RLD
Thermique et Ingénierie

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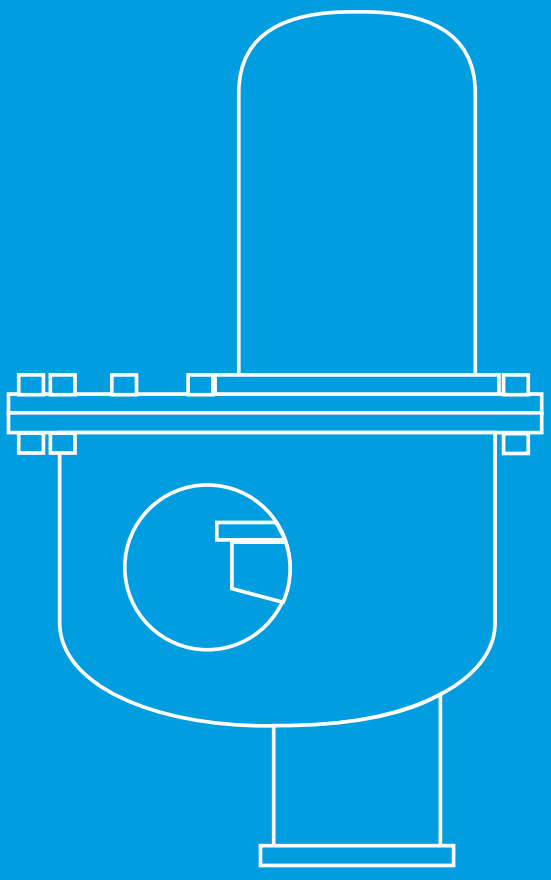
UN CLIMATE CHANGE CONFERENCE

# CRYOBLOW

## *A new wind in cryogenics*



ECONOMICAL SOLUTIONS
LN2
RLD

-195°C ⟷ +300°C

## CRYOBLOW

### The only economical cryogenic circulator on the market.

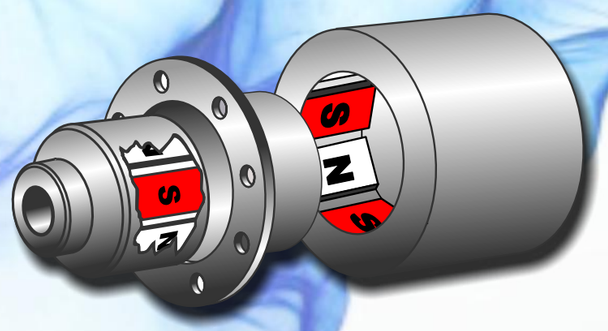
An important number of industrial applications require a confined and precisely controlled thermal environment. Numerous equipments, such as space simulation test facilities, cryopumps, cryostats and LNG test facilities, require to be cooled or heated. A reliable solution consist of the use of a forced flow of pressurized gas at controllable temperature, with powers ranging from 5 kW up to more than 100 kW combined with pressures up to 30 bars.

Such precisely controlled environments can be economically achieved using a forced flow of pressurized nitrogen or helium gas, circulated through an electrically heated/liquid nitrogen cooled heat exchanger.

