RVM 5462

Advanced Automatic Recovery Voltage Meter for diagnosis of oil-paper insulation systems

General

The Recovery Voltage Method is based on established knowledge: the phenomenon of the polarization for oil/paper impregnated insulation.

Many „high voltage working people“ have made this painful experience: to short-circuit a high voltage capacitor (which was previously charged with a direct voltage), to measure a voltage approx. equal to 0 V, to believe the capacitor is completely discharged, later on to touch the connectors of the capacitor and to perceive that there is still voltage between the connectors! This voltage is due to the polarization of the insulation.

There are different types of polarization. In case of moist oil-paper insulation, there is a polarization due to the water molecules contained in the insulation. By applying a DC voltage, these molecules (which were electrically neutral) acquire a polarity and try to drift in the direction of the electrical field. That means, molecules are now energized . We can short circuit and afterwards open the circuit. Some energy is still stored in the molecules. We can measure a voltage due to this stored energy, which is called the „recovery voltage“.
By this method, insulation condition is established by tracing the polarization spectrum from the results of the recovery voltage measurements.

The instrument, the Recovery Voltage Meter type RVM 5462, which is the successor of the very well known type RVM 5461, effectively completes the range of the conventional insulation diagnosis methods, e.g. dissipation factor tanδ and partial discharge measurements, oil analysis, and so on.

Our specialists will gladly advise you on the use of the method and of the instrument. Furthermore, they will help you for the analysis and interpretation of the results.

Features

- ☑ **Charge times** up to **99 999s**
- ☑ Measurement methods: **Charging voltage, Recovery voltage, Initial voltage rise slope, Peak recovery voltage, Time to peak, Insulation resistance, Polarization index, Polarization current, Interference voltage**
- ☑ **Automatic** microprocessor-controlled measurement. Defineable test procedure i. e. to strongly reduce the test time
- ☑ Voltage measurement provided by the built-in electrometer
- ☑ Built-in thermal **printer**
- ☑ **RS 232 C** interface for computer connection
- ☑ Built-in test box for **self testing**

Benefits

Non-destructive diagnosis of the state of paper-oil insulation systems (effect of moisture content and ageing)

An ideal on-site test method for power transformers

A **handy portable instrument**, specially designed to withstand the harshest environments

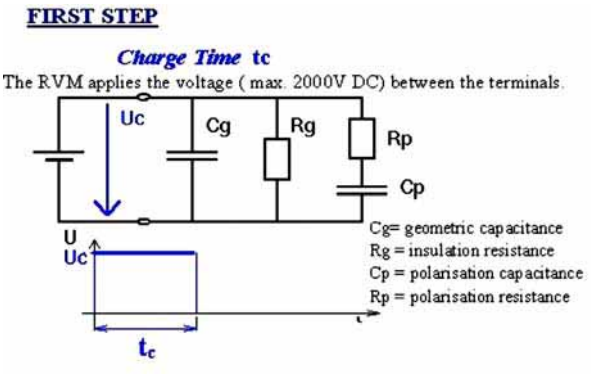
LCD screen shows results in alpha-numerical and graphical form

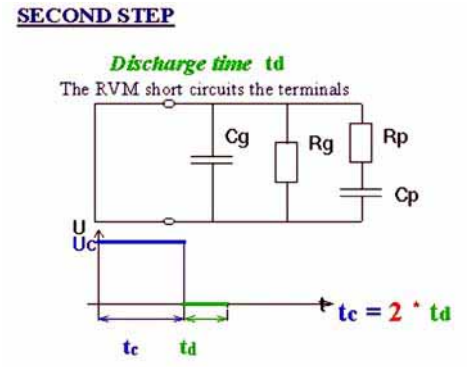
Particularly **user-friendly menu**-driven programs provide for controlled parameter entries and additional information relating to the individual functions

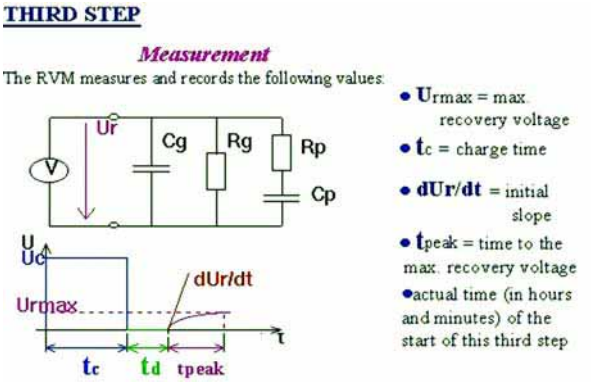
Applications

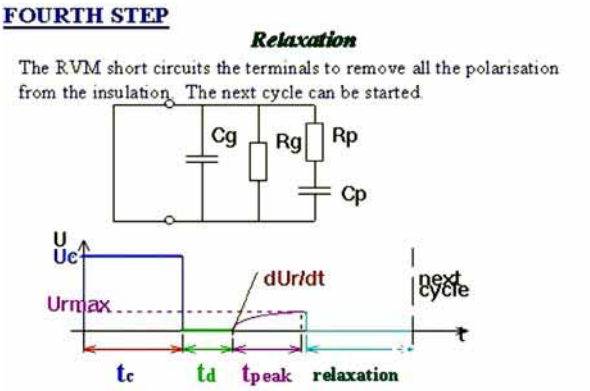
- ➔ **Diagnosis of oil-paper insulation systems**
- ➔ **Research & Development**
- ➔ **Universities**

