

# GRAIN: Mechanics and proximity cryogenics updates

GRAIN working group – Oct 18, 2024



# Inner vessel: Helicoflex

**HELICOFLEX® HNRV130 - Cross section=5.80/6.10**

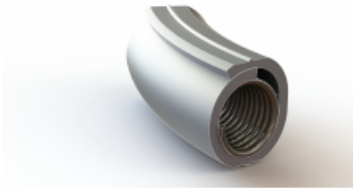
**Outer jacket made of Al**

**Outer dimensions: 568.4 x 1558.3 x R154.15**

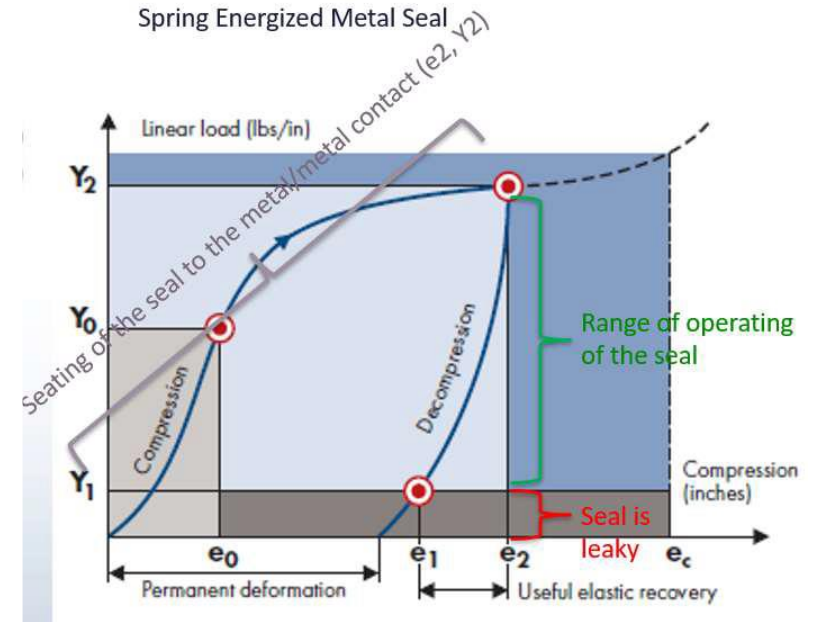
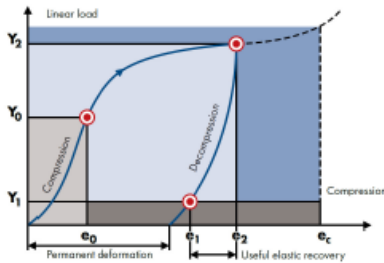
Customer change: 44 x studs M20 become 44 x studs M18 in Bumax88  
1.8 bar becomes also 1.7bar

## Working Conditions

Media to be sealed	Liquid Argon
Working pressure [bar]	1.7
Working or bakeout temperature [°C]	-185
Media side	Internal



Seal style	HNRV130
Cross section [mm]	5.80
Outer length (B) [mm]	1558.3
Outer width (D) [mm]	568.4
Outer radius (Re) [mm]	154.15
Sealing material	Al
Spring material	Nimonic 90
Leak tightness	Helium



- Gasket closure (i.e. gasket compression) is homogeneous along the seal after the bolts' pretension,
- Normal gasket pressure (i.e. seal linear load) is sufficient to ensure leak tightness after applying external loads.

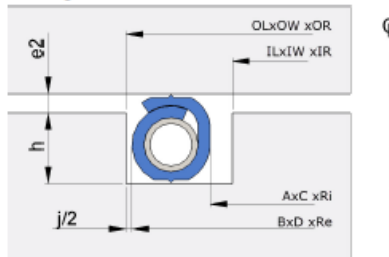
The table below summarizes the results of the study:

Verification	Combination	Value	-	Criteria
Homogenous compression of the seal	DW + BP	0.99768 mm	>	0.9 mm
Leak tightness	DW + BP + SP	122.91 MPa	>	42 MPa

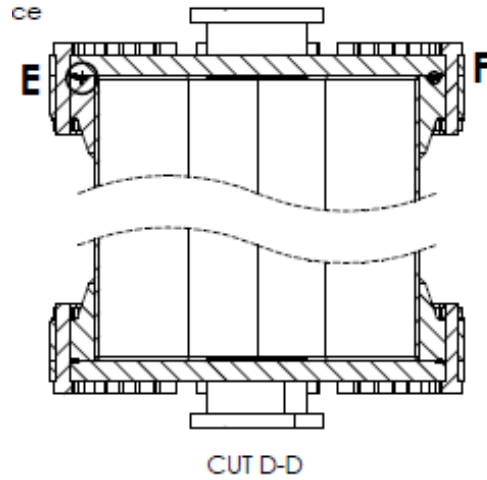
Table 4 – Results' summary table

## Groove Data

Groove dimensions	See drawing 111-0296439 Pages 1 to 3
Compression value (e2) [mm]	1.00
Diametrical clearance (j) [mm]	0.50
Roughness obtained as per Technetics' specification 921-15	Ra0.2 - Ra0.8
Minimum hardness [HV]	100.0

