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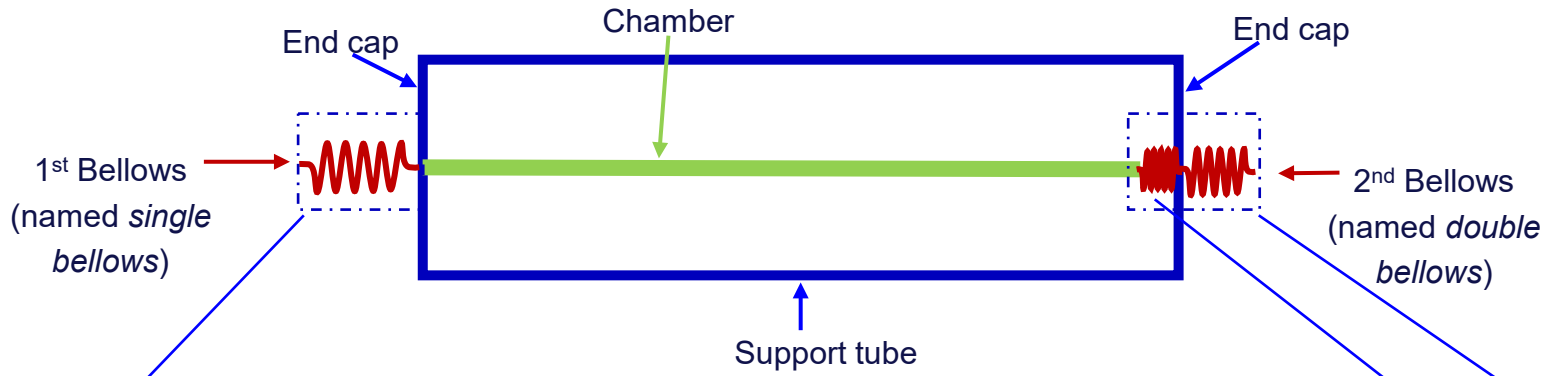
MOCKUP FOR THE BELLOWS

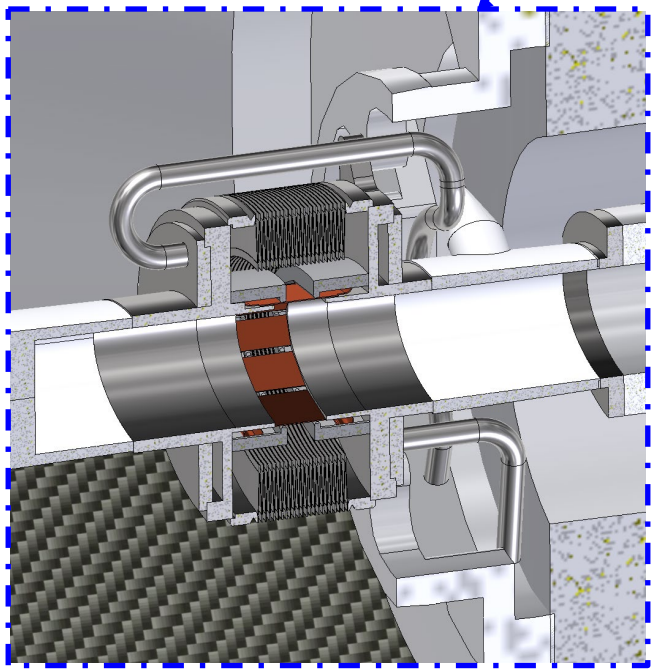
Speaker: Stefano Lauciani

Outline

- **Overview of the bellows schema and 3D drawing**
- **Bellows geometrical constraint**
- **Single and double bellows specifications**
- **RF finger detail**
- **Bellows status on the MDI design**
- **What we can study with the mockup**

