



Battery Test Equipment
Circuit Breaker Test Equipment
Transformer Test Equipment
Motor Test Equipment
Accessories
DV-Win Software



The company was founded in 2000 by a group of engineers with an extensive experience in the power electronics technology area. The headquarters are located in **Stockholm, Sweden**.

Under the trademark **DV Power™** the company develops, manufactures and markets the new generation of the test and measurement equipment for the electric power industry.

Our products are

- **PORTABLE** - Up to three times lighter than similar devices from our competitors.
- **POWERFUL** - Use lighter and thinner cables.
- **USER-FRIENDLY** - Completely automated test procedure.
- **EFFICIENT** - Modern switch techniques, power electronics, sophisticated design.
- **ACCURATE** - Typical accuracy of our products is $\pm 0,1 \%$.
- **ROBUST** - The rigid design makes our products ideal for use in high voltage substation and industrial environments.
- **COMPLIANT** - IEC and other applicable international standards, CE approved.

SALES

The price list and additional information on delivery terms can be received from the DV Power area/country distributor or directly via the e-mail: sales@dv-power.com.

DV Power has a rising presence on the World Market, with over **50 representatives and distributors worldwide**. DV Power products can be found and are in use in more than **70 countries**.

WARRANTY

DV Power provides a **three year warranty** on all our products. This is a guarantee to our customers they will receive the highest quality instrumentation available.

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Our Support

DV Power customer support center provides a wide range of services:

- Technical support
- Product maintenance and calibration
- Feature upgrades
- Training
- Webinars
- Seminars

DV Power has a worldwide network of representatives providing local customer support for sales and after-sales enquiries. Please visit us online to find more information about your local contact:

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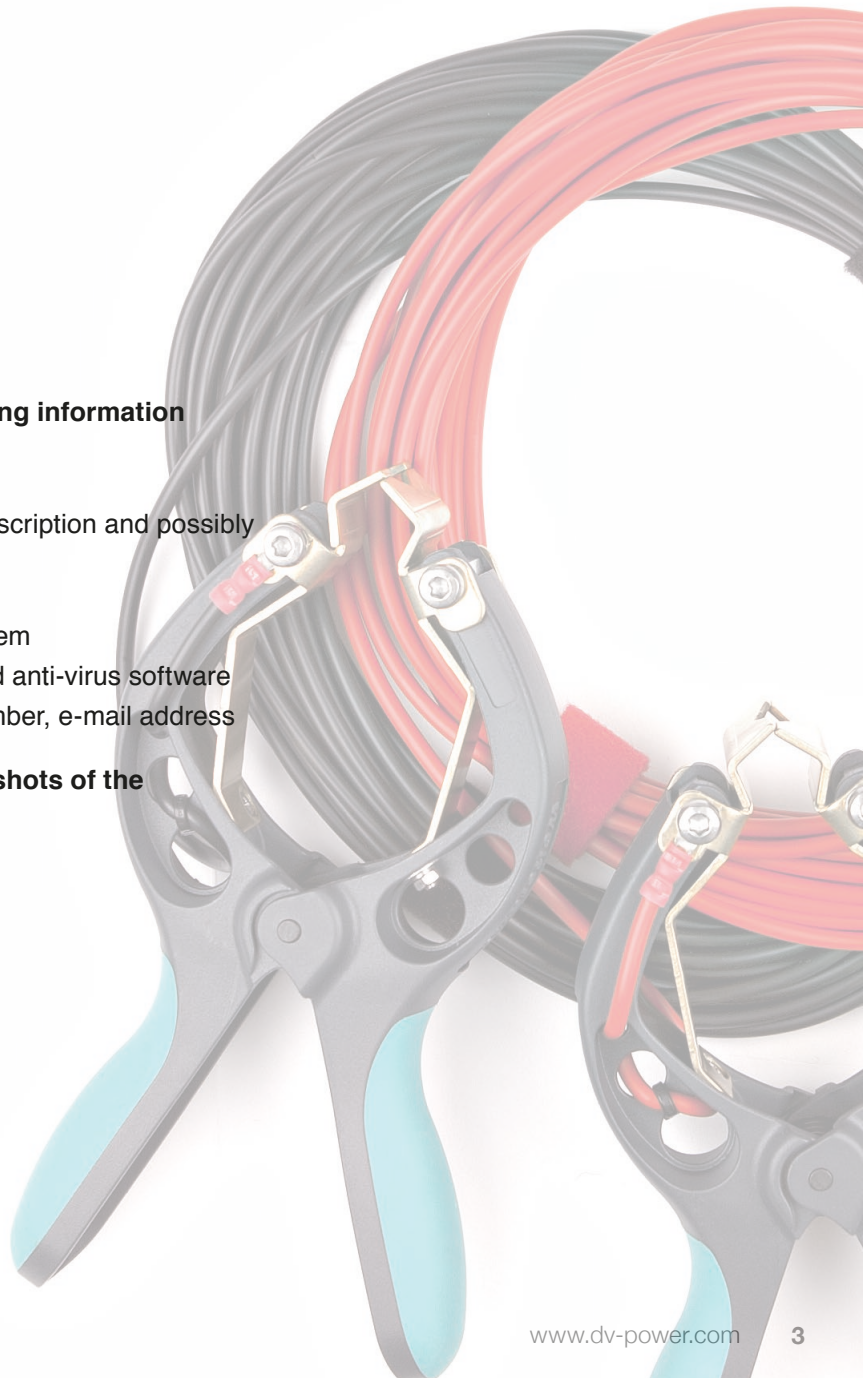
USAsupport@dv-power.com

Equipment service

Before contacting us, please have ready following information

- serial number of your DV Power test device
- information about object being tested, problem description and possibly message(s) reported by our test device
- DV-Win software version installed on your PC
- your PC information: manufacturer, operating system and language), security programs like firewalls and anti-virus software
- contact details: name, company name, phone number, e-mail address

Additionally, it is very helpful to include screenshots of the relevant status and error messages.



- Battery Load Units – **BLU Series**
- Battery Voltage Recorders – **BVR Series**
- Battery Voltage Supervisors – **BVS Series**
- Universal Battery Chargers – **BAC Series**

With this set of instruments, a user can collect, analyze and present various battery status information, such as:

Instrument \ Parameter	BLU Series	BVS Series	BVR Series	BAC Series
Capacity	•			
Intercell connection voltage		•		
Internal resistance measurements	•	•		
Cell/ambient temperature measurement		•	•	•
Voltage of each cell		•	•	
Recharging procedure				•
Short circuit current estimation	•	•		

Every device from this portfolio includes DV-B Win set of software application tools providing data gathering, storing, analysis and generation of test reports.

Battery Load Unit (BLU)

BLU series of devices are designed for measurement of battery capacity using the most advanced power electronics to control different discharging modes. BLU units are portable, easy to use and include a set of DV-B Win software application tools for Windows based PC.

The BLU devices come with an internal memory for saving test data, as well as a flash drive port and a USB cable for an easy data transfer. In addition, they are equipped with a keyboard and graphical color display for user-friendly interaction.

All BLU devices are backed with 3 years manufacturer’s warranty.