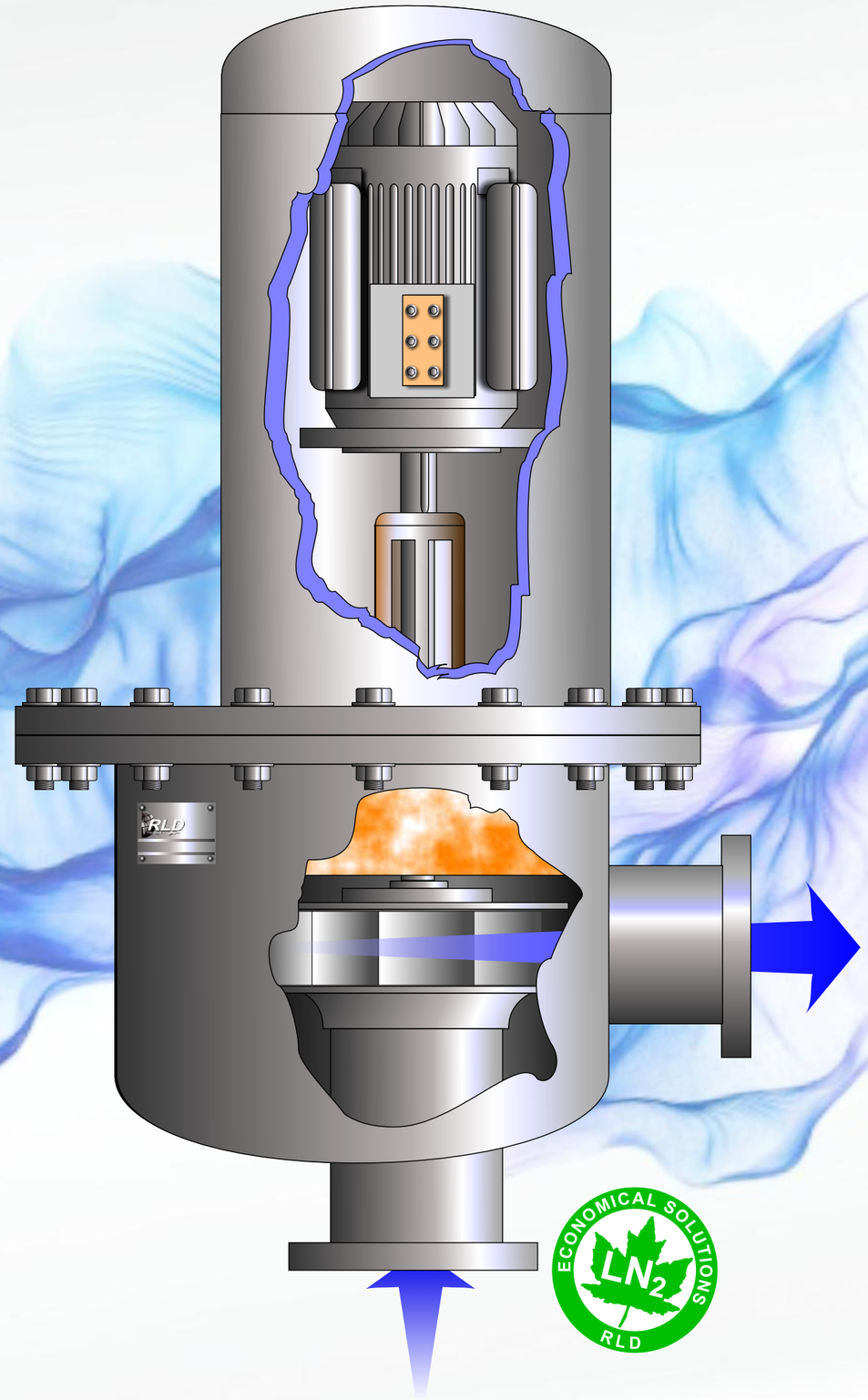
The CRYOBLOW is a frequency controlled versatile circulator capable of meeting a large range of specific customer requirements.

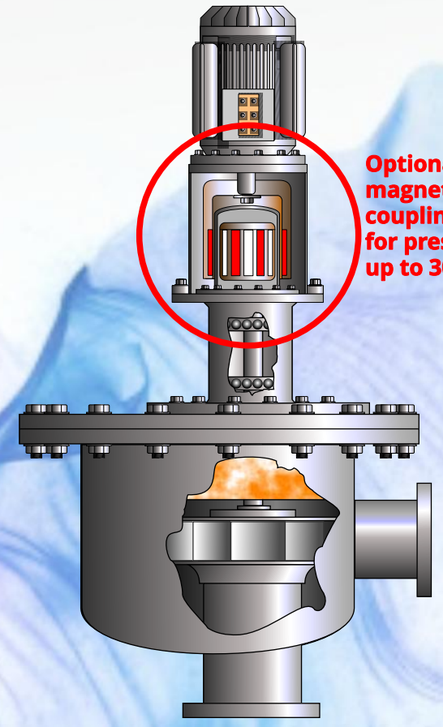
The drive system of the Cryoblow is designed to operate comfortably at ambient temperature allowing for years of maintenance free continuous operation. Thermally it is fully insulated from the gas circuit and hence does not inject any thermal energy.

Emphasis during its design was on maximum liquid nitrogen economy during operation. The unit has been designed by experts in the field of thermal engineering specifically for easy and reliable integration in existing or new processes.




*Inner magnets, non-magnetic bell and exterior magnets of a magnetic coupling set*




All energy (mechanical or thermal) transmitted to the circuit gas must be compensated by an equal amount of refrigeration in order to maintain a stable cooling temperature.

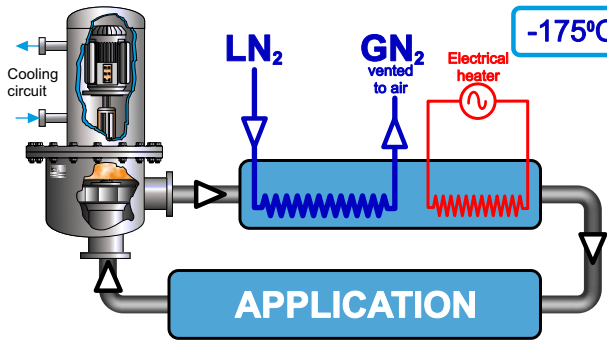
Some figures for $LN_2$ as refrigerant:

