pulsed for earth fault leakage location.

TDR range extender

LDE800

The LDE800 is an add-on for long range TDRs for optimisation of pulse, impedance and signal to noise ratio measurements on cables with extreme parameters such as very long cables, high attenuation, high resistive values, and very high or low impedances as found in sub sea cables, overhead lines, heating cables and district heating monitoring. Instead of the impulse generation by the reflectometer, the LDE800 generates its own measuring pulses up to 2000 V, which are then processed by the reflectometer in the passive transient mode. In practice measurements on HV DC links, ranges of more than 500 km have been achieved.

Cable fault converter

BT500-IS-1

For converting high resistance faults in signal, control and telecommunication cables into low resistance faults.

Time domain reflectometery - TDR

A well-established technique for fault location in both high and low voltage cables, time domain reflectometery has been explained as radar for cable. The reflected wave will show you the distance to the fault. These TDRs can be used with surge generators to form a complete cable fault location system.

Advanced portable reflectometer for fault location systems

Teleflex VX

Teleflex VX is especially designed to capture the rapid events encountered during fault location in power cables. The new hardware with significantly improved specification such as sampling frequency, pulse width and pulse amplitude, offers a longer range, higher resolution and above all, improved measurement.

When used with a surge generator the ΔU trigger technology always provides the perfect trigger timing. The ARMslide records 15 traces in one shot and allows the selection of the best trace, especially for wet and long cables. The ProRange function allows a range-based gain adjustment, displaying distant reflections with the same amplitude as those from short distances. With its large bright colour display Teleflex VX is operated using standard jog dial rotary controller, common to the Teleflex range.

The USB interface permits a very easy data transfer either as PDF files, as data set to the Winkis database software, or directly to a printer.

Portable reflectometer for fault location systems

Teleflex SX

With a range of between 20 m to 160 km Teleflex SX is a powerful TDR. It is easily operated using the touch screen and control knob and it automatically analyses the trace to give the cable end and fault distance indication. It supports all existing pre-location technologies and is compatible with all HV fault location systems.

Bridge TDR

KMK8

A hand-held fault locator for the assessment of the quality of cables and the location of faults; KMK8 is 4 major test protocols, an active bridge for faults on cables with low AC interference voltages levels, a passive Wheatstone bridge for faults on cables with high AC interference voltages levels, a Graaf fault locator for faults on totally water-soaked cables with high and intermittent interference voltages and a TDR for low impedance faults.

Three-phase time domain reflectometer

MTDR300

The 3-phase MTDR300 has a range from 100 m to 55 km is designed to rapidly and accurately pre-locate faults in power cable networks. Operation is via a single jog-dial and an easy-to-use menu with pull-downs. All the operator has to do is select the operation and click to confirm.

The MTDR300 is available as part of a Megger CFL or PFL system and as a stand-alone unit, housed in a rugged field proven case.

Overhead line testing system

This interface permits a Teleflex reflectometer to be safely attached to overhead lines by earthing any dangerous induced voltages. By measuring the impedance changes, it can detect breaks, short circuits and branches off the line, smaller changes in impedance such as poor connections, faulty insulators and changes in cross section and sags in the line.

Time domain reflectometery

Single channel LV cable fault locator

TDR1000/3P

A very capable TDR for identifying and locating faults on metallic cables. The TDR1000 is suitable for use on both dead and live cables without a blocking filter, up to CATIII 150 V phase-to-earth. Using a 2 ns pulse the TDR1000/3P's near end performance is exceptional while offering a maximum range of 5 km.

Dual channel LV cable fault locator

TDR2050

Offering a CATIV 600 V safety rating, the TDR2050 is perfect for chasing down fault on power circuits such as street lighting. It is IP54 rated. The step function trace improves the near-end performance of the TDR2050 as it prevents the trailing edge of the pulse masking faults. Other features are Auto-find taking you to the major events on the cable, Find-end function identifies the end of the cable and measures its length. Distance dependant gain is a major benefit in long cable performance.

Model	Teleflex VX-P	TeleflexSX	MTDR300	TDR2050	TDR1000/3P
Range	20m to 1280 km	20 m to 160 km	55 km	0.5 m to 20 km	0.5 m to 5 km
Output pulse	30 to 160 V	5 to 50 V	25 V	20 V	5 V
Pulse width	20 ns to 10 µs	20 ns to 10 µs	50 ns to 10 µs	min 2 ns	2 ns to 4 µs
Velocity factor range	3 to 50 %	3 to 50 %	30 to 99 %	20 to 99%	20 to 99%
Resolution	0.1 m	0.1 m	0.82 m	0.1 m	0.1 m
Weight	20 kg	10 kg	6.7 kg	1.7 kg	0.6 kg

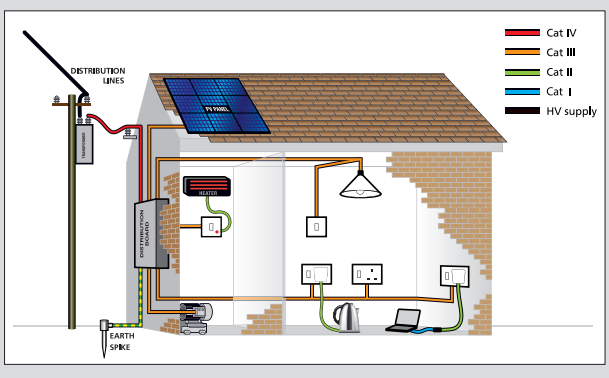
Why CATIV?

A distant lightning strike can produce a transient of several kV on the supply. That transient lasts for a few tens of microseconds and is likely to do little damage.

The problem is that it may initiate an arc and this arc then presents a low impedance path for current from the mains supply. Often, that supply can deliver 1000 A or more before the breaker or other protective device operates. In that time, the amount of energy liberated is enough to start a fire or even cause an explosion. If the arc is within a test instrument there is a high probability that you will be injured or worse!

