

Construction of WENDELSTEIN 7-X – Status and Prospects

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The WENDELSTEIN stellarator line developed by the Max-Planck Institute for Plasma Physics is continued with the superconducting device Wendelstein 7-X (W7-X). The W7-X stellarator, presently under construction in Greifswald, is “fully” optimised, based on the concept of quasi-isodynamicity. W7-X is consistently designed for a consistent operation of long-pulse (30min) reactor relevant plasmas. The advanced component design and the optimisation of the stellarator magnetic field configuration have been developed to ensure stable, high-beta steady state operation, thereby demonstrating the reactor potential of optimised stellarators.

The superconducting magnet system of W7-X consists of 50 non-planar coils (5 different geometry types), 20 planar coils for variation of the magnetic field configuration (2 different geometry types), a bus-bar system to electrically connect the coils, and a central support ring as well as a set of supporting elements to form a mechanically stable system. The cryostat that also provides the thermal insulation of the cold magnet system, consists of the plasma vessel, the outer vessel, the ports, and the thermal insulation.

The manufacturing of the W7-X components has progressed well over the past years, and many components are available for assembly. In parallel, the concept for assembly of the stellarator has been developed. At present, the first two out of 10 half-modules of the magnet system (each with seven coils strung onto one half-module of the plasma vessel) are being assembled.

In the present paper we give a status review of one of the largest superconducting fusion devices under construction world wide. The recent progress is described and the current situation of the most important components of Wendelstein 7-X, technical challenges and solutions are summarized. We will also give an overview over the assembly concept and the further planning until the completion of the device.