IPP INSTITUTE OF PLASMA PHYSICS OF THE CZECH ACADEMY OF SCIENCES

Cryostat overview

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Presentation for preliminary market consultations
based on presentation for Internal tender design review 15. 5. 2025

MINISTRY OF EDUCATION, YOUTH AND SPORTS

Cryostat overview

Main parameters

Diameter: **4.75 m**

Height: **2.64 m** + **6.75 m**(9.39 m)

Weight: **62 t**

Material: AISI **304L** (DIN 1.4306 or 1.4307)
alternatively AISI 316L (DIN 1.4404)

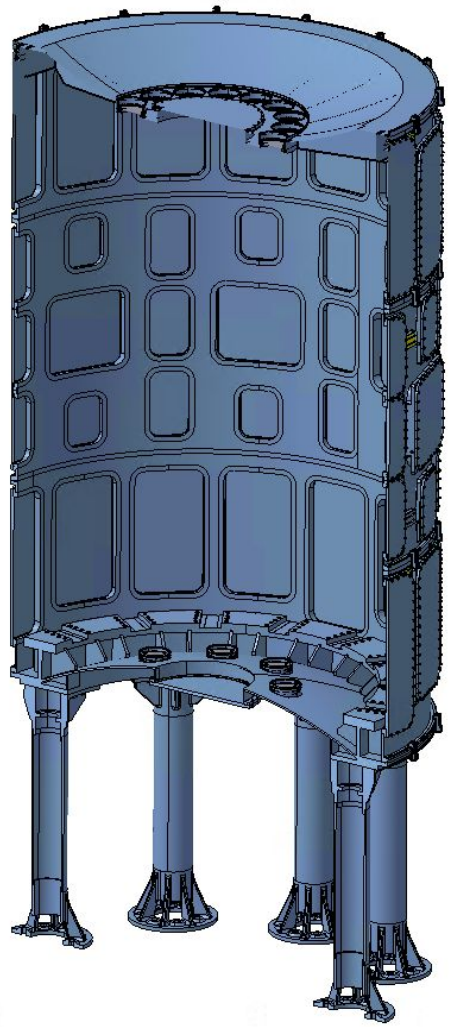
Max. relative magnetic permeability: *to be confirmed* (?)
1.1 for the base material
1.6 for material after machining and bending
2.0 for welds

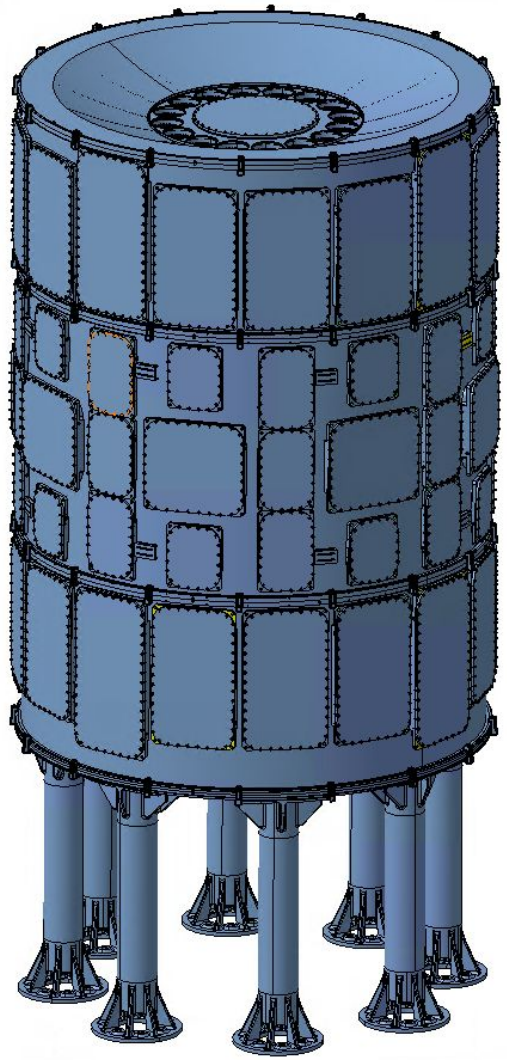
Surface finish: according to CU_DOC_VacuumRequirements
(we do not require polishing, plan to use MLI)

Vacuum: 10^{-6} Pa with a total leak rate of maximum $2 \cdot 10^{-7}$ $Pa.m^3/s$ (air).