Main Features

- Lightweight – up to 15 kg/ 33 lbs
- Powerful – up to 20 kW discharge power
- Operation modes: Constant I/ Constant P/ Constant R
- User selectable load profile operation mode
- No need to disconnect batteries from the load
- Test settings can be altered during a discharge test
- Easily expendable for larger battery strings using BXL-A
- Parallel unit operation enabled
- Adjustable alarm and shut down parameters
- Overcurrent and over thermal protection
- Detailed test analysis available by using DV-B Win
- Battery internal resistance measurement – in combination with Battery Voltage Supervisor (BVS) according to IEC 60896



BLU Series – Standard Models

Model	Weight	Maximum discharge current							
		6 V	12 V	24 V	48 V	60 V	110/120 V	220/240 V	480 V
BLU200A	15 kg/33 lbs	50 A	100 A	200 A	200 A	120 A	120 A	70 A	-
BLU100K	12,5 kg/26 lbs	40 A	80 A	160 A	160 A	120 A	100 A	50 A	-
BLU260V	15 kg/33 lbs	50 A	100 A	200 A	200 A	120 A	120 A	70 A	40 A
BLU220T	15 kg/33 lbs	70 A	150 A	300 A	300 A	-	-	-	-
BXL - A	12,5 kg/26 lbs	80 A	160 A	320 A	250 A	110 A	160/180 A	90 A	

Battery Extra Load Unit (BXL-A)

The BXL-A is a Battery Extra Load Unit that can be used in a combination with the BLU device as an additional load. In case the higher discharge currents are required, several BXL units can be connected in parallel.

Battery Voltage Recorder (BVR)



Battery Voltage Recorders are rechargeable handheld devices for measurement of battery voltages and temperatures while battery is in either online or offline mode. When the BVR is used in a combination with the BLU device, it serves as an efficient supplement to the battery capacity testing.

BVR measures and records cell voltages instantaneously, in less than one second. DV-B Win software application tool set is provided with both BVR unit types to save and analyze data, easily identify bad cells, and create reports.

Technical Specifications

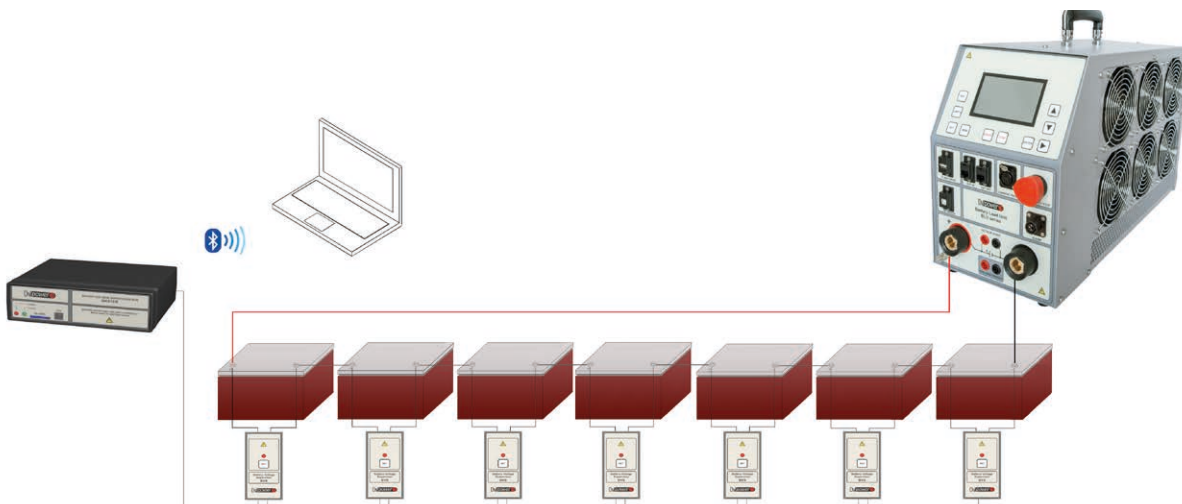
	BVR11	BVR20
Parameters Measured	Voltage, ambient temperature	Voltage, cell/ambient temperature
Measurement range	String Voltage: ± 500 V DC Cell Voltage: ± 30 V DC	Voltage: ± 30 V DC
Resolution	String Voltage: 100 mV Cell Voltage: 1 mV	Voltage: 1 mV
Typical accuracy	$\pm (0,05\% \text{ rdg} + 0,05\% \text{ FS})$	$\pm (0,05\% \text{ rdg} + 0,05\% \text{ FS})$
Warranty	3 years	3 years
Data Transfer	Bluetooth USB Cable to PC	USB Cable to PC
Internal Storage	1000 results	1000 results
Weight	0,5 kg / 1.1 lbs	0,6 kg / 1.3 lbs
Additional features	String voltage measurement RFID cell recognition	Communicating with external Density meter

Battery Voltage Supervisor (BVS)

BVS is a monitoring system for real-time battery voltage recording and presentation. It consists of one or more BVS Modules (BVS M) and the Control Unit (BVS CU). A Power supply of each module (BVS M) is provided from the Control Unit (BVS CU). The BVS identifies potential battery malfunction by continuously monitoring cell voltage, intercell voltage, and temperature of each cell in a battery string.



It can be used during a battery charging/discharging process, as well. If used in a combination with the BLU device, the user can perform additional tests: measurements of a battery internal and intercell connection resistances as well as a short circuit current estimation.



Data acquisition and extensive analysis tools are using the DV-B Win software application set.

Main Features

- Lightweight and very easy to install and operate.
- Measures cell voltages of up to ± 30 V
- Bluetooth communication between the master unit and a PC.
- Sampling rate interval is user selectable.
- In a combination with the BLU series devices, according to IEC 60896 standard:
 - Internal resistance measurement
 - Intercell connection resistance measurement

Universal Battery Charger (BAC)

Battery charger BAC25 is a portable battery charger used for charging primarily lead acid and Ni-Cd batteries.
Main applications are:

- Support the main charger in faster battery recharging
- Serve as a replacement unit to the main battery charger

BAC25 device is equipped with thermal and overcurrent protection.

Main Features

- Lightweight – only 10 kg/ 22 lbs
- Voltage range: 10 – 300 V DC
- Current range up to 25 A DC
- Typical voltage accuracy $\pm (0,25 \% \text{ rdg} + 0,25 \% \text{ FS})$
- Adjustable alarm and shutdown parameters for preventing excessive charge
- Automatic switch from equalized charging mode to float charging mode upon reaching the voltage limit
- Over voltage protection
- Parallel unit operation deployed for higher charging currents



Technical Specifications

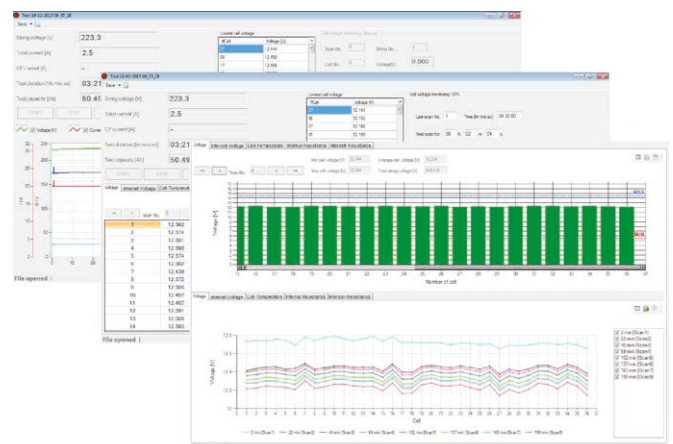
Voltage (V DC)	Current (A DC)	Equalize voltage (V DC)		Float voltage (V DC)	
		Lead-Acid	Ni-Cd	Lead-Acid	Ni-Cd
12	Up to 25	14	15	13	14
24	Up to 25	29	30	27	28
48	Up to 20	57	60	54	56
60	Up to 20	72	75	68	70
110/120	Up to 15	133/145	140/150	125/135	130/140
220/240	Up to 10	263/290	275/300	148/270	250/280

DV-B Win Software

All DV Power battery testing instruments include “DV-B Win” software application tools based on the Windows operating system. The applications provide a friendly user interface as well as data management features such as data acquisition, test control, test result analysis and report generation.

