RVM 5462b

Recovery Voltage Meter

Datasheet



HAEFELY

Current and voltage – our passion

Designed by Tettex

General Description

RVM 5462 effectively completes our range of conventional insulation diagnosis methods, e.g. dissipation factor (tan delta), partial discharge measurements, oil analysis, etc. It provides an indication of the water content in the solid insulation (oil impregnated paper) and therefore the aging status of this crucial transformer component.

The Recovery Voltage Method is based on established knowledge: the phenomenon of the polarization of oil impregnated paper 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. when the circuit is shorted and opened some energy is still stored in the molecules. Voltage due to this stored energy can be measured and is called the "recovery voltage".

By this method, insulation condition is examined by tracing the polarization spectrum from the results of the recovery voltage measurements.

Features	Advantages
▪ Measurement methods: Charging Voltage, Recovery Voltage, Initial voltage rise slope, Peak recovery voltage, Time to peak, Insulation resistance, Polarization index, Polarization current, Interference voltage	☑ **Non-destructive diagnosis of the state of paper-oil insulation systems** (effect of moisture content and ageing on power transformers).
▪ **Automatic** microprocessor-controlled measurement ▪ **Definable test procedure** helps in reducing the test time ▪ LCD screen shows results in alpha-numerical and graphical form	☑ **Easy to use,** ready to measure on power transformers without any knowledge about geometrical or electrical configurations**.**
▪ Built-in thermal Printer	☑ **Immediate** short test report
▪ **Analysis windows software (optional)** ▪ RS 232 C with USB adaptor to download tests results to computer	☑ **Test results can be exported to the** computer, analyzed and stored in a database for further comparison and test object history.
▪ **Built-in test box** for self testing	☑ **Reliable results**, functional test can be done on site with no further devices.

Applications

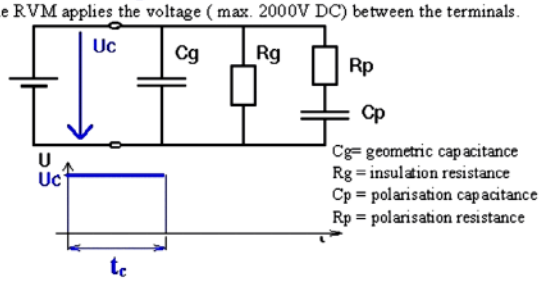
- On-Site diagnosis of oil paper isolation on power transformers.
- Factory detection of non convenient power transformers drying procedures.

Principle of measurement

FIRST STEP

Charge Time tc

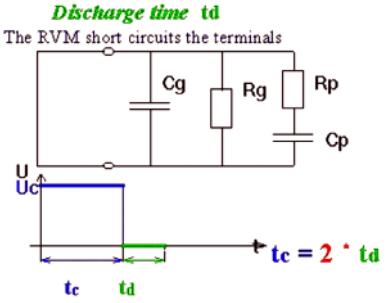
The RVM applies the voltage (max. 2000V DC) between the terminals.



SECOND STEP

Discharge time td

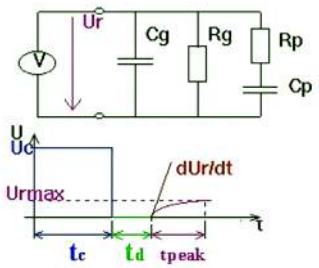
The RVM short circuits the terminals



THIRD STEP

Measurement

The RVM measures and records the following values:

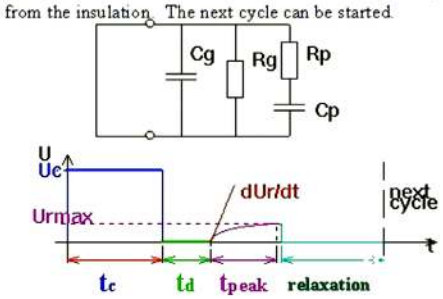


- **U**rmax = max. recovery voltage
- **t**c = charge time
- **dUr/dt** = initial slope
- **t**peak = time to the max. recovery voltage
- actual time (in hours and minutes) of the start of this third step

FOURTH STEP

Relaxation

The RVM short circuits the terminals to remove all the polarisation from the insulation. The next cycle can be started.



The described measuring cycle is repeated at each charging time.

Result analysis

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.

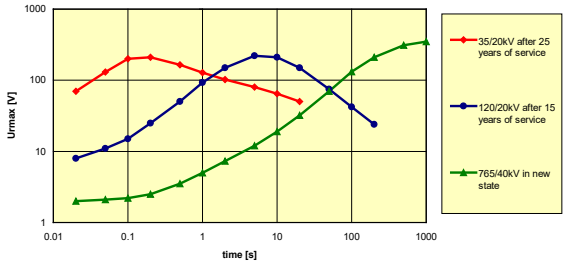
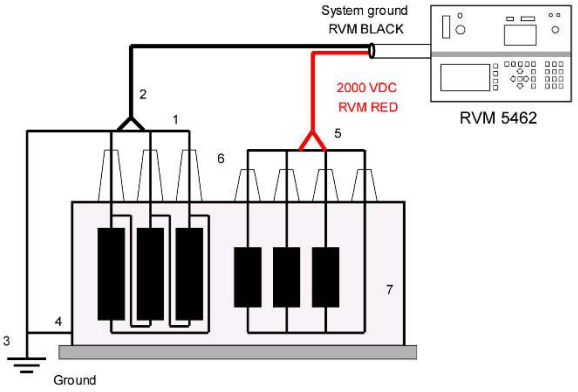


Fig. 3: Examples of polarisation spectrum curves: various transformers of different age

