

JT Cooler Compressor Tailoring to Suit a Wide Variety of Applications

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Joule-Thomson (JT) coolers are becoming increasingly prominent in science missions that require very low temperatures. By extending the range of temperatures achievable by mechanical cryocoolers down to less than 2 K, JT coolers are a key enabling technology for such missions, either as the final cryogenic stage, or as a pre-cooler in a cryogenic chain extending to sub-Kelvin temperatures. Such missions are usually highly bespoke, leading to very significant differences in requirements and the JT cooler must be adapted to suit the operating conditions of a particular application. Cryocooler compressor development can be a lengthy and costly process and it is advantageous to be able to use a single compressor design to cover as many applications as possible. In this paper we describe a modular JT compressor developed at the Rutherford Appleton Laboratory to address this need. Through three case studies, a 2K JT cooler, a 4K JT cooler and a 30K JT cooler, we show how the compressor can be tailored to these three very different applications by adjustment of the modular piston only; the compressor being identical in all other aspects for the three cases.