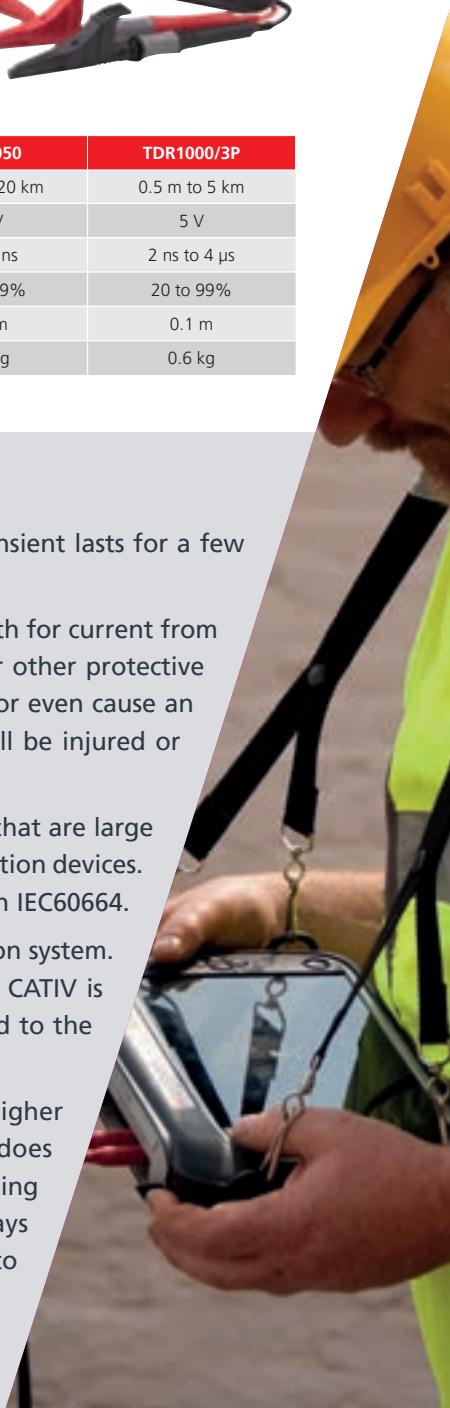
The solution is simple – design the instruments with protection and internal clearances that are large enough to prevent transients from establishing an arc and along with appropriate protection devices. Guidance to this is given in IEC61010 in order to comply with category ratings defined in IEC60664.

In practice, transients are damped quite quickly as they pass through a typical distribution system.



As you can see from the diagram CATIV is recommended for use outside and to the consumer unit.

Using an instrument with a higher installation category rating does not alone create a safer working environment. You should always follow correct work practices to keep you and others safe.



Cable fault location systems

The fundamental objective of any cable fault location system is to provide quick, effective, accurate and safe fault location, resulting in reduced system outages and "Customer Minutes Lost". Megger's fault location systems help you quickly find the location of the underground fault.

Highly portable fault location system

EZ-Thump3, EZ-Thump4 and EZ-Thump12

Weighing less than 33 kg the EZ-Thump series are the most portable fault location systems on the market. It utilises the "Easy Go" test system, which is easy to operate, interprets the results and requires minimal training to find faults. On-board is a TDR with a 7.6 km range and arc reflection at 3, 4 or 12 kV respectively for pre-locating. For pinpointing, EZ-Thump offers a surge energy of 500 j, DC testing for breakdown detection and insulation resistance measurement. The units are operated from line or the internal battery. They can fit in the boot of a car, making them ideal for a flexible, quick response fault finding strategy.

20 kV fault location system

PFL22M1500

This tough portable system offers cable and fault diagnosis, pre-location, fault conditioning and pin-pointing using the acoustical method. There is a 20 kV output for insulation testing and proof / burn. The surge energy is 1550 J at 8 or 16 kV. The TDR has a range of 50 m to 55 km.

Portable cable fault locating system

ST16

This neat, compact system can be powered by on-board batteries or main supply. It utilises the "Easy Go" test system, which is easy to operate, interprets the results and requires minimal training to find faults. Proof test at 8 or 16 kV , surge energy 1500 J, features ICE, ARC reflection (ARM), decay and sheath test modes.

Battery operated cable fault location system

SFX25

Offering 25 kV output voltage this system can provide the full surge energy for up to 1.5 hours continuously, making it prefect for fault location on low and medium voltage networks. ARM is used for high resistance faults while low resistance faults can be located with the TeleFlex SX module without recourse to high voltage methods.

Fault location systems for MV networks

SFX12 and SFX16

A pair of mobile fault locating systems offering up to 12 kV, 1100 J or 16 kV, 2000 J surge energy respectively. They are controlled using the well-renowned built-in Teleflex SX TDR.

Cable fault location systems

8, 16 and 32 kV fault location system

SFX32

SFX32 is a mobile system for testing and fault locating on low and medium voltage cables as the test and surge voltages can be up to 32 kV. The Short Period Arc Reflection Method is used for pre-location of high resistance faults up to 32 kV while low resistance faults can be located with the Teleflex TFX-SX TDR module without recourse to high voltage methods. The burning of faults is possible at all voltage levels by short-term burning. 1750 Joules with a vehicle mounted option of 3500 J of surge energy provide the necessary high power for fast and accurate pinpointing cable faults by the acoustic method.

Mobile cable testing and fault location system

SFX40

The SFX40 is a mobile, multi-functional system for testing, pre-location, pinpointing and converting cable faults in low and medium voltage networks. The system is controlled directly via the connected TFX-SX reflectometer or the integrated control panel. All functions of the system can be easily performed using the selector knob. With DC output up to 40 kV and surge energies of 1000 J or 2000 J this is a powerful system yet the integrated safety system ensures the highest degree of safety is guaranteed.

8 kV fault locating system

SFX8-1000

With an output surge of 1000 J and voltages of up to 8 kV SFX8-1000 is the perfect for finding faults on low and medium voltage cables. For pre-location ARM, ICE modes can be used with the TDR having a maximum range of 160 km. The pre-location unit TeleflexSX can be battery operated and stand alone or integrated with the surge unit on the wheeled mounting frame.

5 kV fault locating system

SFX5-1000

This portable system is used for cable testing, fault conditioning, pre- and pinpoint location of faults in low voltage distribution systems. With an output of up to 5 kV, the unit can supply up to 1000 J.

