



2s102K Cryocooler

Specification Sheet

The 2s102K is a low vibration, no maintenance, highly reliable, acoustic Stirling (pulse tube) cryocooler for applications requiring cooling loads up to 8 watts at 77K. Each unit is driven by two linear reciprocating motors with clearance seal pistons, providing wear free operation with no lubrication required. These compact systems are ideal not only for laboratory use but also for military and aerospace applications.

RIX's design is completely absent of cold moving parts or seals, eliminating maintenance that is required of most other technologies. The dual opposed motor/piston design within the pressure wave generator (PWG) is naturally balanced, reducing vibration and noise. To improve power consumption and increase versatility, each cooler is designed to be adjusted "on-the-fly" to match varying cooling demands. These advantages are accompanied by competitive pricing in both small and large quantities, making them ideal not only for laboratory use but also for HTS, medical, liquefaction, and military and aerospace applications.

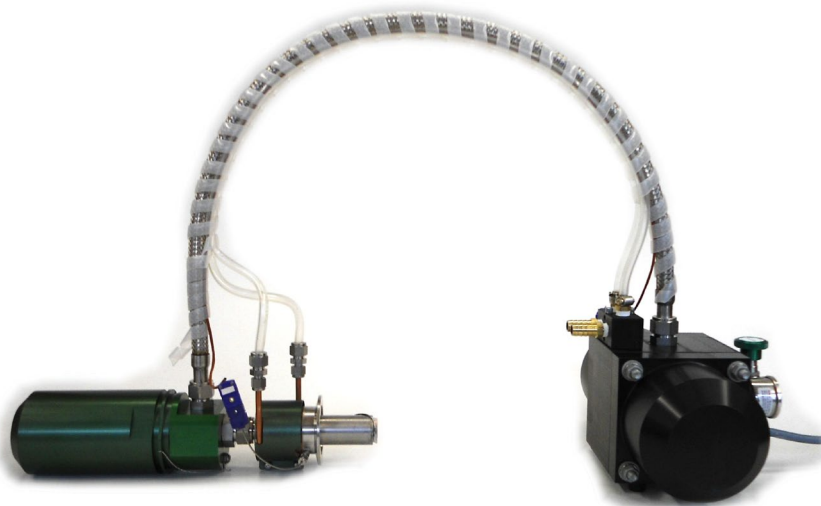


Figure 1: 2s102K FAR Water Cooled



Operating Principle

The base cryocooler unit consists of a pressure wave generator, driven by robust linear reciprocating motors, and an acoustic Stirling (pulse-tube) coldhead. The coldhead consists of a warm heat exchanger, a regenerator, a cold heat exchanger, a thermal buffer tube, a hot heat exchanger, an inertance tube, and a compliance tank. Figure 2 below is shown as an inline configuration for clarity, but the actual coldhead is “folded over” at the cold heat exchanger to create a salient cold zone.