CAD data

CU_CUPG-06	**100477_V08_ASM**	**CRYOSTAT**
CU_CUPG-06	**104381_V01_ASM**	**CRYOSTAT - DELIVERY STATE**





Error field correction coils

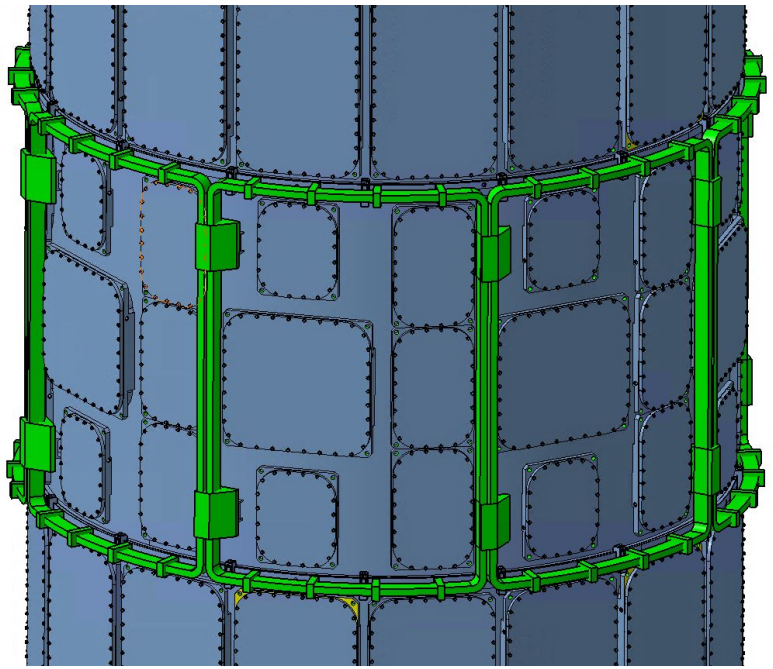
Not part of the delivery - **space envelope** provided to secure the space

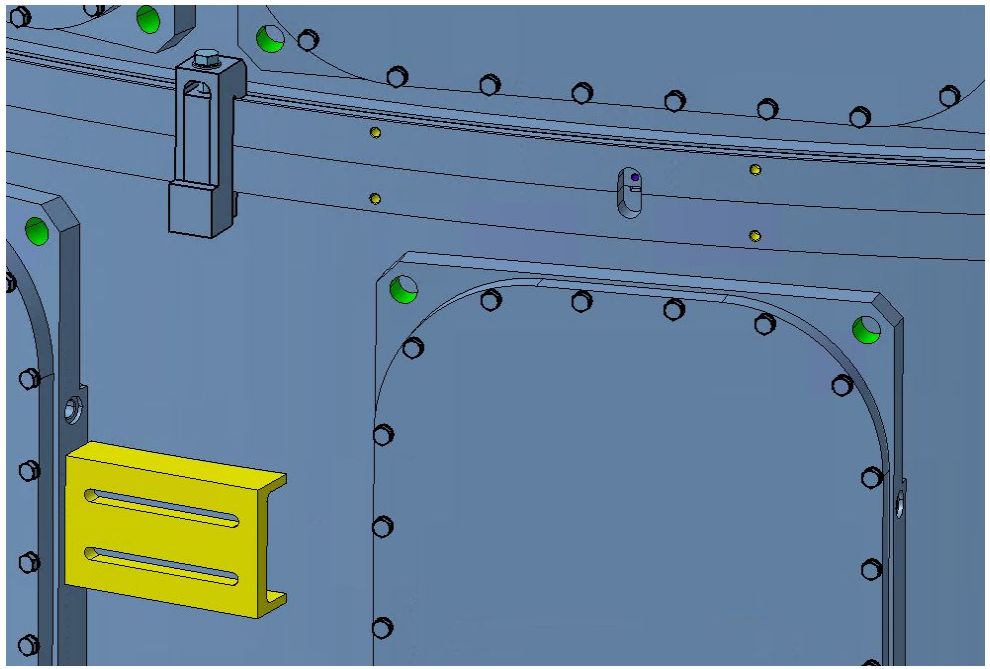
80 kA.turns: 3x7 turns (13+2x0.5 mm) x (13+2x0.5 mm) cross section + 4 mm steel case

