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Automated high pressure water cell - HPWC

Tuesday 16 September 2025 17:00 (1 hour)

The poster presents the development of a high-pressure water cell (HPWC) to be used at the diffraction beam-line P02.1, at PETRA III depicting its mechanical design and the challenges to achieve operating pressures up to 10 kbar (1 GPa). A crucial part of this setup is on its automation, in which the pressure increments are introduced by means of a spindle-pump type compressor. The spindle pump is driven by a stepper motor, which is controlled by a PLC from the Beckhoff brand. The PLC monitors the pressures and temperatures and controls the motor and the valves of the system. The pressure is controlled by a PID-controller and the System has several different operation and safety routines that can be selected by the user. Two pressure sensors monitor the pressure in different positions. Inductive limit switches protect the pump from collisions and magnetic valves with pneumatic actuators split the system in different parts. The valves are also monitor by inductive limit switches. The HPWC consists of a hardened stainless-steel block with three main apertures: two in the beam direction with a set of diamond windows, and a dedicated port for sample loading.

Footnotes

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