Main Features

- Test monitoring and control
- Test data acquisition
- Previous test cases data import
- Data management
- Data analysis
- Data export
- Report generation
- Battery monitoring



Circuit breaker testing devices are portable instruments with local or PC controlled functionality. This set of instruments provide powerful measurement tools during manufacturing, commissioning and maintenance phases of a circuit breaker and disconnecter life span.

Applications supported by the DV Power circuit breaker test equipment include measurements of:

- Contact resistance (IEC62271-100)
- DRM (dynamic resistance measurement)
- Coil resistance and coil current (IEC 62271-100)
- Mechanism charging time (IEC 62271-100)
- Minimum trip voltage (IEC 56, IEEE C37.09)
- Under voltage release (IEC 60694)
- Timing of circuit breaker main, auxiliary, and pre-insertion contacts
- Synchronization between the contacts
- Motion and velocity
- “First trip” test



	RMO	POB	SAT	CAT03	CAT31 CAT61	CAT34 CAT64 CAT64A CAT124A	CAT35 CAT65 CAT66 CAT125 CAT126
Contact Resistance	•						•
DRM							•
Coil Resistance			•				
Coil Current		•	•		•	•	•
Mechanism Charging Time		•	•				
Minimum trip voltage		•	•				
Undervoltage release			•				
Timing of circuit breaker main and resistor contacts				•	•	•	•
Timing of circuit breaker auxiliary contacts					•	•	•
Synchronization between the contacts				•	•	•	•
Motion and velocity						•	•
“First trip” test						•	•

RMO Series – Micro Ohmmeters

The RMO series of instruments are designed for contact resistance measurement of non-inductive test objects. Based on the most advanced switch mode technique available today, the RMO series of instruments generate a true DC ripple-free current with automatically regulated test ramps.

RMO-A Series - Micro Ohmmeters

The RMO-A series models are the "entry level" of RMO devices, but not much less potent than the remaining series of the RMO devices. It includes six different models placed in metal housings. The main difference between these models is the maximum test current that can be generated.

RMO600A

- Lightweight - only 8 kg / 18 lbs
- Test currents 5 A - 600 A DC
- High output voltage 5,9 V @ 600 A DC
- Measuring range 0,1 $\mu\Omega$ - 999,9 m Ω
- Typical accuracy \pm (0,1 % rdg + 0,1% F.S.)
- Best resolution 0,1 $\mu\Omega$
- Standalone / PC controlled (DV-Win Software)



RMO-G Series – Micro Ohmmeter with Both Sides Grounded Feature

The RMO-G series includes seven models mounted in plastic housings. Comparing to RMO-A series, there are additional "Both Sides Grounded" and "Remote Control" features available as options.

RMO800G

- Lightweight – only 11,5 kg / 25 lbs.
- Test currents 10 A – 800 A DC
- Typical accuracy \pm (0,1 % rdg + 0,1% F.S.)
- Best resolution 0,1 $\mu\Omega$
- BSG (Both Sides Grounded) test mode
- Remote control feature (optional)
- Standalone / PC controlled (DV-Win Software)



RMO-D Series – Micro Ohmmeter With Demagnetization Feature

The RMO-D series instruments are the most advanced version of RMO family of instruments. The additionally offered feature is the ability to perform fully automatic demagnetization of a current transformer core after the measurement. Demagnetizing a magnetic core requires alternating current to be applied with a magnitude decreasing down to zero. Using the proprietary solution design, the RMO-D series instruments provide the appropriate decreasing magnitude of DC current that alternates by internally changing its polarity.

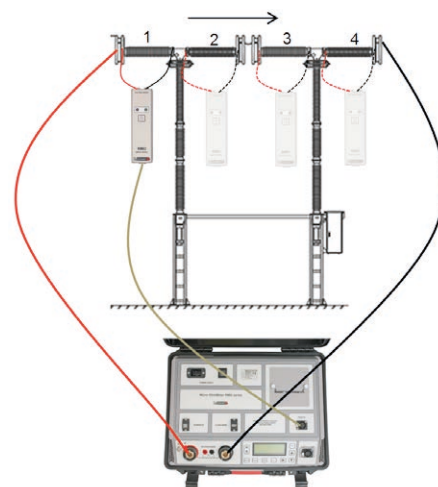
RMO600D

- Lightweight - only 11 kg / 24 lbs
- Powerful 5 A - 600 A DC
- Typical accuracy \pm (0,1 % rdg + 0,1% F.S.)
- Best resolution 0,1 $\mu\Omega$
- BSG (Both Sides Grounded) test mode
- Remote control feature (optional)
- Demagnetization feature
- Standalone / PC controlled (DV-Win Software)



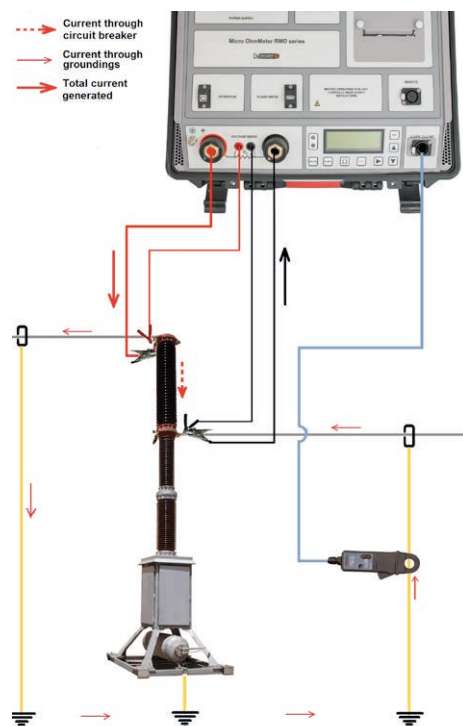
Remote Control Unit

The figure on the right illustrates a connection of the instrument to a high voltage circuit breaker having both sides grounded. In order to remotely perform the measurements, the RMO-G and RMO-D devices are provided with the RMO Remote Control Unit. In addition, it enables multiple measurements to be performed with the same test current. This significantly speeds up the entire test procedure.



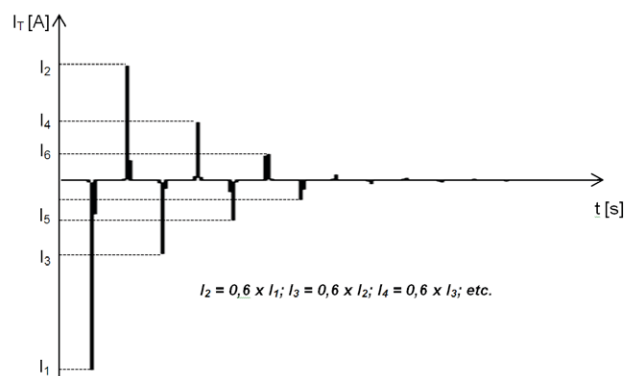
Both Sides Grounded feature

HV circuit During the HV circuit breaker contact resistance measurement, to provide protection from the induced voltages, it is necessary to ground the circuit breaker at both sides. RMO-G and RMO-D series instruments have the possibility to perform measurements with both sides of a test object grounded. This will ensure the operator's safety and protect the instrument as well.