Model		EZ-THUMP3	EZ-THUMP4	EZ-THUMP12	SFX8-1000	ST16	PFL22-M1500	SFX5-1000	SFX12	SFX16	SFX25	SFX32	SFX40
Max output voltage		0 to 3 kV	0 to 4 kV	0 to 12 kV	2, 4 and 8 kV	8 and 16 kV	10 and 20 kV	5 kV	12 kV	16 kV	12.5 and 25 kV	0 to 30 kV	40 kV
Surge energy output		300 J	500 J	500 J	1000 J	1500 J	1500 J	1000 J	1100 J	200 J	1150 J	1750 J	1000 J
TDR range		7.6 km	7.6 km	7.6 km	160 km	7.5 km	55 km	160 kM	160 km	160 km	160 km	160 km	160 km
Pre-location method	ARM	■	■	■	■	■	■		■	■	■	■	■
	ICE				■	■	■	■	■	■	■	■	■
	Decay								■	■		■	■
	Insulation							■					■
Fault conditioning					■	■	■	■	■	■		■	■
Proof/burn					■	■	■	■	■	■		■	■
Pin-pointing		■	■	■	■	■	■	■			■	■	■
Sheath fault					■	■		■	■	■		■	■
Mains operation		■	■	■	■	■	■	■	■	■	■	■	■
Battery operation		■	■	■		■					■		
Width		355 mm	355 mm	355 mm	530 mm	500 mm	536 mm	520 mm	800 mm	800 m	600 mm	800 mm	520 mm
Weight		33 kg	33 kg	33 kg	90 kg	135 kg	131 kg	60 kg	135 kg	135 kg	110 kg	140 kg	116 kg

Underground cable fault pin-pointing

These are used in conjunction with a surge generator or sheath fault locator pulsed energy source to find the exact location of a fault.

Surge wave receiver for acoustic and electromagnetic fault pin-pointing

digiPHONE+

This instrument sets the standard, by integrating audio and electro-magnetic functionality in to one simple to understand, colour display. Combining two new technologies for efficient noise suppression, it offers exceptional acoustic performance which lets pass only the fault noise. This means it is possible to lower the surge energy and to find faults in noisy environments. The operator's hearing is protected by auto proximity mute, turning off the head set as a hand approaches the sensor handle and turning it on again once mechanical oscillations have ceased, and limiting the earphone output to 84 db(A).

Cable tracing is simplified using the left right indicator keeping the sensor over the cable while the compass indicated the direction to the fault and the digital readout displays the distance to the fault.

Multi purpose pin-pointer set

digiPHONE+ NT set

This set combines capabilities of the digiPHONE+ and ESG NT allowing the user to carry a single instrument to locate cable faults and sheath faults in their vehicle.

High voltage bridge for fault location in long cables

HVB10

HVB10 is a highly accurate high-voltage bridge designed to locate cable and sheath faults, perform sheath testing, and pinpoint sheath faults, especially suited to long HV cables. With its high resolution, intermittent fault detection function, and load adaptation for faster cable charging, it is an indispensable tool.

It accurately pre-locates cable interruptions and short-circuit faults, and detects high-resistance conductor faults that cannot be pre-located with impulse reflection based methods.

The HV bridge is equipped with a powerful discharge unit which allows the safe discharge of cables with a capacity of up to 25 µF. Prior to each test, a capacity measurement ensures that the expected discharge energy does not exceed these parameters and damage the instrument making it very suitable for very long cables and their parameters.

HVB10 can also be used for sheath testing and sheath fault pre-location and pinpointing.

Cable sheath fault location

Sheath fault pin-pointer

ESG NT

Used with any dc or pulsed dc sheath test output such as from the MFM10 or MMG10 as a transmitter, the ESG NT pinpoints a sheath fault using the step voltage or pool of potential technique. The easy-to-use instrument utilises a TFT colour display which is very readable in bright sunlight and has auto or manual sensitivity adjustment. Just switch on and go! The display can be a simple digital bar graph, or show the deflections of the last 7 pulses. A fully automatic calibration keeps the display always at zero and the integrated noise suppression eliminates all influences by DC, railway currents, industrial plants and high resistive soil environment. The step voltage is measured using two earth rods.

Sheath tester

MMG10

Designed for the voltage testing of PE and PVC cables and the location of sheath faults in shielded plastic cables in conjunction with a pin-pointer. The system can be used for prelocation of sheath faults on MV shielded cables and line to earth faults on plastic insulated LV cables.

Sheath fault location system

MFM10

For power cables and particularly for cables in the field of telecommunication, an undamaged cable sheath is an exceptionally important prerequisite to avoid serious cable faults which would influence the quality of supply. The value of a cable is also determined by the condition of the sheath. Irrespective of the tests and diagnoses of the core insulation, the early recognition and elimination of sheath faults has a stabilising effect on the operational quality of a cable system.

The sheath fault location system MFM10 was developed for this purpose. This device is used for the general measurement of insulating cable sheaths and, due to its numerous applications, is regarded as the universal device for these measuring requirements. Accordingly, the MFM10 permits in the easiest way the testing of cable sheaths and prelocation and pinpointing of cable sheath faults.

This highly portable system is enclosed in an IP53 wheeled case. Automatic measurement enables the testing of cable sheaths as well as the pre-location and pin-pointing of cable sheath faults. A single test lead makes connection easy and the unit will test its own connections for pre-location.

The sheath fault pre-location method is automatic, the operator just enters the overall cable length. The ± 10 kV dc output permits the testing of HV cables. The bi-polar function eliminates the external thermoelectric and galvanic effects on pre-location considerably enhancing the accuracy.

Cable route tracing and identification

Cable location system

Ferrolux FLG10 and FLG50

This system can be used to accurately trace buried cable to a depth of 7 m with arrows offering precise left-right guidance. When used in conjunction with an audio frequency generator location and depth of the cable can be recorded in the receiver unit and downloaded. The route sensor unit weighs less than 1 kg to reduce operator fatigue.