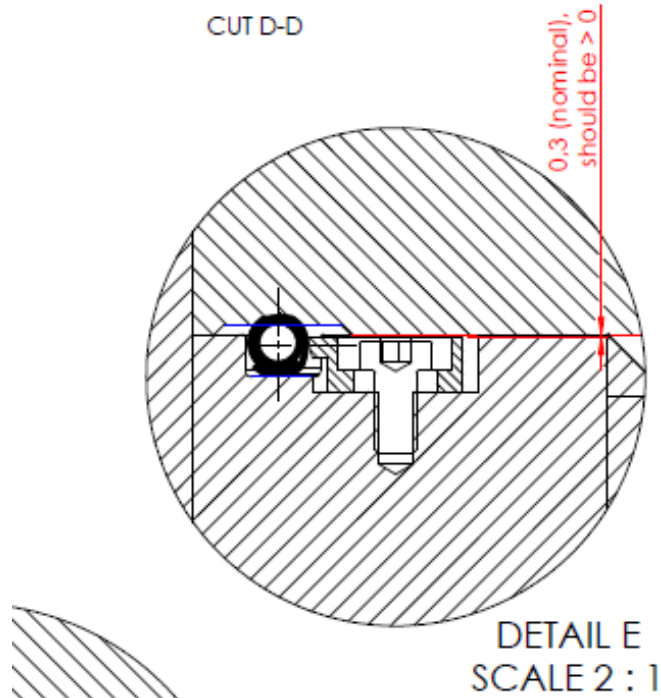


# Inner vessel: Helicoflex

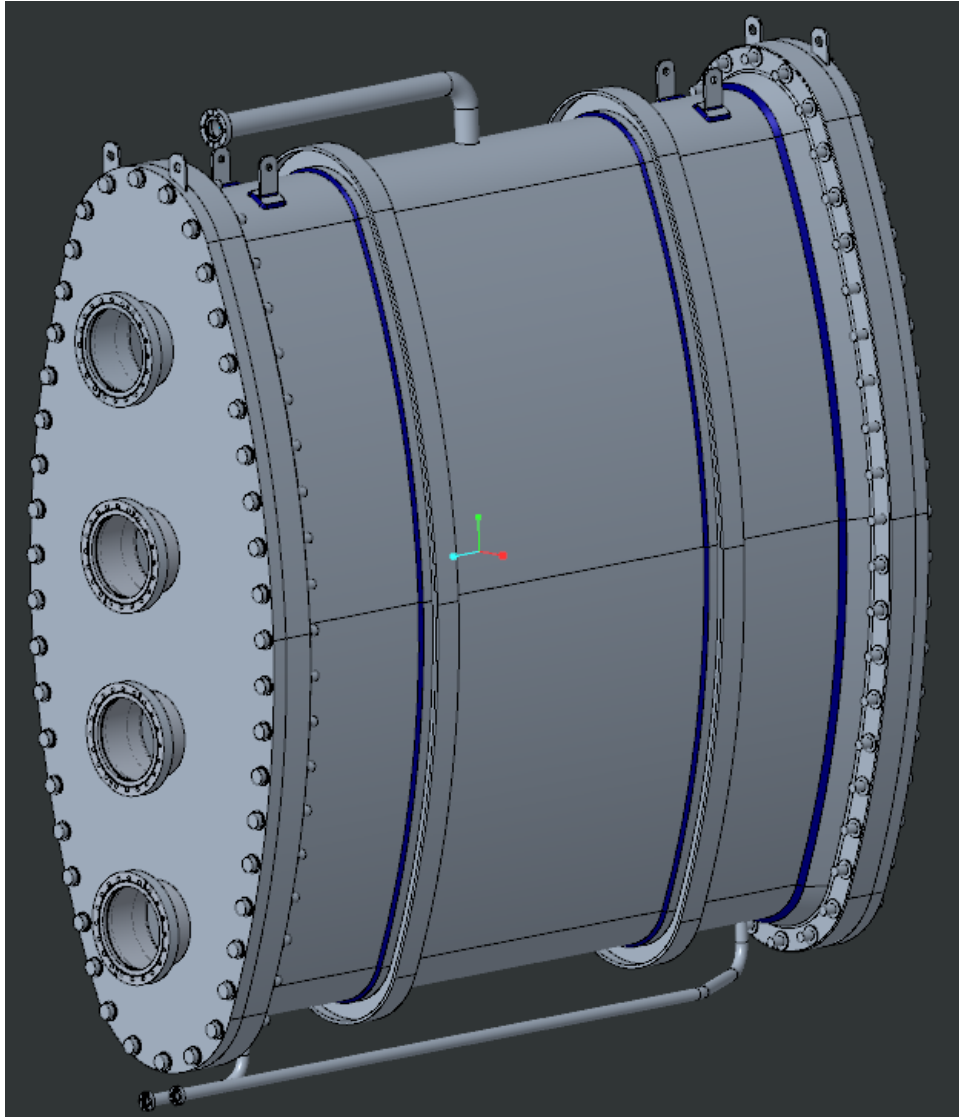


4 metallic clips to keep gasket in position during closure

