RLD
Thermique et Ingénierie

COP21 CMP11
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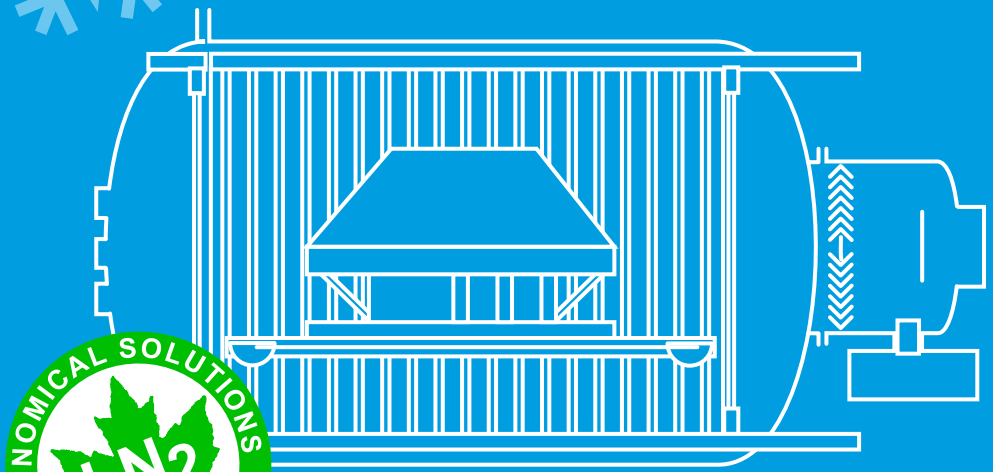
UN CLIMATE CHANGE CONFERENCE

THERMAVAC

Thermally controlled vacuum chamber

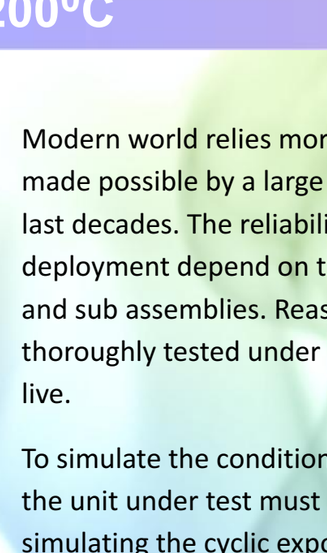


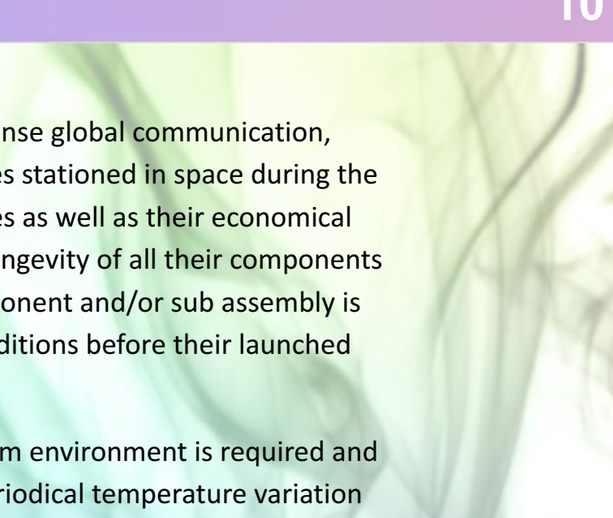
ECONOMICAL SOLUTIONS
LN2
RLD

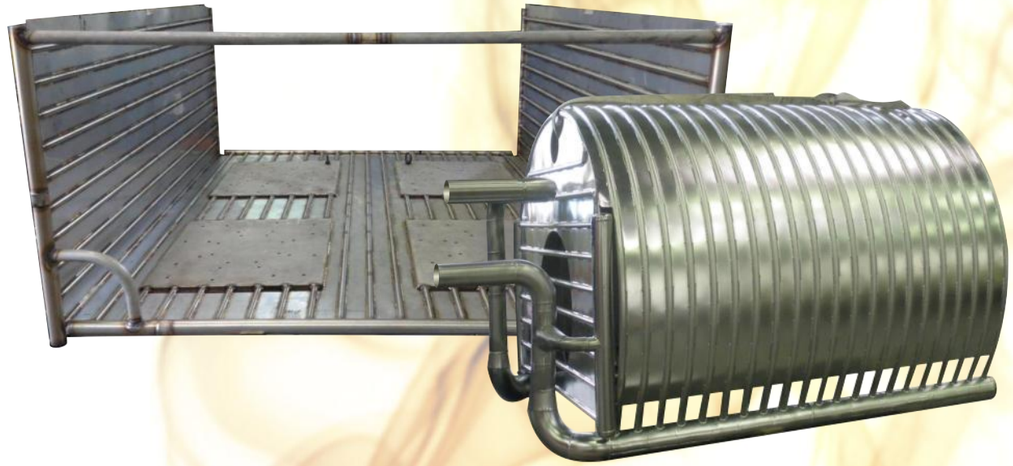
-200^{0}C **10^{-6} Torr** **+250^{0}C**