Utility services detection and location system

EasyLoc

A fast and easy-to-use system for the detection and tracing of underground cable runs and pipe networks. The receiver unit displays the signal level and has a max marker to help with location. The operator is given both aural and visual confirmation of location. EasyLoc also gives an approximate depth measurement.

Phase verification system

PVS100i

Phase identification on live systems is necessary when preparing for and restructuring networks, for recording, updating and revising planning documentation as well as for planning and setting up of new network systems.

The PVS100 system consists of two identical devices, one of which is used as a base station and is connected to a known reference phase. The second device (the mobile unit) can be connected any-where in the network. The phasing can be determined across various voltage levels by comparing the angle of the phase currently being tested with that of the reference phase. Automatic comparison with a direct indication of the phase assignment takes place by synchronising the two devices via a GSM connection, using GPS as a highly accurate time base.

Cable Identifier

CI

The system identifies a particular cable by means of a current impulse generator and receiver. The receiver is connected to a flexible CT or a pad style detector to receive the identification signal. The pulse generator transmits single sawtooth pulses with a peak current up to 100 A into the cable being identified.

Phase identification in earthed and shorted MV cables

PIL8

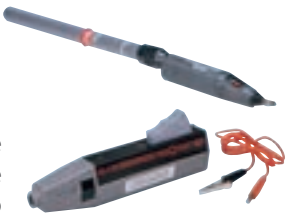
Using three pairs of transceiver clamps connected without any leads, one to each of the short circuited phases. The PIL8 transceiver clamps do not require a power supply.

At the other end of the cable an audio frequency current is injected into the cable by means of a battery operated generator/receiver. This induces a voltage in the transceiver clamps which is rectified and stored in a capacitor. When sufficiently charged the clamp transmits a coded signal to the receiver indicating the designated phase to which the pairs of clamps has been connected.

The PIL8 meets the requirement of EN50110-1 (VDE 0105 part 1), in as much as its application eliminates the need to disconnect the short circuiting and earthing circuit. After installation of the three pairs of clamps, the chamber can be closed greatly enhancing safety.

DETEX

The Detex range of testers is ideal for determining the presence of voltage, be it phase to earth or phase to phase. A verification unit is available to ensure safe operation. Voltage detectors are suitable for voltages from 2.3 kV to 550 kV. Models are available with electronic LED and audible indication or neon indication.



DETEX Voltage detectors are available in seven models that cover a range from distribution class to transmission line voltages up to 550 kV

High voltage discharge rods

EST series

These rods are designed only for discharge of high voltage cables in the context of cable testing. The discharge resistor damps the discharge current flow.

Power quality testing

With the increased sophistication of electrical and electronic equipment, and new micro generation systems being added to the grid, there is now more than ever attention being paid to the quality of supply. Power quality surveys on electrical noise, lamp flicker, load balancing, power factor correction and motor in-rush studies can all be carried out with Megger power quality analysers.

Power quality analysis system

PQA1000 series

This tough, IP65, series of testers is intended for use on public networks and so offers CAT IV safety.

PQA1000 Basic: the device is suitable for load analysis, data-logging and online analysis of the network.

PQA1000 Standard: this version records about 2,000 additional parameters (harmonics and inter-harmonics) and generates automatic power reports according to EN 50160, IEC 61000-2-2 or IEC 61000-2-4 standards.

PQA1000 Professional: this version adds fast oscilloscope traces and 10 msr.m.s. recordings with advanced trigger functions. The automatic trigger function automatically adjusts all triggers to the network disturbances.

Impedance meter

NIM1000

With a test current of up to 1 kA the NIM1000 measures the network impedance of the phase and neutral conductors to the 10th harmonic. It highlights load-sensitive and neutral faults, detects poor contacts and unseen problems. It is also useful for measuring the earth loop impedance close to the source of supply.

Given the complexity of the measurements the NIM1000 is capable of making it remains easy to use. It can measure current capacity under real life conditions, determine voltage dips from given loads and perform tests on cables, supply lines and busbars.

Power quality analysers

MPQ Series

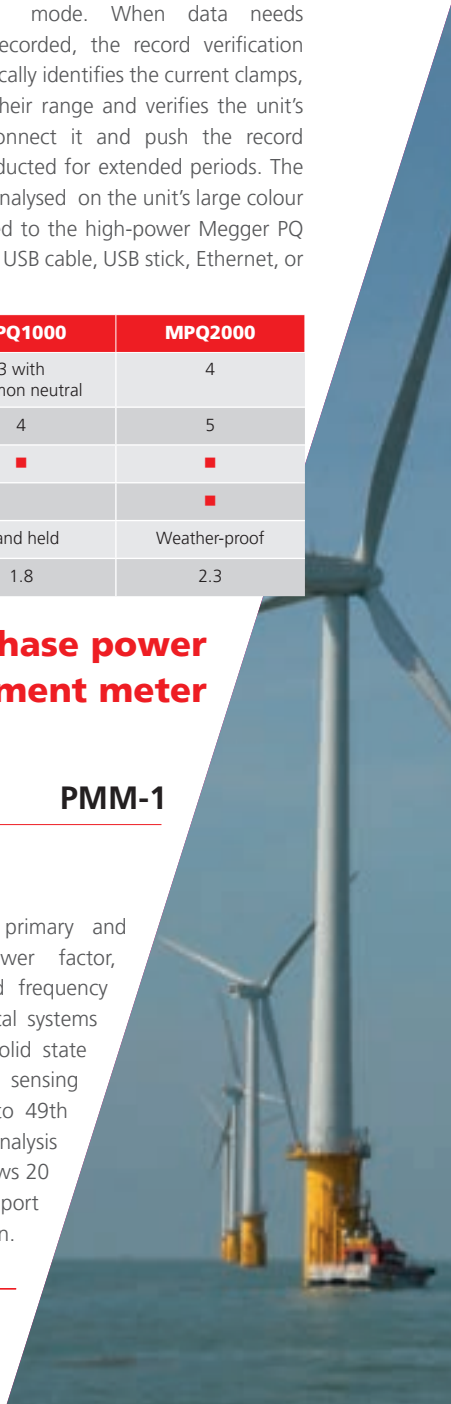
MPQ series of power quality analysers are IEC61000-4-30 Class A compliant three-phase analysers, delivering unmatched capability,. View RMS data, waveforms, demand data, phase angles, harmonics, unbalance, flicker and more in real time in scope mode and DMM mode. When data needs to be recorded, the record verification automatically identifies the current clamps, recognizes their range and verifies the unit's connection. Simply connect it and push the record button. The recording can be conducted for extended periods. The recorded data can be viewed and analysed on the unit's large colour display. The data can be transferred to the high-power Megger PQ Power Quality Analysis software via USB cable, USB stick, Ethernet, or directly from the SD card.

