# INFLUENCE OF CONATCT MATERIAL FOR ROTATING VACUUM ARCS USING INCREASED GAPS ABOVE 20 MM

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## ABSTRACT

For the use of SF6-free circuit breaker technology, vacuum circuit breakers are commonly used in medium voltage level. For higher voltage levels the vacuum interrupter cannot easily be scaled higher like a gas interrupter. The design of other components of the breaker have to be improved as well, see [1]. Higher contact gaps or series arrangements are solutions for the application of vacuum interrupters in voltage levels above 52 kV. There are 2 different contact designs commonly in use: the transversal magnetic field (TMF) and the axial magnetic field (AMF). The AMF-contact is commonly used for higher gaps or a series arrangement of 2 vacuum interrupters. This is because, through the axial magnetic field the vacuum arc is always in a diffuse mode, whereby a high current arc erosion endurance is possible. The disadvantages are the more expensive manufacturing and higher losses than the TMF-contact [2]. The TMF-contact uses the pinch effect to create a constricted arc, which starts to rotate by the radial magnetic field, which results in an even energy distribution of the surface. The limit of contact separation using TMF-contacts is not reached yet. So, the aim is to reach the greatest possible contact separation, where the TMF-effect still working and the advantages of TMF can be used in the voltage level above 52 kV.

While the breakdown of gas interrupter is based on the volume effect, the breakdown of a vacuum interrupter is based on the surface effect. A vacuum interrupter contains no gas inside and the vacuum arc occurs only due to metal evaporation [3]. Thereby, the interruption capability is influenced by the contact material, which generates the evaporated material as a result of the heat during the current interruption. The investigation of this paper will evaluate the arc rotation using CuCr25 and CuCr35 as contact material and higher contact gaps above 20 mm at current zero. This contact separation is reached by a servo drive with belt transmission [4]. The contact gap 20 and 30 mm will be carried out at a sinusoidal 50 Hz current, whereby the contact of 45 mm at a sinusoidal 35 Hz. During the breaking operation the vacuum interrupter will be stressed by a high short circuit current up to 31.5 kA rms. A high-speed camera is used for the arc observation, also electrical data in form of arc voltage and current curve is measured. A former paper [5] shows that the TMF-contacts also work without any negative effects. This paper will expand this investigation and show the influence of contact material.

## References

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