



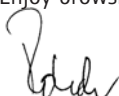
Dear Customers,
Dear Readers,



For the first time our subsidiary HIGHVOLT Prüftechnik Dresden GmbH is publishing an article in the INSIGHT infoletter. HIGHVOLT is one of today's leading manufacturers of High Voltage and High Current Test Systems. With more than a century of experience in the design and production of High Voltage Test Systems, this specialists from Dresden provide a wide range of test equipment to meet today's test requirements. HIGHVOLT offers advanced technical solutions

for utilities as well as for transformer manufacturers. Therefore INSIGHT is an excellent platform for HIGHVOLT to present and discuss its products. And naturally this issue also contains lots of information on on-load tap-changers and their accessories.

Enjoy browsing through this edition!



Michael Rohde
General Manager

P.S. Are certain topics of special interest to you? Send your emails to o.reichmeyer@reinhausen.com. The editors will be looking forward to reading about your interests and ideas.

Quick of the Mark

VACUTAP® RMV replaces Indian made OLTC

An **on-load tap-changer at the Hill Air Force Base** in Utah had to be replaced as quickly as possible since an OLTC from India which was installed in a 22.5 MVA transformer was causing serious problems. Air Force technicians decided to replace the on-load tap-changer although it had just been delivered in 2001. On short notice Reinhausen Manufacturing delivered the replacement - a VACUTAP® RMV-A 1320 Y with back plate modified to fit the transformer. Mountain States Repair Shop personnel did a professional job of installation. And the transformer went back into operation without a single problem. Our pictures show the situation before (left) and after the replacement. ●

Contact: b.kurth@bestlctc.com



MRCADEMY 2006

MRcademy, our academy for customers, was very successful last year. This is the reason you will also be seeing our specialists again 2006 at various locations around the world. Take personal advantage of this opportunity and obtain more information on our practical solutions for everything related to the transformer. MRcademy is an informative event. You will get the latest and most practical information on transformer technology, components and accessories. Go to www.mrcademy.com for current dates. You can also register online there. And if you have questions, just drop us an e-mail. ●

Contact: mrcademy@reinhausen.com

On April 7th 2006: Switch to 300,000!

Tie a knot in your handkerchief, circle the date in red on your calendar or ask your secretary to remind you: Starting on April 7, 2006 be sure to come by and visit www.switch-to-300000.com. You will be glad you did. And tell all your nice colleagues. But only the nice ones ...

www.switch-to-300000.com

VACUTAP® success at Elecrama 2006 in India

Experts from MR and joint venture EMR welcomed customers from all over India at the Elecrama trade fair in Mumbai. Words spread around that the famous on-load tap-changers with vacuum switching technology were exposed and people came. Exactly, lots of interested people were gathering around the VACUTAP® range and also the transformer accessories and indian made tap-changers from EMR. From our joint venture side, the top management of EMR highlighted the importance of this event and the need to provide powerful solutions for the indian market.

India is the 2nd fastest growing economy in the world and already the 7th largest in electricity generation. To transmit and distribute this flow, MR offers a whole range of solutions. For instance the 765kV generating transformers at 3000MW Sipat power plant from ABB are equipped with MR de-energized tap-changers. Transformer manufacturers like Transformers and Electricals Kerala (TELK) or Emco Transformer Ltd. already built MR on-load tap-changers with vacuum switching technology in their power transformers. Not to forget the MR product range of automatic voltage regulators (AVR) and transformer accessories applied throughout the continent. Prospects for India are excellent and therefore we are already looking forward to preparing booth and technical presentations for the CEPSI conference, November 6 - 10 2006 in Mumbai. ●

Contact: m.djamali@reinhausen.com / t.breinkl@reinhausen.com



New: MR holds shares in ITASS in Iran



Since December 2005 MR holds a minority interest in Iran Transfo After Sales Services Co. (ITASS) in Zanjan / Iran. Other shares are owned by Sense Eng. Co. Ltd. as well as companies of the Iran Transfo Concern.

ITASS's goal is to perform service and repair work on transformers of the energy utility companies and industrial customers both in Iran and in the MENA region. Our picture shows the members of the managing board following signing of the contract. ●

Contact: m.djamali@reinhausen.com
www.iran-transfo.com

25,000th OILTAP® V delivered to ABB Finland



During a small ceremony in Regensburg MR, managing director Michael Rohde (3rd from left) presented the 25,000th OILTAP® V on-load tap-changer to Ulf Store and Kaj Jansson (3rd and 4th from right) of ABB Finland, manufacturer of the transformer.

