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C2Po2A-03 [23]: Design and Commissioning of a 700W@3K sub-cooled helium test facility

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In order to increase the magnetic field and temperature margin of superconducting magnets, a test facility of a 700W@3K sub-cooled helium was proposed to decrease the operation temperature from the 4.5K saturated helium to the 3K sub-cooled helium. The process flow of 3K sub-cooled helium test facility has been designed with two cold compressors arranged in series to provide 700W@3K sub-cooled helium by decompressing of saturated liquid helium from 1.2 bar to 24kPa. This 3K sub-cooled test facility has been constructed and operated successfully to cool the 4.5K saturated helium to the 3K sub-cooled helium. The commissioning results indicated that this test facility could provide 760W@3K sub-cooled helium. The start-up process and steady-state operations of this 3K sub-cooled helium test facility were introduced, describing with the experiment data. The thermodynamic parameters and performances of these two cold compressors were analysed and compared with the designed values in a good agreement. The rotation speeds and vibrations during the transient state and stable state running were also analysed.

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