

Megger your Test & Measurement Solution

for

Power Systems
Electrical Installations
Communications Networks

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History of Innovation

- 1889 First Insulation Tester
- 1908 First “Ductor” Low Resistance Ohmmeter
- 1919 First Watt-hour meter test set
- 1923 First Multi-Meter
- 1949 First Turns Ratio Test set
- 1950 First commercial cable fault location system
- 1951 First relay test set
- 1968 First digital Multi-Meter
- 1978 First portable 3-Ph solid state relay test set

Company history

- 1903 – Megger trademark registered
- 1980s – AVO, Biddle, Megger, Multi-Amp join forces
- 2001 – Brands unite as Megger
- 2007 – Acquisition of Programma
- 2008 – Acquisition of PAX Diagnostics
- 2012 – Acquisition of SebaKMT

Megger Portrait

- Robust and reliable equipment for testing in the field
- Customer driven product design
- Focus on ease-of-use to increase customer's productivity
- Setting new standards in operator safety

Local Support

- Megger Cape Town
- Megger Johannesburg
- Megger Durban
- Quality service from local distributors
- Authorised local service, repair and calibration
- High value for money, low cost of ownership

Insulation Testing

- **DC diagnostic Insulation Testing**
 - 5, 10 & 15kV DC test sets
 - High short circuit current
 - High noise immunity
 - Automatic diagnostic testing built in (PI, DD, DAR, Step Voltage)
 - Mains or Battery powered



Low resistance testing

- Output current from 10A to 600A
- Weatherproof and lightweight
- Tests circuit breaker contacts
- Tests integrity of HV bus-bar connections
- Tests integrity of lightning protection apparatus



Transformer Testing

- **Turns Ratio Tests**
 - 3Ph or 1Ph turns ratio test sets
 - Winding resistance testers
 - Excitation current and phase angle deviation
 - Identifies broken or shorted turns, core faults, faulty taps



Transformer Testing

■ Winding Resistance Test Sets

- Direct 2-channel digital reading
- “Quick-Test” techniques
- Demagnetisation feature
- Tests operation of on-load tap changers
- Auto safety discharge
- 6 winding model



MT0330 (PowerDB Onboard)

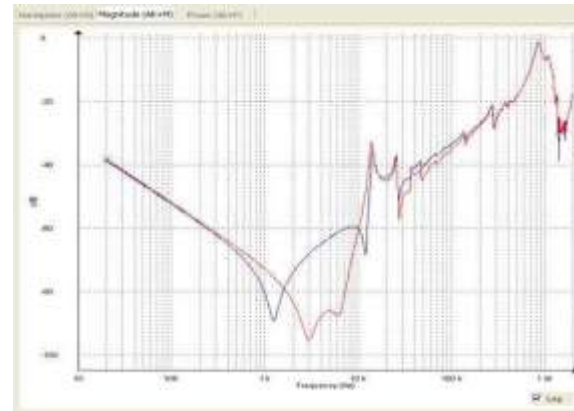


MTO300 (use with external PC with PowerDB)



Frequency Response Analysis

- **SFRA will detect**
 - Core movements
 - Faulty core grounds
 - Winding deformations
 - Winding displacements
 - Partial winding collapse
 - Hoop buckling
 - Broken clamping structures
 - Shorted turns and open windings



Tan Delta Testing

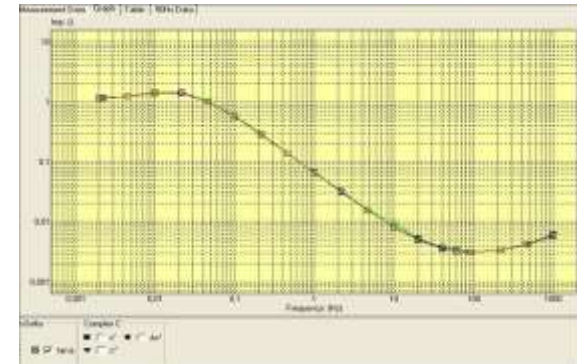
■ DELTA 4000

- 12kV AC
- Automatic operation
- Power factor and capacitance
- ITC and automatic voltage dependence detection
- Lightweight & Portable