Demagnetization feature

Demagnetization of a Current Transformer Core after DC Contact Resistance Measurement. After testing a circuit breaker or a bus-bar using DC current, the magnetic core of associated current transformers may remain magnetized (remanent magnetism). To eliminate this source of potential problems, demagnetization should be done using the feature this instrument provides as well.





RMO60E – Protective Earth Resistance Meter

The RMO60E is ideal for testing the protective bonding (grounding) of equipment with current of up to 60 A DC, following the standard 61010-1 IEC 2001. The set is equipped with thermal and overcurrent protection. The RMO60E has a very high ability to cancel electrostatic and electromagnetic interference in HV electric fields. It is achieved by a very efficient filtration. The filtration is made utilizing proprietary hardware and software.

RMO200H – Handheld Micro Ohmmeter – NEW!

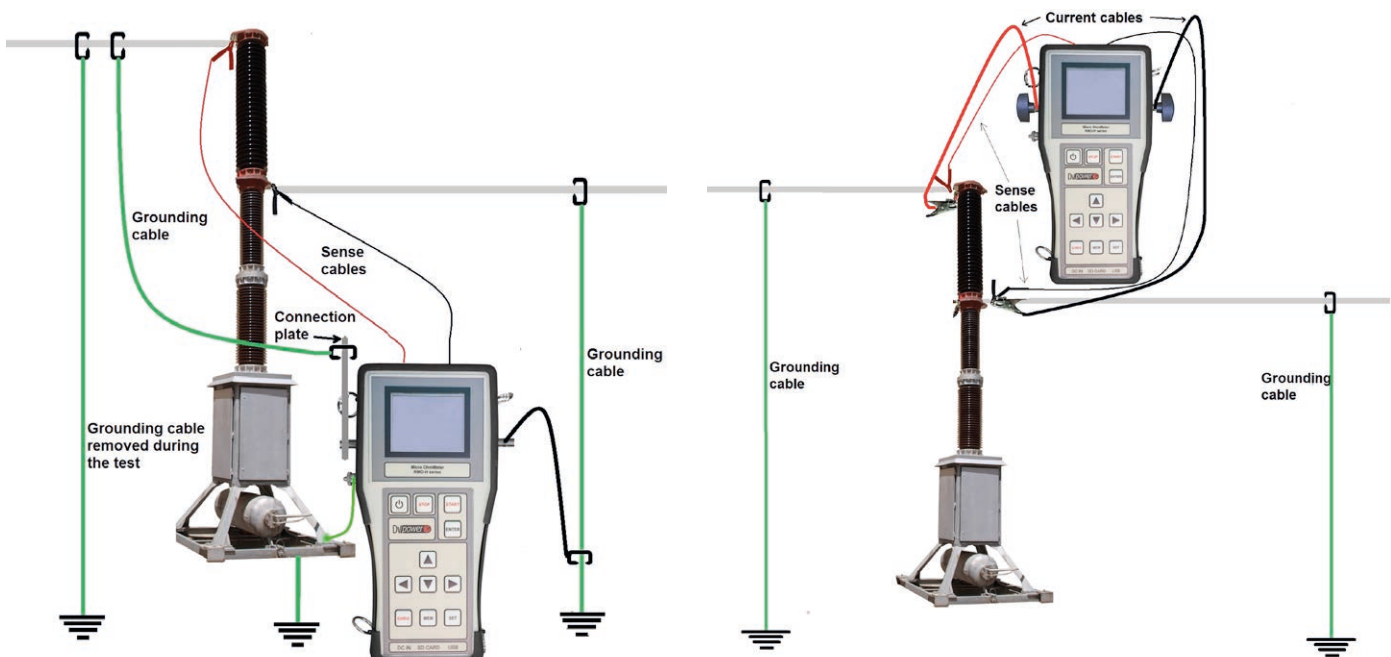
RMO200H is a hand-held Micro Ohmmeter based on a state of the art technology, using the most advanced switch mode technique available today. RMO200H is battery supplied device. The super-capacitor enables generating a true DC ripple-free current up to 220 A. A special software provided with the device enables download and analysis of the results, creating and exporting test reports in different formats, but also full control of the device in test if necessary.

- Lightweight – only 0,9 kg / 2 lbs.
- Powerful – up to 220 A DC
- Battery supplied
- Measuring range 0 – 999,9 mΩ
- Typical accuracy 0,1 %
- Both Sides Grounded Measurement
- Rmax function
- Standalone / PC controlled (DV-Win Software)



As a standard, the RMO200H Hand-Held Micro Ohmmeter is provided with mini USB cable, DV-Win software, transport case and carrying belts. Besides these accessories, there are several variation of test leads available for different test applications and connection diagrams.

Connection to a both sides grounded circuit breaker



POB series – AC / DC Power Supply for Circuit Breaker Testing

The Coil Tester & Power Supply POB series instruments are powerful, lightweight, variable voltage power supply units ideal for testing circuit breakers where substation battery is not connected or available. They are intended for operating breaker coils and spring-charging motors in commissioning and maintenance testing. These devices are compatible with breaker analyzers from different vendors and eliminate use of station batteries during testing.



Highlights

- Lightweight – only 10,6 kg / 23.4 lbs
- Minimum trip voltage test of the circuit breaker's coils
- Power supply for spring-charging motors
- Providing a power supply during a test with breaker analyzers from different vendors

Main Features

- Output current up to 40 A
- True DC ripple-free voltage
- DC Voltage from 10 V to 300 V
- AC Voltage from 10 V to 250 V

	Max DC Current	Max AC current	Output DC Voltage	Output AC Voltage
POB30AD	30 A	12 A	10 V – 300 V	10 V – 250 V
POB40AD	40 A	15 A	10 V – 300 V	10 V – 250 V
POB40ADL	40 A	15 A	1 V – 50 V	1 V – 40 V

	Max DC Current	Output DC Voltage
POB30D	30 A	10 V – 300 V
POB40D	40 A	10 V – 300 V
POB40DL	40 A	1 V – 50 V

SAT Series – Circuit Breaker Coil Analyzer

Circuit Breaker Coil Analyzers, SAT series are designed for circuit breaker testing when a battery is disconnected or unavailable. The instruments can be operated in a stand-alone mode or connected to a PC. A powerful Windows based DV-Win application software tool set, allows the operator to completely program a test plan in advance. Once the test is completed the test results can be displayed, archived, compared, analyzed in trend charts, and compiled into test reports. With their unique features, and in combination with the CAT series of device, SAT devices provide a complete diagnostics of a circuit breaker, while greatly reducing the test duration. They are compatible with breaker analyzers from other vendors as well. A rugged and robust design makes these instruments well suited for use in a variety of harsh environments.

The SAT series provide also a Coil Resistance Measurement, Under Voltage Release test and is equipped with an AC motor supply output.