Operating principles for MDI bellows and CAD drawing

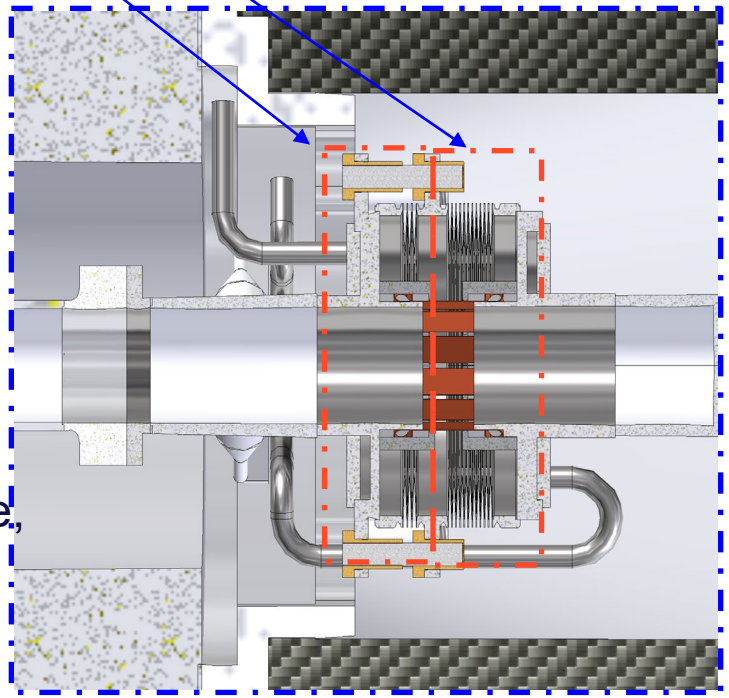




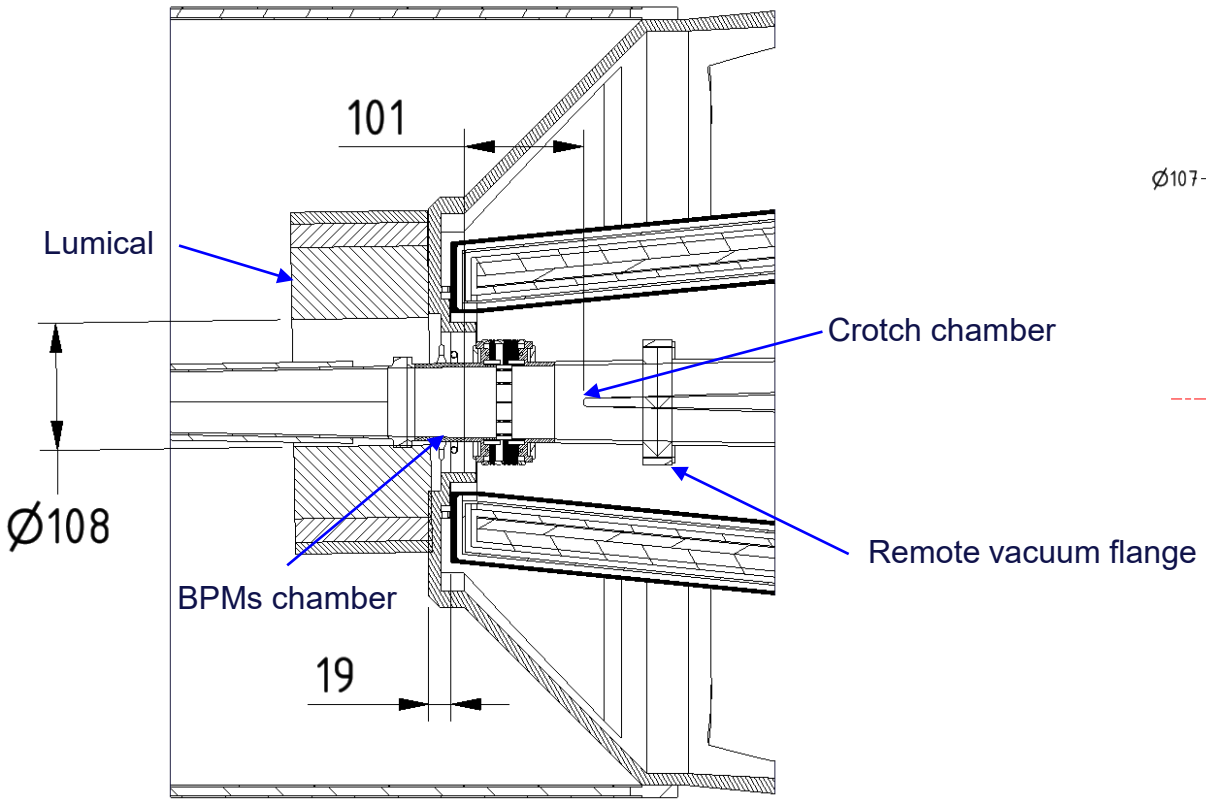
Bellows have same geometrical dimensions in order to have a symmetrical design of MDI area.