Price of each Helicoflex ca 5000 €

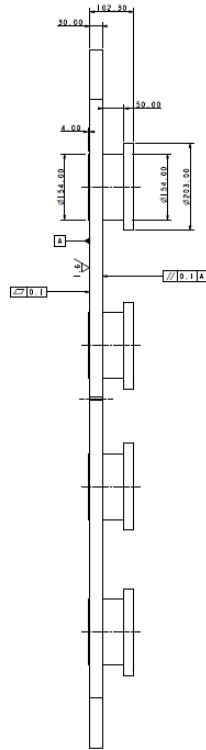
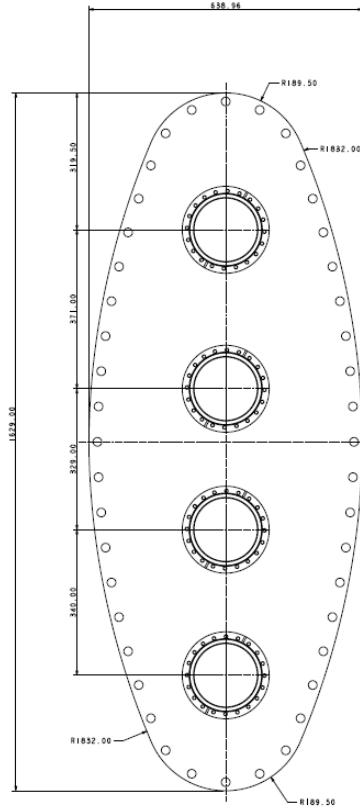
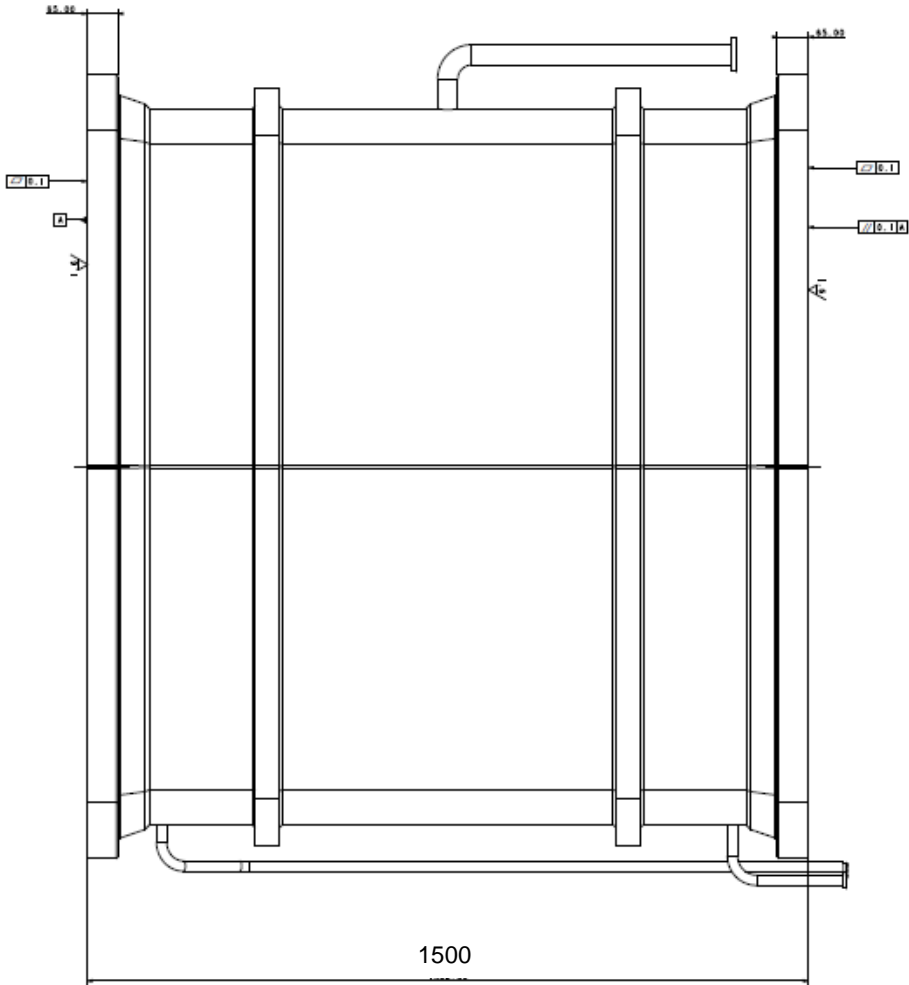
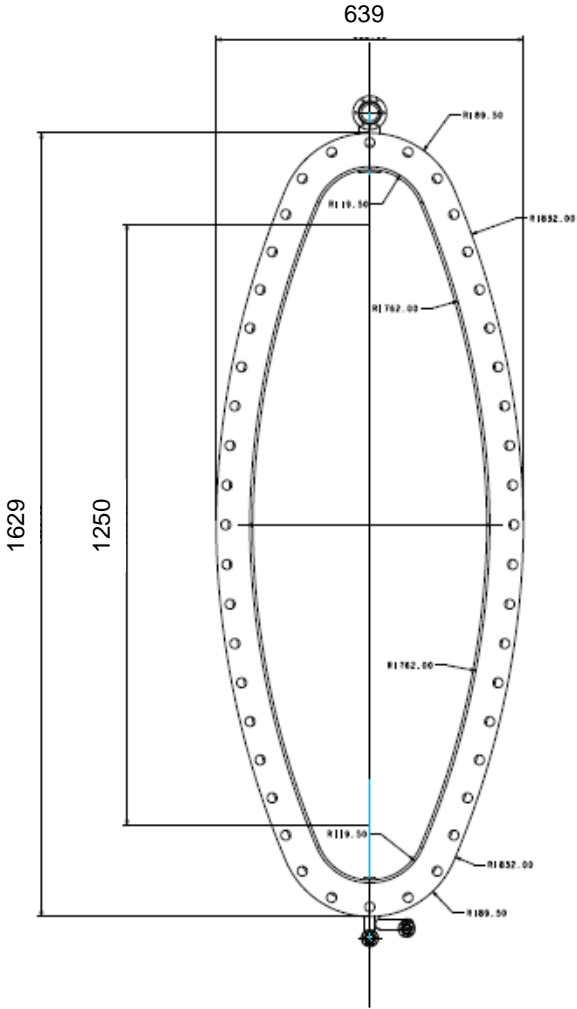