Dielectric Frequency Response

- **Insulation Dielectric Analysis**
- **Determines Power Factor and Moisture Content in**
 - Power transformers
 - Instrument transformers
 - Bushings
 - Motors and generators
 - Cables
 - Generic testing of insulation systems



PowerDB Test Data Management Software

- Allows analysis, comparison and trending of data
- Interfaces with instruments for seamless reporting
- Merge results between field and office databases

The screenshot displays the PowerDB software interface. The left pane shows a tree view of test jobs under 'Job: 112233'. The right pane shows a detailed report for 'INSULATION TESTS TWO-WINDING TRANSFORMERS'.

Job: 112233

- Plant: <None>
- Substation: A-123
 - Position: MAIN
 - 27500 - CT RATIO & EXCITATION TEST
 - 43351 - SEL 5S1
 - 49550 - CEV51A RELAY
 - 49550 - CEV51A RELAY (1)
 - 56360 - 3PH TTR WITH TAP-CHANGER
 - 92510 - PF OIL CIRCUIT BREAKER
 - 92500 - PF TWO-WINDING TRANSFORMERS
 - 1/29/1995
 - 5/17/1998
 - 12/21/1998
 - 12/28/1998
 - 3/24/1997
 - 5/6/1997
 - 4/28/1998
 - 3/26/1999
 - 5/17/2000
 - 1/7/2004
 - 1/14/2004
 - 4/6/2005

- Substation: B-456
- Position: PP-2
 - 13000 - LOW VOLT. PWR. OCT. BKR. TEST
 - 45000 - OVERCURRENT RELAY
 - 92510 - PF OIL CIRCUIT BREAKER
- Substation: C-085

INSULATION TESTS TWO-WINDING TRANSFORMERS

Job: 112233
Substation: A-123
Position: MAIN
Equipment: 92500 - PF TWO-WINDING TRANSFORMERS
Test Date: 4/6/2005
Test Time: 14:00
Test Location: 123 Main Street, Suite 100, City, State, Zip

Test No.	Test Name	Test Date	Test Time	Test Location	Test Result	Test Status
1	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
2	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
3	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
4	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
5	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
6	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
7	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
8	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
9	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete
10	92500 - PF TWO-WINDING TRANSFORMERS	4/6/2005	14:00	123 Main Street, Suite 100, City, State, Zip	Pass	Complete

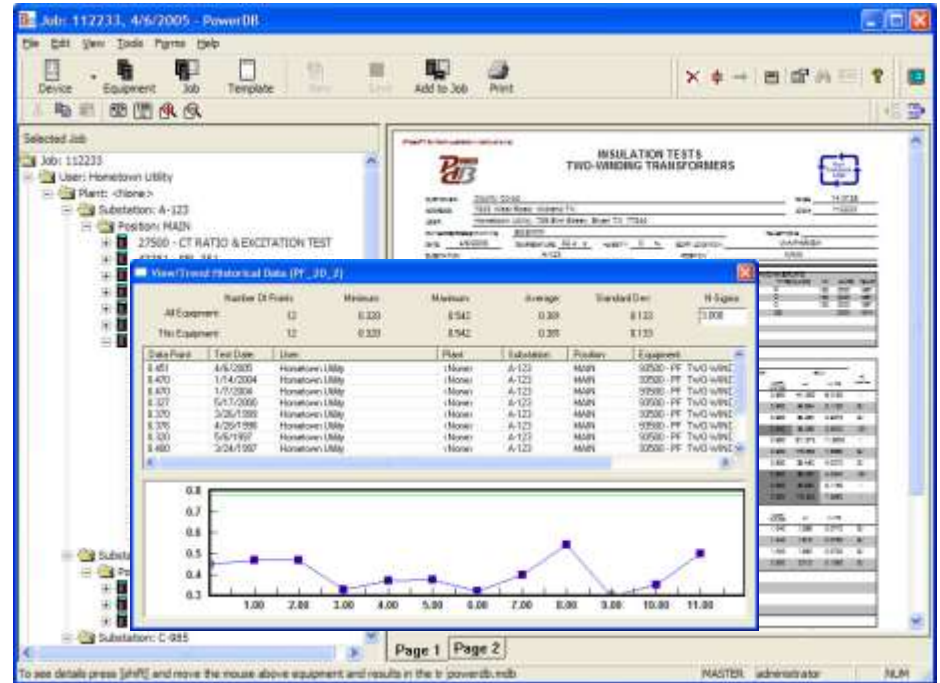
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To see details press [Alt+F] and move the mouse above equipment and results in the browser.

