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# EXOMARS PRE-EQM DRILL AND CONTROL UNIT EM DEVELOPMENT, INTEGRATION AND TESTING

**Abstract**

The ExoMars mission foresees, in its operational scenario on Mars, the acquisition and on board processing of soil samples taken to depths down to 2 meters. Once gathered downstream the sample is recovered upstream and transferred to Rover the on-board scientific instrumentation for analysis. The key element to perform this mission is the ExoMars Drill, based on multi-rod concept.

After successful completion of a Bread-Boarding and test phase on the key components and assemblies (drill tools, extension rods, rod's magazine, positioner, till the whole drill unit), a Drill pre-EQM has been integrated. Such model makes use of parts that are already at qualification level (namely the structure and the mechanics) and parts at commercial level that later on will be upgraded at EQM level (namely the actuators).

Meanwhile, an engineering model of the complete control electronics has also been integrated, including a release 0 of the control software (flight version). The pre-EQM interfaced with the EM control electronics will be subject to a thorough test campaign in the forthcoming months. This campaign will include sample acquisition of Mars-Analogous material in Laboratory and in Mars-Like conditions, with the double objective of getting confirmation of the key drilling parameters (such as power, thrusts needed, advancing speed, amount of sample collected, etc.) and as first verification of operability and timelines of the integrated Drill HW - Control Electronics - Flight Software.

To the purpose of the environmental test campaign, a dedicated facility has been designed and built in order to reproduce Mars-Like conditions in terms of temperatures, atmospheric composition and pressure. Such facility allows complete drill operations down to two meters.

The paper will present the key characteristics of the developed Drill pre-EQM, the main aspects of the developed EM Electronics and their integration. Also the special test facility will be described. As far as available, some of the test campaign results will be presented depending on the actual schedule of the activities.