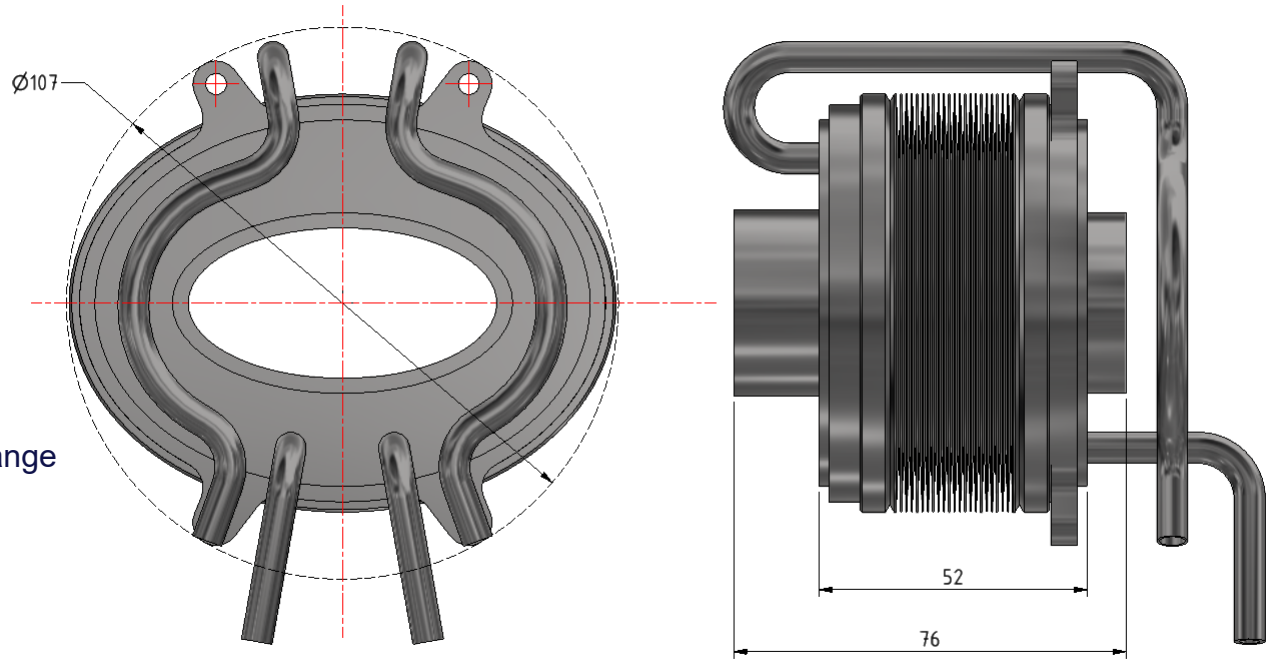
Convolutions configuration and anchoring points on the two sides are different

The bellows serve as constraint points and, therefore, alignment points for the central chamber