# Inner vessel

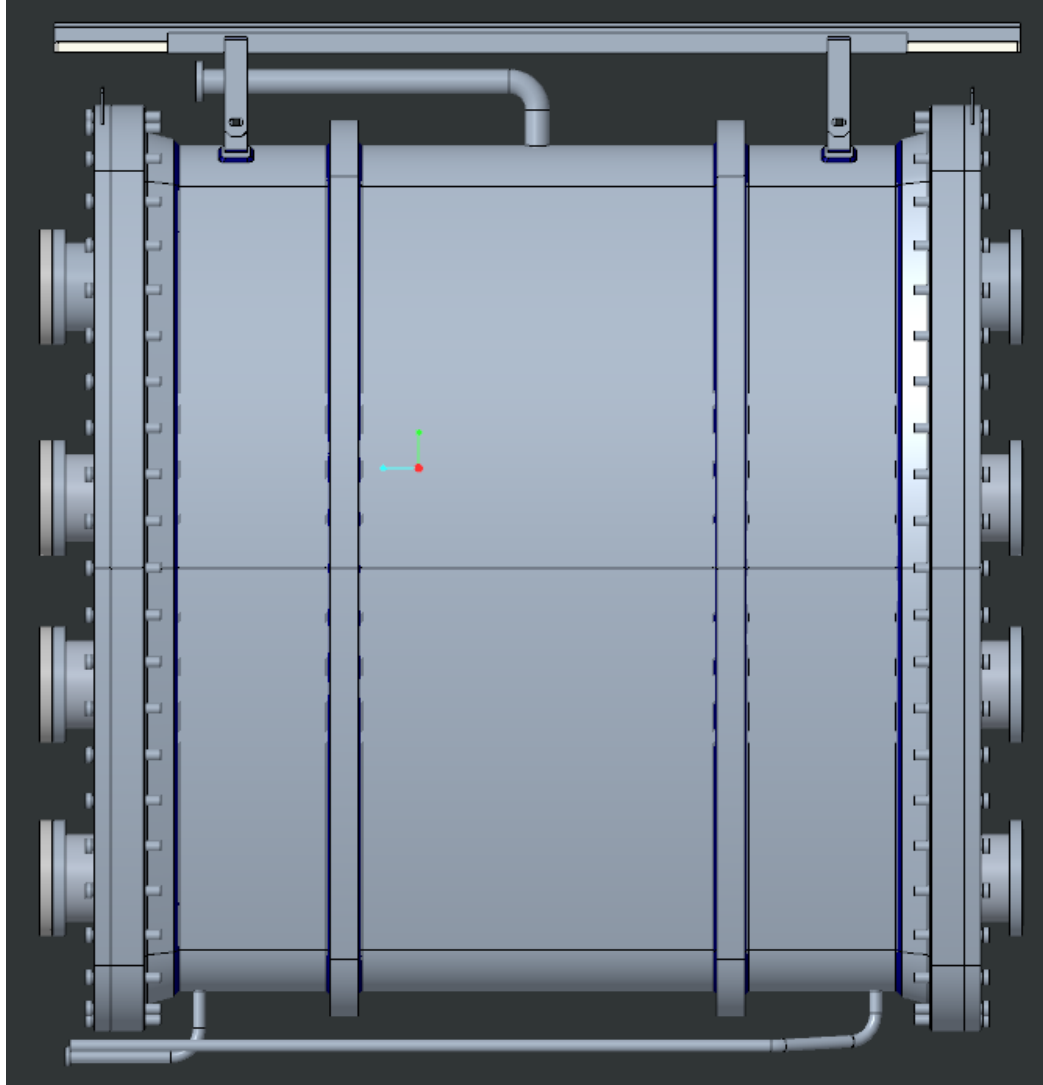


Design ready to be verified by Enginsoft following EN 13445 European standard

