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# Interview with Dr. Ralf Bergmann, Managing Director of HIGHVOLT

## Partner for quality assurance

HIGHVOLT is known as a leading manufacturer of high-voltage test equipment. High-voltage test systems from Dresden have been used worldwide for routine, type, sample and other factory tests, ensuring the high quality and compliance demanded of produced transformers.

Our representatives, and our sales and service teams work closely with the customers and are well familiar with their needs. The company has used this knowledge of customer needs to extend its portfolio significantly over the last decade, introducing consultancy service, new products and systems, automatization, new generation of data management and, of course, local service. HIGHVOLT's innovative solutions enable transformer manufacturers to increase the test accuracy of their test labs, and to operate them in a more effective and productive way, using the available space optimally and minimizing the investment.

On their part, the operators of power transformers, such as energy suppliers, and service companies are also interested

in monitoring transformers after installation, during use or after repair in order to guarantee security of supply and ensure the quality standard during the whole life cycle of the transformer. Here, HIGHVOLT also offers mobile solutions.

Combining the test data over the transformer lifetime – from the manufacturing process, through installation and operation to after repair – as provided by HIGHVOLT, can make the evaluation of the quality of an aged transformer more valid.

Above all, HIGHVOLT considers itself as a partner in quality assurance for transformers across all its aspects.

## Consultancy saves time and money

Saving the investment costs, using minimum space, combining old and new equipment, being prepared for later expansion, speeding up the workflow and having an automatic data management are essential matters for HIGHVOLT's customers. Most of these aspects are inter-related. The later these aspects are taken

into consideration, the more costly they are, and more time will be wasted.

Therefore, HIGHVOLT assists its customers from the very beginning – from the point when they design the test area. HIGHVOLT's support, based on the years' long expertise, ensures that the customer will receive the best possible solution for the test and measuring systems.

Our consulting team offers valuable guidance for the selection of the most effective test procedure and a quicker testing setup. In turn, the time needed for testing procedures is reduced to a minimum, without compromising quality. Our highly experienced specialists from Dresden will suggest an optimal arrangement of the grounding system and safety measures, including electromagnetic shielding.

## Saving space

Most of transformer manufacturing plants have a common and quite agonizing problem of a lack of available space. Saving a few square metres required for test equipment is precious to our customers. HIGHVOLT recognised this problem and developed test systems which allow installing several systems that occupy the space equal to the space needed for only one system. One of these developments is the connection point – a unit for HIGHVOLT's high-voltage impulse test systems. It integrates the components of measurement divider, chopping gap and overshoot compensation in one single base frame.

**HIGHVOLT's test systems have been used worldwide for routine, type, sample and other factory and on-site tests, ensuring the high quality and compliance demanded of transformers**

## Saving investment by modular design and state-of-the-art technology

Another significant advantage of HIGHVOLT test systems is their modular design, which not only aims to exploit the available space, but also to adapt an existing test system to the increased demands in terms of the voltage, current, power and other parameters.

A good example of this is HIGHVOLT's AC test system with a static frequency converter, which was introduced to the market as a commercial product more than 10 years ago. The system is quite easily upgradable by parallel connection of several modules which can significantly save the investment cost. Among other tests, the system is used for induced AC voltage test, measurement of no-load and load losses, and the measurement of short circuit impedance. It is based on the state-of-the-art frequency converter. With its precise waveform and a small partial discharge noise level of less than 10 pC, it is an ultimate alternative to m-g-sets. The small total harmonic distortion of less than 5 % can be actively adjusted by a closed control loop.

## Saving the investment costs, using minimum space, combining old and new equipment, speeding up the workflow and having an automatic data management are of essential importance to HIGHVOLT's customers

Furthermore, the frequency converter can operate in a wide frequency range from 16 2/3 to 200 Hz. All of the above-mentioned tests can be done with only one system as opposed to m-g-sets where often two are needed. In addition, the frequency converter is easier and safer to operate, and requires less maintenance and furthermore requires even less energy during operation.