Principle of measurement









The Fig.2 shows how the RVM works. The described measuring cycle is repeated at each charging time.

An evaluation of the measured spectra according to Fig. 3 clearly shows the change of state of the insulation. The displacement of the curve peak towards small time-constants signifies a degradation of the dielectric.

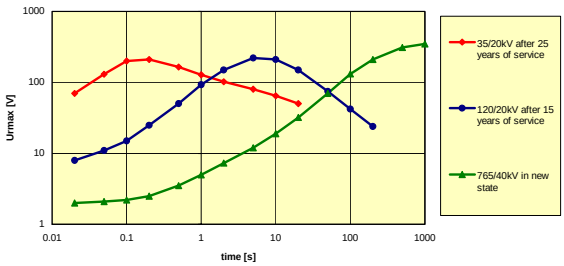
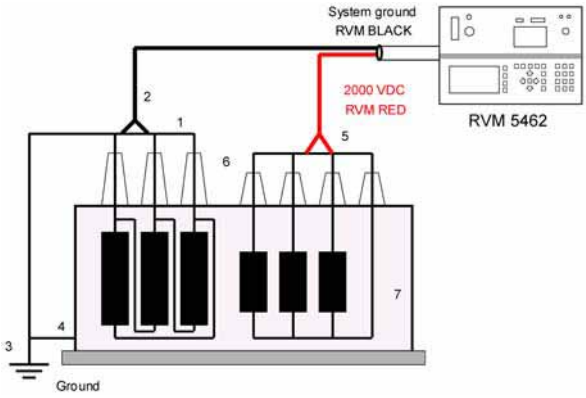


Fig. 3: Examples of polarisation spectrum curves: various transformers of different age.

Test connection for power transformer



1. short circuit high voltage side
2. connect high voltage side to test system ground (**black** clip)
3. grounding of the high voltage side
4. ground transformer tank
5. short circuit low voltage side and connect to the test voltage (red clip). **Make sure that the RVM test voltage is lower than the rated voltage of the connected winding.**
6. assure clean bushings and proper contacts to the test cables
7. oil and paper temperature must be stable. Tests with insulation temperature below 8°C are not recommended

Test Procedure

The user can define an „own test procedure“ inserting the criteria for curve recording and peak detection. The relaxation time (e.g. the time needed for the complete depolarization before the start of the next charge time) can also be fixed. Depending on the definition of the test procedure, a strongly reduction of the test time can be reached. This feature shall be used in the way that the influence to the results will be negligible, as shown in the figure below:

Test procedure „AutoRVM“ is the standard procedure for an automatically RVM test using the RVM 5462.

Test procedure „TURBORVM“ is defined inserting shorter relaxation times. The results of the three tests are similar because all measured dominant time constants correspond to an equivalent relative moisture content value of 1% (at 20°C).

The measuring time needed with the use of the test procedure „TURBORVM“ of RVM 5462 is **lower than the half** of the measuring time needed with the RVM 5461.