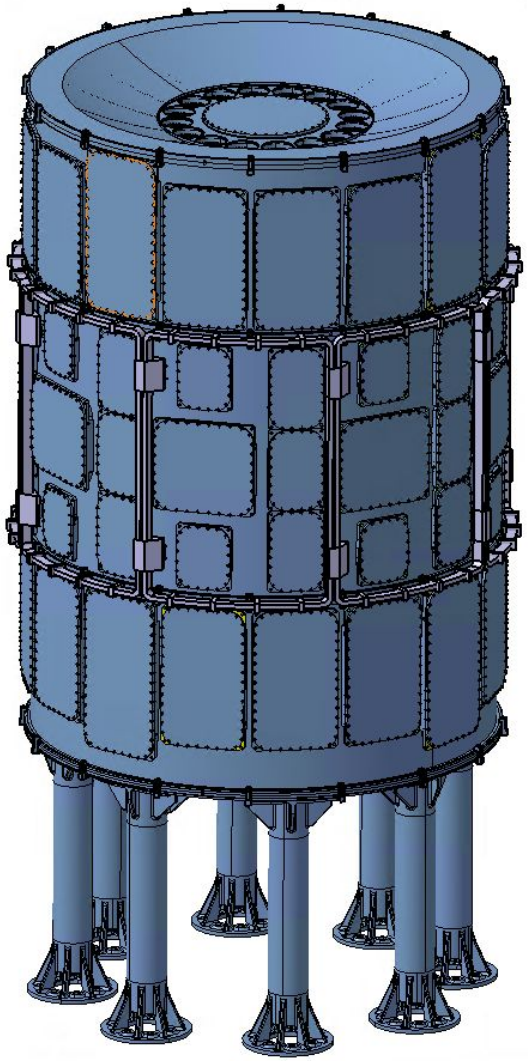
=> **50 mm x 106 mm** (toroidal x radial)

Mounting points are part of the delivery

- U-shape brackets for vertical parts of EFC
- M12 threads for horizontal parts of EFC **(clamps need to be optimised for removal of upper cryostat section)**





