



Time to change tap: DEETAP® DU

A new Standard in Off-Circuit Tap-Changers

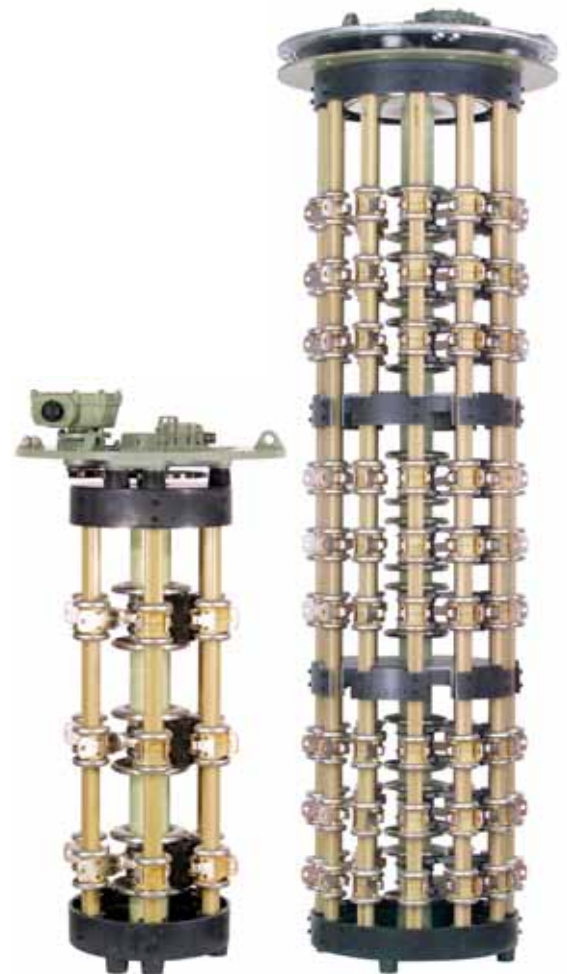
Off-Circuit Tap-Changers (OCTC) are also called de-energized tap-changers (DETC). The new IEC 60214-1:2003 specifies them as „a device for changing the tap of a winding, suitable for operation only when the transformer is de-energized.“ The completely new DEETAP® DU is designed in accordance to this norm.

Some technical highlights of our new standard OCTC range:

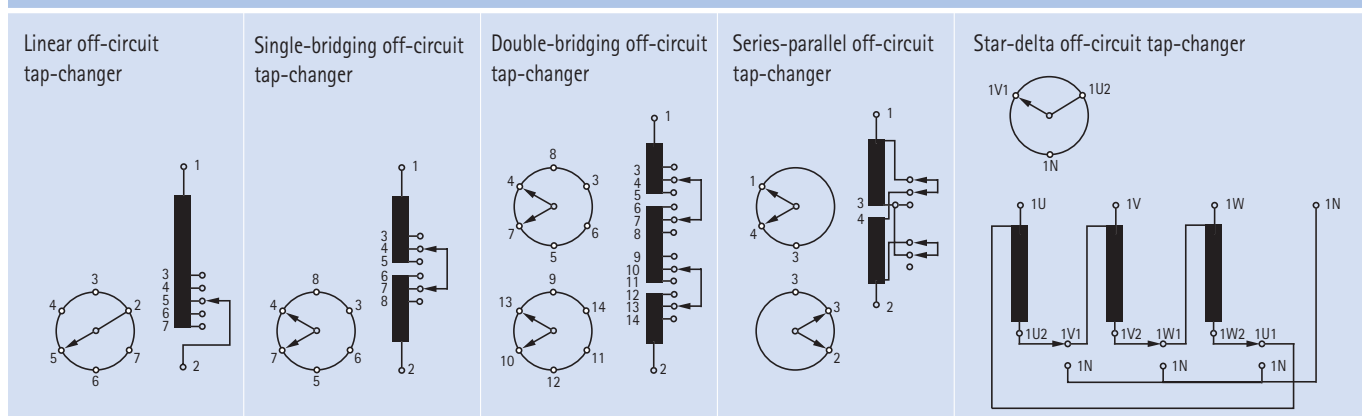
- Single and three-phase up to 2.000A max. rated through-current.
- Rated insulation level up to $U_m=245kV$ (Highest voltage for equipment)
- Easy in-tank installation, even for bell-type tanks
- High safety through monitoring contact
- Compact, robust and intelligent design

