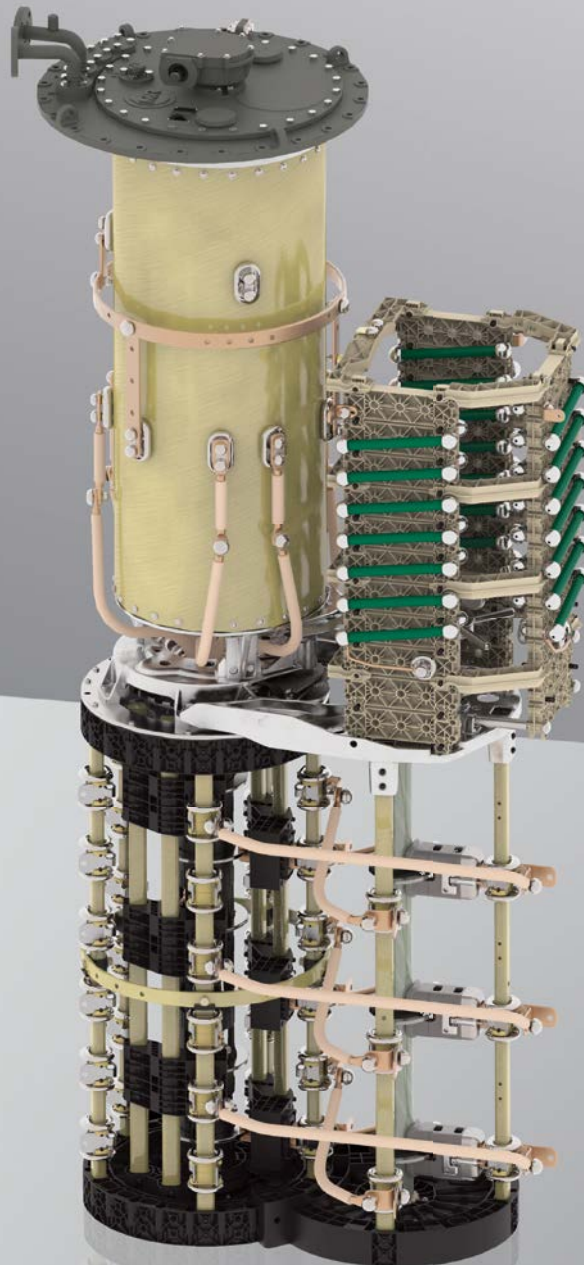




VACUTAP® VR®

MAXIMUM PERFORMANCE.
MAXIMALLY TESTED.

WWW.REINHAUSEN.COM



THE VACUTAP® VR®.
FROM THE INVENTORS OF VACUUM
SWITCHING TECHNOLOGY.



VACUTAP® on-load tap-changers are demonstrating their value around the world thanks to their unmatched ruggedness, reliability and economical operation. They are effective both in everyday use as well as during overload operation of a transformer, or when the requirements for transformer availability are extremely high. We launched the first generation of the VACUTAP® VR® in 2004. Providing 300,000 tap-change operations without requiring maintenance meant zero maintenance for virtually all network applications. The VACUTAP® VR® goes one step further and offers even more power – for maximum performance.

Several tenthousand VACUTAP® VR® units are currently demonstrating their value for our customers around the world. Our engineers incorporated this one-of-a-kind operating experience into the development of the VACUTAP® VR®. The result is sure to impress: Optimization of the design allowed us to increase the permitted values for step voltage and switching capacity once again.

The combination with the R-selector provides additional advantages. The R-selector displays these advantages through the significantly increased tap-changing capacity of the change-over selector and higher permissible operating and testing voltages. This means that higher power requirements are ideal for taking full advantage of the strengths of this combination. In addition, the Active Gas Inhibition System** can be used to reduce gas generation in the transformer tank caused by tap selector operations by up to 90 percent.

Reliable. Rugged. Economical.

These three traits are the essence of our VACUTAP® technology. And the VACUTAP® VR® takes advantage of the enormous versatility offered by this technology. It is ideal for all operating applications:

- Grid
- Electric arc furnace
- HVDC
- Variable shunt reactors
- Phase shifters

In terms of economy, the VACUTAP® VR® makes no compromises, enabling 300,000 tap change operations with-out any maintenance. The diverter switch insert can be used for 1.2 million tap changes before needing replacement.