# Inner vessel



# Internal vessel design

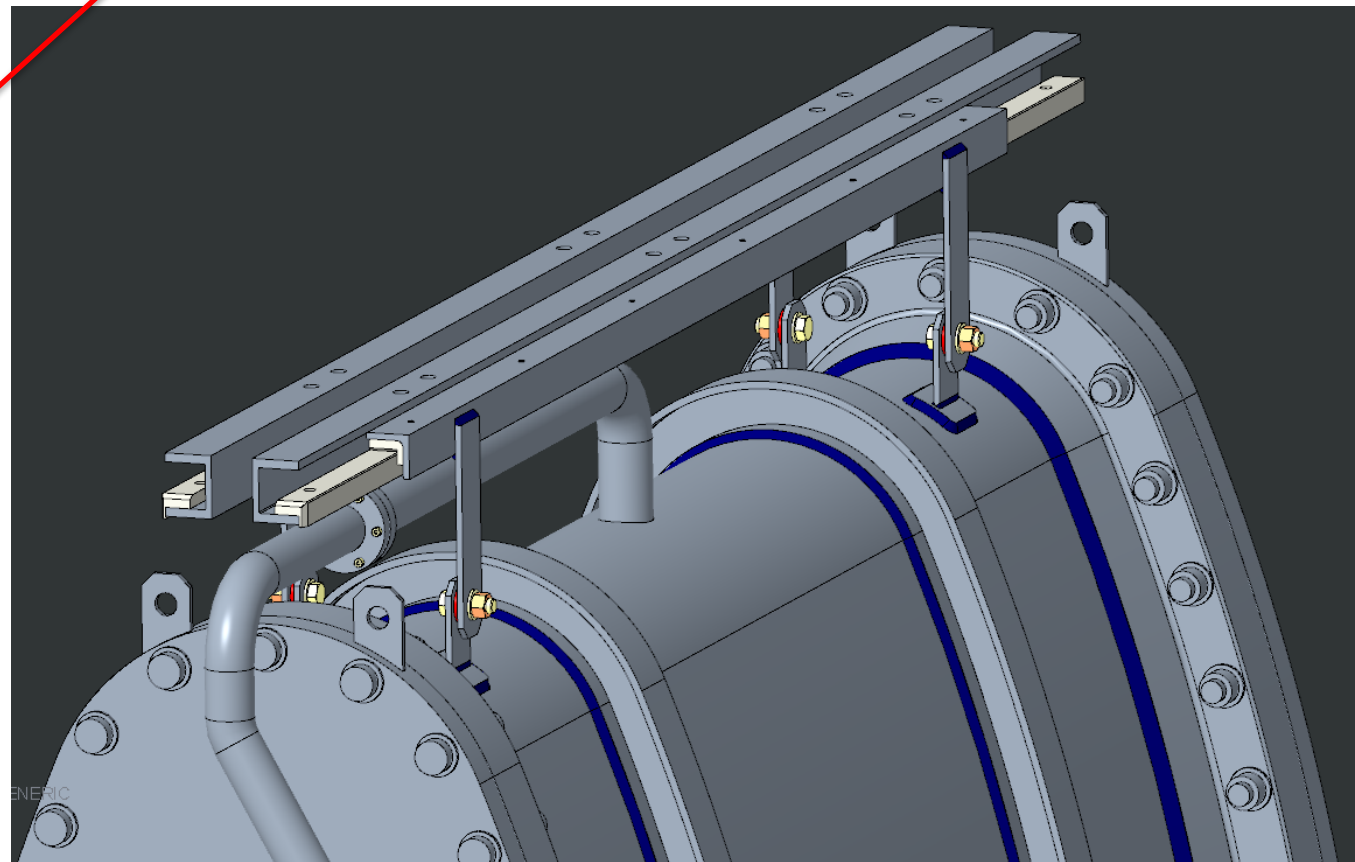
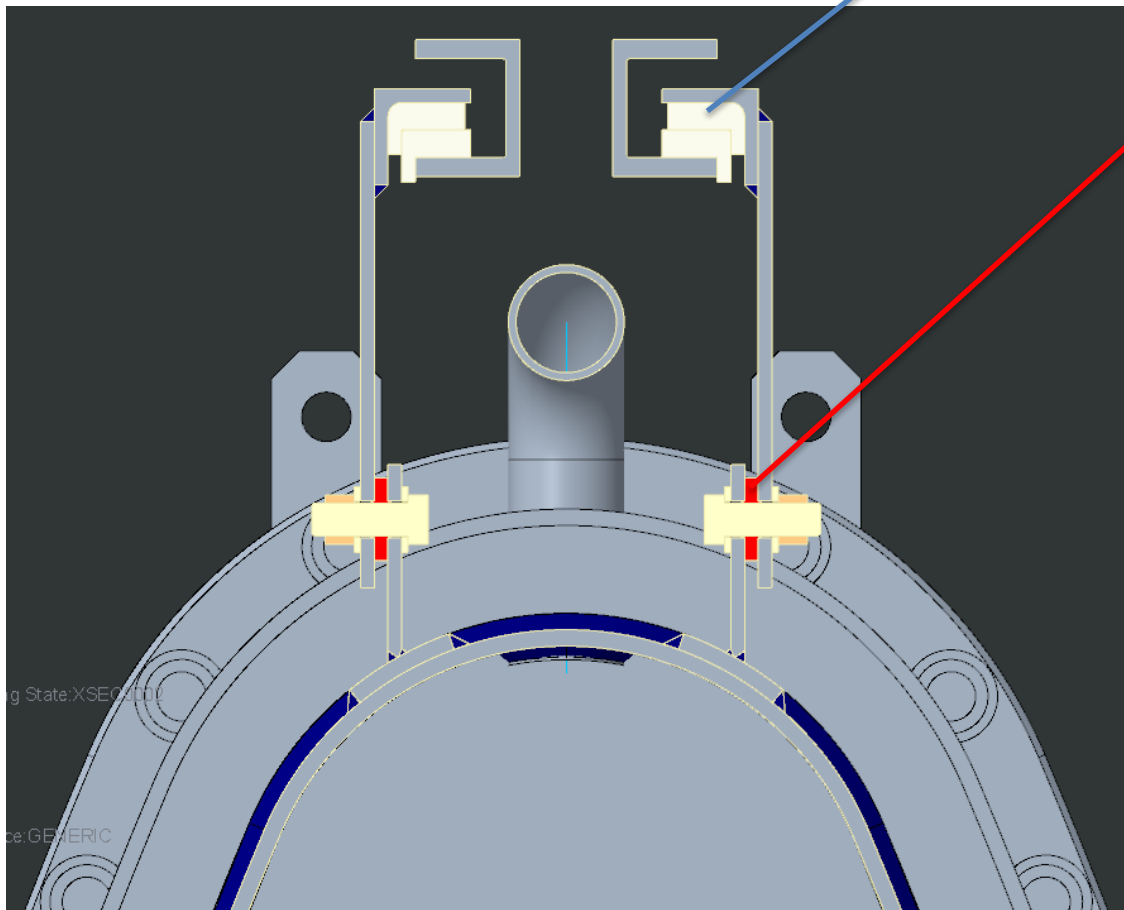