		SAT30A	SAT40A
Load voltage	Max load interval	Max Current	Max Current
110 V	20 sec	24 A	30 A
110 V	60 sec	20 A	24 A
220 V	20 sec	12 A	15 A
220 V	60 sec	10 A	12 A



Technical specification SAT Series

Power Output	
Coils output DC voltage	10 V DC - 300 V DC
Coils output AC voltage	10 V AC - 250 V AC
Motor output DC voltage	10 V DC - 250 V DC
Motor output AC voltage	10 V AC - 250 V AC
Coil resistance measurement	
Measuring range	Resolution
0,5 Ω - 99,9 Ω	0,1 Ω
100 Ω - 999 Ω	1 Ω
Minimum trip voltage - fully automatic test	
Start voltage	10 V - 299 V DC 10 V - 249 V AC
Stop voltage	11 V - 300 V DC 11 V - 250 V AC
Step voltage	1 V - 20 V DC 1 V - 20 V AC
Typical accuracy	± (0,25 % rdg + 0,25 % FS)
Operating temperature	-10° C – + 50 °C

Highlights

- Lightweight – only 9,20 kg / 20 lbs
- Coil current measurement
- Motor output AC voltage – 10 V AC – 250 V AC
- Coil resistance measurement
- Minimum trip voltage test of the circuit breaker's coils
- Undervoltage release test
- Supplying spring-charging motors
- Providing a power supply for breaker analyzers from different vendors

CAT series - Circuit Breaker Analyzers and Timers

CAT devices are either standalone or PC controlled digital instruments for circuit breakers' condition assessment. The robust design incorporates cutting edge technology with latest enhancements for safe and fast testing of medium or high-voltage circuit breakers with live or dead tank design.

The user can select any desired operational mode: Close (C), Open (O), Close-Open (C-O), Open-Close (O-C), Open-Close-Open (O-C-O). Test results can be stored in the instrument's internal memory, a USB memory stick or printed on a thermal printer (optional accessory) in both, tabular and graphical form.

Circuit Breaker Analyzer & Timer CAT64

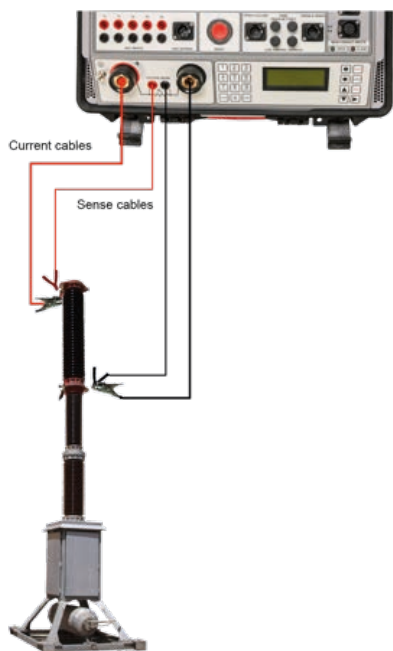
- Safe and fast testing
- Simple & easy to operate
- Timing and motion measurement
- 6 timing channels (3x2) for main and resistive contacts
- 3 timing channels for auxiliary inputs
- Resistance measurement of pre-insertion resistors
- 4 Analog inputs + 1 Transducer input
- Supports both digital and analog transducers
- Detailed analysis of test results using DV-Win software



Circuit Breaker Analyzer & Timer CAT126

- Safe and fast testing
- Timing and motion measurement
- 12 timing channels (3x4) for main and resistive contacts
- 6 timing channels for auxiliary inputs
- 3 transducer input channels
- 4 additional analog input channels
- Built-in Micro Ohmmeter 500 A
- Dynamic resistance measurement
- Detailed analysis of test results using DV-Win software



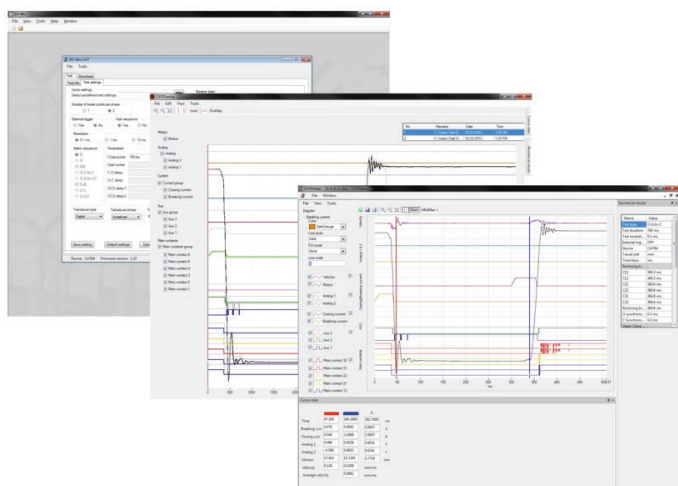
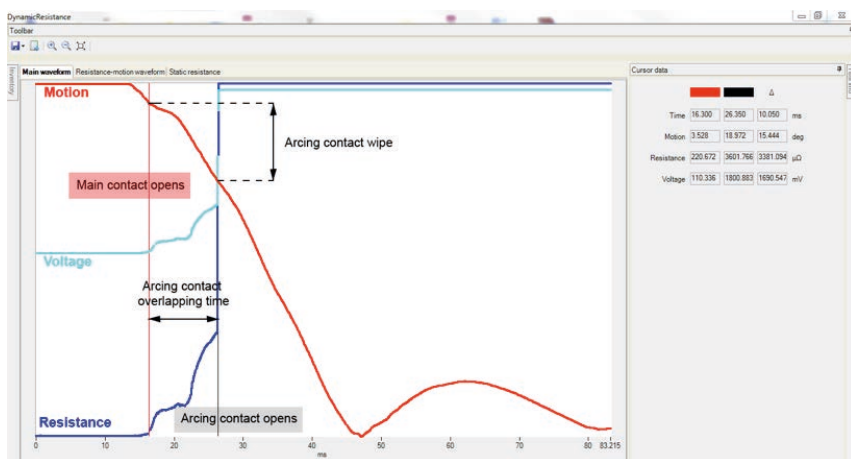


Static/Contact Resistance Measurement

The built-in micro ohmmeter generates a true DC ripple-free current with automatically regulated test ramps. The resistance measurement is using well-known Kelvin's four points method. The DC current is generated through closed circuit breaker contacts. The voltage drop is measured between the terminals of the circuit breakers. The resistance is calculated using Ohm's law $R=U/I$.

DRM (Dynamic Resistance Measurement)

This built-in micro ohmmeter can also be used for the DRM. The DRM test is performed by injecting a current through the breaker contact and simultaneously monitoring the voltage drop across the breaker contact as well as the current flow during the operation of the breaker. Resistance curve, as a function of contact travel, can be used to reveal failures in relation to the arcing contact condition. The test current should be at least 100 A to provide a higher voltage drop to allow easier detection of the arcing contact separation. CAT series instruments provide a high resolution measurement required for the DRM test.



DV-Win

The essential part of a circuit breaker condition assessment is the ability to compare the latest test results with previous testing. Measured values are stored and compared with the limits specified by the manufacturer. A fingerprint obtained in this way can be used at a later stage as a reference during subsequent measurements. In order to obtain accurate comparison, the tests need to be performed using identical test parameters. Any deviation and change in the test results may indicate the circuit breaker condition deterioration. This ability is supported by the DV-Win test plans and graph overlay features.

As a final result of a circuit breaker maintenance process, the DV-Win provides analytical tools and customized report creations.

The first series of CAT instruments were designed to meet requirements of an easy to use circuit breaker analyzer & timer with an attractive price. Their primary intention was timing and motion measurement of HV and MV circuit breakers.