*Available as an option or by default depending on the selector size.

VACUTAP® VR® – EXPERTISE MAKES THE DIFFERENCE.

The VACUTAP® VR® is delivered with all of our expertise gained of more than 30 years of vacuum technology development. This expert knowledge can be seen in many technical details. Details that make the difference and guarantee reliable and safe operation. This makes the VACUTAP® VR® much more than an on-load tap-changer. It is the original. Original VACUTAP®.

VACUTAP® Advanced Arc Control System

The perfectly tuned interaction between our vacuum interrupter (Advanced Interrupter Technology), specially developed for on-load tap-changer applications, and the patented actuation kinematics ensures reliable and optimal arc quenching

Interrupter Exchange Module

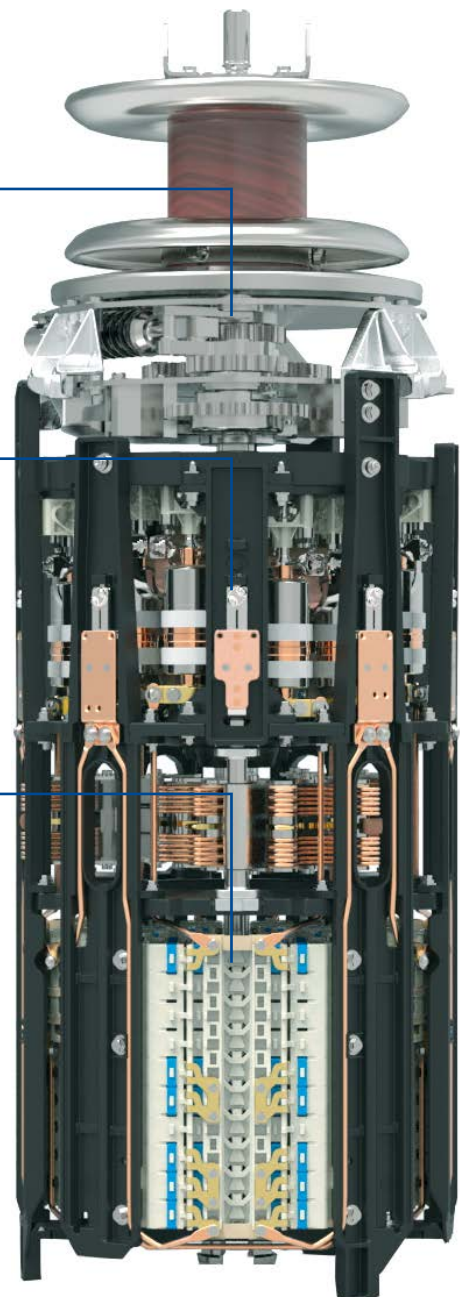
- For applications with an extremely high number of tap-change operations, e.g. electric arc furnace
- Complete carrier unit with pre-installed vacuum interrupters
- A simplified replacement after 600,000 tap-change operations (e.g. electric arc furnace) reduces maintenance-related production shutdown times

VACUTAP® Step Protection System

- This system protects the diverter switch from a phase short circuit when overvoltages occur in the network (e.g. due to lightning strikes, switching operations, etc.)
- Optimal insulation coordination within the diverter switch prevents damage to the insulation in the diverter switch

Advanced Flux Control System

Ensures the function of the vacuum interrupter with the VACUATP® VRL® I 1801..3201 versions at extreme currents magnetic fields in high-end applications



VACUTAP® VR® WITH R-SELECTOR* – A FUTURE-DEFINING COMBINATION.

The R-selector and the VACUTAP® VR® are an unbeatable team for high power capacities. The generation of selectors features more than just an increased switching capacity of the change-over selector. The R-selector combines high economy with maximum durability.

