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Investigating the Neutral-Gas Manometers in the Wendelstein 7-X Experimental Fusion Reactor[1] JEANNETTE MAISANO-BROWN, Massachusetts Inst of Tech-MIT, UWE WENZEL, THOMAS SUNN-PEDERSON, Max Planck Institute for Plasma Phsyics — The neutral-gas manometer is a powerful diagnostic tool used in the Wendelstein 7-X stellarator, a magnetized fusion experiment located in Germany. The Wendelstein, produced at a cost of 1.2 billion euros, and 20 years in the making, had its first experimental results in Winter 2016. Initial findings exceeded expectations but further study is still necessary. The particular instrument we examined was a hot-cathode ionization gauge, critical for attaining a quality in-vessel environment and a stable plasma. However, after the winter operation of Wendelstein, we found that some of the gauges had failed the six-second (maximum) plasma runs. Wendelstein is on track for 30-minute operations within three years, so it has become of utmost importance to scrutinize gauge design claims. We therefore subjected the devices to high magnetic field, input current, and temperature, as well as to long operational periods. Our results confirmed that the manometer cannot survive a 30-minute run. Though our findings did motivate promising recommendations for design improvement and for further experimentation so that the gauge can be ready for upcoming operations in Summer 2017 and eventual installment in ITER, the International Thermonuclear Experimental Reactor, currently under construction.

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