MASTER administrator NAM

PowerDB Test Data Management Software

- Trending



PowerDB Test Data Management Software

- Instrument control

The screenshot displays the Megger Delta Control software interface. The top section shows the 'TEST MODE' configuration with various test parameters. Below this is a large virtual meter with a scale from 0 to 10 kV and a digital readout showing 0.000 kV. To the right of the meter is an 'OSCILLOSCOPE' window and a 'RESULTS' section with fields for F (Hz), T (kV), W (kV), VSP (kV), and Test (kV). Below the meter is a circular control panel with four directional arrows and a central 'C' button. At the bottom right, there are 'INDICATORS' for Interlock Open and Open Ground, and a 'MENU' section with buttons for Settings, Power, Log, and Help.

The bottom section of the screenshot shows a data table with columns for Voltage and Current. The table contains three rows of test data:

Test No.	VOLTAGE			CURRENT		
	V	∅	Hz	A	∅	Hz
1	69.00	0	50.000	0	0	50.000
2	69.00	120.00	50.000	0	120.00	50.000
3	69.00	240.00	50.000	0	240.00	50.000

Oil Testing

- Dielectric strength of insulating oils to 100kV
- Field portable 80kV
- Karl Fisher moisture content testers
- Lightest units on the market
- Automatic test routines



Earth Testing

- Earth resistance testing
- Soil resistivity testing
- Extremely high noise immunity
- 2, 3, or 4 Pole testing with stakes
- ART attached rod technique for quick and safe selective testing
- Stake-less testing using clamp



Battery Testing

- Impedance Testing
- Tests state of health of back-up battery systems
- Identifies individual weak cells
- Finds poor inter cell connections
- On-line test with no down-time
- Very short test times



- Capacity Testing
- Constant current discharge test
- Up to 270A
- Up to 480V

Circuit Breaker Analysis

- Timing tests
- Coil current
- Motion analysis
- Vibration Analysis
- Dual Ground Safety
- Dynamic Resistance Measurements



Relay Testing

- Manual and automatic control
- Easy to use
- Excellent software provides great visuals
- and simple setup
- Lightweight and portable
- Highly accurate
- User can calibrate unit



Relay Testing

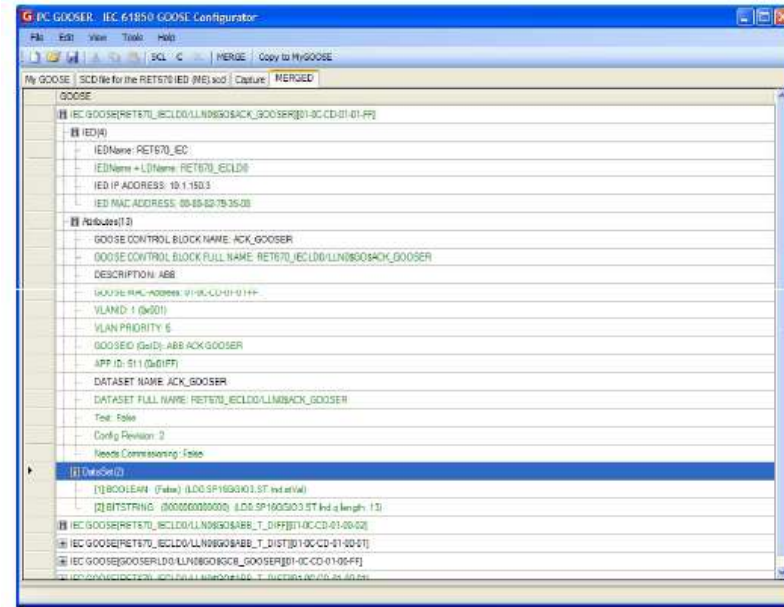
■ Megger SMRT Range

- 60A 300VA rms current channels
- 300V, 150VA voltage channels
- Hand-held manual control
- Built-in automatic test routines
- Tests high burden electromechanical relays as well as modern digital relays
- Software for advanced automated testing and custom test design



