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## **Test set-up for the controlled cooling of heavy magnets down to 77 K**

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In the scope of the High Field Magnets work package of the European FP7-EuCARD project, the structure of the future dipole magnet RMC and FRESCA2 has been tested at liquid nitrogen temperature replacing the actual Nb<sub>3</sub>Sn-based coils by aluminium dummy coils. Such test aims at measuring during the cooling the evolution of the mechanical stresses and the temperatures via compensated strain gauges and carbon-ceramic sensors placed at various locations on the structure (shell, rods, yokes, dummy coils). These measurements help assess the thermo-mechanical behaviour of the assembly for different applied pre-stresses and validate the finite element simulation of the magnet cooling before including the definitive brittle Nb<sub>3</sub>Sn coils.

For this purpose, a specific cool-down / warm-up nitrogen test station has been developed at CERN in order to control the required maximum temperature gradient in the magnet during the cooling and the warming. In this paper, we present in detail the test facility, the instrumentation along with the automatic process control system. An analytical approach computing the expected temperature evolution during a thermal cycle is introduced and the temperature measurements related to the magnets cooling down to 77 K and warm up to room temperature are presented.

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