Series 1	CAT03	CAT31	CAT34	CAT61	CAT64
Main contacts and preinsertion resistors contacts timing channels	3	3	3	6	6
Auxiliary contacts timing channels	NO	3	3	3	3
Coil control	NO	YES	YES	YES	YES
Coil current measurement channels	NO	2	2	2	2
External trigger channels	2	2	2	2	2
Analog input channels	NO	NO	2	NO	2
Transducer input channels	NO	NO	1	NO	1
Thermal printer (built-in)	Optional	Optional	Optional	Optional	Optional
“First trip” test	NO	NO	YES	NO	YES

The second series utilize the latest enhancements for safe and fast testing, with unique technical capabilities for additional diagnostics of circuit breakers. Sophisticated design ensures efficient and reliable operations in high-voltage substations and industrial environments.

Series 2	CAT35	CAT64A	CAT65	CAT66	CAT124A	CAT125	CAT126
Main contacts and preinsertion resistors contacts timing channels	3	6	6	6	12	12	12
Auxiliary contacts timing channels	6	6	6	6	6	6	6
Coil control	YES	YES	YES	YES	YES	YES	YES
Coil current measurement channels	4	4	4	4	4	4	4
Analog input channels	4	4	4	4	4	4	4
Transducer input channels	3	3	3	3	3	3	3
Thermal printer (built-in)	Optional	Optional	Optional	Optional	Optional	Optional	Optional
“First trip” test	YES	YES	YES	YES	YES	YES	YES
Micro ohmmeter	200 A	NO	200 A	500 A	NO	200 A	500 A
Dynamic resistance measurement	YES	NO	YES	YES	NO	YES	YES

CAT-P - Handheld Circuit Breaker Analyzer – NEW!

- Simple and easy to operate
- Lightweight
- On-line measurement (First trip test)
- Off-line measurement
- 3 timing channels (3 x 1) for main contacts
- DC voltage measurement
- DC current measurement
- Touch screen color display 145 mm (5.7 in)
- On-site analysis of test results
- Test results analysis using DV-Win software
- External and internal power supply



Handheld Circuit Breaker Analyzer & Timer CAT-P is a digital instrument for circuit breakers condition assessment. CAT-P records timing graphs of main contacts, DC substation battery voltage, Trip and Close coil currents. Main contacts operating time in on-line mode is calculated based on AC secondary CT's currents. The timing channels record closing and opening of the main contacts.

CAT-P provides an easy selection of different operating modes:

- Trip (O)
- Close (C)
- Tripfree (CO)
- Trip-Close (O-C)
- Close-Trip (C-O)
- Trip-Close-Trip (O-C-O)
- First trip (O)

Before the start of the test, the current clamp needs to be connected to the auxiliary circuitry of the circuit breaker. The measurement starts when the connected current clamp senses the current flow through the auxiliary circuit, Trip or Close coil, depending on the initiated operation.

CAT-P is a powerful diagnostic tool for recording and analyzing:

- Trip/Close coils condition
- Main contacts operating time
- Auxiliary contacts condition and operating time
- Circuit-breaker substation battery condition

CAT-P displays numerical and graphical results (it can overlay up to 4 records in graphical form). This enables quick onsite analysis of potential defects by comparing the obtained test results.

Transformer Test Equipment

Applications supported by DV Power transformer test equipment include:

	TWA40D	TWA25K	RMO-TT	RMO-TD	RMO-TW	DEM	TRT
Winding resistance measurement (IEC 60076-1)	•	•	•	•	•		
DVtest on-load tap changer analysis	•		•	•			
Heat run test (IEC 60076-2)			•	•	•		
Automatic transformer demagnetization	•	•	•	•		•	
Turns ratio measurement of power and instrument transformers (IEC 60076-1)							•
Excitation current measurement							•
Phase angle measurement							•
Transformer vector group detection							•
Demagnetization status verification							•

RMO-TW, TD and TT Series – Tap Changer Analyzers & Winding Ohmmeters

The Winding Ohmmeters RMO-TT, -TD and -TW series are designed for the winding resistance measurement of transformers, generators, motors and for the on-load tap changer analysis of power transformers. Typical application areas of RMO-TT, -TD and -TW are high-voltage substations and industrial environments.

Tap Changer Analyzer & Winding Ohmmeter RMO100TT

- The most powerful portable winding ohmmeter on the market, with test currents up to 100 A
- 3 resistance and 6 temperature measurement channels
- On-load tap changer dynamic resistance measurement
- Rapid automatic demagnetization
- AC current monitoring channel for tap changer motor current measurement
- Measuring range 0,1 $\mu\Omega$ – 10 k Ω
- Automatic discharge process



Tap Changer Analyzer & Winding Ohmmeter RMO60TD

- Two resistance measurement channels
- Test current 5 mA – 60 A DC
- On-load tap changer dynamic resistance measurement
- Rapid automatic demagnetization
- AC current monitoring channel for tap changer motor current measurement
- Measuring range 0,1 $\mu\Omega$ – 10 k Ω
- Built-in tap changer control unit



Winding Ohmmeter RMO20TW

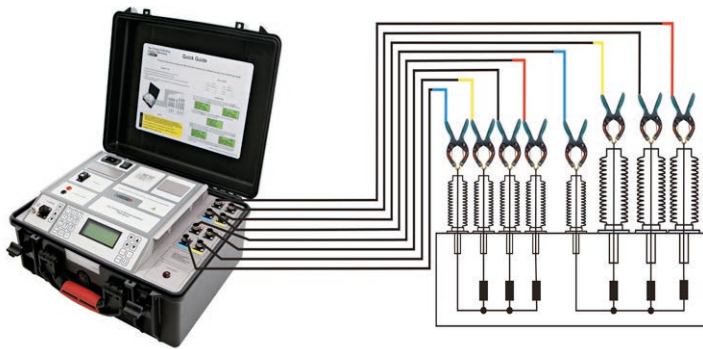
- Two resistance measurement channels
- Test current 5 mA – 20 A DC
- On-load tap changer verification
- Measuring range 0,1 $\mu\Omega$ - 10 k Ω
- Automatic discharge process
- Lightweight – only 7,5 kg/16.5 lbs



TWA40D – Tap Changer and Winding Analyzer

Tap Changer & Winding Analyzer TWA40D is one-of-a-kind diagnostic solution for power transformer testing. Using this device, the transformer testing is safer, significantly faster, and more convenient. The TWA40D instrument is designed for simultaneous three-phase tap changer analysis and six-winding resistance measurement of both, the primary and the secondary transformer windings. Each vector group has a special measurement algorithm that is optimized for the fast stabilization of test results.

Measurements are obtained very quickly by saturating the magnetic core on the HV and LV winding at the same time. Once all 6-8 bushings are connected and the transformer configuration selected, the instrument adjusts the test procedure automatically. The TWA40D generates a true DC ripple-free current. Current injection and discharge of energy from the magnetic circuit are both automatically regulated.



Using two sets of four cables, all bushings of HV and LV sides are connected at once. The connection to the transformer is made with two-contact clamps providing for four-wire Kelvin test method.

- Simultaneous three-phase OLTC dynamic resistance measurement and analysis (for YN configuration)
- Rapid core saturation for fast LV winding test
- Total test current 5 mA - 40 A DC
- Resistance measurement range 0,1 $\mu\Omega$ - 2 k Ω
- All 6 windings measured in one test
- Extremely quick measurement, the cable setup is performed only once
- Typical measurement accuracy of 0,1%
- Automatic discharge process
- Rapid automatic demagnetization
- AC current monitoring channel for tap changer motor current measurement
- Built-in tap changer control unit

Three-Phase Tap Changer Analysis

Dynamic resistance graphs are recorded for all three phases simultaneously, so the synchronization is verified using the cursors provided in the DV-Win software. All three phase traces are plotted on the same graph. In addition, the tap changer motor current is recorded and displayed on the same graph. The measurement is completed quickly even on the largest power transformers.