	MPQ1000	MPQ2000
Voltage inputs	3 with common neutral	4
Current inputs	4	5
Battery powered	■	■
Powered off of A phase		■
Case type	Hand held	Weather-proof
Weight in kg	1.8	2.3

3-phase power measurement meter

PMM-1

Measures AC/DC voltage, AC primary and secondary current, power, power factor, reactive power, phase angle and frequency of single and three phase electrical systems with extreme accuracy. Integral solid state timer for continuity and voltage sensing and harmonic measurement up to 49th harmonic. For detailed waveform analysis a high-speed capture function allows 20 measurements per second. A data port allows bi-directional communication.



Earth or ground testers

Earth or ground resistance testing - One of the most important considerations in an electrical system is the resistance of the earth for reliable operation and safety. Whether you are doing a ground resistivity survey to plan the location of a substation or testing an earth electrode Megger has an earth tester suitable for the job. Megger has more than 50 years' experience of designing and building earth resistance testers. The latest generation is CATIV rated, and have tough moulded cases. Variable test frequency keeps noise down, reliability up.

High resolution earth tester

DET2/2

Our top of the range earth tester. High resolution to 1 mΩ. This level is required to measure resistivity to adequate depth on many substation and communication sites. Measurement of the low earth values required on many installations, to meet Ground Potential Rise (GPR) requirements, need this resolution to ensure valid results. Superior noise filtering greater than 40 V peak to peak to retain resolution under real test conditions.

DET2/2 has excellent noise filtering and is ideal for big earth systems

Earth leakage clamp

DCM300E

Measurement of leakage current. For stable readings down to very low current value with a 0.01 mA resolution. Current measurement ranges from 30 mA up to 300 A.

DCM300E was designed with safety in mind. It exceeds the requirements of IEC1010-2-32

Earth ground testers

DET3 and DET4

- **All models include these features**
- **Extra large selector switch**
- **Extra large, clear display for easier operation in outdoor conditions**
- **Simple one button operation**
- **Battery powered with a bar graph that updates battery strength**
- **Noise reduction up to 40 V peak to peak**
- **Safety rating of CATIV 100 V**
- **IP54 rated (water/dust ingress) for extra protection in harsh conditions**

DET3TD - offers a complete kit for customers wishing to conduct earth electrode testing using the two and three pole techniques.

DET3TC- when used with the optional ICLAMP allows fall of potential testing using the ART technique without needing to disconnect the electrode under test.

DET4TD2 - is a complete earth testing kit for users needing the flexibility to use either the two and three pole electrode techniques or the four pole soil resistivity test.

DET4TR2 - is similar to DET4TD2, with the added advantage of using rechargeable batteries. You can also get an adaptor to charge your tester from your vehicle.

DET4TC2 - is a four pole tester with extended resistance range and variable test frequency. Use it for ART testing, two or three pole testing, four pole resistivity testing and stakeless testing.

DET4TCR2 - is similar to DET4TC2, with the added advantage of using rechargeable batteries. You can also get an adaptor to charge your tester from your vehicle.

DET4TC2 comes as a bare tester or in a full kit

Each instrument includes everything you need to test: Comes complete with test leads, stakes, batteries, calibration certificate and rugged polypropylene carry case.

Earth or ground testers

Earth resistance clamp testers

DET14C and DET24C

Earth resistance clamp testers are suitable for measuring earth resistance of installations such as buildings, pylons and RF transmitter sites and for inspection of lightning protection systems.

- **Elliptical clamp shape improves access to earth cables and straps up to 50 mm**
- **Low maintenance flat jaw interface**
- **Measures ground resistance from 0.05 Ω to 1500 Ω**
- **Measures true RMS ground leakage current from 0.5 mA rms to 35 A rms**
- **Automatically self calibrates**
- **Auto ranging**
- **High and low alarms**
- **Memory and Bluetooth downloading**
- **CAT IV 600 V safety rating**

Professional earth test kit

Megger's Professional Earth Test Kit is designed to be as practical as possible. Housed in a tough polyethylene carry case, the kit is stored neatly, well-protected and easy to transport. In use the reels are fitted and retained on the spike handles, simply run out the test lead to the instrument and plug in, plug the other end directly into the spike, and test. When the test is complete, unplug the test leads and wind them in, whilst still on the spike.

- **Ideal for use with whole range of Megger earth testers**
- **4 wires on easy-wind reels make it quick to get testing and quick to pack away again**
- **1 croc clip test wire**
- **Fibre-glass measuring tape to assist accuracy depth**
- **Auger style spikes make it easy to deploy and to check**
- **Tough easy store case**

Everything you need for earth ground testing, including a tough moulded polyethylene case