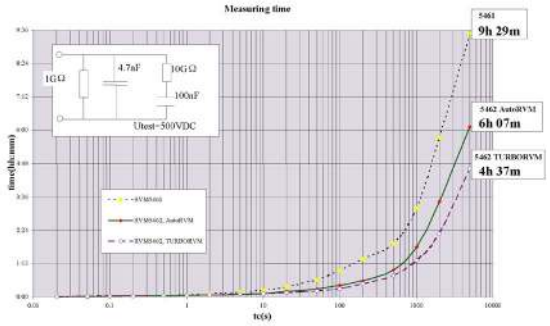
Test connection



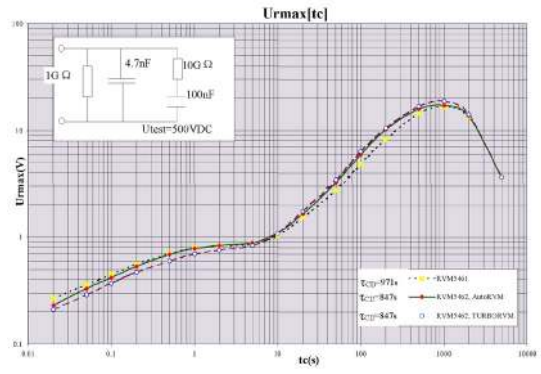
1. High voltage side of transformer to be short circuited and grounded
2. **Black Clip**, Ground of RVM to, be connected to HV Side
3. Transformer tank to be grounded
4. **Red Clip** of RVM to be connected to the Shorted LV side. Care should be taken that the RVM test voltage is lower than the rated voltage of the connected winding.
5. Bushings should be clean and proper contacts to test cables should be ensured
6. Oil and paper temperature must be stable

Measuring time

Testing time has been drastically reduced using the feature “Turbo RVM”, allowing a complete test in around 4 hours, this time can be easily reduced as the best is the transformer the shorter the peak is located, therefore measuring times over 2’000 seconds are normally not requested, on this circumstances a measuring time of 2 hours can be reached.



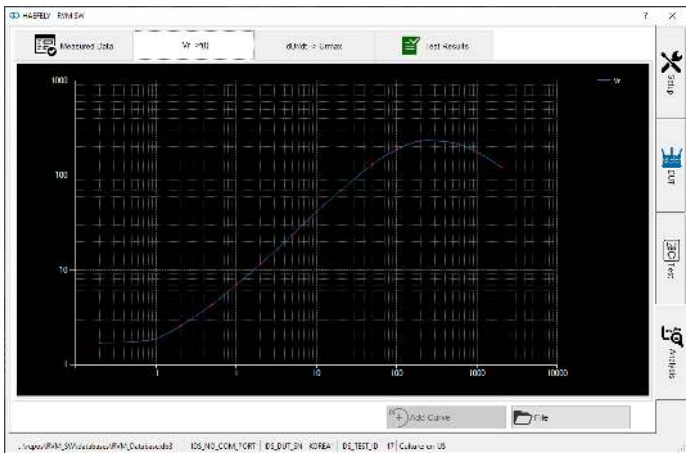
Test results and corresponding measuring times (bottom figure) of three different RVM tests performed on a test box simulating a new transformer with nominal time constant of 1000s (the capacitance and resistance elements used to build the test box have a tolerance of ±10%, i.e. the range of the simulated dominant time constant is between 810s and 973s).



For advance users, is possible to define an “own test procedure“ inserting the criteria for curve recording and peak detection.

5462/swrvm Analysis software

The optional additional software 5462/SWRVM2 allows easy and fast evaluation of the measurement results, providing information as the water content in the paper and the recommended maximum running temperature for the transformer.



The software use the database created by the 5461/SWRVM1 software (included in the scope of supply) and allows temperature corrections and header data modifications.

In addition, other graphics like tpeak in function of tc or dUr/dt in function of Urmax are available for expertise evaluation.

Easy to use reporting tool is also included to create Taylor made measurement results reports.



Scope of Supply

- Type 5462 recovery voltage meter (RVM)
- Tri-axial measurement cable 20 m
- Grounding cable 10 m
- Rolls thermal paper
- Power cable

Technical Data

Measurement	
Measuring range	50...2000 V DC adjustable in 1 V steps
Default voltage setting	2000 V DC
Max. deviation (from target value)	± 0.2 %
Current-carrying capacity (permanent)	5 mA
Max. short circuit current	200 mA, 100 ms
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	
Measuring range	-200 ... +1000 V
Error limits	± 1%
Current input	≤ 1 pA

Hardware	
Display	16 x 40-character back-light Black and White graphic LCD
Interface	RS 232C for computer connection (USB to RS-232 adaptor included)
Emergency switch	Yes
Built-in thermal paper printer	Yes
Test Box	Built-in test box for self testing (max. test voltage 2000VDC, approx. 10s dominant time constant)
Internal temp. monitoring	Yes, overheating protection

Software (5462a/SWRVM optional)	
Controller requirements	Intel Core i3® / AMD Athlon II X2® or better. 1 GB RAM, Microsoft Windows 7 or 10 1 x USB 2.0 port free
Operation system	Windows 10™

Environmental, Mechanical and Power Supply	
Operating temperature	0°C...40°C
Storage temperature	-10°C...50°C
Dimensions (W x D x H)	470 x 190 x 370 mm (18.5” x 7.5” x 14.6”)
Weight	10 kg (22 lbs)
Power supply Spec.	85…260 V_{AC}, 50/60 Hz, 40 VA

Applicable Standards	
General	This instrument is designed in accordance with the safety requirements of VDE 0411/part 1 and IEC 348 (safety class I).
CE conformity	CE mark

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Current and voltage – our passion

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