VACUTAP® VV®

THE COMPACT ON-LOAD TAP-CHANGER TYPE M

TRANSFORMER CONTROL


GH 009
MR

EXPERIENCE FROM US – SECURITY FOR YOU.

The on-load tap-changers of the VACUTAP® series combine decades of experience in vacuum-switching technology with the consistent further development of this technology. This results in on-load tap-changers with unbeatable reliability and efficiency.

We started to develop vacuum-switching technology back in the 1980s. Extensive know-how makes us an expert in this innovative technology.

In contrast to conventional oil circuit engineering, there is no arcing in the insulating oil with VACUTAP® on-load tap-changers. Therefore, no oil filter unit is required in operation. Additionally, this new generation of tap changers is designed for use with selected alternative insulating fluids.

Benefits of vacuum technology compared with oil circuit engineering:

- No arcing in the tap-changer oil
- No oil filter unit needed
- Clean oil makes maintenance work easier and faster
- Substantially reduced frequency of maintenance compared to conventional oil circuit engineering

Extra: Constant switching characteristics over the entire life of the vacuum interrupter. The vacuum level in the tubes is even improved further during switching operations because the metal vapor plasma generated by the arc from the contact material binds with free gas molecules (getter effect). In addition, there is no oxidation of the contact surface. This ensures a uniformly good transition resistance.

Compact design

The VACUTAP® VV® combines a diverter switch and tap selector in one functional unit.
This compact design offers a low-cost solution, especially for delta-connected transformer windings.

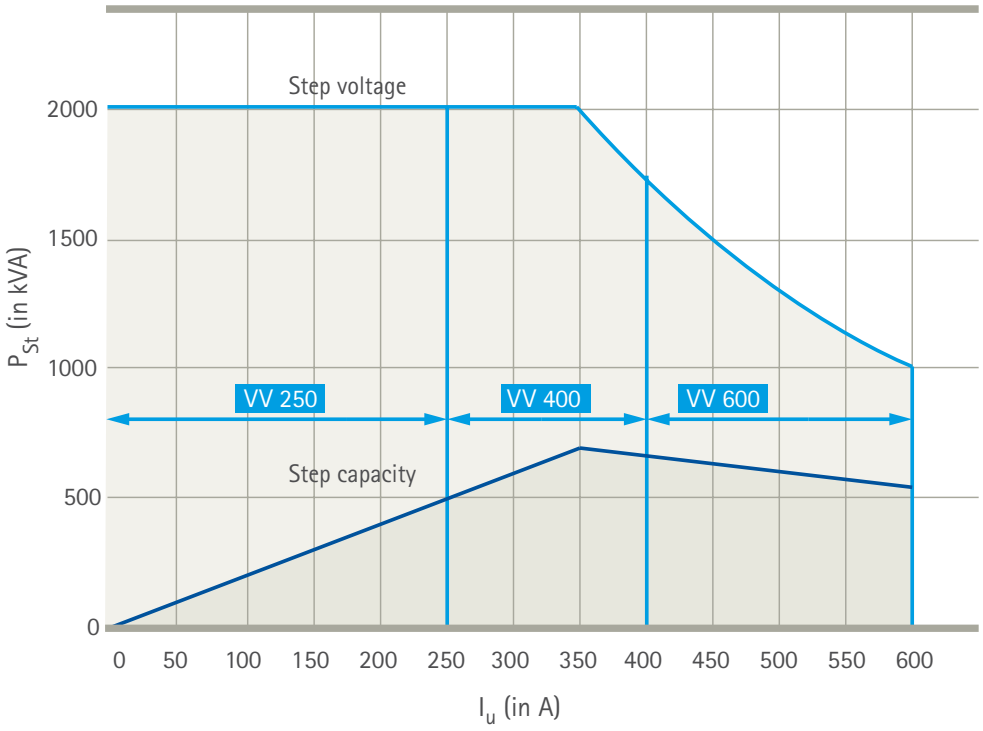
Maintenance-free for nearly all network applications

In 2006, VACUTAP® VR® and VV® became the first tap-changers anywhere in the world to perform 300,000 tap-change operations without maintenance. For you this means maintenance-free performance for nearly all network applications and therefore maximum availability of your transformers. This is made possible through features such as vacuum interrupters, which are developed in-house in accordance with our strict requirements and have proven themselves in years of operation. In our globally unique Testing Department, our on-load tap-changers are also tested in mechanical and electrical service life tests well beyond the requirements of IEC standards.

