



Contribution ID: 368 Contribution code: WED-PO2-613-13

Type: Poster

Status and Progress on First-of-a-Kind Feeder Busbar Joint Assembly at ITER Magnet System

Wednesday 17 November 2021 10:30 (20 minutes)

In ITER magnet system, there are feeders for toroidal field (TF) coils, poloidal field (PF) coils, central solenoid (CS) modules, correction coils (CC), magnet structure cooling and monitoring instrumentation. Main busbar is used for TF, PF and CS feeders and corrector busbar for CC feeders. Main Busbar (MB) operated up to 68 kA with peak field of 3.6 T is used for TF, PF and CS feeders. Operating condition up to 10 kA with peak field of 2.9 T is led by CC feeder consisting of Corrector Busbar (CB). Nearly 250 feeder joints and coil to feeder terminal joints shall be realized during on-site assembly. The segments of superconducting busbars in each coil feeder are required to be connected in series and to the current lead and to coil terminals with busbar joints. Connections to each segment of MB and CB and coil rely on the twin-box shaking hands concept. The two half-joint boxes are assembled with shims as a means of misalignment mitigation of the assembly tolerance. In turn, ground insulation is made with compound tapes of glass-fiber and polyimide film to withstand the test voltage of 30 kV. Paschen test is considered in terms of technical benefits, risk and project schedules. Structure parts mainly consist of cooling pipes, instrumentation ducts, thermal shield and vacuum duct to complete the assembly of joint regions. The paper describes the assembly status of feeder-type busbar joints and its structures. This first-of-a-kind assembly on the segmented superconducting busbars is carried out using an approach where risks are identified, assessed and prioritized. Development on the busbar joint assembly processes via qualification and successful implementation of the technique to realization at assembly phase are addressed.

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Session Classification: WED-PO2-613 Joints between Superconductors