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C1Po1F-03: Design, Development and Commissioning of the Control System for the cryogenic distribution system at ESS

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The cryogenic distribution system (CDS) at the European Spallation Source (ESS) connects the refrigeration plant with the linear accelerator, consisting in 13 spoke and 30 elliptical cryomodules that are cooled at 2K via multi-transfer lines, individual valveboxes for every cryomodule and an endbox. The designed control system monitors and controls the cooling helium flow through the CDS.
The controls architecture for the CDS is based on one Programmable Logic Controller (PLC) per valvebox and another one for the endbox, which are integrated into EPICS through the Controls Network and takes care of the process functions, making it a total of 44 PLCs. This type of integration allows for the remote operation of the CDS from the control room and the necessary interaction of the control system with other related systems and EPICS services like archiving, alarms and save-and-restore.
Pre-commissioning activities like loop checks, temperature curve validation, pressure sensor calibration and valve initialization started in summer 2022. Eventually, the system was ready for commissioning and a first cooldown was performed in December 2022.
The paper describes the design, development and commissioning of the control system and diverse challenges during the deployment and commissioning activities. Future activities are discussed including the implementation of a sequencer for automatic cooldown and warmup, integration with the cryomodule controls and a master PLC to handle the helium management.

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