

Cryostats for the HL-LHC magnets: Pre-series production, assembly infrastructure and project plans

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The superconducting system of the High Luminosity LHC project (HL-LHC) at CERN comprises a total of 38 new cold masses, prototypes and spares included, all requiring cryostats for magnet operation at 1.9 K. These cryostats shall ensure optimal thermal performance, as well as magnet alignment stability over the machine lifetime. Specific cold mass dimensions and a multitude of interfaces related to cryogenics, power supply and instrumentation resulted in 19 cryostat assembly types. Having so many design variants relative to the number of units to be built is a challenge in terms of cost, resources, and schedule management. Our answer was the development of a modular concept maximising component sharing between cryostat types, which also allows for a common assembly infrastructure. To date, manufacturing of cryostat components is nearly finished, and a pre-series comprising the first cryostat assemblies for each cold mass type has been built up to the stage of readiness for cold testing. This paper presents our experience and lessons learnt from component manufacturing and first assemblies, how we setup an assembly hall with purpose-built tooling, and insights on logistics and resources. We also explain our plans to ensure timely delivery of the cryostat assemblies, without compromises to the high reliability level expected for equipment that will become part of the 27 km long particle collider. Installation in the LHC machine is planned for the next LHC long shutdown, starting in 2026.

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