Potential connection concept

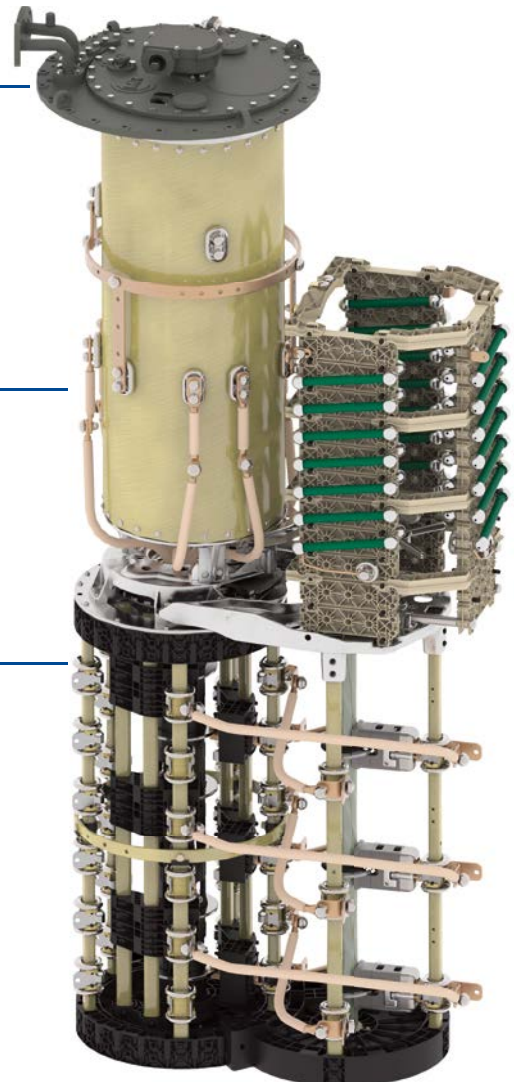
The length of the R-selector does not depend on whether tie-in resistors or tie-in switches are being used. This is made possible by the modular potential connection concept, whereby the required resistors as well as the optional tie-in switches are installed on the side, above the change-over selector. This gives transformer manufacturers planning security in the layout and design of transformer tanks from the very beginning.

Active Gas Inhibition System®**

When disconnecting change-over selector contacts, a capacitive current caused by the coupling capacitors of the tap windings has to be interrupted. The Active Gas Inhibition System® ensures that minimal gas is generated by the change-over selector connection. The high permissible reverse voltage of 60 kV and the cut-off current of up to 600 mA are decisive here.

Optimized handling

Customer requests were consistently implemented in the design of the R-selector. This made it possible to improve the handling significantly. This enables shorter lead times for transformer manufacturers and ultimately reduces costs. Lifting the selector to the diverter switch oil compartment (using a forklift or scissors lift) is also made easier, since the bottoms of the tap selectors and change-over selectors are on the same level. This means improved handling as well as increased work safety when connecting to the diverter switch. Selector take-off leads on the interior side and the resulting simplification of the cable routing guarantee more space and flexibility for the connecting leads. The contacts are also more accessible and provide a larger connection surface.



VACUTAP®	I _r	Phases	Selector
VRS®/VRM®/VRL®/VRH®	700...1300 A	I + II + III	R-selector up to 6 levels
VRL®	1600 A	III (Y)	E-selector with 6 levels
	1600 A	I	R-selector with 4 levels
	1800...2400 A	I	
	2401...3200 A	I	R-selector with 6 levels

** Available as an option or by default depending on the selector size.

VACUTAP® VR® – TECHNICAL DATA.

On-load tap-changer	VACUTAP® VRS® I/II/III				VACUTAP® VRM® I/II/III			
Designation	VRS I 701 VRS II 702 VRS III 700 Y	VRS I 1001 VRS II 1002 VRS III 1000 Y	VRS I 1301 VRS II 1302 VRS III 1300 Y	VRS I 2622 ¹⁾	VRM I 701 VRM II 702 VRM III 700 Y	VRM I 1001 VRM II 1002 VRM III 1000 Y	VRM I 1301 VRM II 1302 VRM III 1300 Y	VRM I 2622 ¹⁾
Max. rated through-current I _r (A)	700	1000	1300	2600	700	1000	1300	2600
Rated short-time current (kA)	10	12	16	26	10	12	16	26
Rated duration of short-circuits (s)	3	3	3	3	3	3	3	3
Rated peak withstand current (kA)	25	30	40	65	25	30	40	65
Max. rated step voltage U _{ir} (V)	4500	4500	4500	4500	4500	4500	4500	4500
Step capacity P _{stm} (kVA)	1500 ²⁾ 2100 ²⁾	1500 ²⁾ 2100 ²⁾	1500 ²⁾ 2100 ²⁾	3000 ²⁾ 4200 ²⁾	3000	3000	3000	6000
Rated frequency (Hz)	50...60				50...60			
Operating positions	without change-over selector: max. 18, with change-over selector: max. 35				without change-over selector: max. 18, with change-over selector: max. 35			
Motor-drive unit	ETOS®				ETOS®			

¹⁾ Forced current splitting by two parallel winding branches required. Not for electrical arc furnace operation.