The ABB Group is the world's largest transformer manufacturer and also one of MR's biggest customers. MR representative Chanaka Benjamin (2nd from left) received a symbolic on-load tap-changer model for the final customer - the Ceylon Electricity Board in Colombo. Two actors of Regensburg's "Stadtmaus" theater group presented a short scene showing an historical reference to Otto von Guericke whose electrified machine and diverse vacuum experiments caused great excitement back in the 17th century. The OILTAP® V has been in production since 1979. ●

Contact: g.panzer@reinhausen.com, t.breinkl@reinhausen.com



Messko supplies comprehensive monitoring system for Swiss Hydroelectric Plant Ferrera

Three 70 MVA transformer groups (dating back to the year 1958) for 220/10.5 kV, each with single-phase poles and one reserve pole were installed at the Ferrera Water Power Plant of the Hinterrhein AG power plants (Graubünden, Switzerland). This total of 10 machine transformers is used to transfer the produced energy to the 220-kV network. Due to their age and the resulting technical weaknesses, all ten single-phase poles had to be replaced. The primary demands placed by the Hinterrhein power plants on this new transformer equipment were the absolute reliability and efficiency of the new units.

MESSKO equipped all transformers with oil level and oil temperature monitoring units. The latest generation of MTEC® systems which handle the monitoring of the winding temperature and the entire cooling control were integrated in the switching cabinets. For reasons of safety, both the transformer tanks and the on-load tap-changers were equipped with MPreC® pressure relief devices.

"Our goal is to turn on the operational resources at our power plant and then just forget about them for a long, long time," said Guido Conrad, Head of the Hinterrhein AG power plants. "And when it comes to the monitoring of our transformers," he continued, "MESSKO is our first choice." In cooperation with MESSKO, SGB and with the gracious approval of the Hinterrhein AG power plants, a film was produced portraying the construction, transportation and commissioning of the transformers for this impressive project. To see this film go to www.messko.de. ●

Contact: a.hinz@messko.de

Lago di Lei is an 8-km long artificial lake almost completely located in Italy. Only the 143-m high, 950-m long entrance tunnel is located in Switzerland. The dam wall is made of 840 000 m³ of concrete; the dam volume is 229 times greater (197 million m³).



A new standard in Impulse and AC Measurements

Brand new Digital Impulse Analyzers for Impulse Voltage as well as Impulse Current Tests



Impulse voltage as well as Impulse current tests for electrical power apparatus and components are common ways of testing nowadays. Digital impulse analysers are used to monitor shapes as well as parameter evaluation of applied pulses. HIGHVOLT's brand new digital impulse analyzers of the types MIAS have already caused great excitement among experts. Now production of this new standard series with its totally new design has begun.

The digital impulse analyzers MIAS can be adapted to very different types of measurements, but both, hard- and software, are especially designed for measurements in high-voltage, high-current and high-power technology.

This includes the application for impulse voltage and impulse current testing with complete parameter evaluation, for testing with combined and composite voltages, for transient processes in special tests with alternating and direct voltage and for synthetic high-power tests. Furthermore MIAS can also be applied for the adjustment of circuit breakers, tap changers and similar electrical-mechanical processes.

Of course the digital impulse analyzers type MIAS are designed in full line with the IEC standards 61083-1 and 61083-2.



Mobile stand-alone unit of the digital recorder type MIAS for e.g. on-site applications

Digital recorder type MIAS with INDUSTRIAL PC and printer in a mobile rack designed for a robust application in e.g. routine test fields

Some more highlights:

- MIAS is successfully applicable to all tests according to IEC 60060 (general), IEC 60044 and IEC 60076 (instruments and power transformers), IEC 60099 (arrester), IEC60694 and IEC 62271 (switchgear), etc.
- MIAS is available in reference quality for calibrations and calibration service providers.
- MIAS has been EMP/EMC as well as mechanically tested successfully according to relevant standards and carries the necessary certificates (e.g. CE,C-Tick, EN 61010-1)
- MIAS has an excellent electromagnetic compatibility and is intermateable with all types of HV dividers and HC shunts
- MIAS has a compact, robust, flexible and intelligent design with a self-explanatory Windows-compliant user interface
- MIAS displays linear time and amplitude curves (independent from sampling rates and scale factors)

