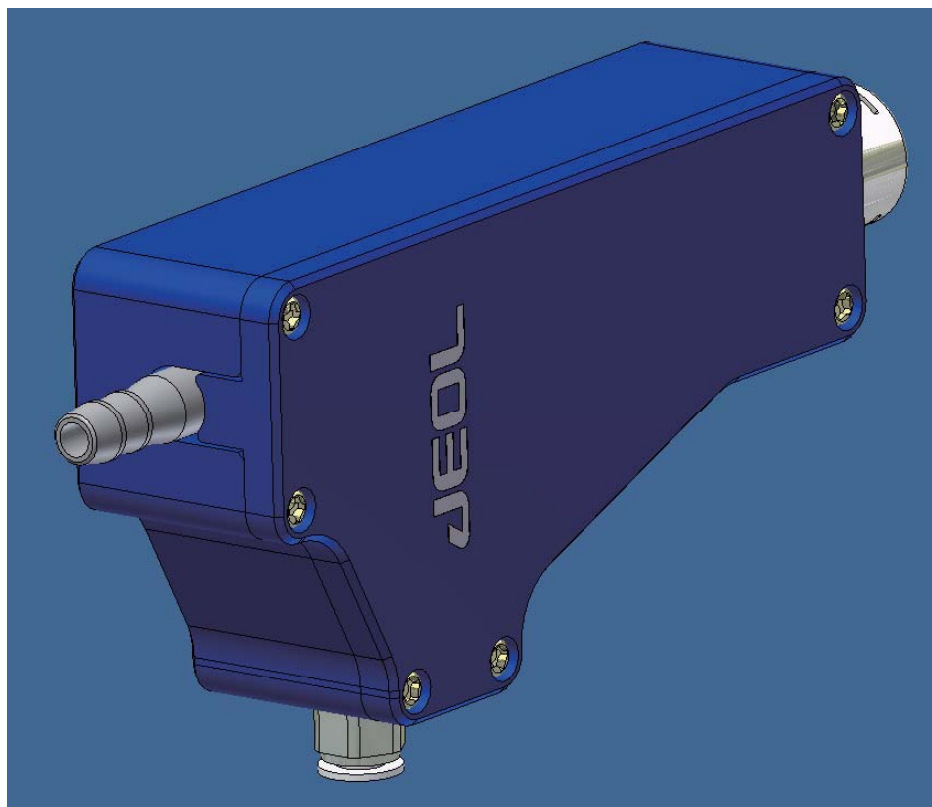


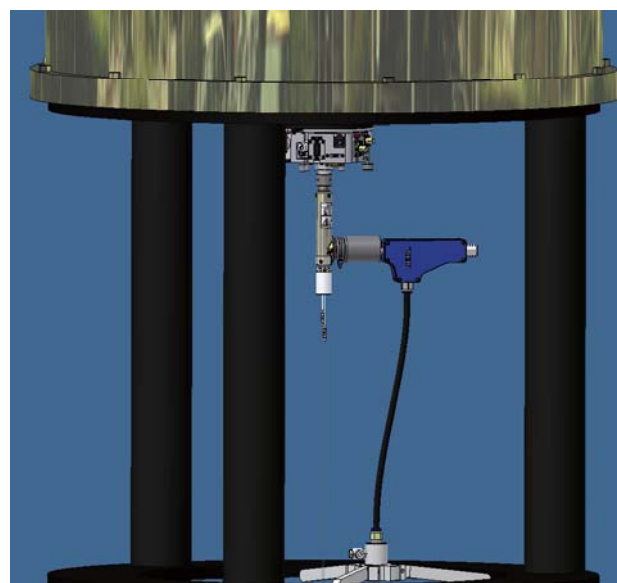
Long-time VT attachment Compressor-type low-temperature unit



Product image *1

Features

- Easy operation for low temperature.
- Maintenance free (no movable parts).
- Supply *ca.* 25°C colder air than RT to a probe.*2
- Long-time stability of temperature.
- No need for cooling media such as liquid nitrogen.