The complete new design impresses with its modular concept and innovative materials like reinforced plastic. Worth to mention is also the patented terminal contact system. Finally, DEETAP® DU is delivered with hand wheel or hexagonal shaft and can easily be equipped with either manual or motor drive. Of course special designs, e.g. for higher rated through currents and/or higher voltages for equipment are available on request. ●

More technical data: www.deetap.com, Contact: sales@reinhausen.com



Off-circuit tap-changer basic connections



DEETAP[®] DU: Technical data

The technical data specified here are limited by the wide variety of possible off-circuit tap-changer models. Please contact us for information on your individual requirements. Our publication 266/01 contains a detailed list of technical data and other details for selection of off-circuit tap-changers DEETAP[®] DU.

Off-circuit tap-changer type DEETAP [®] DU I/ DU III ¹⁾	200	400	600	800	1000	1222	1202	1622	1602	2022
Number of phases	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Max. rated through-current I_{um} (in A)	200	400	600	800	1000	1200	1200	1600	1600	2000
Rated short-time withstand current (in kA)	4	6	8	10	12	16	20	20	25	25
Rated short-circuit duration (in s)	3	3	3	3	3	3	3	3	3	3
Rated peak withstand current (in kA)	10	15	20	25	30	40	50	50	63	63
Operating positions Contact circle diameter 400 mm 600 mm	max. 5 max. 11									
Off-circuit tap-changer basic connections	Linear off-circuit tap-changer for neutral application ²⁾ Linear off-circuit tap-changer for delta application Single-bridging off-circuit tap-changer Double-bridging off-circuit tap-changer Series-parallel off-circuit tap-changer ³⁾ Star-delta off-circuit tap-changer Off-circuit tap-changer for special applications									
Rated frequency (in Hz)	50 ... 60									
Rated insulation level Highest voltage for equipment U_m ⁴⁾ (in kV)	36 72.5 123 145 170 245 ⁵⁾									
Rated lightning impulse withstand voltage (in kV, 1.2/50 μ s) ⁶⁾	200 350 550 650 750 1050									
Rated switching impulse withstand voltage (in kV) ⁶⁾	850									
Rated AC withstand voltage (in kV, 50 Hz, 1 min) ⁶⁾	70 140 230 275 325 460									
Rated withstand voltages of internal insulation	see section 2.2 in 266/01									
Weight (in kg)	contact circle \varnothing 400 mm: max. ca. 305 kg, contact circle \varnothing 600 mm: max. ca. 565 kg									
Drive	Hand wheel or hexagonal shaft with operating key Manual drive BM 75, manual drive MR 404, motor-drive ED									
Safety devices	Electrical locking by cam-operated switch; lock-in occurs after 1/12 actuating path Contacts: 1 NO and NC contact with common lock-in action, switching capacity AC, 250 V, 8 A									

¹⁾ Max. rated through-currents of more than 2000 A are available on request.

²⁾ Single-phase types for Y applications are declared as D type.

³⁾ The max. rated through-current is based on series connection.

⁴⁾ According to IEC 60214-1 section 3.57: highest r.m.s phase-to-phase voltage in a three-phase system for which a tap-changer is designed with respect to its insulation.

⁵⁾ Off-circuit tap-changer type DU for insulation to ground $U_m > 245$ kV available on request.

⁶⁾ Linear off-circuit tap-changers for delta application: voltages generated at free oscillating winding ends could be higher than those at line terminals. To take this effect into account, higher voltage values than the standardized rated insulation levels are admissible for linear off-circuit tap-changers for delta application.
Rated lightning impulse voltage: + 20 %, rated switching impulse withstand voltage: + 10 %, rated AC withstand voltage: + 10 %.

World Premiere For Operation at Explosion-Prone Sites

MR On-Load Tap-Changers Made to Ex-Standards

Effective immediately, MR's on-load tap-changers VACUTAP® VV and VACUTAP® VR, motor drive ED, protective relay RS, drive shafts and oil filter are also available Ex design for explosion-prone sites such as e.g. oil rigs, the chemical industry, and transformers in closed areas.

MR is the first OLTC manufacturer worldwide to certify his products in accordance with Directive 94/9/EC (ATEX) (compliant with IEC and NEC 505 in North America). Incidentally, this also applies to MR's internal quality assurance system. In mid-July, the first explosion-protected VACUTAP® VV-Ex was delivered to "France Transfo". The 20-MVA transformer was destined for an oil platform in the Congo.

