THE UPDATED DESIGN OF THE JT-60SA SUPERCONDUCTING TOROIDAL FIELD MAGNET

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The main magnetic confinement of the JT-60SA experiment is provided by a set of eighteen D-shaped superconducting Toroidal Field (TF) coils. The winding pack of each TF coil contains 72 turns of a 22 x 26 mm rectangular steel jacketed NbTi cable-in-conduit conductor, which is cooled by supercritical helium. Each winding pack is housed in a stainless steel casing, which is also cooled by supercritical helium to assist magnet cool down.
The 18 coils are wedged together over their straight section to support in-plane centralising forces. Overturning moments on the coils are supported by keys between the casings in the upper and lower inboard curved regions, which are pre-compressed by toroidal bolts during assembly.
In the outer region a conceptually new outer intercoil structure (OIS) has been designed, supporting the casings against out-of-plane loads. Adjacent OIS components are connected toroidally by bolted shear plates, forming a complete structure to support all 18 TF coils. Since the OIS is detached from the coil casings, it also allows some in-plane expansion of the coils.
Low voltage electrical insulation is placed between the TF coils in the wedged region at the straight leg, and additionally between the OIS shear panels, avoiding the circulation of currents during the dynamic operation of the plasma.
The TF coils are supported by a kinematic gravity support which is bolted to the cryostat base structures. Each of these supports is enclosed in the thermal shield and includes a cryogenically-cooled thermal barrier.
The design of the TF coil system will be described in detail, highlighting the key aspects of the proposed solutions. Additional information about manufacturing procedures will be provided and technological issues will be reported.