The Swiss Plasma Center (SPC) has developed a layout of Toroidal Field (TF) coil for EUROfusion DEMO tokamak, basing on a reference baseline of 2015. Each TF coil winding pack is wound with graded Nb3Sn conductors and consists of 12 single layers, connected in series by means of inter-layer joints. The design of inter-layer joints takes into account the react-and-wind (R&W) manufacturing technique for fabrication of TF coil winding pack, i.e. the inter-layer joint is prepared with use of two already heat treated Nb3Sn conductors. The development, preparation and test of inter-layer joint at SPC is performed in frame of R&D program for TF coil of EUROfusion DEMO tokamak.

The high-grade Nb3Sn TF conductor, operating at 63 kA and 12.4 T (Tcs >6.5 K) was tested at SPC, and afterwards was used for fabrication of inter-layer joint. The developed TF inter-layer joint is an "overlap-type" joint, which can be fit within the dimensions of TF winding pack. Each end of two conductors is copper cladded by a plasma-spraying technique and bonded together over the surfaces of cladded copper by a high-frequency inductor.

This paper describes the design of inter-layer joint, its manufacture and the test results obtained at SPC in the SULTAN test facility.

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