	DET2/2	DET4TCR2	DET4TC2	DET4TR2	DET4TD2	DET3TC	DET3TD	DET14C	DET24C
Test techniques available									
4 pole resistivity test	■	■	■	■	■				
3 pole electrode test	■	■	■	■	■	■	■		
3 pole electrode test with ART		■	■			■			
2 pole electrode test	■	■	■	■	■	■	■		
Stakeless test		■	■					■	■
Power									
Rechargeable	■	■		■					
Dry cells			■		■	■	■	■	■
Warnings									
Excessive noise	■	■	■	■	■	■	■		
Potential spike resistance high	■	■	■	■	■	■	■		
Current spike resistance high	■	■	■	■	■	■	■		
Resistance range	0.010 Ω-19.99 k Ω	0.01 Ω-200 k Ω	0.01 Ω-200 k Ω	0.01 Ω-20 k Ω	0.01 Ω-20 k Ω	0.01 Ω-2.0 k Ω	0.01 Ω-2.0 k Ω	0.05 Ω-1.50 k Ω	0.01 Ω-1.50 k Ω
Resolution	0.0 01 Ω	0.01 Ω	0.01 Ω	0.01 Ω	0.01 Ω	0.01 Ω	0.01 Ω	0.01 Ω	0.01 Ω
Earth current range									
0.02 mA to 35 A								■	■
0.5 mA to 19.9 A		■	■			■			
Test frequency	105 Hz-160 Hz	94 Hz, 105 Hz, 111 Hz, 128 Hz	94 Hz, 105 Hz, 111 Hz, 128 Hz	128 Hz	128 Hz	128 Hz	128 Hz	1500 Hz	1500 Hz
Noise rejection 40 V peak to peak	■	■	■	■	■	■	■		
Test results storage								■	■
Downloadable test results									■
Supplied with basic test lead set		■	■	■	■	■	■		
IEC61010-1 safety rating	CAT III 300 V	CAT IV 100 V	CAT IV 100 V	CAT IV 100 V	CAT IV 100 V	CAT IV 100 V	CAT IV 100 V	CAT IV 600 V	CAT IV 600 V
Weatherproof and dust proof to	IP54	IP54	IP54	IP54	IP54	IP54	IP54	IP30	IP30
Supplied with Power DB earth testing forms		■	■	■	■				

Battery testing

With the increasing dependency of back-up systems on battery strings, and the escalating cost of replacing batteries, instrumentation and software systems that can measure, trend and manage the life-cycle of cells is a cost effective option. There are two methodologies for testing batteries; the first, impedance testing is an on line test and can be performed frequently to identify individual weak cells before they fail. The second, battery discharge test is, normally, an off-line test and tests the actual output of the whole battery under load conditions. This will show what will actually happen if the battery is required to take the load. Most battery systems are floating and have earth leakage monitors and trips if there is an earth fault. The Battery Ground Fault Tracer allows you to trace a faulty circuit easily in a complex floating system.

Battery impedance test equipment

BITE3

BITE3 battery impedance test equipment determines the health of lead-acid cells up to 2000 Ah by taking measurements of the most important battery parameters, cell impedance, an internal ohmic test, cell voltage, intercell connection resistance and ripple current.

For the first time in a battery test instrument, BITE3 measures float current and the harmonic content of the ripple current. There is a built-in spectrum analyser to show the harmonic content of the ripple current.

BITE3 determines the health of lead-acid cells up to 2000 Ah by taking measurements of the most important battery parameters

DC earth fault locator

Geolux GL660-1

For fault location in isolated, earth free DC battery systems as used in railway signalling, hospitals and power plants etc. the GL660 directly connects to the faulty line with live voltages up to 660 V, and generates a low frequent pulsed signal which allows the tracing by a specific receiver along the faulty line to the fault position.

A single earth fault will cause no service interruption however with the occurrence of a second earth fault there is a high risk of partial or complete breakdown of the installation, consequently any earth fault must be located and repaired as fast as possible. The GL660-1 can locate faults up to 150 kΩ even in noisy environments and without the need to switch off the system.

Battery impedance tester for up to 7000 Ah cells

BITE2P

A rugged durable instrument whose enhanced capabilities make it easier to determine the true state of health of a battery system, terminal plate to terminal plate. BITE2P is ideal for battery systems up to 7000 Ah, used in substations, generating stations, telephone exchange UPS systems and cabinetised UPS batteries, railway substations, signal and communications installations.

BITE 2P Battery Impedance Test Equipment determines the condition of lead-acid and nickel-cadmium cells up to 7000 Ah

Battery ground fault tracer

BGFT

An instrument that identifies, tracks and locates ground faults in unearthed DC battery systems, on-line. Effective in high electrical noise environments, as the strength of test current can be adjusted. Useful for industries where power supply for operating measurement, communication and control equipment is critical.

The Battery Ground-Fault Tracer is an economical, manually-balanced instrument that identifies, tracks and locates ground faults in ungrounded DC battery systems - on-line. It is particularly effective in a high electrical noise environments, as the strength of the test current can be adjusted

Battery testing

Battery Load Units

TORKEL910 and TORKEL930

TORKEL™900 series is used to perform load or discharge testing, which is the only way to determine battery systems actual capacity. Together with the optional cell voltage logger, BVM, connected directly to the TORKEL 900, it becomes a complete, stand-alone, discharge test system.

TORKEL930 is used for battery systems ranging from 12 to 300 V, often encountered in switchgear and similar equipment. The high discharge capacity of TORKEL gives the opportunity to shorten the test time. Discharging can take place at up to 220 A, and if higher current is needed, two or more TORKEL units or extra load units, TXL, can be linked together. Tests can be conducted at constant current, constant power, constant resistance or in accordance with a pre-selected load profile. Testing can also be carried out without disconnecting the battery from the equipment it serves. Via a DC clamp-on probe, TORKEL measures the total battery current while regulating it at a constant level. Battery systems can be plus or minus grounded or free floating.

	TORKEL930	TORKEL910
Maximum discharge current	220 A	110 A
BVM functionality	2 strings of 120	
Charging measurement	■	
Full report functionality	■	

TORKEL910 is very much the same as the TORKEL930 but has lower discharge current and some limitations see the table.

Battery voltage monitoring

BVM series

BVM is a battery voltage measurement device that is used for the capacity testing of large battery banks. When used in conjunction with TORKEL unit, and test data management software, the BVM enables the user to perform a completely automated battery bank capacity test, according to IEC test method. The test also meet NERC/FERC requirements.

Digital hydrometer

For determining the specific gravity of flooded cells, electrolyte is simply drawn in and the specific gravity and temperature are determined in five seconds. It provides memory for both temperature and specific gravity for eight tests of 256 cells each. The stored data can be easily downloaded into any PC.

Battery extra load

TXL

For use with the TORKEL testers which controls the test, the extra load units allow the battery to be discharged at a greater rate.

