

Artur Rojek: Searching for Critical Currents of High-Speed Circuit Breaker DC

The high-speed DC circuit breakers constitute an essential protection in the event of occurrence of short circuit or overload. Before release to service they are subject to tests embracing among others designation of values and time of breaking of critical currents. According to the law provisions in vigor in Poland, those tests are conducted according to the PN-E-06121 [3] norm. This norm serves different requirements in relation to tests of critical currents than the European norms PN-EN 50123-1 [4] (DC circuit breakers for traction substations) and PN-EN 60077-3 [6] (for on-board high-speed DC circuit breakers). The Polish norm serves the maximum burning time of an arc (500ms), whereas European norms do not determine any time restriction in this field. Other differences between the requirements of Polish norms and European norms regard tension during testing, time constant of a circuit and number of repetitions.

This testing of value and time of switching off critical currents were conducted for several types of high-speed DC circuit breakers. Taking into consideration the fact that the norms do not impose critical currents values, but only contain requirements related to determining of their value, all the test finished with positive result. The values of tested circuit breakers are included within bracket between 20 A and 300 A. Test results demonstrated that the value of critical currents switched off in time lower than 500 ms is dependent on a construction of a high-speed breaker, as well as on a device that was used to support a transition of electric arc from main contacts to arc chamber and on direction of current flow through non polarized breakers.

Keywords: high-speed circuit breaker DC, critical currents, burning time of an arc, electromagnetic blowout