Modern world relies more and more on intense global communication, made possible by a large number of satellites stationed in space during the last decades. The reliability of these satellites as well as their economical deployment depend on the reliability and longevity of all their components and sub assemblies. Reason why each component and/or sub assembly is thoroughly tested under its operational conditions before their launched live.

To simulate the conditions in space, a vacuum environment is required and the unit under test must be subjected to periodical temperature variation simulating the cyclic exposure to the sun.
The items are supported by a temperature controlled table surrounded by shrouds to simulate thermal radiation. In this way the physical stresses and behaviours can be checked in every specific situation and the tested component can be improved or modified where and if required.







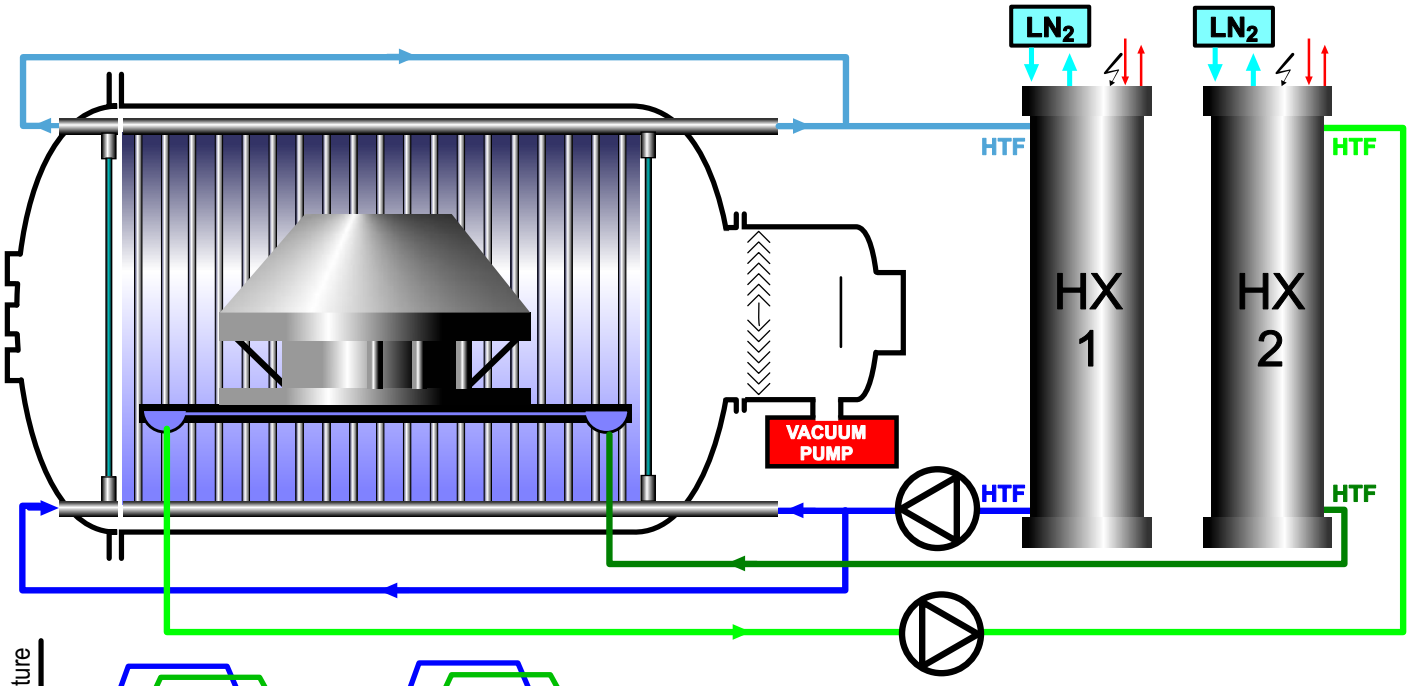
RLD has re-designed and built space simulation chambers for over 10 years in collaboration with a boiler maker specialized in cryogenics.