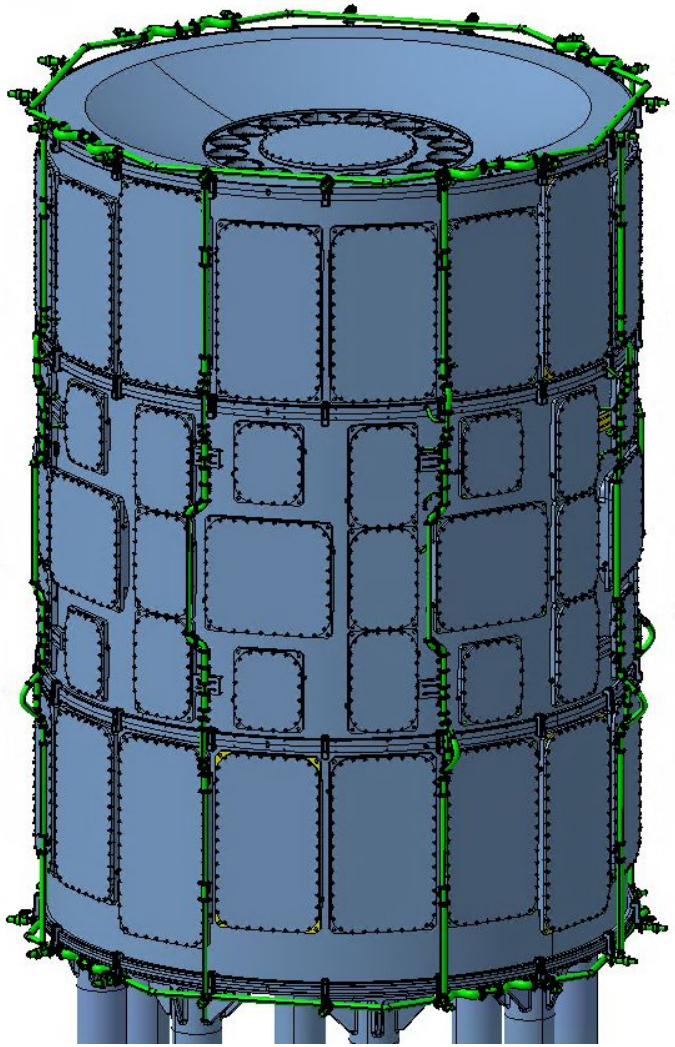


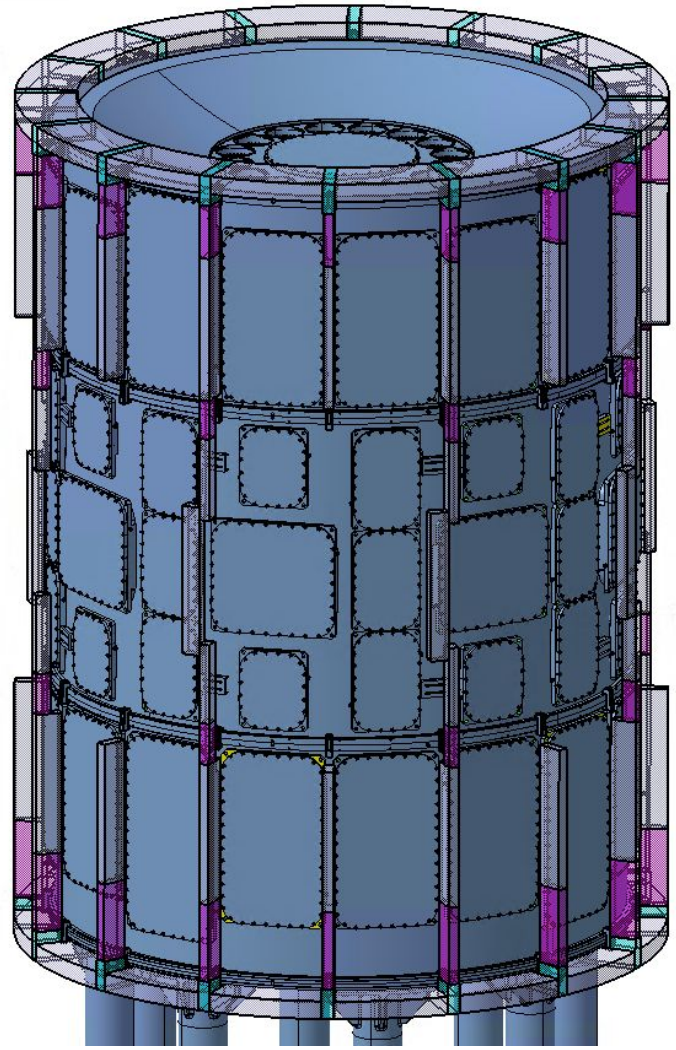
Fore vacuum pumping

Fore vacuum pumping of the interspace between 2 o-ring sealings of flanges

Part of delivery

Space envelope provided - actual design to be made by the supplier

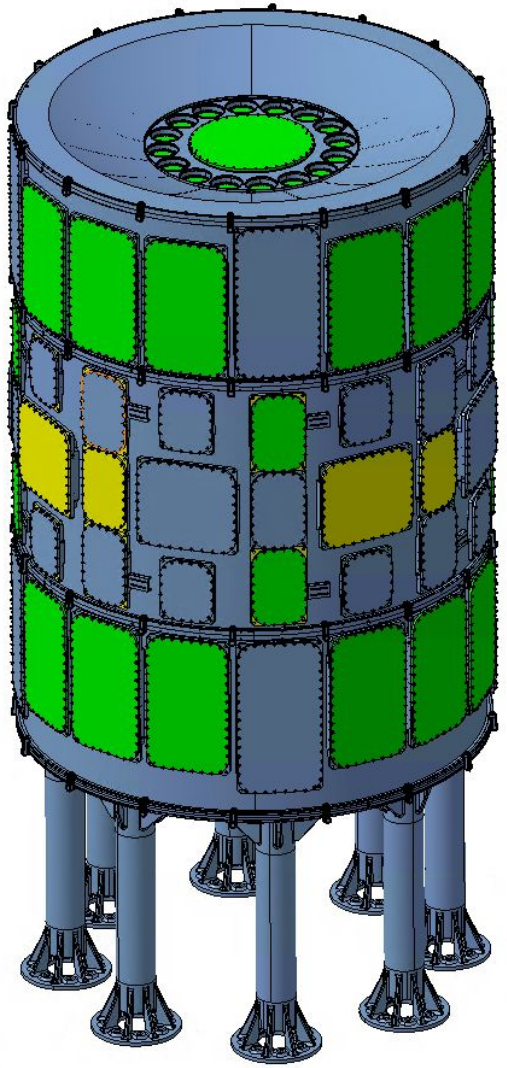




Blank flanges

Material of blank flanges

- 304L for ports where we do not plan port extensions
- 304L for vertical ports
- 304L flanges: 4 x MN, 4 x MX (?)
- Not specified for the rest - for vacuum testing and as protection during transport and storage



