

Artur Rojek: DC High Speed Circuit Breakers in Rail Transport

The monograph examines the construction and principle of operation of DC high-speed circuit breakers (HSCB). There are described various breakers constructions, how their basic elements are built and how they operate, particularly as regards drives, triggers, arcing chambers and magnetic blowout devices. Special attention was drawn to HSCB parameters such as opening and arcing times as well as their possibility to switch off critical currents. Another important issue described in the monograph is the coordination of short-circuit protection in the traction vehicle – traction substation set. In the chapter relating to these problems there were presented, inter alia, test results of breaking selectivity while applying various HSCB types. Moreover, there were outlined issues related to the occurrence of short circuits in DC circuits of electric traction power supply systems, HSCB modeling, legal and normative requirements that high-speed breakers have to meet due to their place of installation, parameters and breaking methods. Two chapters are dedicated to the description of DC breaking process and its accompanying phenomena as well as external factors impact on the discharge arc and switching overvoltage. Furthermore, the influence of other equipment on the short circuit current and its switching off by a high-speed breaker was presented. The monograph is complemented with a description and an overview of HSCB parameters used in the rail transport in Poland and Europe. It also covers the history of high-speed breakers, starting with T. Edison's patent, through magnetic blowout breakers to ultrafast breakers that use semiconductors and the counterflow breaking method.

Keywords: high-speed circuit breaker, short circuits, arc voltage, coordination of protection, critical currents, breaking times