Geometrical constraints

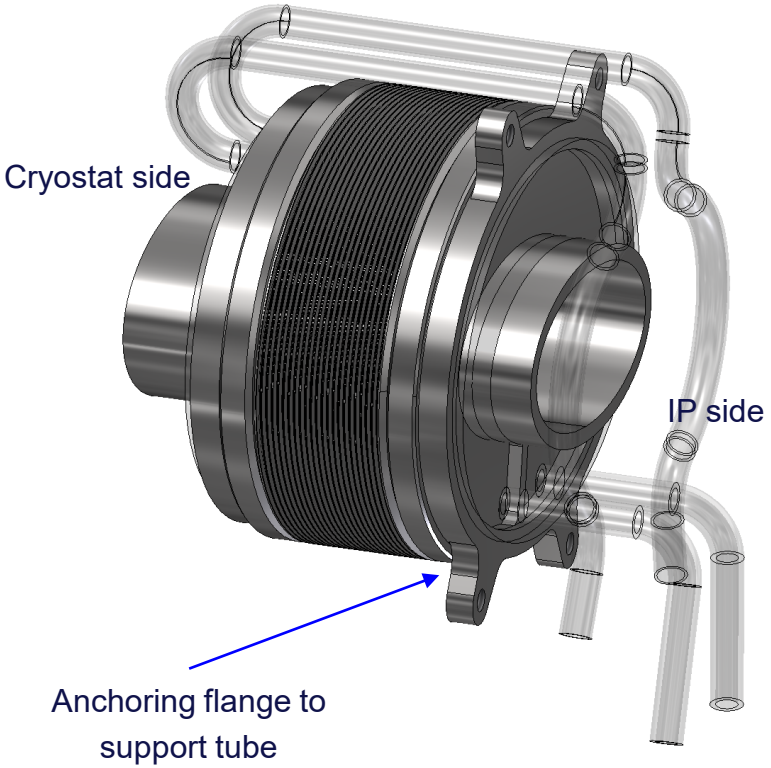




Bellows are in one of the most critical/challenging areas in terms of available space due to services, remote vacuum flange and cryostat

Max diameter: 108mm
Max length: ~101mm
Services space: ~19mm

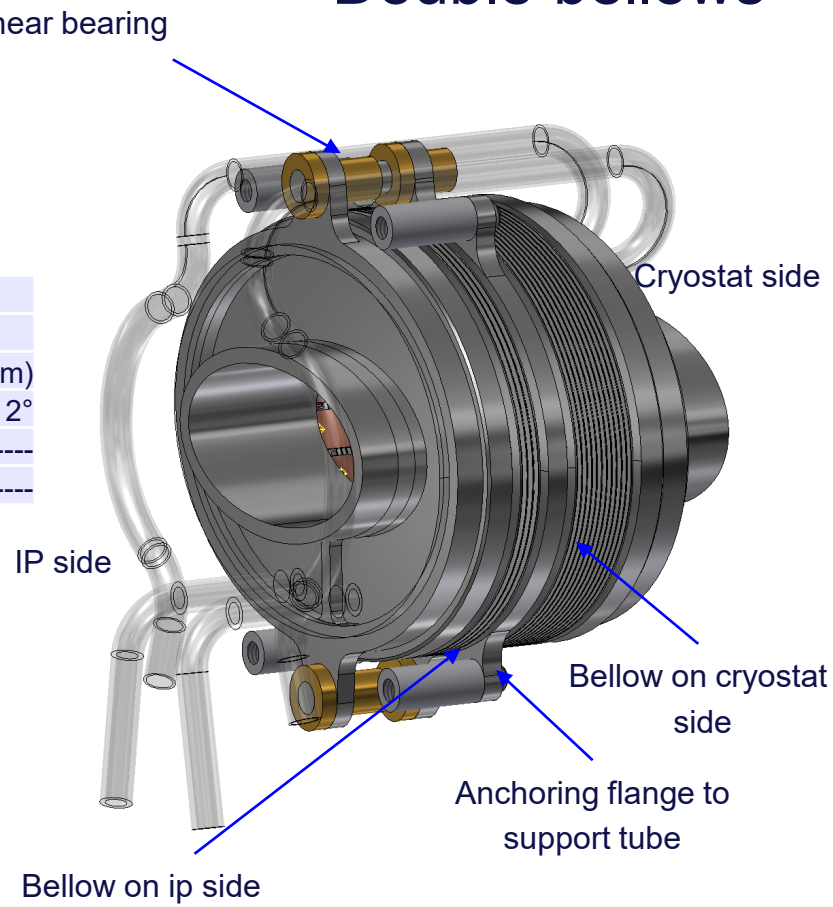
Single bellows



	Simple Bellow	Double bellow	
		Cryostat side	Ip side
Axial Stroke	-15/+9 (mm)	-10/+6 (mm)	-2.3/+1.4(mm)
Angle	12°	8°	2°
Radial offset (x)	1.15 (mm)	0.5 (mm)	-----
Radial offset (y)	1.54 (mm)	0.7 (mm)	-----