ATEX-certified

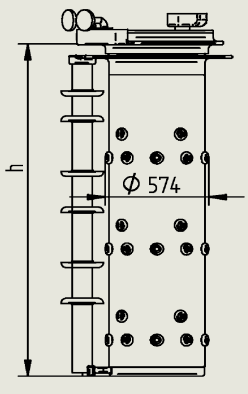
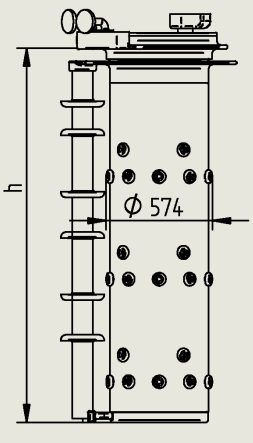
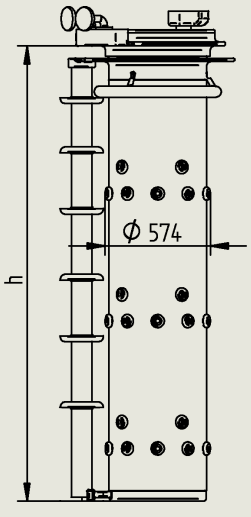
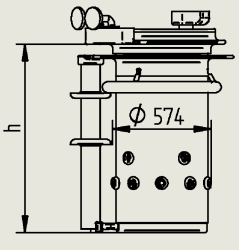
MR vacuum switches are used in steel and aluminum smelters around the world as well as on drilling rigs in areas that pose an explosion hazard or in chemical operations with a corrosive or dirty environment. This is because MR is the first and only manufacturer of on-load tap-changers to have VACUTAP® VV® and VACUTAP® VR® tap changers certified in accordance with Directive 94/9/EC (ATEX) – conforms to IEC and NEC 505 in North America.

VACUTAP® VV® step capacity diagram



Step capacity diagram for electric arc furnaces upon request.

Installation lengths

3-phase MIII					1-phase VV I	
Y 40 kV	D 40 kV	Y 76 kV	D 76 kV	D 145 kV	76 kV	145 kV
250, 400, 600 A	250, 400, 600 A	250, 400, 600 A	250, 400, 600 A	250, 400 A	400 A	400 A
h = 1,628 mm	h = 1,628 mm	h = 1,810 mm	h = 1,810 mm	h = 2,224 mm	h = 816 mm	h = 978 mm
						

TECHNICAL DATA.

On-load tap-changer

Designation	VV III 250 Y	VV III 250 D	VV III 400 Y	VV III 400 D
Number of phases and application	3; at neutral point	3; at any point on winding	3; at neutral point	3; at any point on winding
Max. rated through-current I_{um} (in A)	250		400	
Rated short-time current (in kA)	4		5	
Rated duration of short-circuits (in s)	3		3	
Rated peak withstand current (in kA)	10		12.5	
Rated step voltage U_i (in V)	2,000		2,000 ... 1,700 [1]	
Step capacity (in kVA)	See P_{St}/I_u diagram			
Rated frequency	50 ... 60 Hz			
Operating positions	Without change-over selector: max. 12, with change-over selector: max. 23			
Rated insulation level				
Highest voltage for equipment U_m (in kV) [2]	40/76	40/76/145 [4]	40/76	40/76/145 [4]
Rated lightning impulse withstand voltage (in kV, 1.2 | 50)	200/350	200/350/650	200/350	200/350/650
Rated short-duration power frequency withstand voltage (in kV, 50 Hz, 1 min)	70/140	70/140/275	70/140	70/140/275
Rated withstand voltages of internal insulation	See table 2.3 in technical data for VACUTAP® VV® (TD 203)			
Oil compartment	Pressure-tight up to 0.3 bar permanent differential pressure (testpressure 0.6 bar), head and cover of the on-load tap-changer are vacuum-proof.			
Temperature range	The VACUTAP® VV® on-load tap-changer can be operated in the rated load range at oil temperatures of between -25 °C and +105 °C.			

