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Type tests of the ITER Switching Network Unit components and Protective Make Switches

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In ITER, each circuits of the central solenoid as well as poloidal field coils PF1 and PF6 is provided with a system for plasma initiation, called the Switching Network Unit (SNU), able to provide up to 8.5 kV for the coils. This will be obtained by inserting resistors in series with the pre-energized coils with the help of a DC current commutation unit (CCU) composed of connected-in-parallel mechanical bypass switch and a thyristor circuit breaker.

The paper describes the results of the work on development and testing of the main mechanical DC switches forming part of the CCU, namely, Bypass Open Switch (BPOS) and Bypass Make Switch (BPMS). These switches provide commutation of currents up to 55 kA at a voltage of 10 kV within 2-4 ms.

In addition, protective make switches (PMS) similar to the BPMS are considered. These devices are intended to shunt the AC/DC converters supplying power to the coils in case of their failure or in case of a quench, when the energy stored in the magnet system is extracted by a fast discharge to resistors.

After a short description of the design, the paper focuses on the procedure and results of the type tests on full-scale prototypes. In addition to electrical, hydraulic and pneumatic tests the test program implemented in 2017-2018 included EMC tests, functional tests with control system at rated currents and peak current tests at a current higher than 350 kA.

The successful results of the type tests confirmed the suitability of the design and compliance with the ITER requirements making it possible to start manufacturing of the switches for delivery to the ITER Site.

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