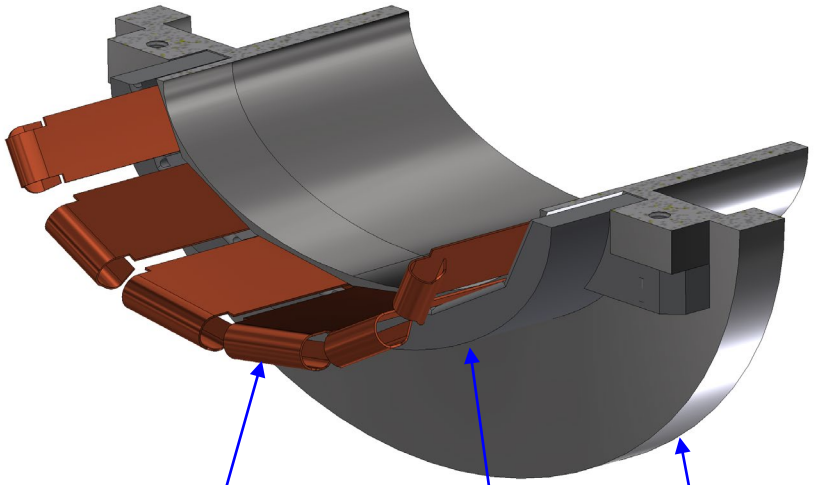
Max values, combination of displacement reduce the stroke