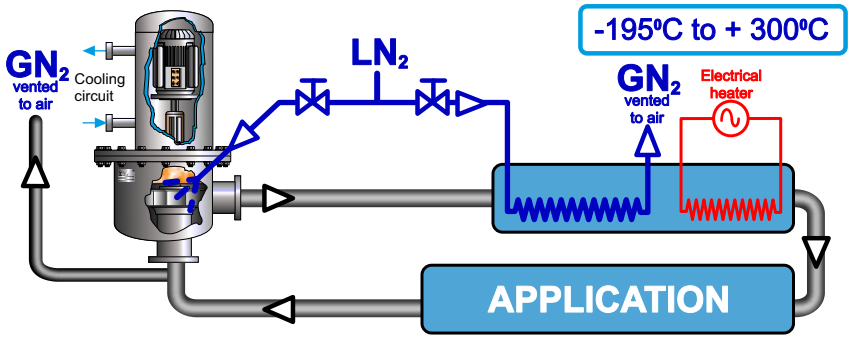
| Working Temperature | Power input | $LN_2$ consumption |
|---|---|---|
| +100°C | 1 kW | 10 liters/hr. |
| 0°C | 1 kW | 12,5 liters/hr. |
| -160°C | 1 kW | 22 liters/hr. |

A large operational temperature range is possible:

- With a heat source (steam or electrical heater) up to +300°C.
- With a cold source (liquid nitrogen), the Cryoblow can descend to -195°C.
- A combination allows for operation from -195°C up to +300°C.

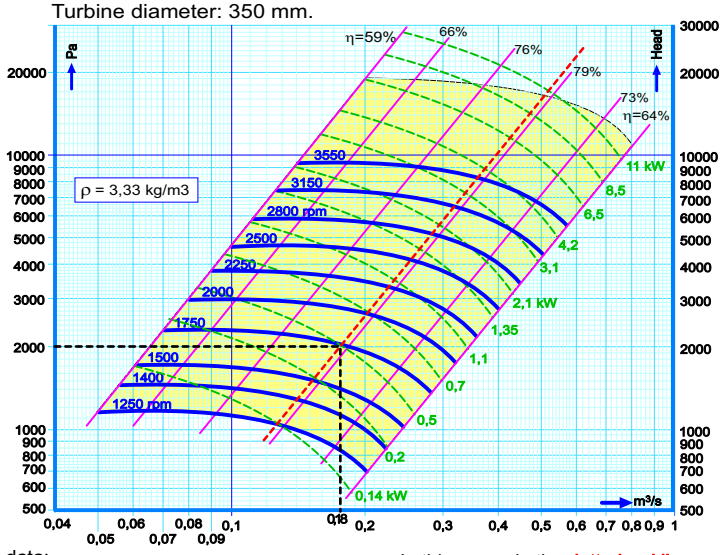
Each Cryoblow is individually designed and optimized for the customer's application. After factory testing it will function for years with impressive efficiency resulting in economical low $LN_2$ consumption and operational cost.




| Ø Turbine (mm) @ 3600 r.p.m. | Head (meters) @ 3600 r.p.m. | Max. flow (m³/s) @ 3600 r.p.m. | Max. flow (m³/h) @ 3600 r.p.m. |
|---|---|---|---|
| 250 | 130 | 0,5 | 1800 |
| 280 | 160 | 0,7 | 2500 |
| 310 | 200 | 0,9 | 3200 |
| 350 | 300 | 1,5 | 5400 |
| 400 | 350 | 2 | 7200 |
| 450 | 420 | 2,7 | 10000 |
| 500 | 550 | 3,5 | 12500 |

Turbine diameter: 350 mm.




Example data:

- Process temperature: -160ºC
- GN2 density: 3,33 kg/m³
- Flowrate: 0,18 m³/sec (648 m³/h)
- Pressure loss: 2000 Pa
- Turbine speed: 1750 r.p.m.

In this example the **dotted red line** represents the caracteristics of the client's circuit. The Cryoblow has an aeralique efficiency of 78% while consuming 500 watts. The liquid nitrogen consumption of the Cryoblow itself is only 11 liters per hour.

| | EXISTING SOLUTION | Cryoblow |
|---|---|---|
| Power range | 15 kW | **5 - 100 kW** |
| Head (m) | 350 @ 6300 rpm | **550 @ 3600 rpm** |
| Efficiency | Not communicated | **up to 80%** |
| $T_{in\ min}$ | -188ºC | **-195ºC** |
| $T_{in\ max}$ | +150ºC | **+300ºC** |
| Flow rates | 350 m³/h | **up to 12500 m³/h** |
| | | |
| R.P.M. | up to 6300 | **500 - 3600** |
| Turbine | not insulated* | **insulated** |
| ATEX | optional | optional |
| Construction | Stainless steel | Stainless steel |
| Maintenance | each 2500 hrs. | **each 30000 hrs.** |

*** direct thermal exchange between GN2 and the ethylene glycol transfer fluid at room temperature**



The green sign for Economical Solutions for equipment using LN2 indicates products developed by RLD Thermique - Ingénierie from Grenoble France.

Grenoble is known worldwide for high technology and innovative solutions. In addition to the local high manufacturing quality of industrial and scientific products the company RLD Thermique - Ingénierie has made it their trademark to optimize their designs for low LN2 consumption combining efficiency, reliability, low maintenance and longevity.

Over 40 years experience in designing and manufacturing key elements for major international projects guarantees high quality units optimized for their intended tasks.

For additional information see:

www.thermique-ingenierie.fr

Each Cryoblow is factory tested without thermal insulation prior to delivery to the customer, .