On-load tap-changer

Designation	M III 600	VV III 600 D	VV I 401 [3]	VV I 401 [3]
Number of phases and application	3; at neutral point	3; at any point on winding	1; at any point on winding	
Max. rated through-current I_{um} (in A)	600		400	
Rated short-time current (in kA)	6		5	
Rated duration of short-circuits (in s)	3		3	
Rated peak withstand current (in kA)	15		12.5	
Rated step voltage U_i (in V)	2,000 ... 1,000 [1]		2,000 ... 1,700 [1]	
Step capacity (in kVA)	See P_{St}/I_u diagram			
Rated frequency	50 ... 60 Hz			
Operating positions	Without change-over selector: max. 12 With change-over selector: max. 23		With change-over selector: max. 23	
Rated insulation level				
Highest voltage for equipment U_m (in kV) [2]	40/76	40/76/145 [4]	76	145 [4]
Rated lightning impulse withstand voltage (in kV, 1.2 | 50)	200/350	200/350/650	350	650
Rated short-duration power frequency withstand voltage (in kV, 50 Hz, 1 min)	70/140	70/140/275	140	275
Rated withstand voltages of internal insulation	See table 2.3 in technical data for VACUTAP® VV® (TD 203)			
Oil compartment	Pressure-tight up to 0.3 bar permanent differential pressure (test pressure 0.6 bar), head and cover of the on-load tap-changer are vacuum-proof.			
Temperature range	The VACUTAP® VV® on-load tap-changer can be operated in the rated load range at oil temperatures of between -25 °C and +105 °C.			

[1] See also P_{St}-/I_u diagram
[2] In accordance with VDE 0111, Part 1: Effective value of the conductor-conductor voltage for which an equipment is dimensioned in terms of its insulation.
[3] 600 A model on request
[4] A maximum operating voltage of 132 kV + 15 % = 151.8 kV is permitted if the test voltages for the 145 kV series are not exceeded.

ENVIRONMENTALLY FRIENDLY AND FORWARD-LOOKING.

A future trend in transformer technology has kept our developers busy: the increasing demand for higher fire safety, greater compatibility with the environment and largely maintenance-free performance. We have found a solution. It is based on the connection of our VACUTAP® technology with alternative insulating fluids.

Alternative insulating fluids with natural esters are made from plants such as rapeseed, soy, sunflower or coconut. Filtering these fluids and adding additives results in a high-quality electrical insulating fluid that provides exactly the advantages that will be required in the future.

All variants of our VACUTAP® VV® on-load tap-changer are suitable for use with selected alternative insulating fluids.

Permitted oil temperature (°C) for tap-changer operation		
On-load tap-changer type	Synthetic esters	Natural esters
VACUTAP® VV®	-15 to +115	-10 to +115

Permitted ester fluids:

- Synthetic ester: – MIDEL 7131 (M&I)
  – ENVIROTEMP 200 (Cargill)
- Natural ester: – ENVIROTEMP FR3 (Cargill)
  – BIOTEMP (ABB)

Fireproof

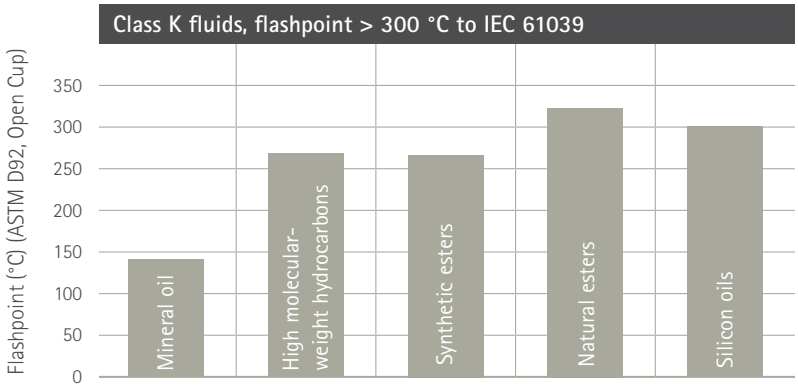
A variety of fluids is available on the market that fulfill fire protection requirements (class K fluids with a flashpoint > 300 °C to IEC 61100). The natural esters seem particularly advantageous in this regard.

