

NEXT-100 Pressure Vessel, May 7, 2012

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- Vessel Supports
- Gas Vent and Pressure Relief
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- Field Cage Servicing Scheme
- Movesa
- Next Steps

Vessel Design simplified, Material chosen (S.S., 316Ti alloy).

- Torispheric heads identical - 4 nozzles each - extra capacity
- Head nozzles shortened - extensions will be used as needed
- Nozzle extensions and cover plates contain O-ring grooves and pumpout ports
- 316Ti (EN1.4571) - best radiopurity (200 mBq/kg), popular alloy, plate only (ASME, div 1 only)

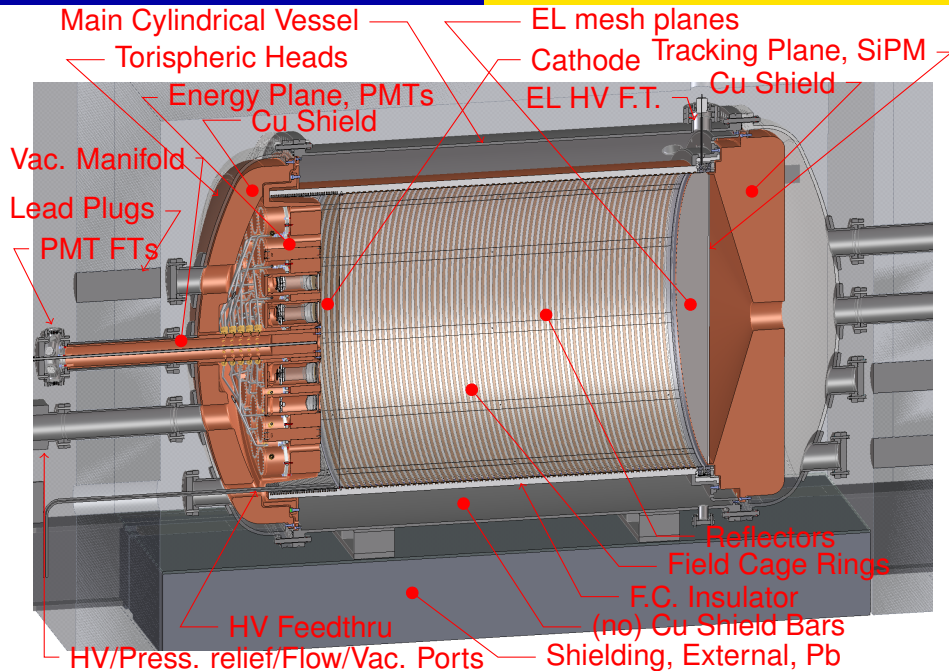
Manufacturer chosen - Movesa , Madrid

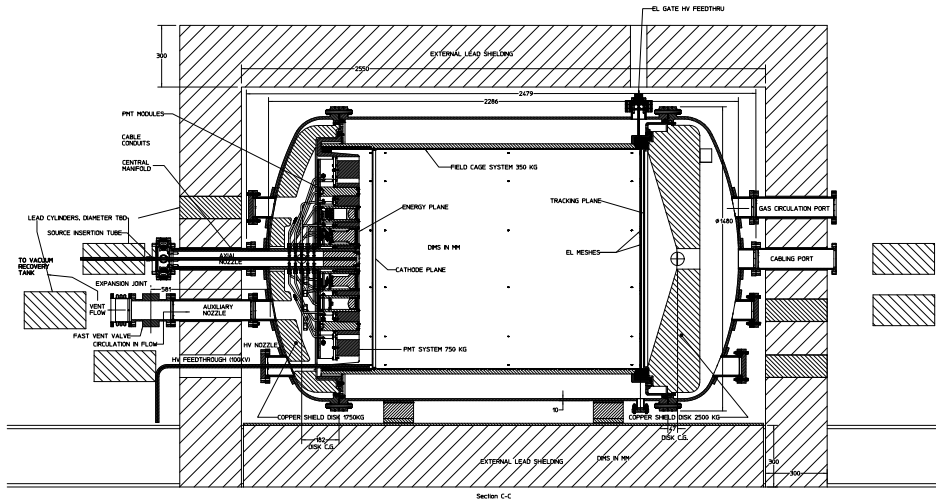
- Site visit Fall 2011 - one other mfr. visited
- Capable and versatile mfr. - boilers, reactors for food and pharmaceutical, turnkey processing systems
- Separate facilities for stainless steel vs carbon steel
- Convenient for frequent visits during fabrication