Since, thanks to their vacuum interrupters, none of MR's tap changers of the VACUTAP® series generates any shut-down arcs in the insulating oil, this type of innovative technology is particularly suitable for applications in explosion-prone environments.

Benefits of MR's Ex Protection Concept:

- Simple and easy Ex certification of the entire transformer if Ex certified products are used
- All of MR's Ex certified products are delivered in fully finished and ready-to-install condition, i.e. no need of additional expenses for works by the transformer manufacturer
- All works with the motor drive mechanism ED-Ex involve compressed air, thus obviating the need for time-consuming and labor-intensive replacement of the Nitrogen bottles during Nitrogen flushing
- IEC compliance, i.e. no limits of operation in comparison to non-Ex applications ●



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	Equipment category*	Temperature class*
VACUTAP® VR-Ex	3G	T3
VACUTAP® VV-Ex	3G	T3
Motor drive ED-Ex	2G	T3/T4 (T4 with reservations)
Protective relay RS 2001-Ex	2G/3G	T4 (depending on protection type)
Drive shaft-Ex	2G	T4
Oil filter unit OF 100-Ex	3G	T4 (available as of October 2005)

* Please refer to the appendices for explanations on equipment categories and temperature classes (Page 4):

Table 1: Classification into zones

Table 2: Classifications of the gases and vapors in temperature categories



Table 1

Conditions in potentially explosive area						
Flammable materials	Temporary behavior of the flammable material in Ex area	Division of the potentially explosive areas			Required identification of the usable resource as per CELENEC	
		CELENEC / IEC	US NEC 505	US NEC 500	Device group	Equipment category
Gases, fumes	* Present continuously, over the long-term, or frequently	ZONE 0	Class I Zone 0	Class I Division 1	II	1 G
	* Occur occasionally	ZONE 1	Class I Zone 2		II	2G or 1G
	* Probably will not occur, but if they do, then only rarely or briefly	ZONE 2	Class I Zone 2	Class I Division 2	II	3 G or 2 G or 1 G
Dusts	* Present continuously, over the long-term, or frequently	ZONE 20	-	Class II Division 1	II	1 D
	* Occur occasionally	ZONE 21	-		II	2D or 1D
	* Probably will not occur due to swirling dust, but if they do, then only rarely or briefly	ZONE 22	-	Class II Division 2	II	3D or 2D or 1D
Methane, dust	-	Mining Mining	-	Mining -	I I	M1 M2 or M1

Table 2

Temperature classes and maximum surface temperature of the resources							
Temperature class =>	T1	T2	T3	T4	T5	T6	
Surface temperature =>	< 450°C	< 300°C	< 200°C	< 135°C	< 100°C	< 85°C	
Ignition temperature =>	> 450°C	450°C to 300°C	300°C to 200°C	200°C to 135°C	135°C to 100°C	100°C to 85°C	
Explosion group	I	Methane	-	-	-	-	
	II A	Acetone Ethane Ethylacetate Ethylbromide* Ethylchloride Ammonia Aniline Benzene Chlorbenzene 1,2-dichlorbenzene Ethanoic acid Natural gas Carbon oxide* o-cresol Methane Methylacetate Methylalcohol Methylbromide Methylchloride Methylenechloride Naphthaline Nitrobenzene * Phenol Propane Toluol O-xylol	Ethylalcohol* Ethylene glycol* i-amylacetate n-butane n-butylalcohol 1-butylene 1,2-dichlorethane Di-i-propylether Natural gas Acetic anhydride n-propylacetate N-proryl alcohol* i-propylalcohol Vinylchloride	n-amylalcohol Primary gasolines Diesel Heating oil n-hexane Hydrogen sulphide	Acetyldehyde Ether Ethylether*	-	-
	II B	Ethylbromide* Hydrogen cyanide Carbon oxide* Nitrobenzene City gas	Ethylalcohol* Ethylene Ethylene glycol* Ethyleneoxide Butadiene-1,3 Dioxan-1,4 Divinylether Isoprene n-propylalcohol*	Dimethylether Hydrogen sulphide*	Ethylether*	-	-
	II C	Hydrogen	Acetylene	-	-	-	Carbon disulphide

* Materials are close to the measured values for assignment to the next higher explosion group or temperature class. For this reason, they are listed in both groups/classes.