Battery testing software

TORKEL Win PC Software

TORKEL Win allows remote control of TORKEL battery load testers, recording time, voltage current and discharge capacity, and permitting the display of voltage curves and production of reports.

Testing data management software

PowerDB

Do you have problems managing test data?

Once tests have been done on site there is the issue of recording and managing the data. This may have been recorded by a number of field engineers or 3rd party contractors. How do you correlate all this data and store it so that it can be used efficiently for maintenance or referenced for auditing?

PowerDB software allows the user to manually enter test results into specifically designed forms for testing substation assets such as transformers, CTs, batteries and relays. It allows the user to quickly and easily enter the test results straight into a unique test data form on a laptop.

This form can then be sent over the internet to be synchronized with the PowerDB database, which stores and manages the data so that it can be easily referenced.

PowerDB is specifically designed for storing and managing data from commissioning and maintenance, including analysis and trending of test results.

PowerDB can then quickly create entire test documentation packages that include test reports, comment and deficiency summaries, table of contents and field service reports.

PowerDB's test forms are designed to be used with each of the following assets:

- Batteries
- Insulation Fluids
- Cables
- Loadbreak Switches
- Circuit Breakers
- Motor Control
- Coordination Data
- Power Factor Tests
- Disconnects
- Relays
- Generators
- Switchboards
- Ground Fault Tests
- Transfer Switches
- Ground Mat/Grid Tests
- Watthour Meters
- Instrument Transformers
- Transducers
- Power Transformers

If IT implementation is a problem, PowerDB can even host your data on a dedicated server, to reduce reliance on company IT systems.

This economic software package has been designed for Utilities, OEMs, HV contractors, maintenance, service and commissioning companies. In fact, anyone involved in substation asset testing.

Easier Management of Test Data

PowerDB offers a straightforward approach to data management. The basic step in creating this user-friendly package was to make test data entry screens and printed forms identical. Users will appreciate

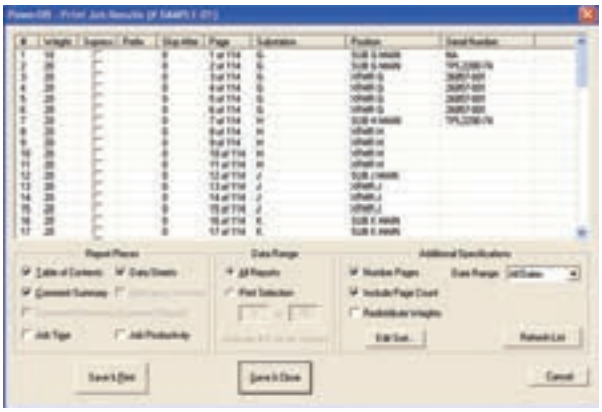
that what they see on the screen is what they will get in the printed version. PowerDB simplifies testing and data management by allowing users to deliver reports electronically. The software will execute several tasks including equation calculations, temperature, correction factors and charting.

PowerDB helps predict possible equipment failure by trending results, which can be stored in PowerDB or imported from other software. This makes transitions to PowerDB easy.

Industry standard test forms are not always what a company needs. So PowerDB software allows the user to customize forms. With a drag and drop feature anyone, even those without database experience, can create a form simply by dragging and dropping in tables, text boxes, images, charts and more, to create a customized form. And, with VBScript, calculations can be defined, tables looked

Testing data management software

up, and it can even interact with other applications. One time definition of common items can be used to put logos, headers and footers on every page or in many multiple forms. One change will automatically update every form the common item is used in.



There are three ways to document testing using the PowerDB software. First and foremost, data fields can be filled in using manual entry, standardizing the reporting of test results. Second, forms can be filled in using other applications, including Megger's AVTS, entering data into the fields using information stored in the other applications. Finally, the software can communicate directly with test and measurement equipment produced by Megger.

Built-in Report Flexibility

PowerDB can create reports in one step, with customisable sorting of the order of test forms. Forms can be removed, and page numbering will be automatically adjusted. In a single print job, supplementary reports can also be printed at the same time as the primary report. The supplementary reports, including comment and deficiency summary reports, open up the data and information for all of the equipment tested on one job. Finally, all of the information can be generated for the on-demand world using the optional PowerDB Web server. All of the user's important information is published to the Web and can be accessed from anywhere in the world.

Computerized Maintenance Management System Support

Many electrical utilities and other company operations have invested in sophisticated CMMS systems, such as Digital Inspection's Cascade and MRO Software's MAXIMO. However, due to test instrument specific software packages and handwritten test results, these firms often struggle to get test data into their systems. One electric utility even referred to getting data into the CMMS as 'feeding the monster'.

PowerDB's speciality is 'feeding the monster'!

PowerDB allows you to link easily with the CMMS system so that the system can pre-populate the PowerDB equipment database, send PowerDB all work orders, add forms based on the job plans, and even return the measurement points, obtained from a multitude of test sets, back to the CMMS system.

Furthermore, Megger will work directly with your CMMS personnel to integrate your data into your internal CMMS system.

Simplifying the compilation and reporting process

The new PowerDB software package eliminates many common paperwork and recording problems. With the software, the number of man-hours devoted to preparing reports will be minimal. The user can customize the reports to be what a job requires but will not have to write the report, which is automatically generated by the software. Included in the reports are a table of contents, data sheets, as well as comment and deficiency summaries. PowerDB even comes with a built-in spell check.

Automatically generated professional reports means that a testing company, for instance, is able to complete jobs faster and in a more efficient manner. PowerDB is well-suited for technicians who prefer to spend a minimum amount of time writing reports and want a more concise way to process data.

Electronic records of test data can create a couple of different problems for companies and utilities. While many electronic records are hard to locate due to the vast amount of records kept on one system PowerDB makes it easier. By using its relational database it is much easier to find present and past records. And, because it has multiple safe guards, PowerDB prevents lost data. By saving documents that are in progress to multiple places, the problem of lost data is eliminated. PowerDB also synchronizes the date to several machines, meaning that a single crash does not create a costly loss of data.

Low voltage testing

Electrical contractors throughout the world depend on hand-held test equipment to ensure installations are safe and function correctly. Count on Megger to produce tough machines that are designed to surpass the requirements of wiring regulations.