²⁾ See step capacity diagram

³⁾ The VACUTAP® VRH® and VRX® on-load tap-changers are special models and are only available on request.

⁴⁾ VRL I 1601 with R-selector (4 levels); VRL III 1600Y with E-selector (6 levels).

Rated insulation level

Designation	VRS III 700 Y VRS III 1000 Y VRS III 1300 Y	VRM III 700 Y VRM III 1000 Y VRM III 1300 Y	VRL III 1300 Y VRL III 1600Y	VRH III 650 Y ²⁾ VRH III 1300 Y ²⁾	VRS II 702 VRS II 1002 VRS II 1302	VRM II 702 VRM II 1002 VRM II 1302	VRL II 1302	VRH II 652 ²⁾ VRH II 1302 ²⁾		
Highest voltage for equipment U _m (kV)	72,5	123	170	245	72,5	123	170	245	300	362
Rated lightning impulse withstand voltage (kV, 1.2 50 μs)	350	550	750	1050	350	550	750	1050	1050	1175
Rated short-duration power frequency withstand voltage (kV, 50 Hz, 1 min.)	140	230	325	460	140	230	325	460	460	510

¹⁾ Forced current splitting by two parallel winding branches required. Not for electrical arc furnace operation.

²⁾ Special applications on request

VACUTAP® VRL® I/II/III

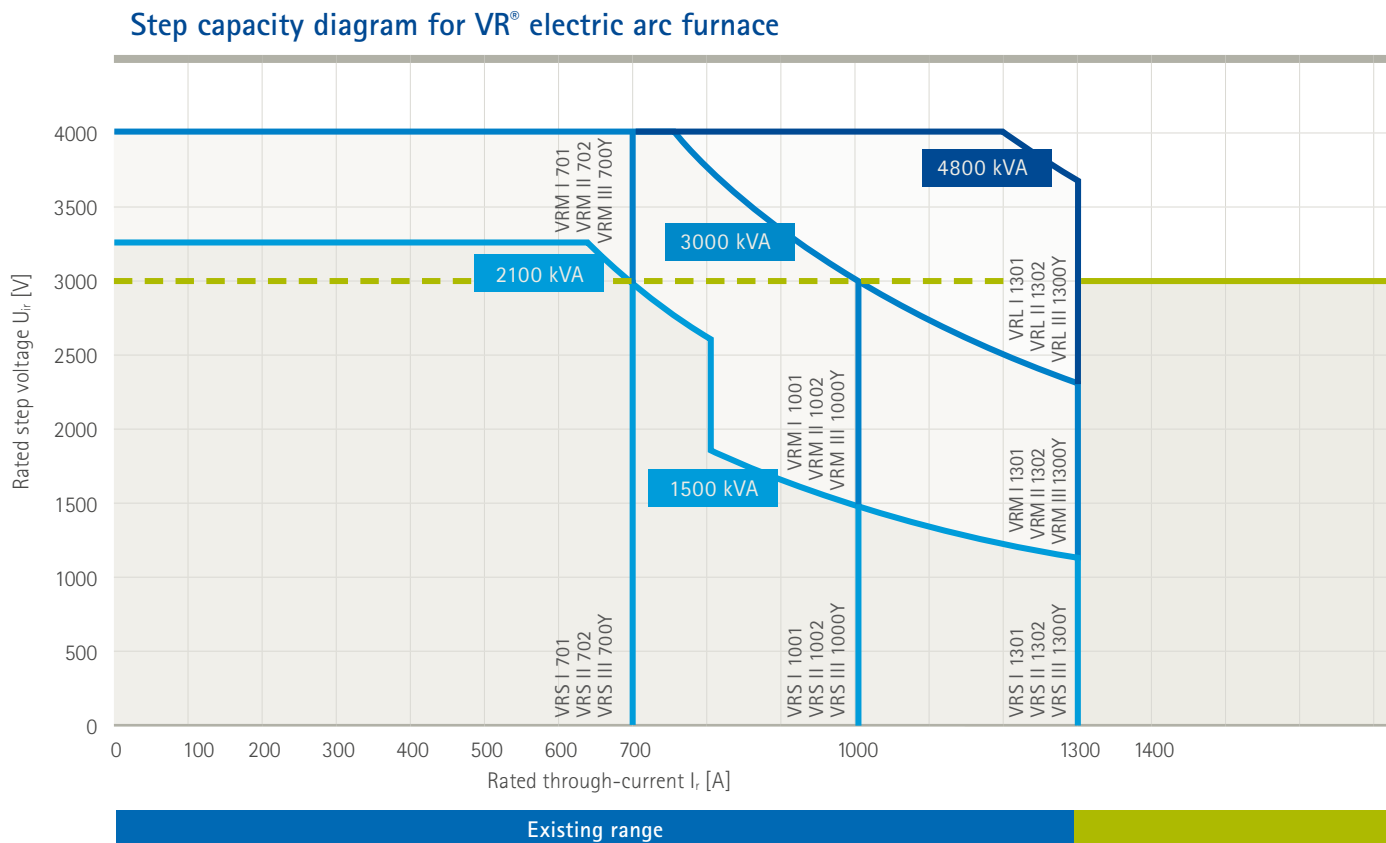
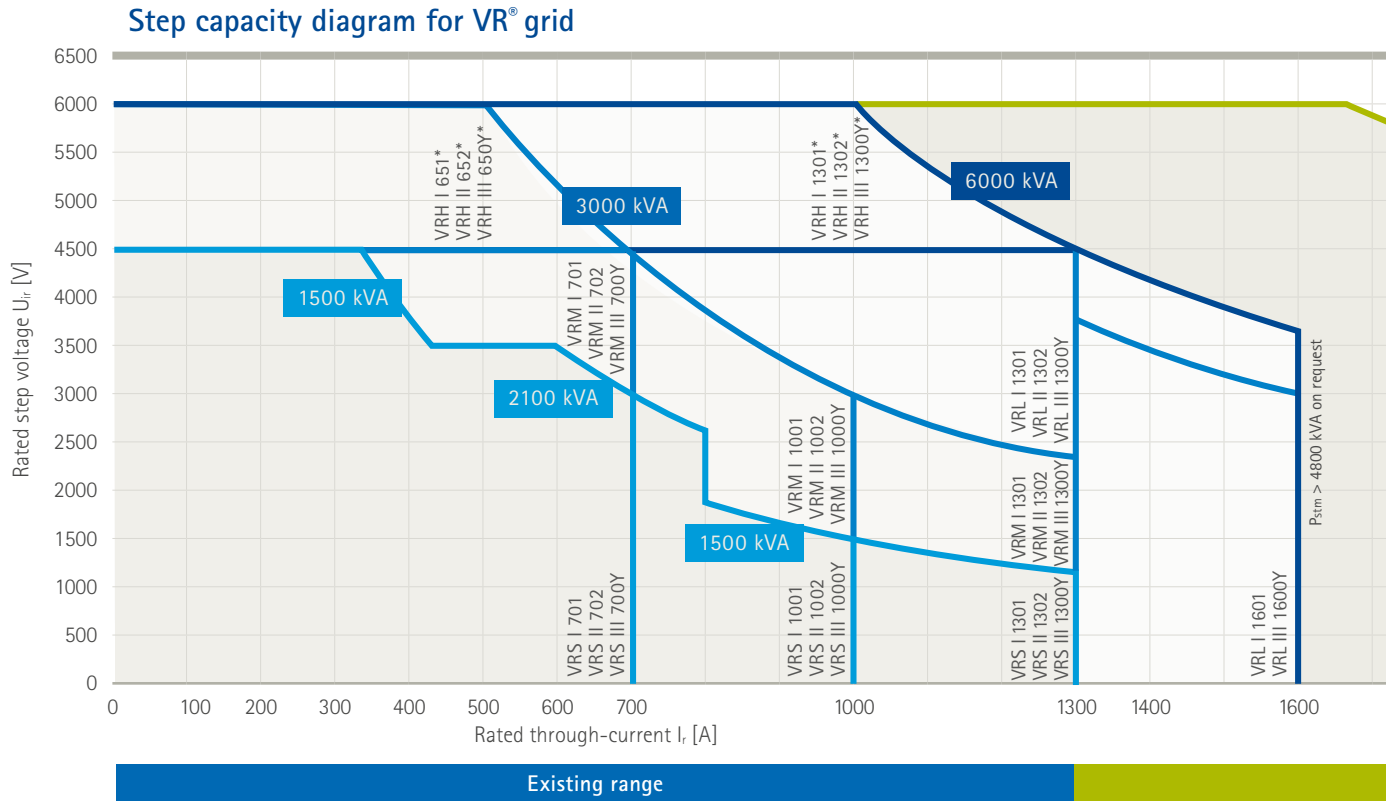
VACUTAP® VRH®/VRX® I/II/III³⁾