Cryostat delivery phases

Delivery 0 ***03/2026 (?)*** *assuming start of project in 10/2025*

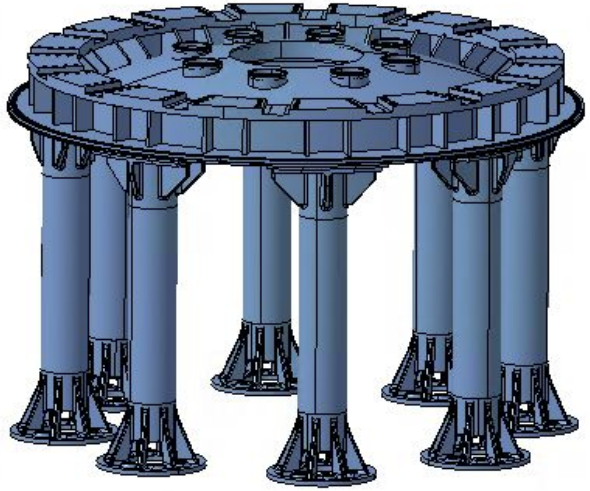
- Final design + design review
- FEM design validation
- Manufacturing documentation

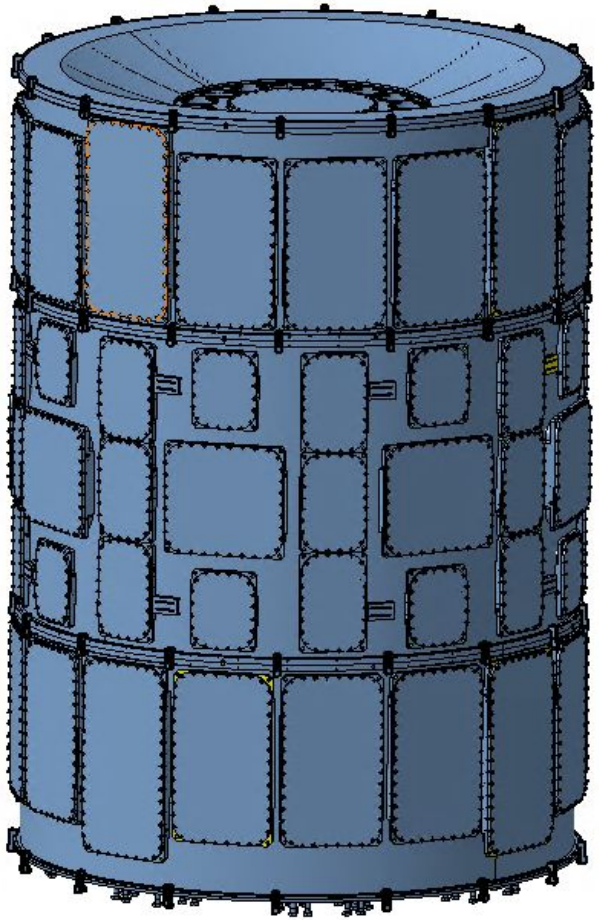
Delivery 1 ***06/2026 (?)***

- 8 cryostat supports
- cryostat base
- blank flanges
- (temporary cover for vacuum testing)

Delivery 2 ***03/2027 (?)***

- 3 cryostat vertical sections
- cryostat top lid
- blank flanges





Testing

Material testing

- 3.2 material certificates required (chemical composition, mechanical properties and magnetic permeability)

Weld testing

- Welding qualification required
- No specific NDT required

Vacuum testing

- Local weld leak rate $\leqq 3 \cdot 10^{-9}$ Pa.m^3.s^{-1} (?)
- Flange leak rate $\leqq 2 \cdot 10^{-9}$ Pa.m^3.s^{-1} per m of the double o-ring seal
- Pump down to $\leqq 1 \cdot 10^{-3}$ Pa, fill cryostat with dry N2,
  then reach pressure $P_{fin} \leqq 1 \cdot 10^{-3}$ Pa faster than $t = V/S_{eff}\ 2.3 \cdot \log (P_{atm}/P_{fin}) +$ X days
  - V is volume of tested part
  - S_{eff} is effective pumping speed of used pump (including effect of conductance of used connections)
  - P_{atm} is starting pressure
  - p_{fin} is final pressure, better or equal to $1 \cdot 10^{-3}$ Pa