New supporting system to avoid oscillations and the critical use of bearings for vacuum and magnetic components

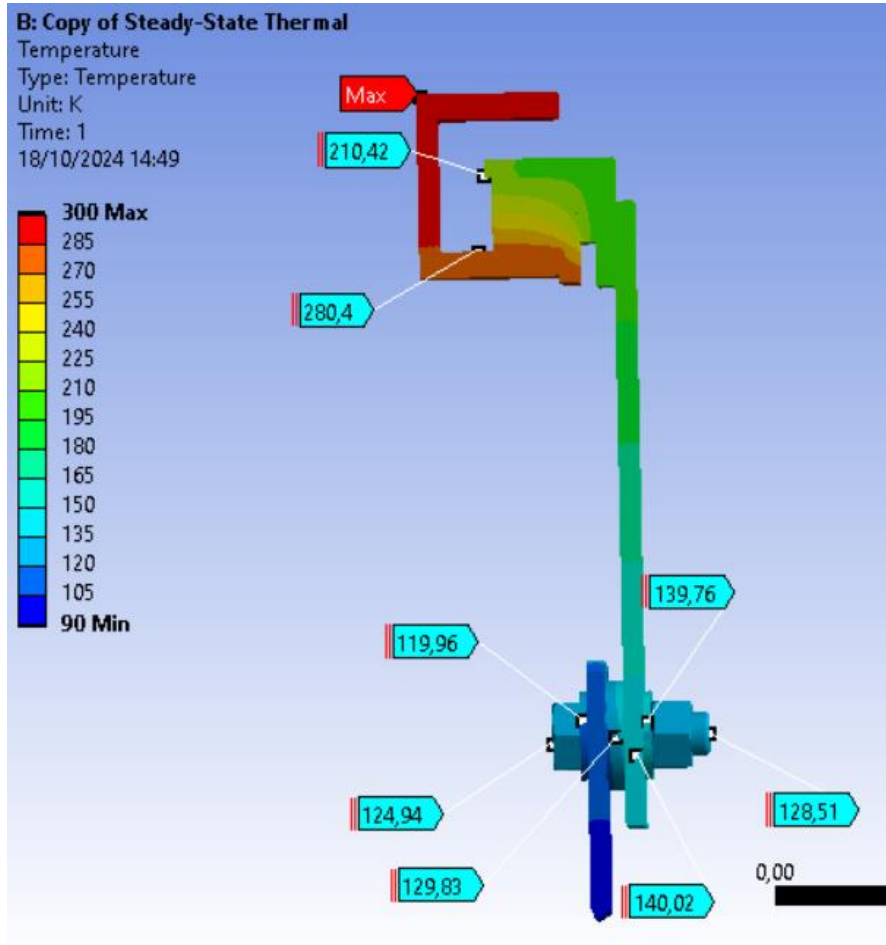
# Sliding system

Teflon sliding element

G10 for thermal brake



# Sliding system



$$\text{Heat transfer rate: } Q = (K_h - K_c) \left( \frac{A}{L} \right)$$

