

TOPIC: E - Magnets and Power Supplies  
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## Design of the joints for the bus bar system of Wendelstein 7-X stellarator

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The superconducting magnet system of the WENDELSTEIN 7-X experiment consists of 50 non-planar and 20 planar coils. Coils are connected by 121 bus bars that are arranged in series of seven groups each for ten coils. The electrical and hydraulic interconnections of the bus bars will be provided by means of 184 joints each with the required resistance of less than 5 nΩ. The joint structure should withstand the internal pressure due to the quench event. For possible joint replacement and repair after installation the joints have to be designed as demountable structures.

Based on a conceptual design for the internal pressure of 30 bar and for the current of 18 kA the disconnectable joints have been redesigned for the pressure of 255 bar and the current of 20 kA.

The joints have been laid out and have to be manufactured in FZ Juelich.

The joint casing consists of two main structural parts screwed together and welded afterwards. Due to internal pressure the significant shear load is taken by the thread connection. The weld seam provides vacuum tightness. To make the structure demountable the welded portions of the structure (lips) can be cut off up to 3 times for parts separation.

A 3D Finite Element model is used for the stress analysis of the joint casing under internal pressure of 255 bar due to quench.

Prototypes have been manufactured and withstood several thermal cycles between the room temperature and 77 K. Pressure tests at 200 bar and Helium leakage tests at 36 bar have also been performed.