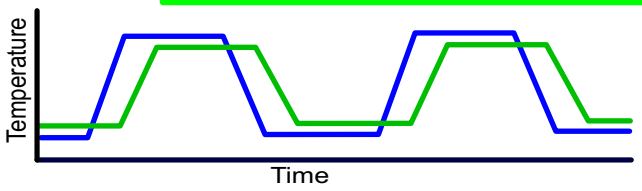
The classic welded LN_2 shrouds are only designed to function at liquid nitrogen boiling temperature. The specially designed RLD shrouds however make it possible to exactly calculate the fluid behaviour in each panel and obtain a homogeneous surface temperature with low and optimized LN_2 consumption.

Moreover the components of the thermal circuit have been redesigned with:

- fully optimized RLD heat exchangers (using proprietary software)
- low heat in-leak RLD circulators (see CRYOBLOW and CRYOFLUID brochures) operating continuously and economically without any maintenance for years.

The complete re-design results in a low investment combined with little operating costs for man hours and required energy.



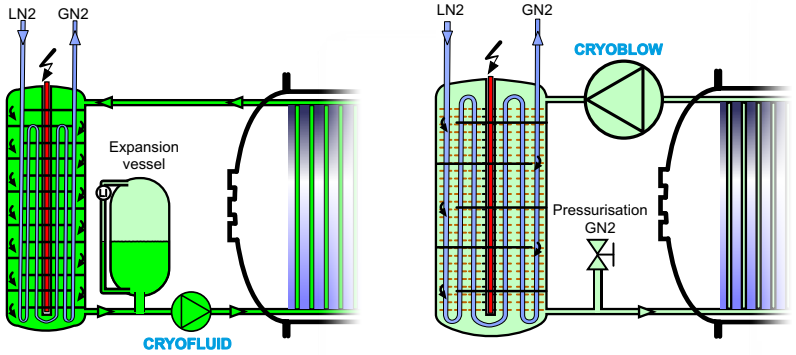


Shroud temperature

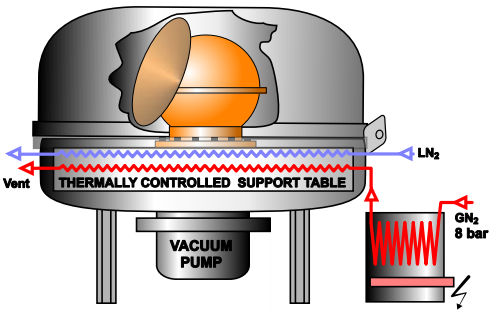
Table/specimen temperature

Temperature ranges for heat exchanger (HX)

- liquid heat transfer fluid (LHTF): -100°C to 150°C
- gaseous heat transfer fluid (GHTF):-190°C to 250°C



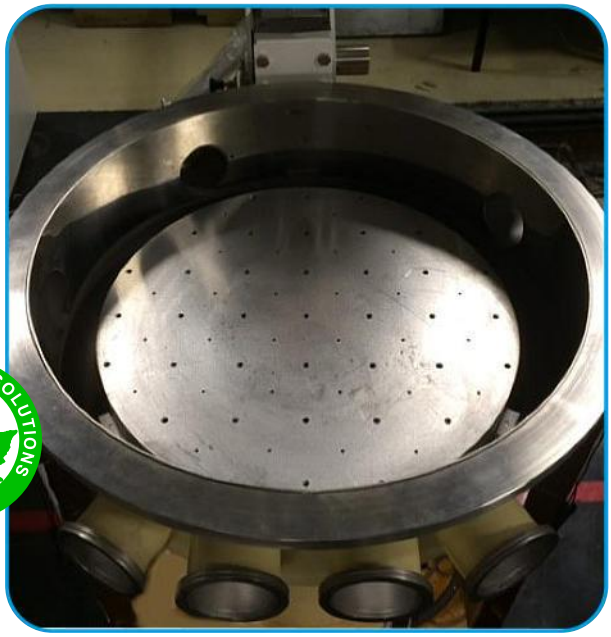
The left heat exchanger configuration with the **CRYOFLUID** is used for liquid heat transfer fluids such as typically silicon oil or 3M segregated hydrofluoroethers (HFEs), while the **CRYOBLOW** configuration on the right is intended for use with gaseous heat transfer fluids (pressurized GN_2 or helium).



For smaller size vacuum chambers where only a temperature controlled table is required, cast aluminium heat exchangers (see HEXAL brochure) can be offered as alternative. Only liquid and hot gaseous nitrogen are used resulting in dramatically reduced overall consumption.

The green sign for Economical Solutions for equipment using LN_2 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 RLD Thermique - Ingénierie has made it their trademark to optimize their designs for low LN_2 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.



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