The carefully conceived design offers a great number of standard versions and impresses with its modular concept. New materials ensure innovation and a high level of quality. The digital impulse analyzers type MIAS consist of the digital recorder with one to four channels, type MIA, an Industrial PC or notebook and a related software package, type IAS. The basic software IAS is delivered with the "graphical user interface", the data recording, the automatic evaluation of all impulse parameters for lightning and switching impulse voltages according to IEC 60060-1 and the maximum value of the current. It is also equipped with the manual parameter measurement by cursors, zooming, viewing channels, the data storage and the preparation of test reports. Of course, special designs and additional software packages are available upon request. ●

Contact: sales@highvolt.de

More technical data: steiner@highvolt.de

Technical parameters type MIAS:

digital impulse analyzer	MIAS 100-14/...	MIAS 200-12/...
model	design with bus for external PC / with built-in Industrial PC	
	ADC analog digital converter	
sampling rates	1,6 kS/s until 100 MS/s	3 kS/s until 200 MS/s
resolution	14 Bit => 0,61 ppm	12 Bit => 2,44 ppm
number of channels	2 / 4	2 / 4
random interleave sampling	2 GS/s (repetitive signals only)	4 GS/s (repetitive signals only)
sample points	up to 4 Mega samples memory	up to 4 Mega samples memory
time base accuracy	±25 ppm	±25 ppm
total sample clock jitter	< 2 ps	< 2 ps
triggering	Internal, external, slope or window	Internal, external, slope or window
	input divider 1000 V (div1000)	
ratio	100:1	100:1
input impedance	1 MΩ 25 pF	1 MΩ 25 pF
analogue bandwidth (-3dB)	> 100 MHz	> 140 MHz
measuring range for impulse	10-1000 V	10-1000 V
full scale input range	20 V up to 1000 V	20 V up to 1000 V
input range	1 MΩ 25 pF	1 MΩ 25 pF
AC measuring range	500 V	500 V
over voltage protection	1 kVpp	1 kVpp
over voltage tested	4 kVpp	4 kVpp
	input divider 2000 V (div2000) optional	
ratio	200:1	200:1
input impedance	1 MΩ 25 pF	1 MΩ 25 pF
analogue bandwidth (-3dB)	> 100 MHz	> 140 MHz
measuring range for impulse	40-2000 V	40-2000 V
full scale input range	40 V up to 2000 V	40 V up to 2000 V
input range	1 MΩ 25 pF	1 MΩ 25 pF
AC measuring range	1000 V	1000 V
over voltage protection	2 kVpp	2 kVpp
over voltage tested	8 kVpp	8 kVpp
	direct input (10 V)	
measuring range	0-10 V	0-10 V
analogue bandwidth (-3dB)	0,4 V up to 10 V: > 90 MHz 0,2 V: > 70 MHz	0,4 V up to 10 V: > 140 MHz 0,2 V: > 70 MHz
full scale input range	200 mV up to 10 V	200 mV up to 10 V
input impedance	1 MΩ 25 pF	1 MΩ 25 pF
	filter, coupling, connectors	
filter (-3dB)	20 MHz, 35 MHz, 100 MHz	20MHz, 60MHz, 150MHz
coupling	AC, DC	AC, DC
connector	N-type	N-type
full and chopped SI and LI	peak value ≤ ±1,0 % (opt. ±0,7 %)	peak value ≤ ±1,0 % (opt. ±0,7 %)
voltage uncertainty	time parameter ≤ ±2,0 %	time parameter ≤ ±2,0 %
internal performance check	scale factor, offset, frequency response, triggering and timing	scale factor, offset, frequency response, triggering and timing

Thanks to DynamiC[®] equipment by PQM:

Turbine Blades are produced without Voltage Flicker



The huge press during re-assembling



Factory tests of the PLC-programming



Voltage monitoring



Six of the 40 capacitor steps besides the 5,000 A CB

Our experts at PQM Power Quality Management were faced with a special challenge when they were called for assistance by Siemens PTD a few months ago. A British manufacturer of airplane turbine blades had invested in one of the largest and most powerful screw presses in the world. The second-hand machine had already been imported from the USA in complex special transport procedures, converted to 50 Hz and re-assembled in the newly-constructed hall when the several-million euro investment threatened to fall apart. Following network calculations, the utility company had determined that operation of the press would result in serious short-term voltage drops throughout the entire surrounding area of the factory, and subsequently refused connection to the 11 kV network. The first step taken was to rent three large diesel generators that enabled the conduction of tests and a provisional operation at greatly reduced output. In the meanwhile, Siemens and MR-PQM worked hard on a solution, a task that was made more difficult not lastly through the fact that very few reliable electrical data was available on the used press; thus the actual operational behavior could only be estimated with the aid of experience-based data and computer simulation. The customer was ultimately offered a tailor-made solution including a performance guaran-



Contact: h.kretzschmar@reinhausen.com

tee. The first expansion stage was finished within a very tight time schedule and successfully commissioned on site at the factory a short time ago.