Megger GOOSE Configurator

- Test IEC61850 substation communications protocol
- MGC built-in to relay test set
- Or stand alone GOOSER model



Current Transformer Testing

- Increased measurement accuracy to support metering class CT testing
- Smallest and lightest 2kV secondary voltage injection unit on the market
- Integrated single phase relay test system
- Grouped testing: demagnetization, knee points, ratios, saturation curves, and more
- Measure all ratio's and saturation curves on multi-tap CT's with one lead connection
- Built-in insulation resistance testing



Substation General Tools

- PAM420 Phase Angle Meter
- Timer
- Voltage, Current, Frequency
- Voltage Detectors
- Discharge Sticks
- Phasing Testers



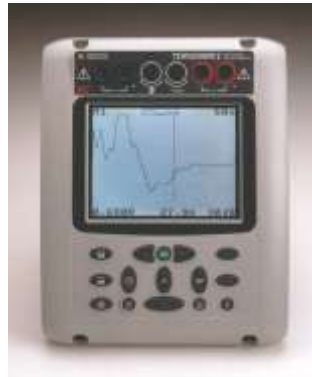
Cable Fault Location

- Find faults fast in buried power cables
- Industry leading specification. 34kV Impulse, 40kV Proof/Burn
- TDR, Arc Reflection, Impulse Current and Voltage Decay pre-location methods
- Portable and van-mount models
- Full range of fault finding equipment including line-tracing and pinpointing tools



Hand-held TDRs

- **TDR1000/2**
 - Single channel - 3km
- **TDR2000/2**
 - Dual channel - 16km



Primary Injection Test Sets

■ Ingvar Range

- Up to 3000A (5000A for 1 sec)

■ Oden Range

- Up to 7700A (21,900A 1 sec.)

■ DDA Range

- Up to 50,000A (80,000A/1 sec)



Power Quality Analysis

- Demand Recording
- Fast data capture rate
- Full 3phase data capture (9 inputs)
- To 63rd Harmonic
- THD, TDD, Flicker
- Weatherproof for field use
- Report Generator Tools
- Records all PQ parameters



HV Dielectric Test Sets

- Testing to 70kV, 120kV or 160kV DC
- Proof Testing
- Insulation resistance and leakage current



Electrical Safety Testing

- Megger offers a full range of products for electrical safety testing in the building wiring area.
- Look out for the new range of products offering CAT IV operator safety
- Insulation Testing <1kV
- Loop Impedance
- RCD circuit breakers
- Clamp-meters
- Multi-meters
- Appliance Testers



1kV Insulation & Continuity Testing

- **Lightweight Model**
 - MIT200
- **Contractor Model**
 - MIT300
- **Industrial Model**
 - MIT400



Earth Loop Impedance and RCD testers

- **2-wire loop testing**
 - LTW300
- **LT300**
 - High Current Loop testing
- **RCDT**
 - RCD testing
- **LRCD**
 - Combined Loop & RCD tester



Multifunction test sets

- 1kV Insulation Testing
- Continuity Testing
- Earth Loop Impedance
- RCD
- Earth Resistance
- Phase Rotation



Multi-meters and Current Clamps



Portable Appliance Testing

- Fully tests portable, transportable, desktop and semi-permanent installed equipment
 - Bond test
 - Insulation
 - Leakage
 - Touch current
 - Operation (VA)
 - Flash test