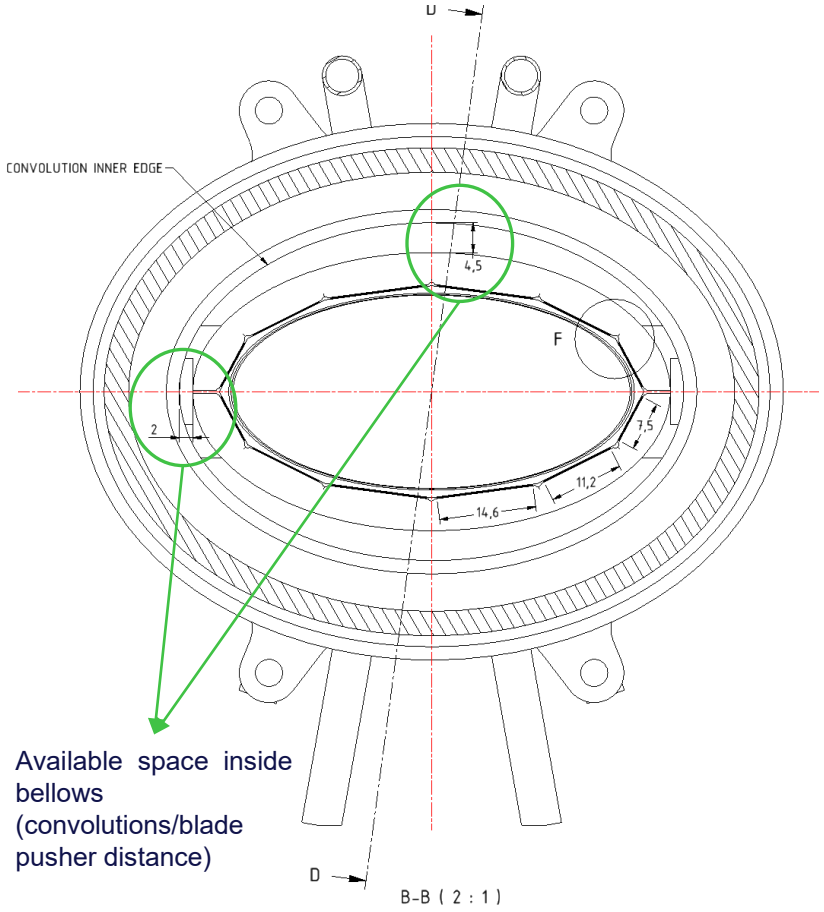
Double bellows



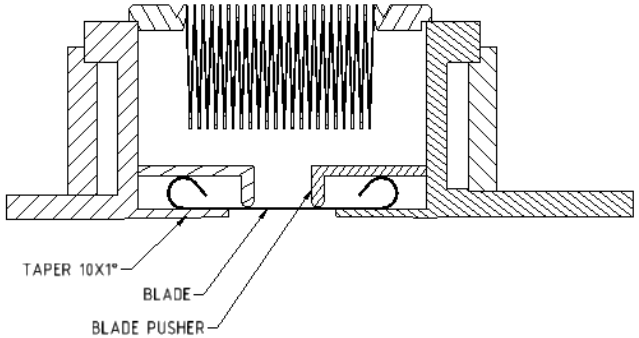
Bellows have been designed considering geometrical constraints due to unknow required specification
If maximum allowable displacement can withstand thermal deformations or assembly tolerances is unknown.

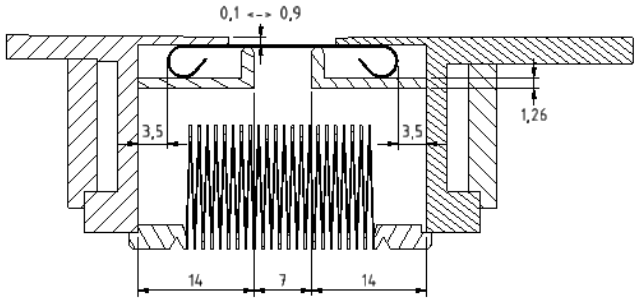
RF Finger

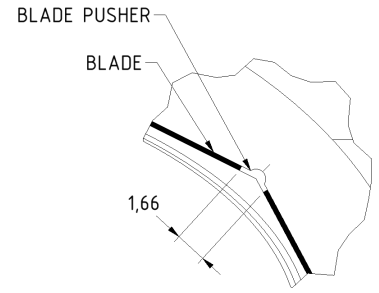




Available space inside bellows (convolutions/blade pusher distance)







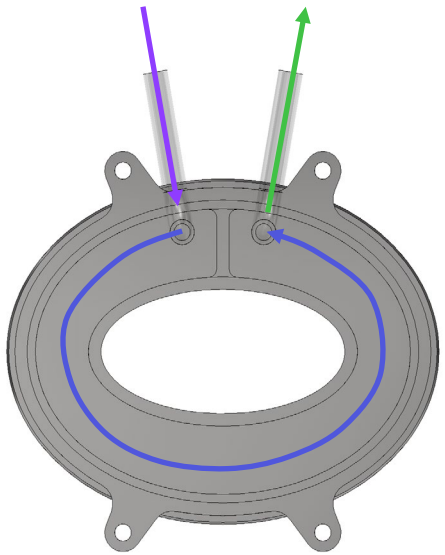
Chamber-blade step height depends on the curvature, angular position, and the number of vanes (min 0,1 – max 0,9)