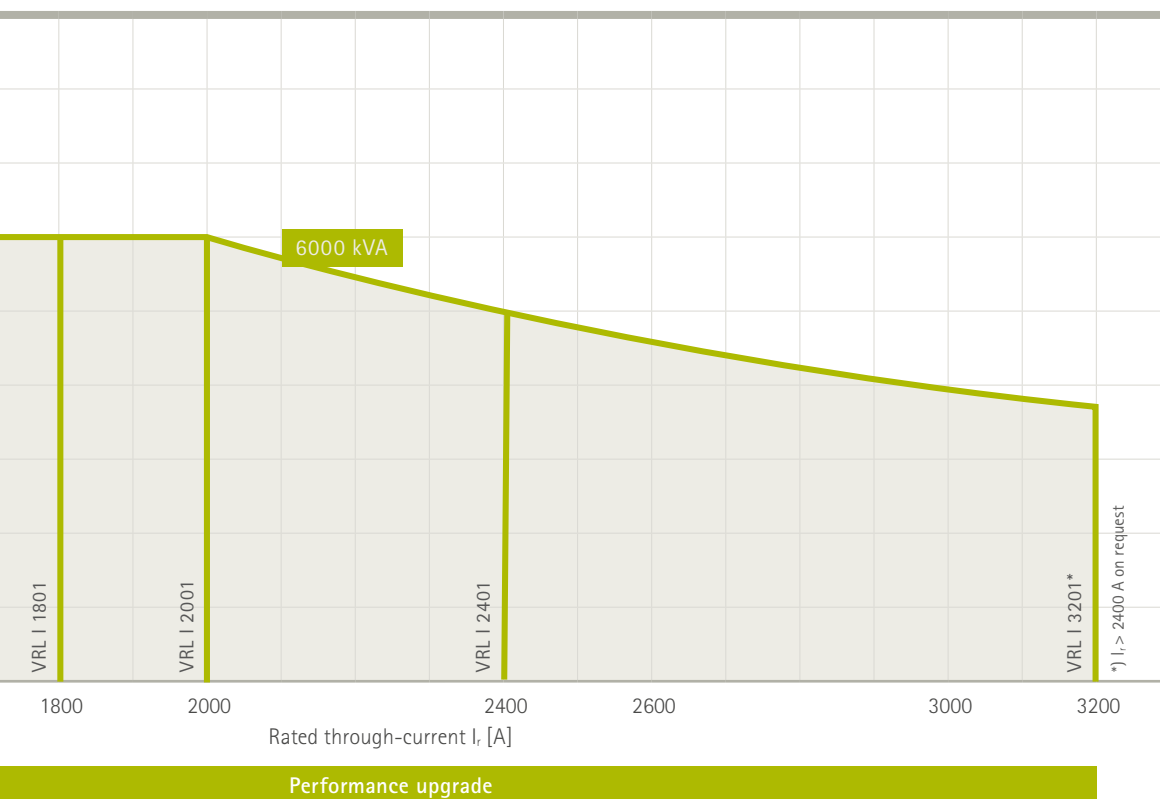
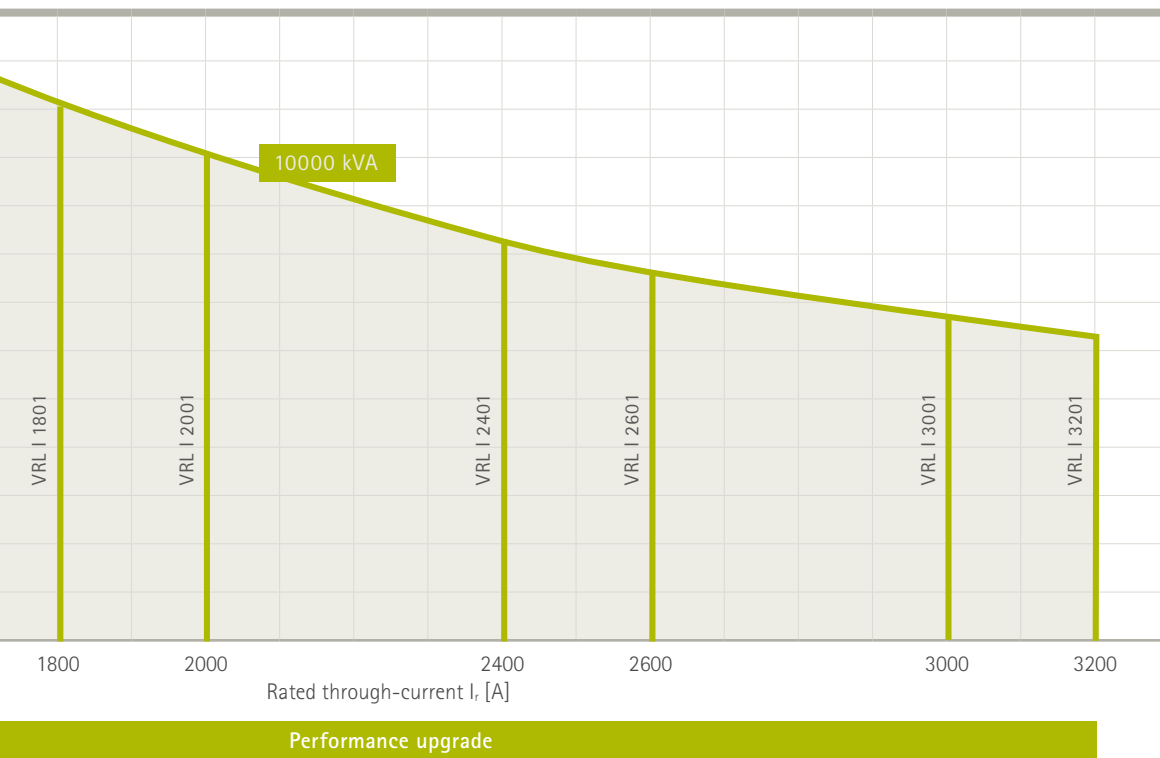
VRL I 1301 VRL II 1302 VRL III 1300 Y	VRL I 1601 ⁴⁾ VRL III 1600 Y ⁴⁾	VRL I 1801	VRL I 2001	VRL I 2401	VRL I 2601 VRL I 2622 ¹⁾	VRL I 3001	VRL I 3201
1300	1600	1800	2000	2400	2600	3000	3200
16	16	19	24	24	25/26	30	32
3	3	3	3	3	3	3	3
40	40	47,5	60	60	65	75	80
4500	4500	6000	6000	6000	6000 4500	6000	6000
5850	4800 ²⁾ 6000 ²⁾	10000	10000	10000	10000 11700	10000	10000
50...60							
without change-over selector: max. 18, with change-over selector: max. 35							
ETOS®							