### Integrating control and measured data

For transformer manufacturers, one of the cost drivers to be considered is the total testing duration time, including test preparation. Due to HIGHVOLT's sophisticated control system HiCOS, the configuration necessary to shift the test system to the actual test procedure is shortened. The setup is half- or fully-automatic, depending on the object under test and the test

system. For instance, the AC test system with a static frequency converter for induced AC voltage test on power transformers is available within only few minutes by automatic adjustment of the tap changer at the step-up-transformer, or by automatic configuration of capacitor banks.

In transformer test bays, it is often the case that measuring devices and test systems used come from different manufacturers and belong to different generations. The test engineer needs to prepare a report based on the measurements conducted by all systems. If he has to collect all of these data by himself, the process will turn inefficient and will be prone to mistakes. HiCOS is designed to be able to communicate with HIGHVOLT older test and measuring systems as well, and even with the measuring devices of other manufacturers. HIGHVOLT's control system



Transformer test bay with impulse voltage test system (left); AC test system with variable frequency (centre); and transformer loss measuring system LIMOS and HV-filter (right)

## The modular design of HIGHVOLT test systems requires less space, aiming to adapt an existing test system to the increased demands in terms of the voltage, current, power and other parameters

HiCOS collects the requisite data automatically, liberating the test engineer from unnecessary and often strenuous work.

### Testing with highest accuracy

Needless to say, accuracy is the central value of any testing laboratory, and the same is true of the test bays in transformer manufacturing plants. Nowadays, when customers' requirements and various regulations force the manufacture of more efficient and low-loss transformers, it is particularly important that a transformer plant is able to measure losses with the highest possible accuracy. The ability to measure progress in loss reduction is critical here. Integrating the voltage and the current measuring system in one device, HIGHVOLT has developed and launched its own high-accuracy system for loss measurement: LiMOS.

One of the solutions we developed is transmission of signals by fibre-optic cables instead of conductive cables. In this way, as opposed to the conventional loss measurement systems, LiMOS is able to avoid disturbances caused by electro-magnetic interference. The combined voltage/current sensors and the digital signal processing enable a very compact design, saving space and resulting in the most accurate and stable measurement – which is an advantage for manufacturers and their end customers.

### Fully automated testing of distribution transformers

Testing distribution transformers is a challenge in terms of time and space. We have developed the latest generation of HIGHVOLT's DiTAS test systems combining a static frequency converter,



Connection Point CP 1780/1800 DOC with divisible base frame and top electrode, movable by air cushions.

Due to its smaller size of connection point than three separate components, the test field can be smaller. Furthermore, the test period is shorter, since it has not been necessary to remove chopping gap during SI tests.



**HIGHVOLT's high-accuracy transformer loss measuring system LiMOS is one of the best and most innovative measuring devices available on the international market**

## The entire test and measuring system for distribution transformers DiTAS is installed in a small cubicle and enables performing all HV routine tests in one sequence within approximately 12 minutes



Static frequency converter of HIGHVOLT's transformer test system installed in a container at customer's site, cooling on the top. The container solution allows outdoor installation, thus saving place and investment costs. A test system with static frequency is almost maintenance-free. Requiring low investment, with low operating costs and minimal installation requirements, it has particularly low lifecycle costs.



Service engineer Kai Pfeffer controls the quality test run on a sold test system in HIGHVOLT's workshop, using the operator desk and HiCOS control system as part of the scope of delivery.



HIGHVOLT's transformer loss measuring system LiMOS is one of the best and most innovative measuring devices available on the international market. It is characterized by a space-saving, compact design and highly accurate measurement of losses due to its digital transmission of preprocessed signals via fiber-optic cable to the receiver unit.

precise measuring systems, and sophisticated control with automation. The entire test and measuring system is installed in a small cubicle which can also be installed outside the test room, and even outdoors to save space. The automation unit is installed at a height that is adjustable.