Water hazard class*	
Mineral oil	1
HMWH	1
Silicone oil	1
Synthetic esters	0
Natural esters	0

*Classification in accordance with the German Administrative Regulation on the Classification of Substances hazardous to waters into Water Hazard Classes (VwVwS), Germany 1999: WGK 0 = non-hazardous to water, WGK 1 = low water hazard

Biodegradable

The environmental friendliness (biodegradability) of a material can be evaluated by, for example, its classification into a water hazard class. Ester fluids have an advantage in this regard because they are classified as "non-hazardous to water".



Please note: The use of VACUTAP® tap changers in conjunction with ester fluids is a special application.
Our experts will work with you to clarify the possibilities for the specific application.

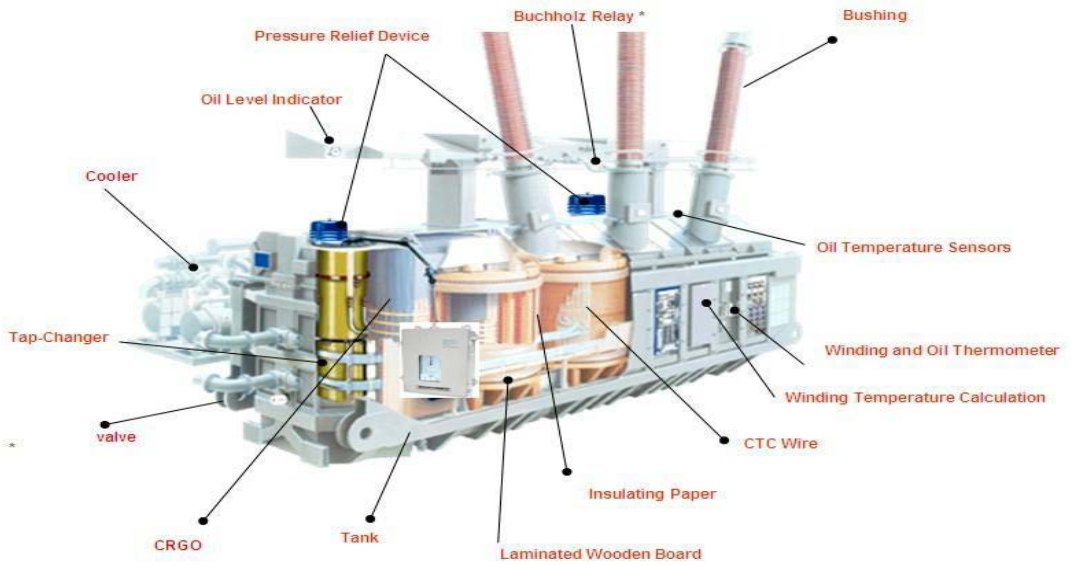
Detailed information can be found in our publication "Alternative Liquids for Tap-Changers".

VACUTAP® VV® –
AN INVESTMENT THAT PAYS OFF.

COMPLETE SPARE PARTS FOR TAP CHANGER type M :

* CONTACT LEADS
* O-RING
* SCREENING CAP
* Bildanleitungen/QUICK GUIDE VV
* Motor-drive unit
* BRAIDED LEAD
* PROTECTIVE RELAY
* CURRENT STRIP
* SQUARE TUBE (Ex)
* COUPLING BRACKET SUBASSEMBLY
* COUPLING BOLT
* WASHER
* NUT
* CARDAN JOINT WITH O-RING COMPL. K90
* CARDAN JOINT
* EXTERNAL TUBE SET 1150LG/1150LG
* HOSE CLIP D85-110 W5
* GUIDE PLATE
* Adapter
* ROTATABLE PROTECTIVE TUBE
* Guard plate cpl 2300 long, varnished
* GEAR CD6400-90-90-A/B 1:1
* HOSE CLIP D85-110 W5
* Diverter switch insert
* HEXAGON HEAD SCREW
* HEX NUT
* COMPLETE DIVETER HOUSING*

Maschinenfabrik Reinhausen GmbH Tap changer
for Power Transformer 120,000 KVA



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THE POWER BEHIND POWER.