New Managing Director at Guangdong MR

Hubert Häring successor of Dr. Jens Frost



As of June 20, 2005, our Panyu-based Chinese subsidiary Guangdong MR is under the leadership of a new managing director: Hubert Häring (photo right), MR's sales director of many years' standing, has succeeded Dr. Jens Frost (left hand side) who will be taking over new responsibilities at company headquarters in Germany.

Hubert Häring is looking forward to his new tasks. His many years as MR's sales director have allowed him to acquire an excellent knowledge of the Chinese market. Next on his agenda will be lots of visits to customers in order to further strengthen and expand the good contacts. One thing is particularly high on his list: „Reliable after-sales service. At Panyu, we have a team of specialists and even a training center of our own, where we have trained a considerable number of Chinese transformer manufacturers' employees so far. They were thrilled with the high technological standard and the quality of the training".

Manufacture of the OILTAP® V and VACUTAP® AVT tap-changers for dry-type transformers at Panyu is running at full throttle. And MR plans to dazzle customers with new and ground-breaking innovations. That is why to visit the MR booth at the Beijing 5th International Power Transmission and Distribution Fair on October 12th through 14th, 2005 will be worthwhile. Additionally Dr. Dazong Shen from MR's R&D department will give there a lecture on vacuum technology. ●

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Successful Turnkey Project in Qatar

Al Hamad Trading, MR's agent in Qatar, successfully completed a project involving the engineering, supply, installation and commissioning of two automatic voltage regulators TAPCON® 240 at Qatar Chemical Company Q-Chem at their Messaied plant. Q-Chem operates two 98 MVA transformers (132/34.5 kV from EFACEC) with MR's OILTAP® M tap-changer. Prior to that, regulation of the transformers was strictly manual and without automatic voltage control. Within the scope of a turnkey project, MR and Al Hamad installed two automatic voltage regulators TAPCON® 240 for automatic voltage monitoring.

The TAPCON® 240 AVRs were installed in a special Rittal cabinet, following major electrical modifications at the main substation to accommodate the AVRs. Along with specially ordered indicators to measure the incoming voltages, the commissioning and training was done by MR engineers. The entire project took almost six months to plan and three months to execute. It is especially the industrial companies – with their operation of machinery and equipment – who stand to profit most from a constant voltage and in particular automatic voltage regulation.

The photo shows Q-Chem engineers with Al Hamad Trading's General Manager Manoj Megchani (extreme right). ●

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MRcademy for the first time in Asia



Bangkok was chosen to host the first MRcademy in Asia. About 140 invited guests participated and highly welcomed the good organization of local MR agent Tan&Sons. The conference theme was "Asset Management for your On-Load Tap-Changing Power Transformers". On Monday, August 8, 2005, the participants attended the different workshops in the Novotel Siam Square in Bangkok. Managers and Engineers from local transformer manufacturers like ABB, Charoen Chai Transformer Co., Ltd or Ekarat Engineering Public Co.,Ltd were present as also representatives from Thai utilities EGAT, MEA and PEA or industrial companies like Siam Yamato Steel Co., Ltd. or Thai Petrochemical Industry Group of Companies.

Special interest was given to the lecture about vacuum switching technology for on-load tap-changers. ●

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Register now for MRcademy in Germany and The Netherlands



Overwhelmed by the successful events in Dubai, Madrid and Bangkok, we have decided to open MRcademy's gates twice again this year. Our customers from Germany, Austria and Switzerland will be in for a truly outstanding experience on September 28 and 29, 2005 in Vöhringen/Ulm: for the first time in Germany, we'll be hosting a transformer workshop directly at the 'hotspot' itself – a

substation of Lechwerke (LEW) power company. Our participants will be given the opportunity to attend a complete tap changer maintenance. And what is more: we'll be putting on a series of live demonstrations using a 200MVA transformer (installing Messko-accessories, exchange of motordrive ED). Add to that eight presentations of field-experienced specialists and five theme pavilions for professional users. Anyone interested in signing up should act fast: there are only a few seats left. All registration forms are available on our German homepage. ●