Interchangeable Cables with the TRT63

The test cables used for the measurement are completely compatible with the DV Power TRT63 Three-Phase Transformer Turns Ratio Tester instrument. This enables the user to measure, with a single connection of the test leads:

- Transformer turns ratio
- Excitation current
- Phase angle
- Winding resistance at every tap position
- Dynamic resistance during each on-load tap changer transition
- On-load tap changer motor current
- On-load tap changer transition time for every transition
- On-load tap changer transition ripples for every transition
- Transformer vector group

Automatic Three-Phase Demagnetization

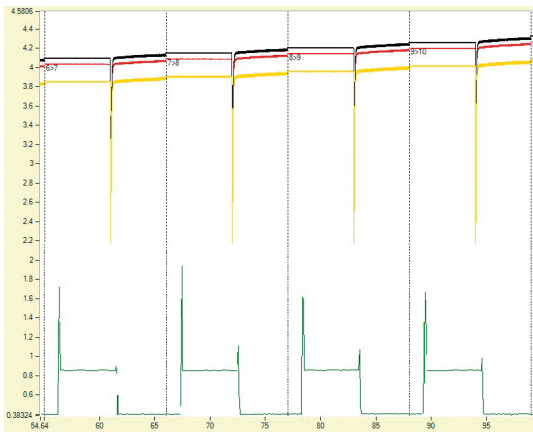
The TWA40D instrument can perform three-phase demagnetization after the DC test is finished. The process is completely safe, fully automated and very fast. This enables the user to avoid problems such as high inrush currents at the start-up of power transformers, incorrect operation of protective relays, erroneous diagnostics or inaccurate electrical measurement on a transformer.

The **TWA25K** is a simplified version of the TWA40D model, specifically focused on three-phase winding resistance measurement. The differences between the TWA25K and TWA40D models are listed in the table below.

	TWA25K	TWA40D
Six-winding resistance measurement	Yes	Yes
DC test current	5 mA – 25 A	5 mA – 25 A (up to 25 A for winding resistance measurement and up to 40 A for the 3-phase synchronization test)
Measurement accuracy	± (0,1 % rdg + 0,1 % FS)	± (0,1 % rdg + 0,1 % FS)
Simultaneous 3-phase winding resistance measurement	No	Yes (Quick YN test)
DVtest sampling resolution	4 ms	0,1 ms
Simultaneous 3-phase DVtest	No	Yes
Tap changer motor current measurement	No	Yes

DVtest – On-Load Tap Changer Analysis with DV Power Instruments

The **TWA40D instruments** enable simultaneous OLTC testing of all three phases in a single pass through the tap positions. In this manner, the total OLTC testing time is greatly reduced, by two thirds in comparison with the classic methods. This test procedure also enables observing the synchronization problems between the different phases.



The **static resistance measurement** provides winding resistance values at every tap position for each of the three phases. There is no need to discharge the transformer between the measurements in different tap positions. The DV-Win software enables creating the static resistance graph from the results of the resistance measurement in different positions, as well as the automatic recalculation of the measured values to a reference temperature value. The shape of the static resistance graph depends on the winding regulation mode.

The **dynamic resistance measurement (DVtest)** feature enables measuring and recording the test current at high sampling rate during the tap change transition. The variation of the current represents the change of the resistance in the circuit during the change of the tap positions. Tap changer verification

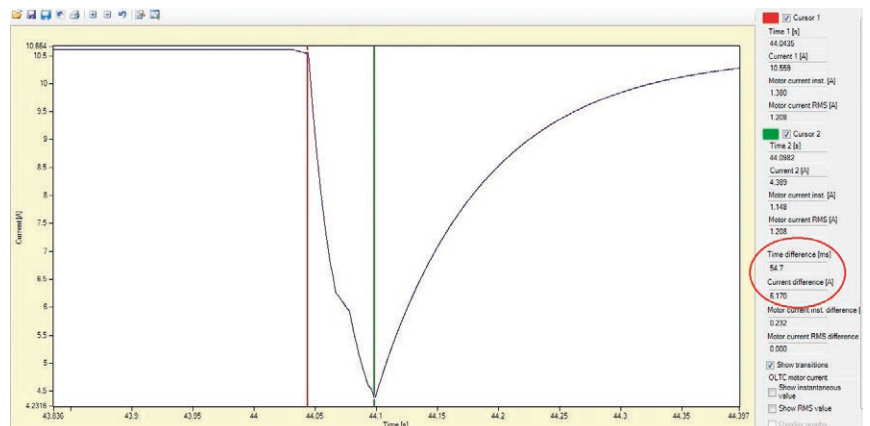
can be performed with the DV-Win software or on the stand-alone TWA40D or RMO-T instruments. The stand-alone instruments detect any open circuit during the tap changer operation.

The dynamic resistance measurement graph is unique, and above all, powerful tool providing condition assessment of an OLTC regarding the mechanism itself and its contact wear. It is recorded by the DV-Win software.

The graph analysis tools enable a detection of:

- High resistance contacts in the tap selector
- Loose contacts in the tap selector
- Burned, loose contacts in the diverter switch
- Broken resistors in the diverter switch
- Abnormal arcing
- Misaligned contacts
- Contact bounce
- Mechanical and motor problems
- Phase synchronization problems

The **AC current monitoring channel** enables monitoring and recording the OLTC mechanical-drive motor current during the tap changer operation. The motor-current waveform is also printed on the same DV-Win-generated graph, and can help in detecting OLTC mechanical problems.



TRT Series – Three-Phase Transformer Turns Ratio Testers

The TRT is a true three-phase, fully automatic test set, specially designed for a turns ratio, a phase shift and an excitation current measurement of power, distribution and instrument transformers. The TRT determines the transformer turns ratio by accurately measuring the voltages across the unloaded transformer windings. As a test result it displays the ratio of these voltages.

All the TRT devices are equipped with a tap changer control unit that allows changing tap positions remotely, and even automatically. USB Flash Drive feature enables saving all the test results to a USB memory stick. DV Power provides 112 mm built-in thermal printer as an option.

Main Features

- Best turns ratio accuracy $\pm 0,03\%$
- Highest ratio range 0,8 – 50 000
- Test voltages 1 V to 250 V AC
- Measurement of turns ratio, phase shift and excitation current
- Automatic vector group detection
- Automatic turns ratio measurement at every tap position
- Internal memory enables storing 10,000 results
- Test plans available with included DV-Win software



Setting up the TRT is as simple as connecting it to de-energized transformer and entering the transformer configuration using the device front panel keyboard. Once the parameters are selected, the test of the three-phase transformer is performed in one of the two ways:

SINGLE-PHASE – Three single-phase voltages are applied to the three transformer primary windings, and all three phases are measured consecutively (phase by phase). All connections and short circuit procedures at the primary and secondary voltage terminals are automatic, done internally before each measurement, depending on the selected vector group.

TRUE THREE-PHASE – A true three-phase excitation voltage is applied to the three transformer primary windings. Three induced phase voltages are measured at the same time. In such a way it is possible to detect the phase angle and measure the turns ratio of any transformer type, including phase shifting transformers, where other “three-phase” turns ratio testers cannot.