Earth loop impedance testers

LT300

A high current loop tester that is ideal for industrial applications with 50 V to 500 V and 16 Hz to 400 Hz operational range. LT300 offers users the assurance of a CAT IV rating.

LTW300 Series

2-wire non-tripping loop testers that makes loop impedance testing clear and obvious what is being tested. Unlike three-wire loop testing it makes it possible should no neutral be present. With auto-start the LTW300s will calculate and display the PFC and PSCC value at the press of a button up to 20 kA.

LTW425

Measuring loop impedance to 3 decimal places make this 2-wire non-tripping loop tester highly desirable. This feature means that contractors can use this instrument to make measurement close to the source of supply. It calculates the PFC and PSCC value up to 40 kA. See also NIM1000 on page 49

Residual current device testers

RCDT300 series

This tester is built on the same case as the tough LTW series, they are easy to use with no buried functions. It tests all RCDs from 10 mA to 1000 mA, and can offer the auto RCD test as well as ramp testing.

Low voltage testing

Multimeters

AVO410

A CAT IV 600 V multimeter that offers true rms on AC functions. It is auto ranging with the option of manual range selection. AVO410 has data hold and max and min measurements. It has a capacitance range to 6.000 µF and frequency to 60 MHz.

AVO210

A CATII 600 V multimeter that that offers auto ranging with a manual over-ride. These low cost meters are great value.

Clampmeters

DCM series

A choice of 4 clamp meters and a fork multimeter for use during the installation, maintenance and checking of electrical systems and equipment. Our selection of clamp meters gives the option of measuring currents between 10 A and 1.5 kA. The forked multimeter and DCM1500 offer CAT IV safety.

DCM300E

The DCM300E is a specialist clamp for earth leakage detection and diagnosis. With a 10 µΩ resolution it can make fault finding surprisingly quick and easy. With a maximum range of 300 A the DCM300E is a very flexible tool.

Isolation test kits

TPT320 and MPU690

These CATIV 1000 V 2-pole tester indicate the presence of voltage using either an LED array or an LCD screen. The MPU690 proving unit confirms the correct functioning before and after proving that the circuit is not live.

Portable appliances testing

A range of testers are offered for in-service inspection and testing of electrical equipment in accordance with the IEE code of practice.

PAT100 series

Offers truly simple PAT testing with a hand-held, battery operated tester.

PAT300 series

Designed for those who want to conduct the regime but do not need to store the results on the machine.

PAT400 series

Offers a sophisticated tester with on-board asset database for high speed testing, and data download for certification.

Multifunction installation tester

MFT series

Offering insulation resistance, continuity, earth loop impedance, RCD and earth electrode testing all in one tester. They are ideal for installation testing and periodic inspection of low voltage domestic, commercial and industrial systems. The top of the range models offer Bluetooth connectivity for paperless certification and the a full range of earth electrode tests.

Combined insulation and continuity testers

Pocket sized insulation and continuity tester

MIT200 series

The MIT200 series are CATIII 600 V tested offering 250, 500 and 1000 V test voltages and have applications in electrical contracting, on domestic and industrial systems, as well as site maintenance and service departments. They are small and light making them ideal for those engineers that need to carry them for extended periods.

Insulation resistance and continuity testers for electricians

MIT300 series

Tough enough to soak up the treatment meted out to testers on site, the MIT300 series offer CATIV 300 V safety with flexibility. The MIT300 comes in five versions from a basic two-test voltages digital tester to a downloading three-test voltages tester. Each of the digital versions of MIT300 series offers the Megger analogue arc technology, while for those who like a classical insulation and continuity tester there is an analogue instrument.

This series of testers is characterised by its case design which is particularly tough and has a cover to protect the screen.

Insulation resistance and continuity testers for industrial maintenance

MIT400/2 Series

Recently updated and including stabilised test voltage control, MIT400/2 series testers offer CATIV 600 V safety in a convenient easy to hold format. It is a classic 2 wire low voltage insulation and continuity instrument.

MIT400/2 series are true diagnostic instruments measuring insulation resistance up to 200 GΩ, they measure insulation deterioration long before most testers even offer a reading. They offer functions such as TRMS voltage measurement, polarisation index (PI), dielectric absorption ratio (DAR) and capacitance measurement. These diagnostic tests make it ideal for engineers working in industrial maintenance, allowing them to trend motor performance, and give them more solid evidence when taking a motor out of service.

Insulation resistance and continuity testers for telecommunications

MIT480/2 Series

Designed for the telecommunications industry, the MIT480/2 series testers are 3-wire testers consequently the connection is made once and then the measurement are made by switching between the pairs at the instrument.

This convenience has found application among electrical contractors who limit their insulation testing to 500 V.

With stabilised insulation test voltage, MIT480/2 series offers variable insulation test voltages from 10 V to 500 V, and full CATIV 600 V safety.

Combined insulation and continuity testers

Hand-held insulation and continuity tester for higher voltage applications

MIT2500

This tough CATIV 600 V tester designed for industrial maintenance and electrical contractors offers a lot of power in a very small and convenient package, performing insulation tests with a test voltage up to 2500 V, and measuring insulation resistance up to 200 GΩ.

This tester is a 3–wire tester using the well-established Megger guard terminal technology to ensure that surface leakage is discounted when making a measurement.

Megger

Power on

DLRO100 series
Highly portable micro-ohmmeters

Weighing as little as 7 kg this micro-ohmmeter which outputs 100 A, offers CAT IV safety and can be operated using mains and, or battery.

See page 12

SVERKER900
Relay and substation test system

The ultimate test box for engineers that addresses the increasing need for three-phase testing capability in substations and industrial applications.

See page 20

TRAX series
Multifunctional transformer and substation test systems

This exciting new test system that offers a plethora of automated standard transformer tests all in one box.

See page 30

TDS NT series
Combined cable test and diagnosis systems

By combining VLF testing and damped AC this system can more reliably diagnose the condition of the insulation of a cable.

See page 34

Part No: 85711
UniversalPower_85711_SC_en_V02