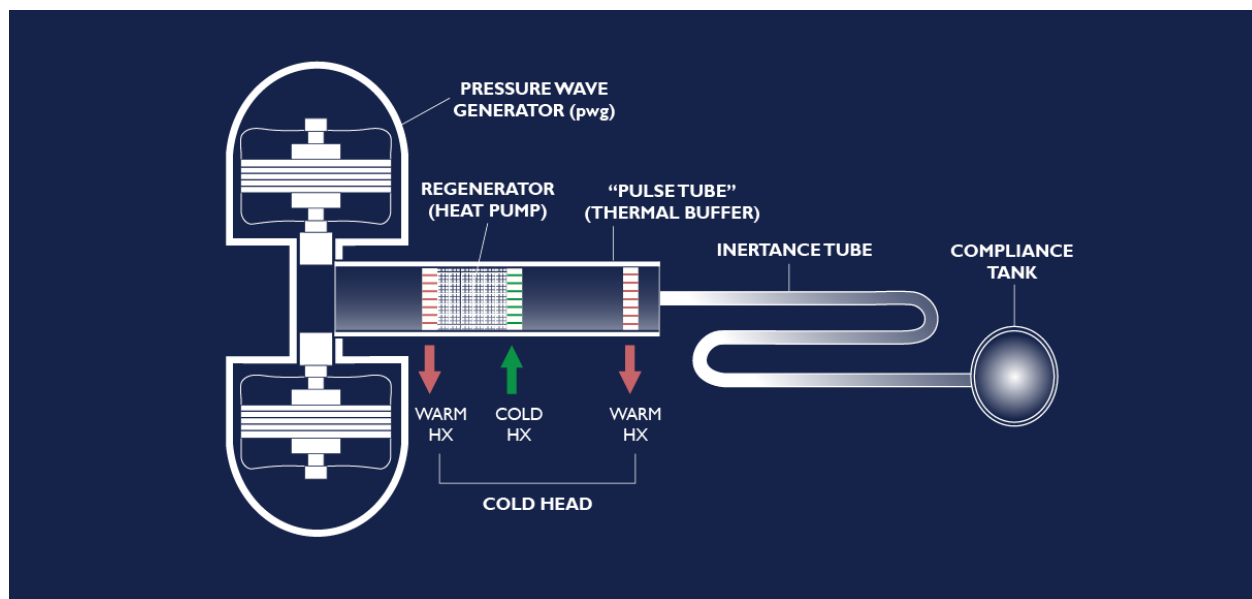


Figure 2: Thermoacoustic Stirling Diagram

- 1) Pressurized helium gas is cyclically compressed and expanded relative to the mean pressure (charge pressure) by the pistons of the PWG.
- 2) With each forward stroke of the pistons, the gas moves through the aftercooler, or warm heat exchanger, where heat is removed. The gas parcel continues through the regenerator, which precools it before reaching the cold heat exchanger.
- 3) As the gas moves toward the cold heat exchanger, gas in the acoustic network (thermal buffer tube, hot heat exchanger, reservoir) also moves in the same direction. Even as the driven gas stops advancing, when the pistons reach their upper limits, the network's gas continues moving, driven by its own inertia in the high-speed inertance tube. This acts like a virtual piston, moving away from the cold exchanger, which expands the gas in that area. As it expands, it gathers heat from the surroundings (the area or substance to be cooled).
- 4) The pistons begin withdrawing and helium then moves back through the regenerator and aftercooler. Still delayed by its inertia, the gas in the network follows and the cycle begins again.
- 5) The cryocooler motors and heat exchangers are cooled by local air, water, or an optional closed water loop that consists of a reservoir, a pump, and a liquid-to-air heat exchanger.

Specifications

General:

Model 2S102K cryocooler generates 6-8 watts rated cooling output @ 77K, or 28 watts @ 150K, from 250 watts electrical input, rejecting to 20°C water, as shown in Figure 3. Exterior surfaces are mainly constructed of anodized aluminum with an NW50 O-ring sealed vacuum flange for mounting (optional CF/DN flanges available). Piston stroke is rated at 10mm, with a maximum rating of 12mm, and controlled by the input power electronics. Instrumentation, electrical heat load, automatic temperature control, water-cooling, and drive electronics are optionally available.

Acoustic coldheads have NO MOVING PARTS.