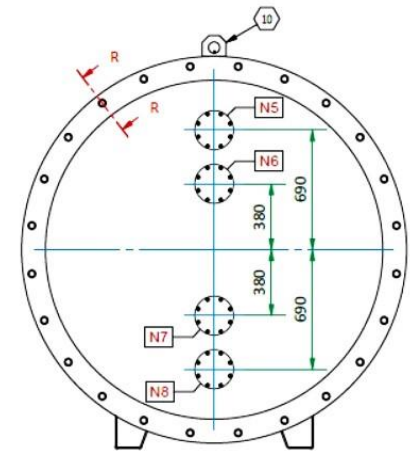
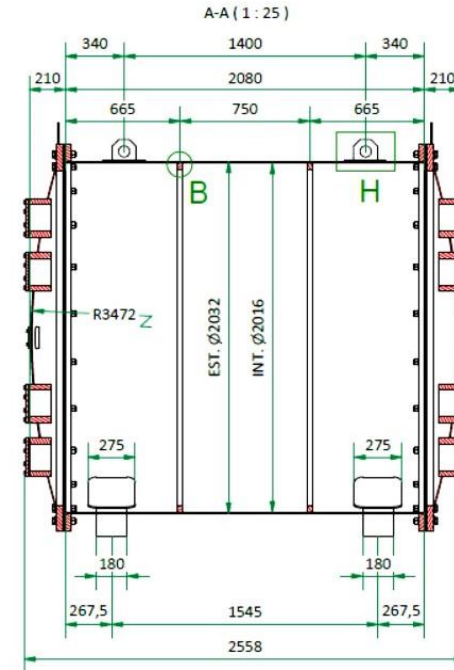
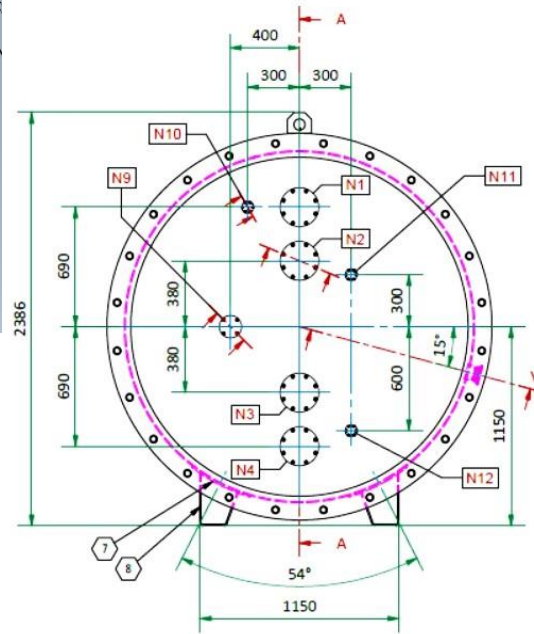
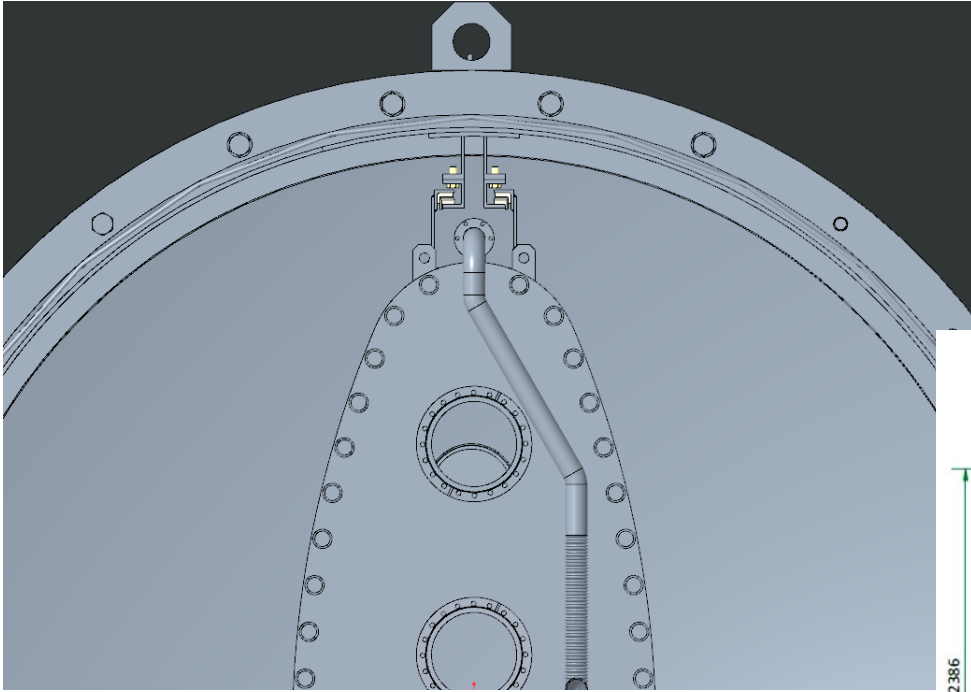
Across stainless steel ca 3,5 W

Across Teflon ca 4 W

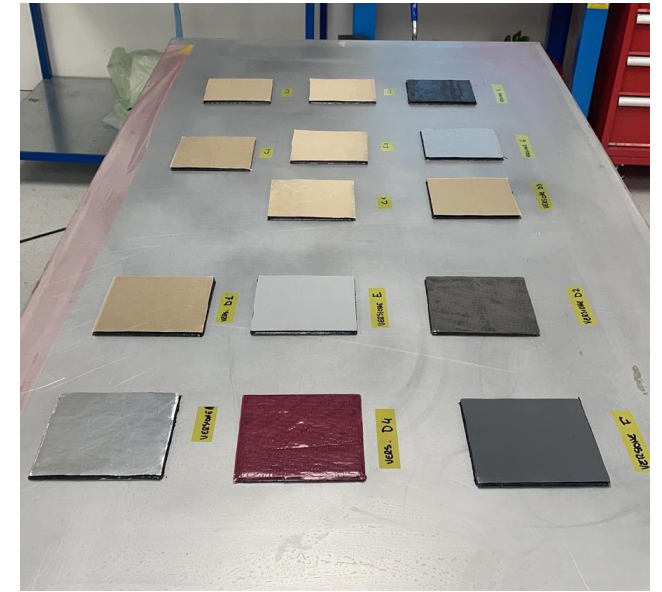
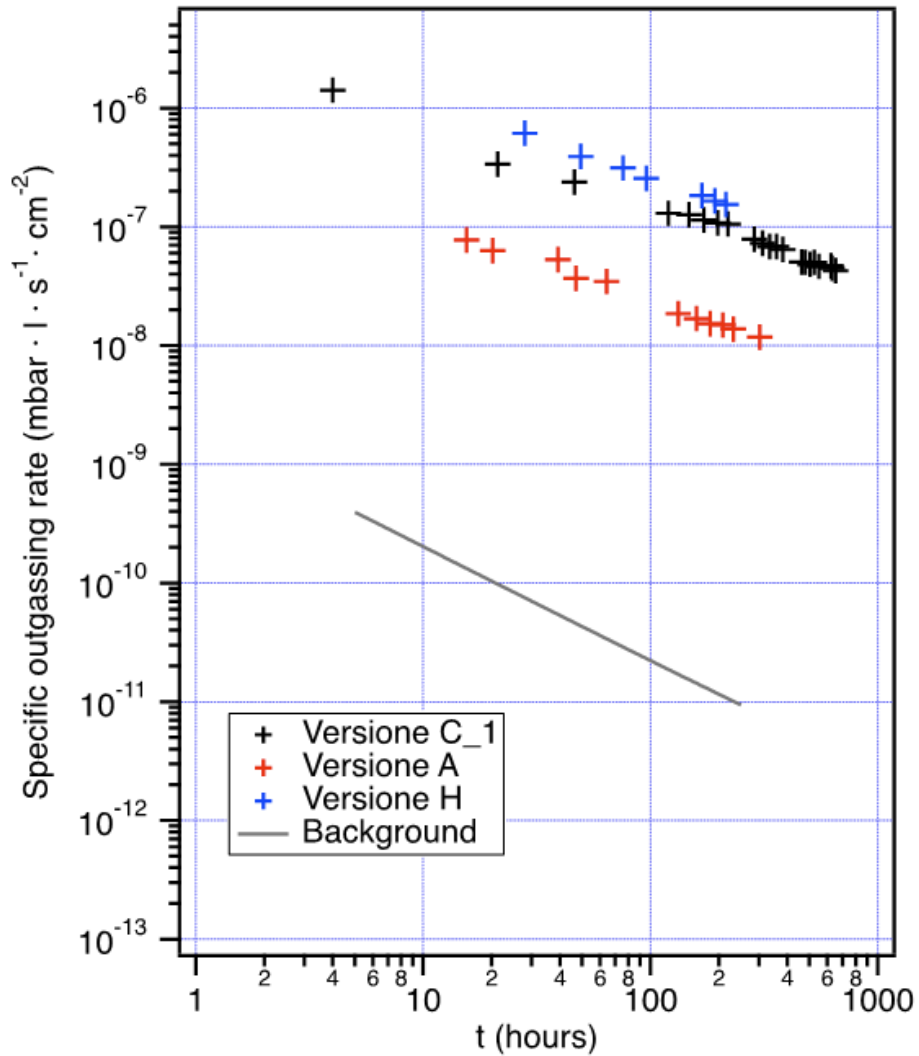
Total heat transfer ca 8W