In a specially erected building, a low-voltage capacitor battery having an output of 2.4 Mvar was installed which can be switched over 40 steps using thyristor power modules. In the final construction, output will subsequently be 4.8 Mvar. Connection to the power supply network is done via a specially-designed transformer directly to the 11 kV factory power line.

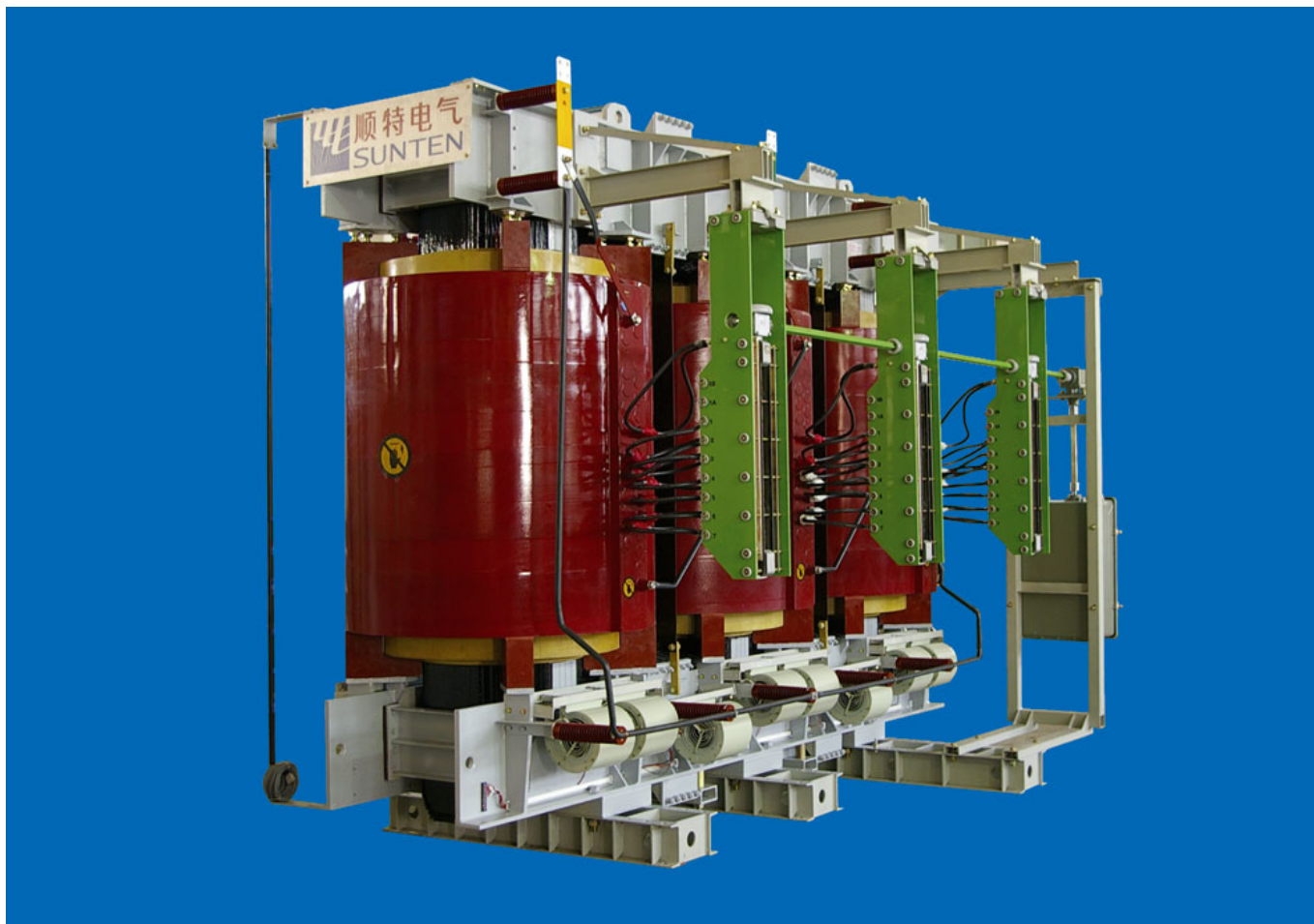
Targeted switch-on of capacitor steps can enable the system to correct voltage drops of up to 2 % within just a few milliseconds. A fast SPC system with monitoring functions

provides for the calculation of the number of steps respectively required and exactly synchronous switching to the four press drives with a maximum time offset of 20 ms.