The distribution transformer has to be clamped on only once. All HV routine tests will be performed in one sequence within approximately 12 minutes. The measuring results will then be extracted from the data bank and put on the protocol when the test is finished.

Despite the high degree of automation, the operator is always in full control. Actual values and reference values are always on the screen as well as the setup of the test system. The operator always has to confirm the accuracy of the results. The sequence of test as well as the configuration can always be adapted. Customers very much like the possibility to use predefined test setup. This allows fast arrangement of the test system and setting the reference value with a few mouse clicks.

### On-site testing

HIGHVOLT also produces mobile HV test systems. These test systems are able to perform the same IEC conform tests that are performed in the lab, such as all kinds of induced voltage tests and applied voltage test. Mobile testing solutions enable checking the quality of a transformer after installation, particularly if a major assembly is done on-site. In addition, the characteristics of important transformer during its lifetime can be determined. Finally, the quality of an on-site repair of transformers can be checked.

HIGHVOLT's large variety of different test systems give the manufacturers, users and transformer service providers the possibility to obtain comparable information throughout the lifetime of a transformer necessary for a better evaluation. The measured data are stored in one data base, allowing fast access and comprehensive analysis.

### Quality and services are vital to success

The availability of test systems is of vital importance for our customers. Therefore, HIGHVOLT pays careful attention to the

highest quality standards to guarantee a high level of quality for all components and systems. HIGHVOLT develops and manufactures the key components, such as controls and transformers, in-house. No measuring device, component, or even a system leaves the plant without successfully passing the tests at the HIGHVOLT's own test bay. Test systems are checked in our own lab, even up to highest voltages, very often in the presence of the customer. This quality assurance check is one of the largest of its kind in the world. It also provides the customers with the opportunity to get familiarized with the test system and how it functions.

Most of our test systems are equipped with computer control, including remote access. This enables HIGHVOLT to provide fast support, such as supplying the latest software, giving on-line support or trouble-shooting. Our systems operate very reliably. Nevertheless, over the years problems may occur. In this case, more than 95 % of all issues can be solved fast by remote access.

In addition to this, we have a large service department providing local support, training or observation of critical tests. Our service is available anywhere in the world within only a few days.

The measuring accuracy of high-voltage tests of electrical equipment is particularly important not only for HIGHVOLT's customers, but also for their own customers. To guarantee this, the test and measuring systems should be calibrated on a regular basis by a qualified laboratory following an established standard. All systems sold by HIGHVOLT are calibrated in the DAkkS-certified HIGHVOLT calibration laboratory. The laboratory also offers the calibration of already installed high-voltage measurement devices and systems at the customer's site, independent of the individual manufacturer.

**HIGHVOLT's high quality test systems serve their customers to monitor and prove the high quality of their products**

**HIGHVOLT mobile HV test systems allow two or more test systems to be connected in parallel, making it possible to test even largest power transformers in the GVA range, and can be set up on-site within an hour**



Container raised static frequency converter with a movable platform for easy connection and testing. One particular advantage of the test system is its automatic operating mode, in which all of the internal settings are pre-selected on the basis of the corresponding test data set. The control system is characterized by a user-friendly intuitive handling.



The transformer test system for on-site testing is based on the state-of-the-art frequency converter technology. The modular design and the latest digital control technology allow two or more test systems to be connected in parallel, making it possible to test even largest power transformers in the GVA range. Generally the test system can be set up on-site within an hour. There is no need for additional "lifting" or "assembly."



Felix Wolf is calibrating a voltage meter, used for AC and DC voltages, with a calibrator. HIGHVOLT calibration laboratory is certified by Germany's National Accreditation Body DAkkS, according to DIN EN ISO/IEC 17025:2005. The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA), of the International Accreditation Forum (IAF) and of the International Laboratory Accreditation Cooperation (ILAC).