VRH I 651 VRH II 652 VRH III 650 Y	VRH I 1301 VRH II 1302 VRH III 1300 Y	VRH I 2622 ¹⁾	VRX I 652	VRX I 1302
650	1300	2600	650	1300
10	16	26	10	16
3	3	3	3	3
25	40	65	25	40
6000	6000	6000	12000 ²⁾	12000 ²⁾
3000	6000	12000	6000	12000
50...60				
without change-over selector: max. 18, with change-over selector: max. 35				
ETOS®				

VRS I 701 VRS I 1001 VRS I 1301 VRS I 2622 ¹⁾	VRM I 701 VRM I 1001 VRM I 1301 VRM I 2622 ¹⁾	VRL I 1301 VRL I 1601 VRL I 1801 VRL I 2001 VRL I 2401 VRL I 2601 ²⁾ VRL I 2622 ^{1) 2)} VRL I 3001 ²⁾ VRL I 32 01 ²⁾	VRH I 651 ²⁾ VRH I 1301 ²⁾ VRH I 2622 ^{1) 2)}	VRX I 652 ²⁾ VRX I 1302 ²⁾
72,5	123	245	300	420
350	550	1050	1050	1425
140	230	460	460	630

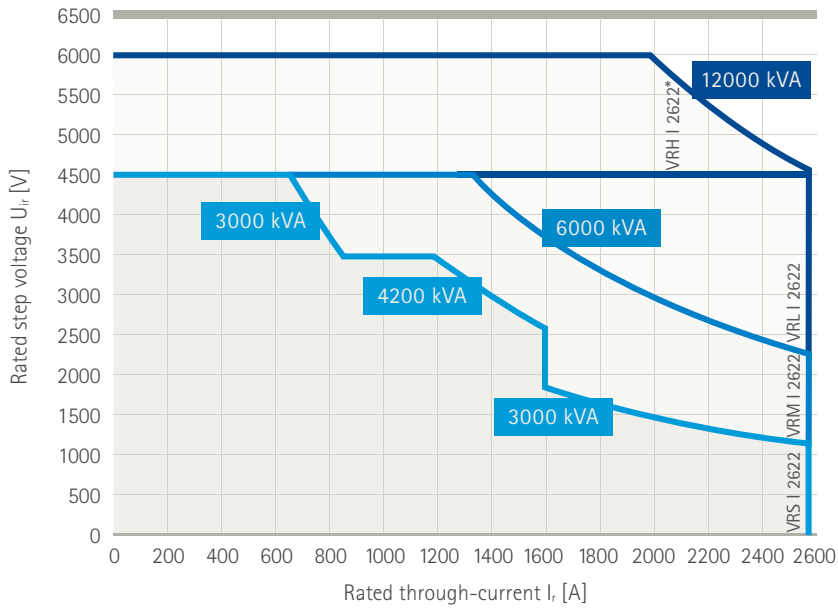
VACUTAP® VR® – TECHNICAL DATA.



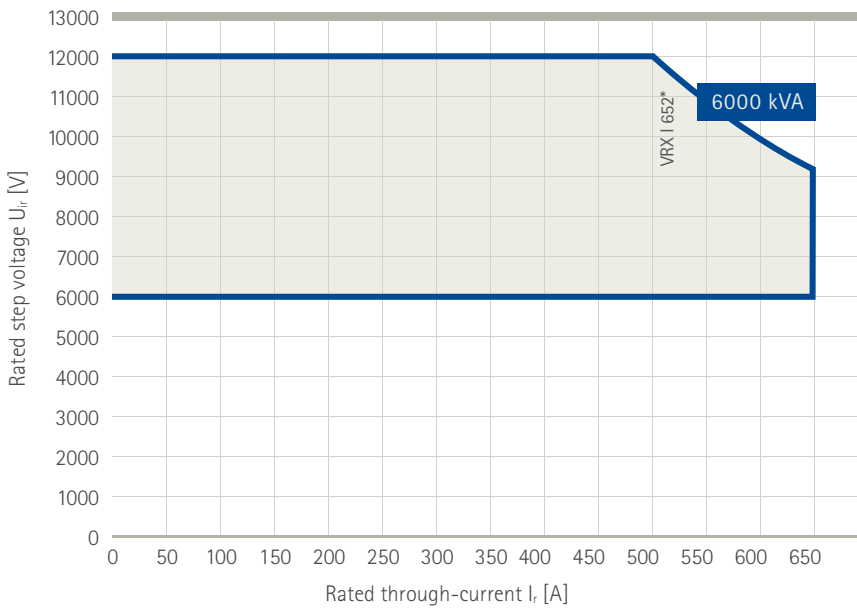


VACUTAP® VR® – TECHNICAL DATA.

Grid with forced current splitting VR®
step capacity diagram



VRX® I 652 step capacity diagram



MORE POWER. MORE VALUE.



Maintenance-free and long-lasting

- Maintenance interval of 300,000 tap changes without time-based components
- Lifetime of the diverter switch insert is 1.2 million tap-change operations
- Minimal maintenance requirement despite maximum lifetime



Maximum operational reliability

- Absolutely reliable arc quenching thanks to VACUTAP® Advanced Arc Control System
- Maximum protection of the diverter switch in the event of surges in the network thanks to VACUTAP® Step Protection System



Low life-cycle costs

- Completely maintenance-free in most applications
- In extreme operating conditions (e.g. electric arc furnace), the Interrupter Exchange Module allows for a simplified replacement after 600,000 tap-change operations



Designed with future requirements in mind

- The top-performance vacuum on-load tap-changer for future applications
- Suitable for selected alternative insulation fluids
- Depending on the application, an optimal selection of selectors is available in various series



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THE POWER BEHIND POWER.