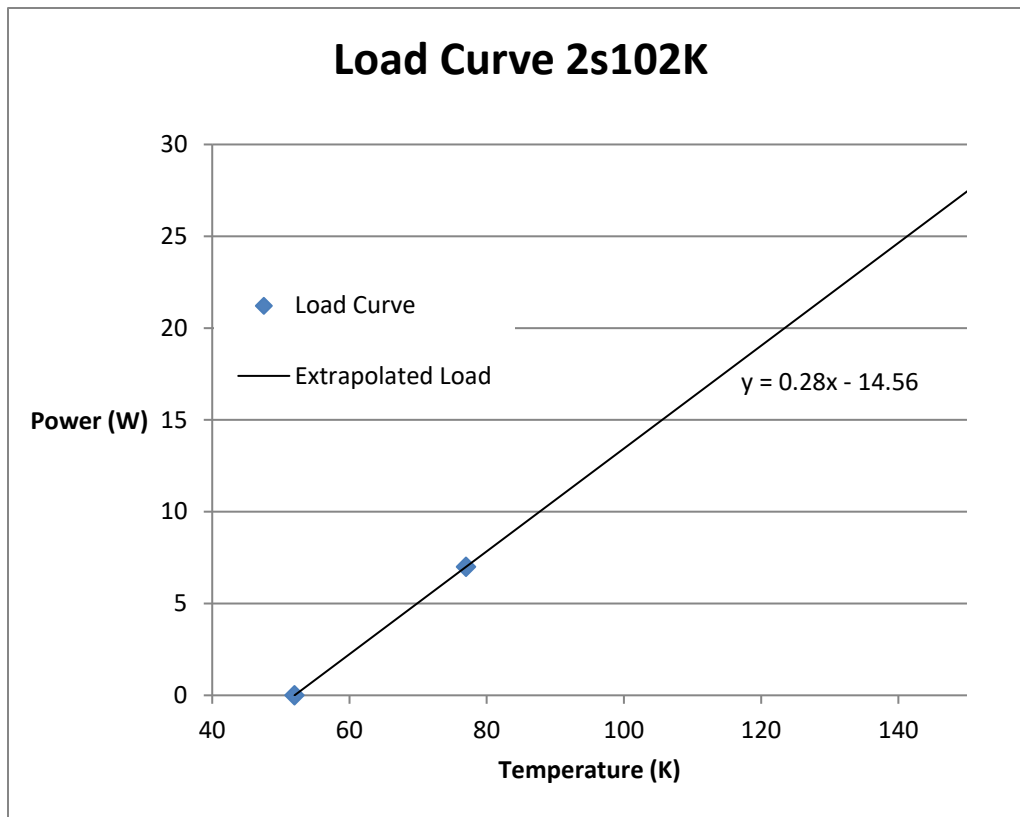


Figure 3: Load Curve 2s102k

FOR BEST PERFORMANCE THE COLD FINGER SHOULD BE MOUNTED VERTICALLY AND FACING DOWN. RIX'S SPECIFICATIONS ARE BASED ON THIS MOUNTING CONFIGURATION.

Materials of construction:

Anodized aluminum in most non electromagnetic parts except heat exchangers (copper). All vessel components are constructed in accordance with applicable ASME Vessel Code requirements but are NOT stamped.

Mounting:

- Pressure Wave Generator: Four #10-32 tapped holes as outlined in Figure 4
- Coldhead: NW 50 vacuum flange
- Cold Finger: Four #6-32 tapped holes, 0.50" on center

FAR flex line, 1 meter long with stainless steel braid and metallic bite seals.

Capped Schrader or Swagelok valve is provided for evacuation, filling, or connection. If water-cooled, (open-loop), standard water connections are 1/4 Swagelok tubes at the aftercooler.

Dimensions (approx.):

See Diagram in Figure 4 below.

Weight:

Approximately 15 kg water-cooled, net of options.

Motor rating (subject to change):

- 125 x 2 We at 60 Hz, 10 mm stroke
- Core impedance @ 110VAC winding: 7-ohm DC, (45 @ 60 Hz)
- Stator inductance @ 110VAC winding: 84 mH
- Rated operating voltage/current: 110 VAC 1 ϕ rms @ 60 Hz/2.0 A rms (0.8 power factor)
- Stroke limit 12 mm (10 mm operation must be centered within 1 mm)

Piston & Gas Management:

- Clearance seals, Rulon buffers
- 3.0 MPa maximum allowable working pressure

Thermal Management:

- Water-cooled is standard with 1/4" Swagelok tubing external inlet/outlet ports
- 1 Liter/minute minimum required flow at full load. Less than 10 kPa pressure drop (internal)
- Type E thermocouple on cold tip for monitoring (control included with TI option)

