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C2Po2C-04 [06]: Preliminary design of the electrical feeding devices for the HL LHC superconducting powering

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The High Luminosity LHC (HL-LHC) project aims at upgrading the LHC collider after 2025 to increase its luminosity by about a factor of five. As part of this upgrade, new magnets will require an electrical powering system where the power converters are placed in a newly dug service gallery to shield them from the radiations of the colliding beams. The electrical powering will be ensured via a superconducting line, in MgB₂, housed into a flexible cryostat of length up to 140 meters, and carrying currents along diverse circuits between 0.6 kA and 18 kA. At the extremities of the flexible cryostats, electrical interconnection devices allow connecting the superconducting cables to the magnets in the LHC tunnel and to the current leads and power converters in the service galleries. Moreover, the devices ensure a regulated cooling by a vapour mass flow of helium through the continuous powering chain up to 10 g·s⁻¹, at about 1.3 bar, and in the 4.5-17 K temperature range. This paper presents the technical requirements and the preliminary design of the electrical interconnection devices. The operating modes during transient and nominal phases are presented as well as the thermo-mechanical and cryogenic flows layouts. Integration and assembly in the LHC machine are also explained, including specific safety aspects and maintainability requirements.

Primary author: LECLERCQ, Yann (CERN)

Co-authors: Dr BALLARINO, Amalia (CERN); PASDELOUP, Florian (CERN); FALORIO, Iole (CERN); BETEMPS, Robin (CERN); PARMA, Vittorio (CERN); BAILEY, Wendell (University of Southampton); YANG, Yifeng (University of Southampton (GB))

Presenter: LECLERCQ, Yann (CERN)

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