# first vacuum tank for LNL facility test

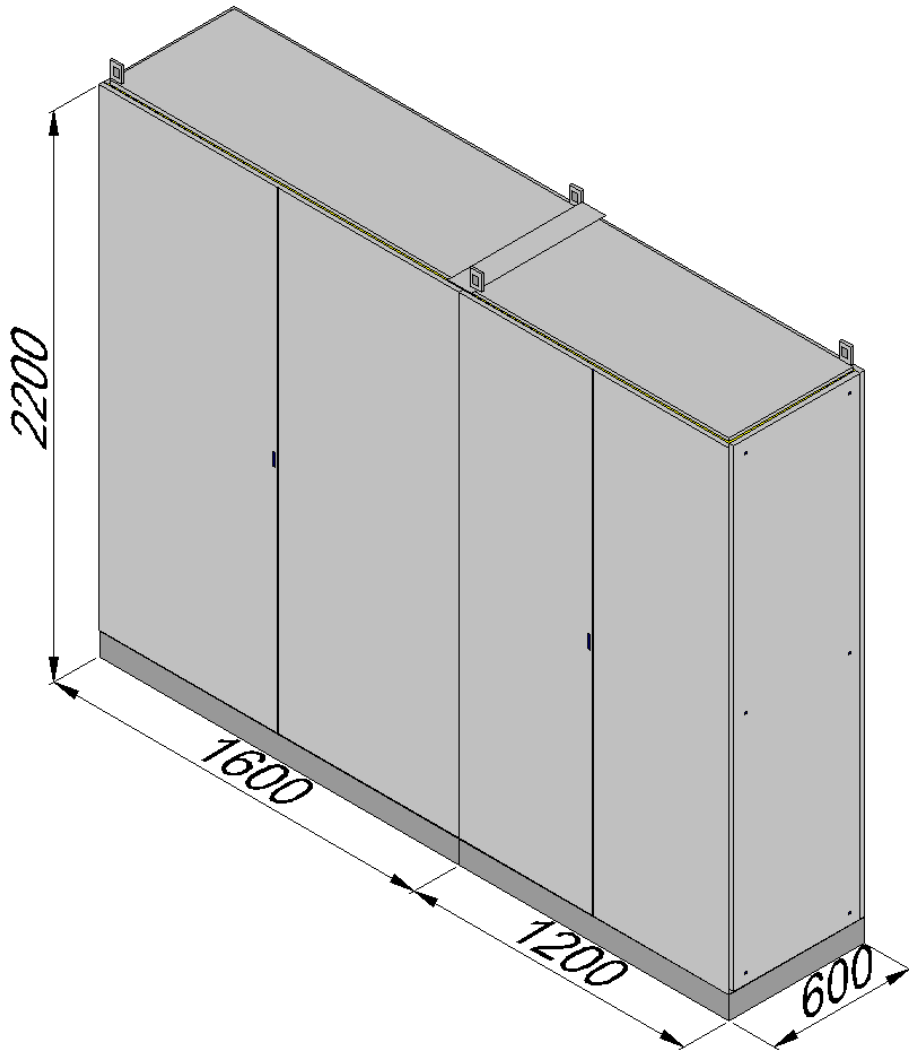


# CFRP samples campaign test



The campaign of outgassing test in LNF is almost completed

# Facility test LNL



Materials for the electric control panel has been delivered, now we are ready for assembling and cabling



# Facility test LNL



# Facility test LNL

Tender for proximity cryogenics to be prepared.  
Three companies are interested: Criotec, Demaco and Simic  
By the end of the month we should receive the quote