Test voltage	TRT03A	TRT03B	TRT03C
Single phase	8/40/100 V AC	10/40/100 V AC	8/40/80 V AC
	TRT30A	TRT30B	TRT30C
Single-phase	8/40/100 V AC	10/40/100 V AC	8/40/80 V AC
True three-phase	$3x(8/40/100)\sqrt{3}$ V AC	$3x(10/40/100)\sqrt{3}$ V AC	$3x(8/40/80)\sqrt{3}$ V AC
	TRT33A	TRT33B	TRT33C
Single-phase	1/8 /40/100 V AC	1/10/40 /100 V AC	1/8/40/80 V AC
True three-phase	$3x(1/8/40/100)\sqrt{3}$ V AC	$3x(1/10/40/100)\sqrt{3}$ V AC	$3x(1/8/40/80)\sqrt{3}$ V AC
	TRT40A	TRT43A	
Single-phase	8/40/125 V AC	1/8/40/125 V AC	
True three-phase	$3x(8/40/125)\sqrt{3}$ V AC	$3x(1/8/40/125)\sqrt{3}$ V AC	
	TRT63A	TRT63B	TRT63C
Single-phase	1/8/40/100/250 V AC	1/10/40/100/250 V AC	1/8/40/80/250 V AC
True three-phase	$3x(1/8/40/100/250)\sqrt{3}$ V AC	$3x(1/10/40/100/250)\sqrt{3}$ V AC	$3x(1/8/40/80/250)\sqrt{3}$ V AC

CVT40 – Extension transformer

CVT40 is an extension single-phase transformer which, in combination with DV Power new TRT4x series devices, can increase TRT4x output voltage 40 times, up to 5 kV AC. This combination is specifically developed for testing turns ratios of capacitive voltage transformers.

Main Features

- Maximum output voltage 5 kV AC
- Maximum input voltage 125 V AC
- Turns ratio accuracy $\pm 0,5\%$
- Suitable for exciting CVTs of up to 0,02 μF



DEM60C – Three-Phase Transformer Demagnetizers



The Three-Phase Transformer Demagnetizer DEM60C is a portable instrument designed for a single and three-phase transformer core demagnetization. Demagnetization process eliminates the remanent magnetism from the transformer core. In this way users avoid problems such as high inrush currents at the start-up of power transformers, incorrect operation of protective relays, erroneous diagnostics or inaccurate measurement on a transformer.

The demagnetization process with DEM60C instrument is completely safe, fully automated and very fast. The instrument generates an alternating current applied with decreasing magnitude down to zero. This option is implemented by internally changing the polarity of a controlled DC current.

This powerful instrument generates a true DC ripple-free current of up to 60 A. High output currents enable an effective demagnetization even in case no data of transformer core condition or previous test results are available.

DEM60C enables current waveforms and values to be displayed during the demagnetization progress on the DV-Win generated graph. The graphical display of demagnetization current in real time enables monitoring the transformer core demagnetization process.

This powerful instrument

Main Features

- Fully automatic demagnetization
- Demagnetization currents 5 mA - 60 A DC
- Lightweight – only 13,1 kg / 29 lbs
- Automatic discharging circuit
- Displaying and monitoring demagnetization current in real time, using DV-Win software

Generator/Motor Test Equipment

RMO50M and RMO100M – Winding Ohmmeters

The Winding Ohmmeters RMO50M and RMO100M are designed for motor and generator winding resistance measurements. Built-in discharging circuit provides energy discharge after a test is completed. Using DV-Win software, a test can be performed from a PC and the results can be processed efficiently.

Main Features

- Lightweight – only 8 kg
- Test currents 5 mA - 100 A DC
- Measuring range 0,1 $\mu\Omega$ - 1000 Ω
- IP43 mechanical protection
- Extremely quick dual-channel measurement



Cables & miscellaneous

- Current cables 2 x 10 m 10 mm² and Sense cables 2 x 10 m with TTA clamps



- Sense cables 2 x 10 m with TTA clamps



- Current clamp (30 / 300 A)



- Remote control



Bags and cases



Transducers

- Digital rotary transducer with 5 m connection cable



- Linear analog transducer with 5 m connection cable



- Universal transducer mounting kit and digital transducer with accessories



- Doble transducer adapter



DV-Win Software (included)

DV-Win, a proprietary user friendly software application has been developed as a tool compatible with all series of our instruments. The software automatically detects a test device connected to a PC and selects appropriate applications and user interface.

It is based on the Windows operating system and provides useful features to help a test engineer:

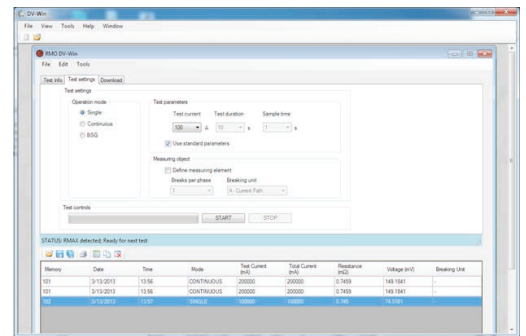
- Two-way communication between test devices and a standard PC over the USB connection
- Full remote control of all DV Power instruments and test steps from a PC
- Preparing test plan/schedule in advance and off line
- Acquisition and analysis of test results in real-time
- Downloading results for later analysis
- Viewing, editing, storing, printing and exporting numerical test results and graphs

Depending on a type of a test instrument, it further provides a specific set of applications. Few examples are presented below.

DV-Win version for RMO series instruments

One of additions to multiple instrument's internal functions, testing in Continuous Mode is upgraded with a sample-time feature allowing a user to record test results in selected time intervals set in seconds. After the completion of a measurement, results can be saved in various formats and a test report can be generated and saved or printed.

Results can be downloaded to a PC using several search filters. DV-Win application provides a Help menu, with detailed instructions and explanations of all functions and features.



DV-Win version for CAT instrument types

This version provides:

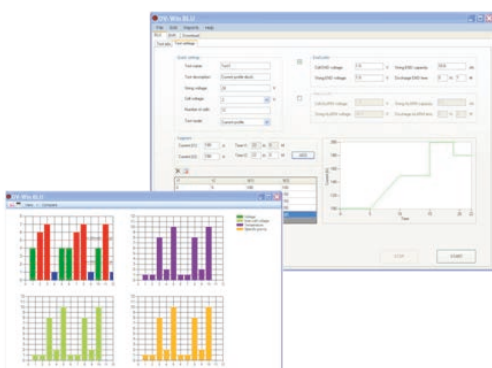
- Viewing and overlaying multiple graphs for a complete and easy test result comparison
- Selecting the measurement points and intervals using two available cursors
- Zoom and pan graph feature
- Specific test sequence setup
- Customized configuration of test result graphs

DV-Win version for TWA40D instrument type

The software provides OLTC (tap changer) condition assessment through analysis of the Dynamic Resistance Graphs recorded during the tap changer transitions. Additionally, the DV-Win measures and calculates OLTC transition time and the ripple for every transition, as well as the winding resistance in each tap position.

DV-Win version for BLU200 and BVR instrument types

The software provides a possibility of setting additional parameters (cell voltage, string voltage, capacity and time) for alarming and terminating the test. The profile mode setting is graphically displayed. Using DV-Win during discharge process, the current, voltage and capacity values as well as the waveforms can be observed. Additionally, online tracking function using histogram shows the distribution of the voltage on each cell of the battery string.



When discharging process is done, the results are saved and can be arranged or printed for the report in a selectable format as an Excel spreadsheet, PDF, Word or ASCII format. This enables further analysis, historical preview and comparison of the results.



Smart test devices for reliable electric power systems

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