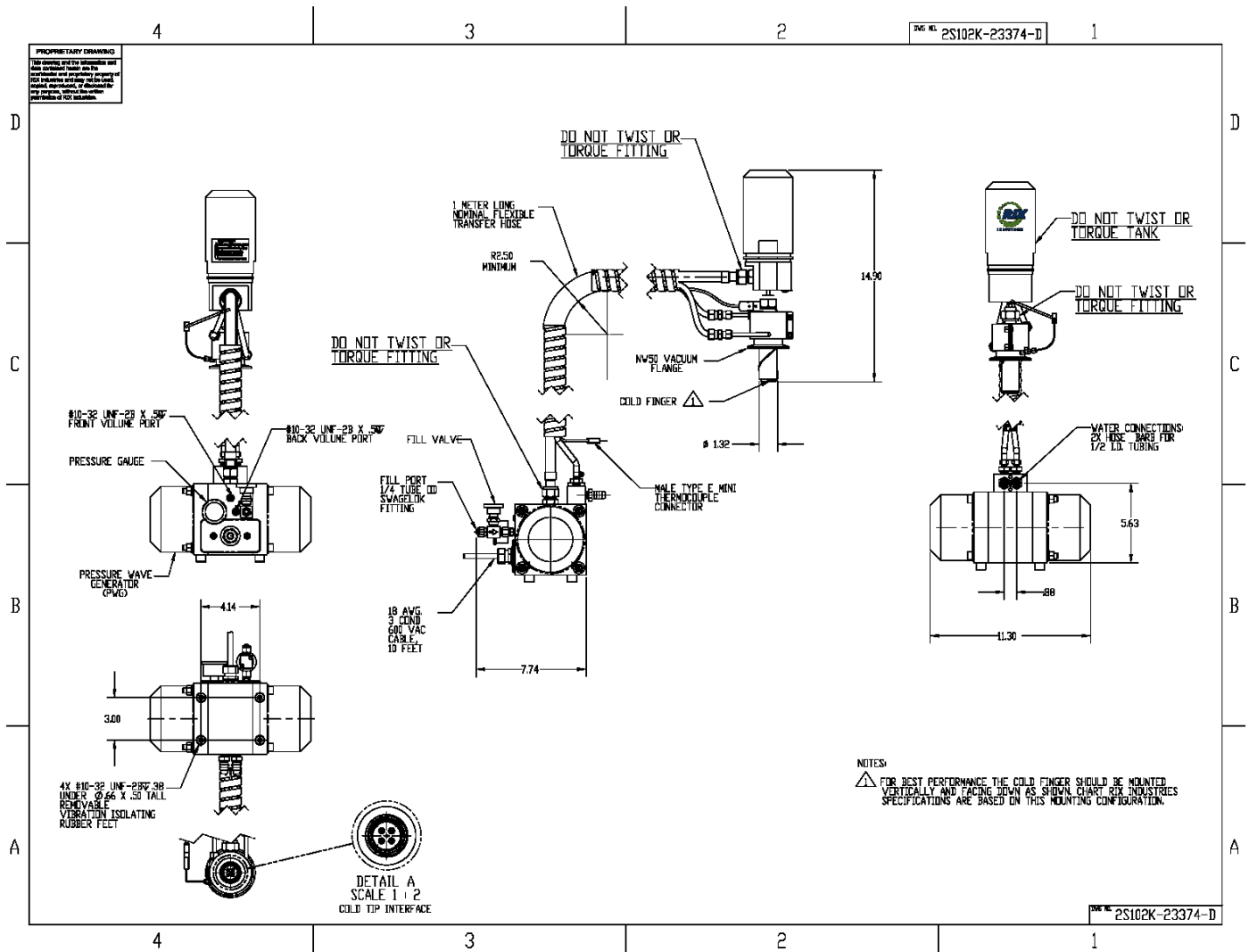


Figure 4: 2s102K Water Cooled FAR Cryocooler

All specifications and options are the most accurate representation of product at time of offering and subject to change without notice. Purchaser is responsible for verifying details of interface requirements.