## **INCREASED FRICTION FOR W7-X CONNECTIONS BY USING MICRO-FORMLOCK**

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The Max-Planck-Institut für Plasmaphysik (IPP) currently assembles the stellarator experiment Wendelstein 7-X (W7-X). Some bolted connections of the magnet system and its support structure are highly stressed, usually under multi-axial loads. To transmit lateral forces as well as torsional momentum without slippage of the connected parts to each other a coefficient of friction (COF) of 0.5 is required. The COF for steel-on-steel in the range of 0.2 - 0.3 is not sufficient. High COFs (>0.5) can be achieved with special coatings consisting of a matrix and protruding hard particles which in turn create a micro-formlock by indenting the surface of their counterpart. Since these coatings are intended mainly for automotive use under oily conditions at elevated temperatures no specifications are given by the manufacturers for the operational requirements of the W7-X cryostat.

Thus, to check the applicability, IPP has performed experiments in a scaled down set-up resembling the conditions at a certain flange connection. Measurements at room temperature as well as in  $LN_2$  at 77 K and in LHe at 4.2 K were conducted using the same apparatus. Results are presented, indicating the suitability of the coating even under the demanding conditions of the W7-X cryostat.



Figure 1: Hard particles, protruding from coating, create micro-formlock by indenting surface of their counterpart (taken from manufacturers leaflet).