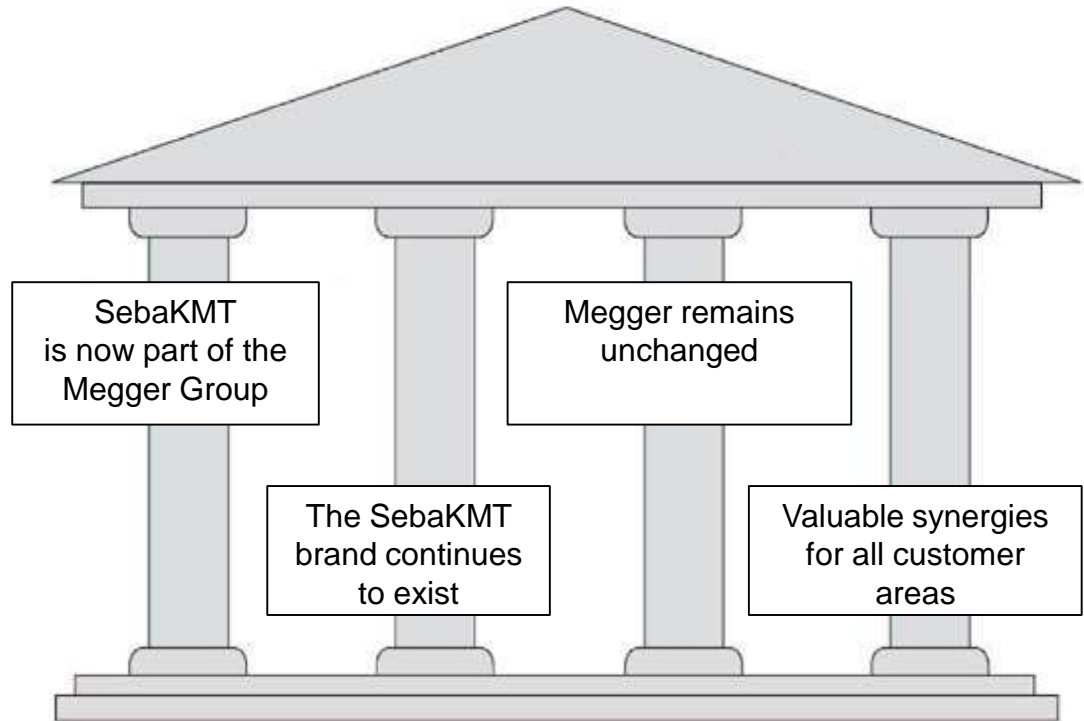
Megger & SebaKMT = the perfect synergy

- **Customer benefits:**

- Unrivalled product portfolio in the power sector
- Technological co-operation for product development
- Empirical values totaling more than 180 years
- Increased range of service and support
- Extended sales network

Market communication

- Together, we are the No.1 provider for measuring, testing and locating techniques.



Market communication

- We have the widest product range in our business!
- No competitor has more products available.
- Megger-Seba has the largest sales and development teams in our business.
- With a common pool of products and customers, the Megger-Seba synergy will be a huge success story.

Market communication



Power Networks



Communication Networks



Water Networks



TV Inspection of Sewers



Line and Object Location

Market communication

For over 60 years we have worked in partnership with all the major electricity, water and telecommunication network operators.



Spheres of Competence

■ Electricity

- Cable test vans and systems
- Cable fault pre-location
- Cable fault pinpointing
- Cable testing



Cable Test Vans

- **Our flagship:**
 - The Centrix, the only fully automatic cable test van on the market



Spheres of Competence

■ Electricity

- Partial discharge measurement
- VLF test
- Dielectric diagnosis
- AC/DC testing
- Cable and phase identification



OWTS Measuring Systems

Mobile partial discharge measurement und fault localisation systems



Spheres of Competence

■ Water

- Leak location with correlators
- Electro-acoustic leak locating
- Noise level and frequency measurement
- Flow measurement
- Trace gas location



Spheres of Competence

■ Line location

- Cable location
- Pipe location
- Sheath fault location
- Location of non-metallic pipes
- TV inspection of sewers



TV Inspection of Sewers

More security for your supply infrastructure.

- Intelligent systems for efficiently and effectively locating cables and pipelines.



Cable and Pipe Location

Product range for
pipe and object location



Conclusion

Megger provides a unique local service in collaboration with our distribution partners across a complete range of test and measurement instruments for electrical and communications industries.