On October 18 and 19, 2005 we'll be delighted to meet our customers from Belgium and the Netherlands. We'll be happy to welcome them at the Hotel Koniginshof in Eindhoven for a series of presentations tailored specifically to meet the requirements of these two countries: e.g. the issue of savings potentials in maintenance or Power Quality, among else. In addition to MR's specialists, we'll also give the stage to guest speakers. Interested in attending? The program and registration form are available on our homepage (www.reinhausen.com). ●

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All RMV-LTCs equipped with Monitoring now

New Standard at Reinhausen Manufacturing

Reinhausen's RMV line of VACUTAP® Load Tap Changers (LTCs) are taking the concept of "Maintenance-Free" to a whole new level. Effective July 1st, 2005 the enhanced Model 'B' Vacuum Interrupter Monitoring (VIM) System is now standard equipment on all variations of the RMV. Reinhausen completes the circuit board wiring and its new location within the motordrive cabinet improves accessibility and functionality of the system. Continuous improvement with an appreciation of value for our customers is a way of life at Reinhausen Manufacturing.

In addition Reinhausen automatic voltage regulators type TAPCON® 230 can be easily integrated (see photo on the right) ●

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High ranking Award for Dr. Axel Krämer

Head of MR's Test Department



During the "Transformer 05" from May 16th to 19th 2005 in Pieczyska (Poland) the "Professor Alfons Hoffmann Medal" was granted to international participants for their outstanding merits in the field of the development of power engineering, especially progress of transformers, and for propagating the Professor's idea. One of them was Dr.-Ing. Axel Krämer, Head of Test Department and Chief Consultant Application Engineering at MR Regensburg see photo center). The medals were handed over by Tadeusz Domzalski (President of the Association of Polish Electrical Engineers, Division Bydgoszcz; President of the Chapter of the Prof. A. Hoffmann's medal, left) and Prof. Janusz Turowski PhD, DSc, Dr. h.c. (WSHE – Lodz; Technical University of Lodz, right). ●

Unique OLTC-Compendium

This book is a standard work when it comes to on-load tap-changers. Its title: "On-load Tap-changers for Power Transformers: Operations, Principles, Applications and Selection". The author, Dr. Axel Krämer has been with MR since 1991 where he is head of the test department. This English-language volume is only available from us. You can order it on our website. ●

www.reinhausen.com/mr/en/news/media_order/

New Video CD: installation of OLTCs

What is involved in installing an on-load tap-changer in the transformer? With camera in hand, we had the opportunity to watch. Here are the primary steps from unpacking down to coupling with the motor drive unit ED. Interested in our video CD? It is available in english and chinese. Check out our website for the order form. ●

www.reinhausen.com/mr/en/news/media_order/

Dynamic Compensation Solutions for Drilling Companies

Save Money with PQM Berlin's Tailor-made Solutions



The experts of Power Quality Management Berlin were commissioned for the second time in short order to equip a drilling derrick of German company ITAG Tiefbohr GmbH (Celle) with a dynamic compensation system. For a geothermal power drilling project in Munich, a container

was equipped with a compensation plant supplied via mobile transformer station from the public power network.

Up to that point, the power demand of mobile drilling fields had been satisfied by Diesel generators. In view of the high operating costs, however, it seemed like the most economical solution to supply the power via mobile transfer stations from an integrated network. Characteristic of this type of power supply is that in addition to the active power, the reactive power volume is also recorded by the meters and hence charged to the user. For that reason it was necessary to equip the transfer stations in the containers with reactive power compensation systems.

Another good reason for the use of compensation systems was the necessity to keep the current loads of the provisional feed-ins for the mobile drilling stations as low as possible. Reactive power compensation systems, which reduce the power volume to the pure active-power component and hence limit the current loads at the feed-ins, are an important contribution to meeting that requirement, allowing current reductions of up to 50%, depending on load condition!

What makes equipment used for drilling purposes so challenging is the sudden and rapid application of loads to the rotary drive and lifting equipment for the drill poles. I.e. the compensation systems must react simultaneously with the load changes. To meet this requirement, PQM Berlin used dynamic compensation systems with a nominal capacity of 2.8 Mvar total. In systems



such as these, the reactor-protected capacitor steps are operated by electronic thyristor controllers, without delay and without system perturbations, while the network load is reduced to a minimum at all times.

The compensation systems have successfully stood their first tests in the tough drilling business. Expectations have been more than met: no more costs for reactive power, coupled with important reductions in feed-in current loads. ●

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