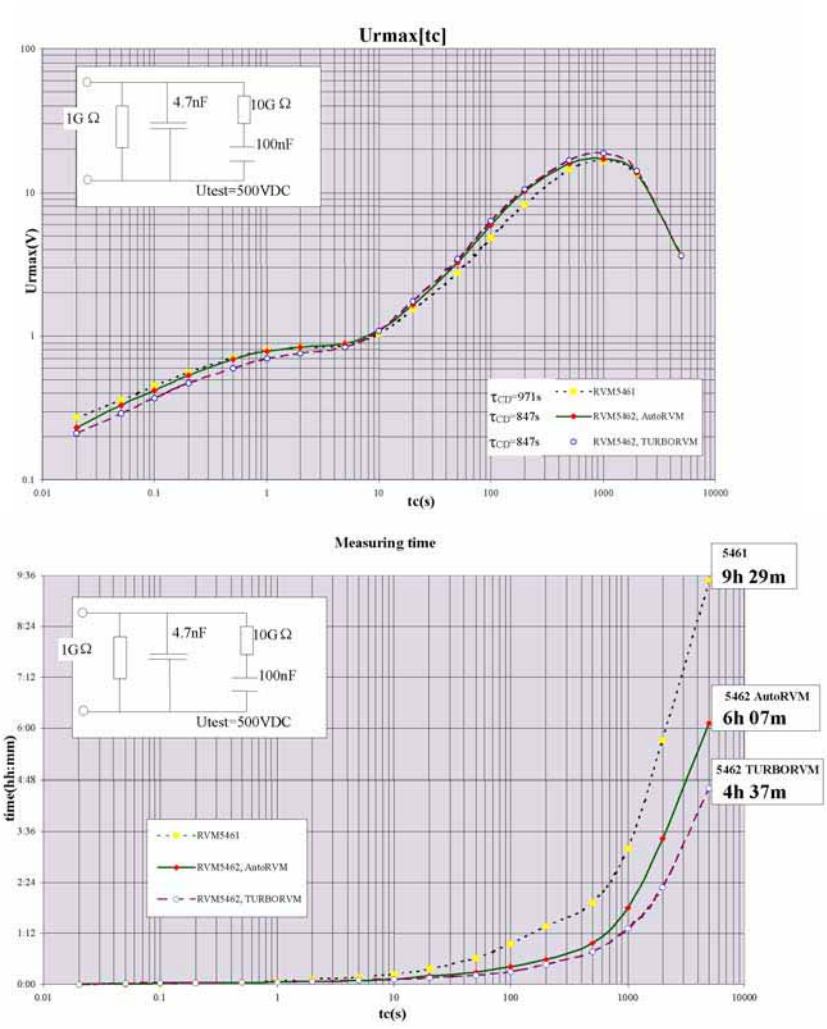


Fig.4: Test results (upper figure) and corre-sponding measuring times (bottom figure) of three different RVM tests performed on a test box simulating a new transformer with nominal time constant of 1000s (the capacitance and resistance elements used to build the test box have a tolerance of ±10%, i.e. the range of the simulated dominant time constant is between 810s and 1210s).

Scope of Supply

Standard supply

Type 5462 recovery voltage meter (RVM) with incorporated RS 232C interface, external printer connector, built-in test box for self testing and thermal paper printer.

Qty. 1	Triaxial measurement cable 20 m
Qty. 1	Grounding cable 10 m
Qty. 2	Rolls thermal paper no. 017834-00
Qty. 1	Power cable
Qty. 1	Software for data acquisition 5462/SWRVM1
	Mains voltage 85...260VAC, 50/60 Hz

Other optional supplies

- Data link for RS 232C interface, 3 m
- Software for data analysis 5462/SWRVM2

Technical Specifications

System

Display	16 x 40 -character back-light Black and White graphic LCD
Interface	RS 232C for computer connection
Emergency switch	
Built-in thermal paper printer	
External printer connector	
Built-in test box for self testing (max. test voltage 2000VDC, approx. 10s dominant time constant)	
Internal temperature measurement, thermal overheating protection.	

Test voltage

Measuring range	50...2000 V DC adjustable in 1 V steps
Basic setting	2000 V DC
Max. deviation from the set value	± 0.2 %
Current-carrying capacity (permanent)	5 mA
Max. short circuit current	200 mA, 100 ms
Delayed short-circuit protector	
Charging and discharging time range	t_c , t_d 10 ms... 99 999 s
Charging / discharging time relation (t_c/ t_d)	0.1....10 , Basic setting 2
Charging and discharging current measurement capability	20mA...10pA (max resolution: 1pA) Error limits ± 1 %+5pA
Resistance measuring range	1 MΩ ... 1000 GΩ Error limits (to 100GΩ) ± 1.5 %

Electrometer data

Measuring range	-200 ... + 1000 V
Error limits	± 1%
Current input	≤ 1 pA

Operating Conditions

Voltage supply	85...260V_{AC}, 50/60 Hz
Power input	max. 40 VA
Temperature range	Instrument operating temperature 0°C...40°C Recommended test object temperature ≥ 8°C

Mechanical

Dimensions	47 x 19 x 37 cm (18.5” x 7.5” x 14.6”)
Weight	10 kg (22 lbs)

Standards

Reference and rated operating conditions as per IEC 359, rated range of use I.
This instrument is designed in accordance with the safety requirements of VDE 0411/part 1 and IEC 348 (safety class I).

European Contact
Haefely Test AG
Lehenmattstrasse 353
CH-4052 Basel
Switzerland
☎ + 41 61 373 4111
🖷 + 41 61 373 4912
sales@haefely.com

Locate your local
sales representative at
www.high-voltage-hubbell.com

USA Contact
Hipotronics Inc.
1650 Route 22
PO Box 414
Brewster, NY 10509 USA
☎ + 1 845 279 8091
🖷 + 1 845 279 2467
sales@hipotronics.com