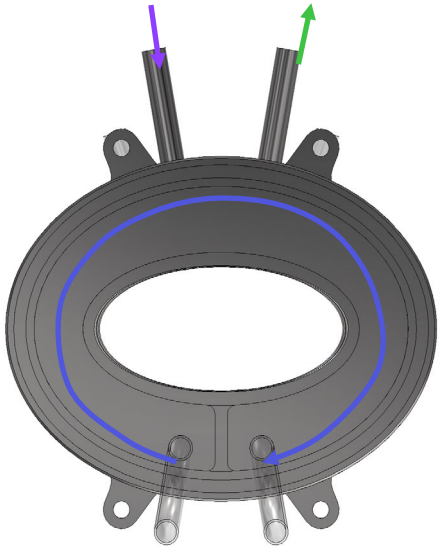
Blade-to-blade distance is ~1.7mm

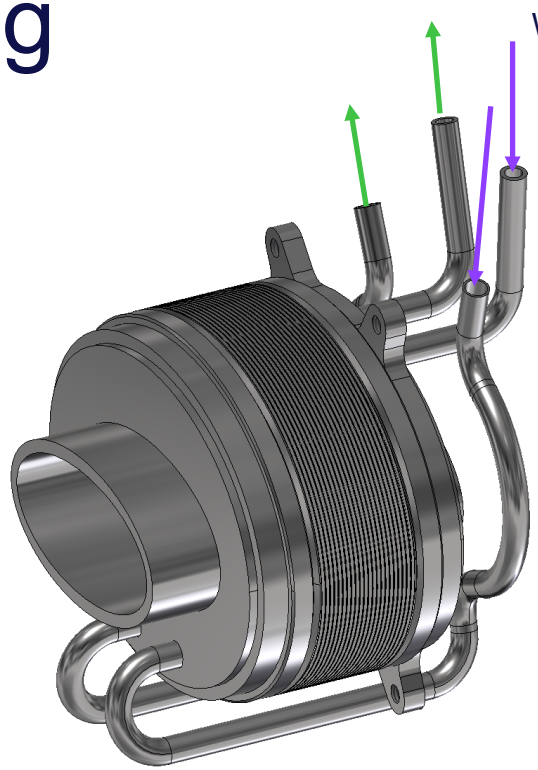
Very limited space for adding more items

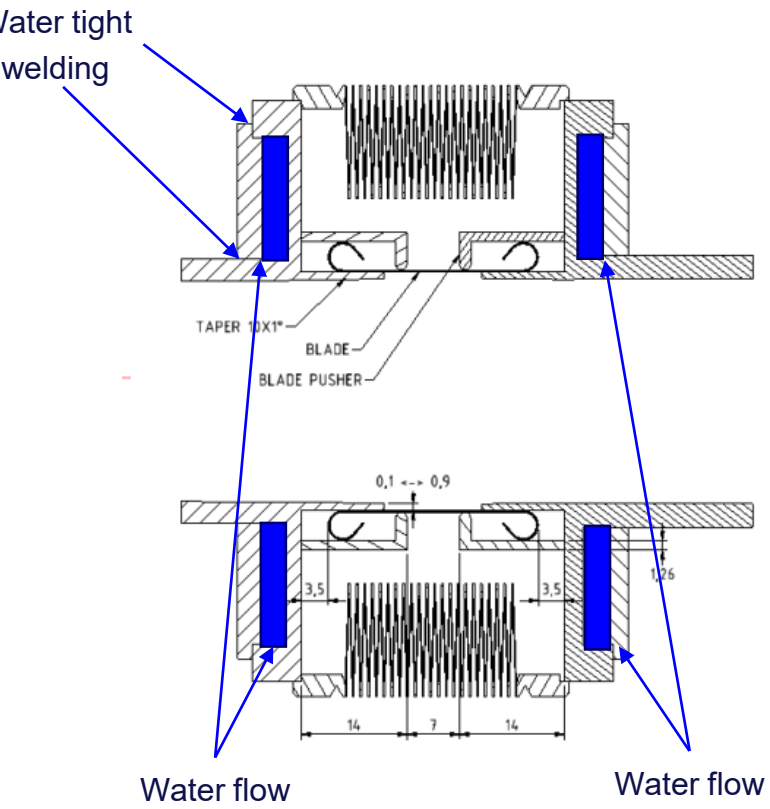
Blades design is similar to ESRF bellows