In test operation spanning several weeks, the adherence of the system to flicker limits was demonstrated and the power supply company was able to issue its clearance. Incidentally, the generators were dismantled as quickly as possible, because, after only a few weeks, their operating costs had already equaled the complete investment amount for the flicker compensation system made by MR. ●

Regulated Voltage for the Shanghai Airport

Largest Dry-Type Transformer in the World with Vacuum OLTC by MR



A successful Chinese/German collaboration: The Chinese manufacturer Sunten supplied what is probably the largest dry-type transformer in the world for the expansion of the Shanghai Pudong Airport. MR supplied the brand-new vacuum OLTC called VACUTAP® VT. Both companies are proud that they were able to contribute to this significant project.

The transformer SCZ9-25000/35/10.5, with its 25,000 kVA, possesses the highest power ever reached by a dry-type transformer. On 27 December 2005, it was sent to the national "Transformer Quality Control and Test Centre" to undergo all necessary testing. It passed all tests relating to short-circuit capability and lightning impulse strength without a hitch.

This project is a further milestone for Sunten. In 1996, the company produced the first 16,000 kVA dry-type transformer, thus demonstrating its lead in the special area of transformer construction.

With maintenance-free vacuum technology, simple connection and a compact construction, the VACUTAP® VT on-load tap changers offer significant, customer-friendly features. Vacuum interrupters based on proven MR vacuum technology serve as diverter switch contact elements. They guarantee excellent electrical and mechanical characteristics over an extremely long operation period. ●



For further information: www.reinhausen.com
Contact: sales@reinhausen.com

TAPCON® 260-D Passes Factory Acceptance Test at ABB Switzerland

MR voltage regulators meet all IEC61850 requirements

A couple of TAPCON® 260-D voltage regulators delivered to DEWA (Dubai Electricity and Water Authority) have successfully passed an important test. At ABB in Baden (Switzerland) they passed the so-called Factory Acceptance Test (FAT) and the conformity test of the IEC61850 control system protocol with flying colors.

Using almost 70 protective devices, a DEWA plant was simulated and tested as a network while the customers looked on. The IEC61850 control system protocol was the center of attention. This innovative protocol is based on the "network connection" of every individual device. It provides a server-client structure for control purposes and for communication of information. This network included three TAPCON® 260-D voltage regulators which contained the IEC61850 control system protocol and various special functions in addition to the actual voltage regulator (TAPCON®240) and the OLTC operating control system (TAPGUARD® 240). Supplemental functions offering "Buffered Report Control Blocks" had just been added to the control system. Today ABB and MR are the only companies that offer these blocks worldwide.

When a communication system crash occurs, all recorded data that have not yet been sent can now be automatically forwarded to the control system without losing a single piece of data. With conventional devices, these data would have been irretrievably lost as "Unbuffered Report Control Blocks" after a breakdown in communication.

The conformity test performed after the FAT represented a certification of the IEC61850 control system protocol. The TAPCON®260 was tested by the SVC (System Verification and



Validation Center) of ABB for scope of protocol, structure, system control and documentation. This certification is internationally valid and is comparable to the KEMA certificate which the TAPCON® 260 had already been awarded (September 2005). ●

Contact t.krueger@reinhausen.com / w.fleischmann@reinhausen.com

MR at the Middle East Electricity in Dubai

MR also had a booth this year at the Middle East Electricity in Dubai. This specialized electricity trade fair is considered the most important in the entire Arabic region. MR's principal emphasis was on Vacuum Technology in combination of PQM and our colleagues from HIGHVOLT who presented their testing technology designed especially for high voltage cables. In front of the trade fair hall, Emirates Transformer of Dubai presented a

brand new 20 MVA/33kV transformer which was made for SEWA (Sharjah Electricity and Water Authority). And of course it was equipped with an OLTC from MR, a VACUTAP® VV and an ED motor drive unit. ●

Contact: w.fleischmann@reinhausen.com / m.djamali@reinhausen.com



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Editor: Marketing Communications, o.reichmeyer@reinhausen.com, Phone +49 941 4090-648, Fax +49 941 4090-666, ISSN 1612-1856