Installation View

< Working principle >

A compressor-type low-temperature unit generates cold air using Ranque-Hilsch vortex tube, which was discovered by Georges Ranque in 1930's and became widely known in 1940's by Rudolph Hirsch's research. Nowadays, vortex tubes are mainly used to cool products and industrial tools in the area of machining. It generates air flow shown in Fig. 1, yielding hot air and cold air. Its application to NMR was reported by R. W. Martin and K. W. Zilm in 2004 [1].

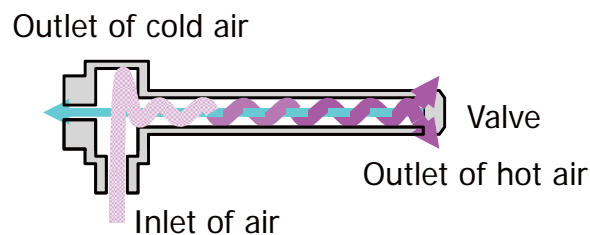
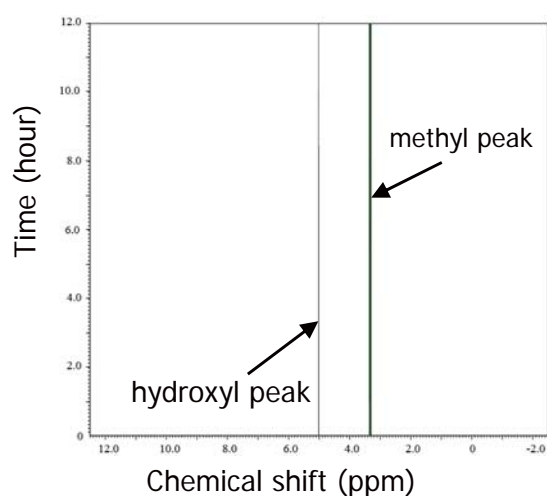


Fig. 1 Air flow in vortex tube



< Usage example 1 >

A compressor-type low-temperature unit can stabilize temperature, similarly to JEOL long-time VT equipments. As an example, Fig. 2 shows NMR results of methanol under temperature control at 10°C for 12 hours using JNM-ECA500. The peak positions of methyl and hydroxyl signals did not change, demonstrating high stability of temperature.

Fig. 2 Time dependence of chemical shifts of methanol

< Usage example 2 >

Figure 3 shows results of variable temperature NMR measurements, illustrating the chemical-shift difference of methyl and hydroxyl peaks of methanol at various temperatures. The linearity of the chemical-shift difference and temperature manifests applicability of the compressor-type low-temperature unit to variable temperature NMR measurements with high stability.

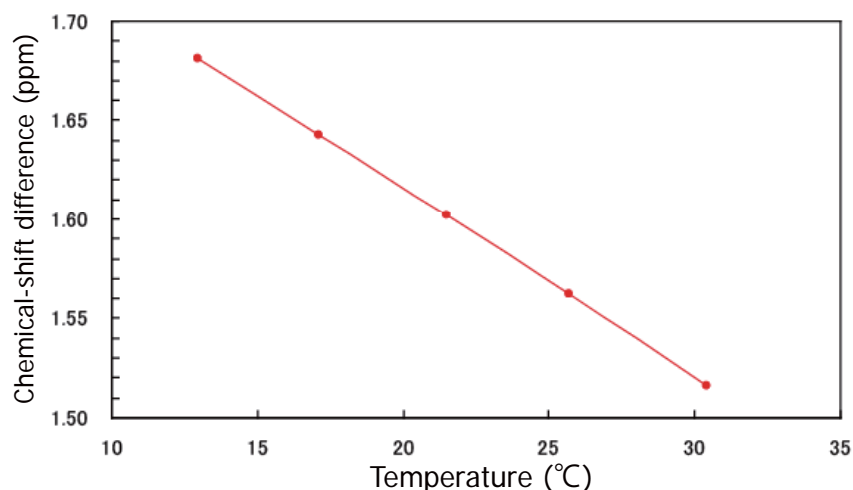


Fig. 3 Results of variable temperature NMR measurements

Reference

[1] K. W. Martin and K. W. Zilm, Variable temperature system using vortex tube cooling and fiber optic temperature measurements for low temperature magic angle spinning NMR, *J. Magn. Reson.* 168, 202-209 (2004).

*1: Specification and appearance may change without notice.

*2: Controllable temperature range depends on the instruments in use and environments.