Bellows Cooling





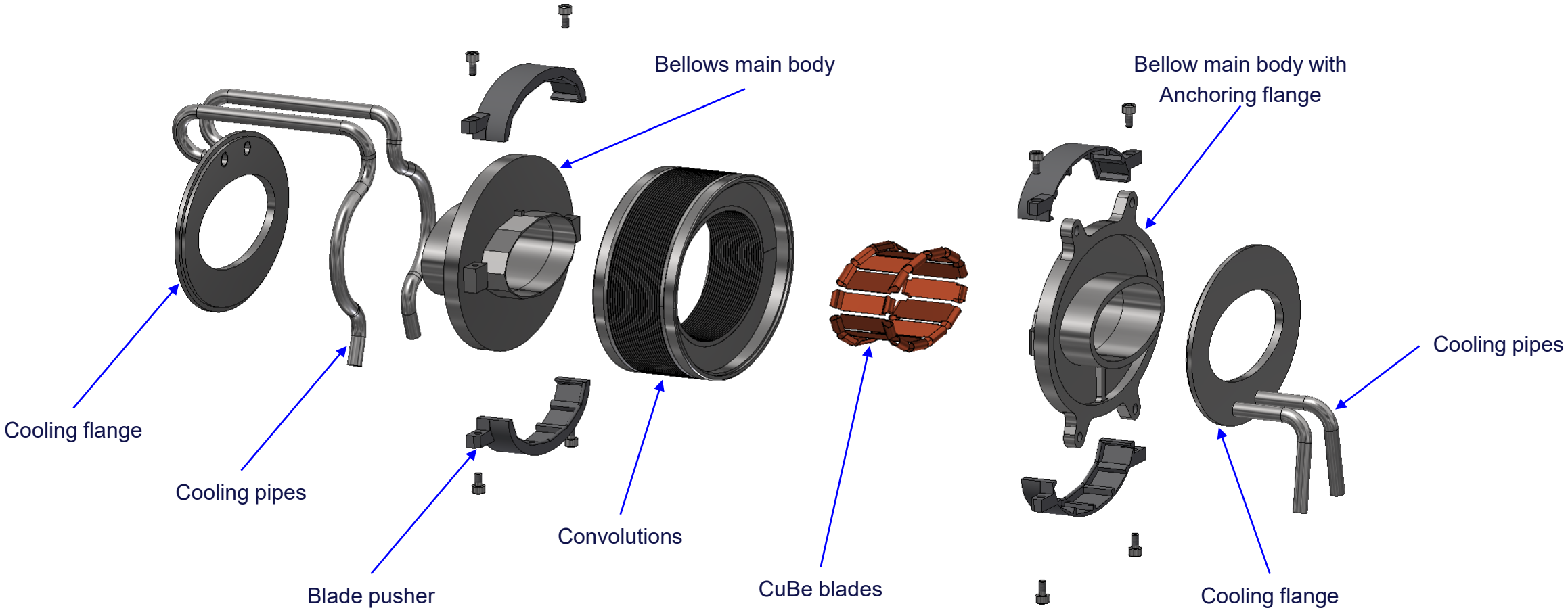




Cooling is on both sides of the bellows, but currently, the specifications regarding the power to be dissipated are unknown.

Pipe cross section and cooling channel need to be addressed

Overall view of the bellows



Status of bellows design for MDI

- Bellows are in a critical area in terms of space and lumical is the main geometrical constraint
- The interface area between the cryostat and the chamber is still in progress, many details are missing or subject to change in future
  - Support tube endcaps design are not compatible with cryostat design and services
  - Remote vacuum flange is understudy
  - Lumical is defined only in terms of dimensions
- Bellow design is preliminary and is evolving with the ongoing information
- Performance and dimensions of cooling system will be determined once power is known
- Bellows are chamber constraints points and are crucial for its alignment, no alignment system has been designed
- Pumping points position and dimension not defined

What we can do with the mockup

- Utilize the current geometrical constraints but overlook space limitations and interferences with the cryostat (i.e. routing for services, chamber alignment system)
- Finalize (for the mockup) a design or an envelope for the endcaps
- Design an alignment system for the chamber (support tube endcap <-> bellow interface)
- Use a standard measuring system (laser tracker) for testing the alignment performance
- Test the constraint schema:
  - Demonstrate the double bellows' capability to absorb thermal loads and stress on central chamber.
  - Measure the loads on the central chamber (intermediate dummy prototype of the bellow and central chamber may be necessary)
- Measure the stiffness of bellows with CuBe blades
- Measure the cooling performance and check if cooling on one side is enough for the thermal load (double sided cooling may overload the chamber due to pipe stiffness and may overcrowd the space for services)

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THANK YOU FOR YOUR ATTENTION

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