Datasheet

Stirling Liquid Nitrogen Pump

Providing liquid flow for closed loop cooling

STIRLING CRYOGENICS

High efficiency liquid flow for closed loop cooling systems

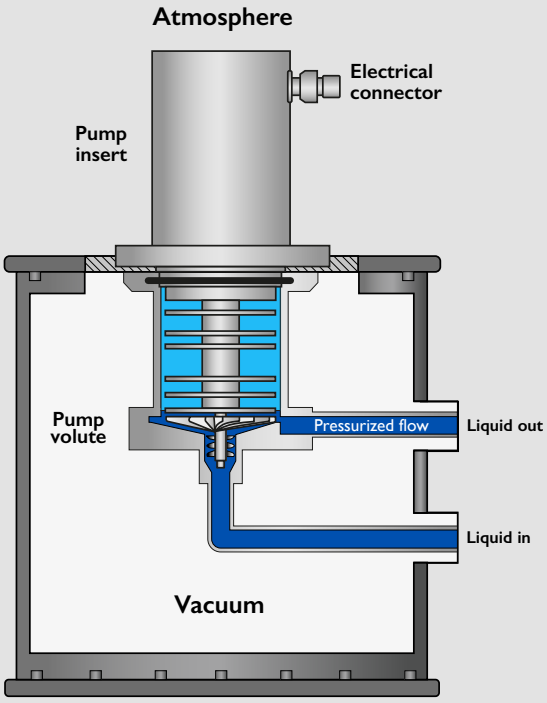
Through decades of experience Stirling Cryogenics has developed immeasurable cryogenic knowledge, especially for cold handling and delivery to a customer application. This has resulted in our optimized liquid nitrogen pump to efficiently transport cooling power generated by a Stirling Cryogenerator.

These pumps are used to circulate a liquid gas to transport cooling power from a cold source into and through an application. Examples include superconducting cables and thermal shields in vacuum chambers or other (large) devices. The required cooling power usually comes from a cryogenic system using a cooling machine or bulk cryogenic liquid. In either of these cases there is a limited budget of cooling power which makes the efficiency of the pump of the utmost importance. The efficiency of Stirling Cryogenics' liquid gas pumps ranges from 30 to more than 50%, depending on the set-up of the closed loop system. Important considerations are the required flow and the pressure drop over the system. By balancing these at the system design phase, the final set-up can be optimized.

Design concept of the liquid nitrogen pump

Stirling's liquid nitrogen pumps are based on the generic design concept of Stirling Cryogenics' successful CryoFans.
Like all centrifugal pumps, the main parts are the impeller and the volute. Their dimensional shape determines the functionality and efficiency of the pump. The impeller is driven by a high rpm air-cooled electric motor to create the flow. All of the components are integrated into a single housing with the motor installed inside the pressurized gas volume. This solution does not require a dynamic seal which eliminates a common source of leakage.

In order to create a thermal barrier between the ambient temperature motor and the cold impeller, the latter is mounted on a long thin stainless-steel shaft. This low-conduction set-up with a precision balanced shaft and impeller eliminates the necessity of a cold bearing. This ensures a MTBM of over 20.000 hours.



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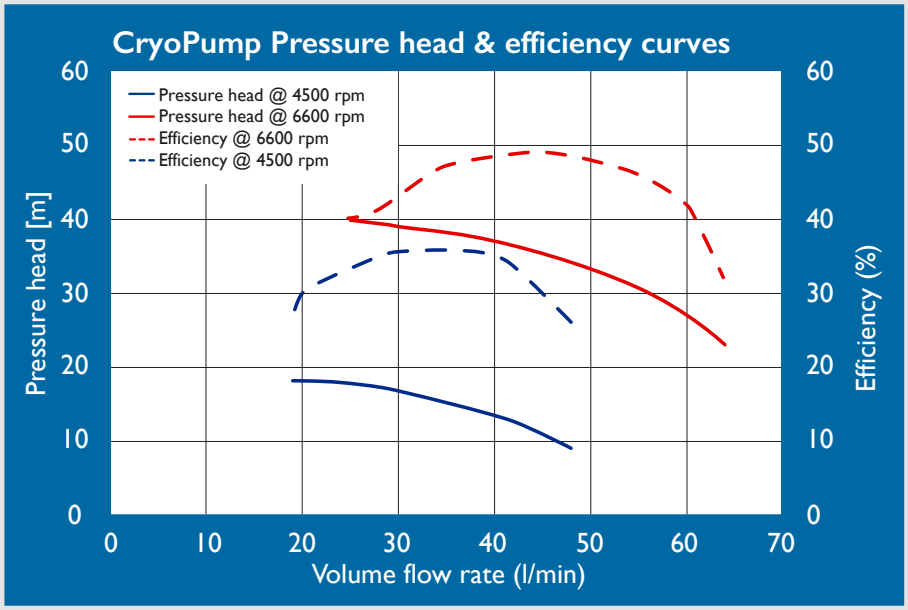
The design of the Stirling Cryogenics liquid gas pumps also allows them to be used as a gas circulator. When they are used as a circulator, the motor is set at a higher velocity to achieve sufficient gas flow. This feature is utilized during the cooling down phase of a system. Instead of pumping cold liquid into the application, causing thermal shock, cold gas is circulated to cool down the application gradually reduce temperature.

Once a sufficiently low temperature has been reached, the system can be switched to liquid mode and the pump will run slower for use with liquid. The pump motor is driven using a VFD and its pumping capacity can be regulated as required.

The liquid pump concept is easy to integrate into a system cryostat. Only a hole with a flange pattern is required. This pattern can be machined in the cryostat flange or in an ISO-K or CF blind flange. The pump volute is mounted inside the cryostat where the inlet and outlet lines are connected. The motor, shaft, and impeller are mounted from the outside. This means that the complete impeller unit can be removed without breaking the vacuum of the application.



Stirling Cryogenics BV
Science Park Eindhoven 5003
5692 EB Son, The Netherlands
T +31 40 26 77 300
info@stirlingcryogenics.com

Sales Offices in USA, Germany, Sweden and Italy