User Design Specification Completed (ASME)

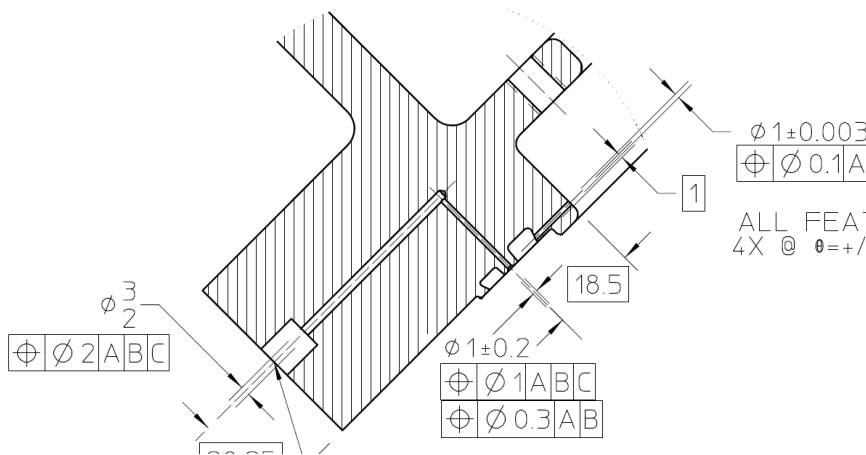
- Specifies all vessel requirements and operating conditions
- Now goes to Mfr. and Certifying Authority for review and approval
- Mfr. will recalculate - final design must be agreed upon
- Head thickness may meet EU code, but not ASME

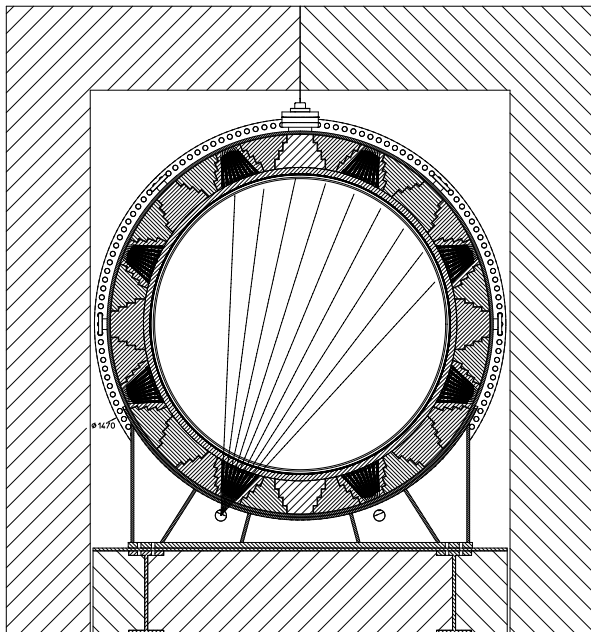
Parameter	qty	units
Active Volume Radius	53	cm
Active Volume Length	130	cm
Maximum Operating Pressure (MOP) (differential)	14.0	bar
Maximum Allowable Working pressure (MAWP) (differential)	15.4	bar
Minimum Allowable Pressure (differential)	1.5	bar
Inner diameter	136	cm
Outer Diameter, Vessel	138	cm
Outer Diameter, Flanges	148	cm
Length, inside inner shielding	2.26	m
Length, end to end, axial	2.48	m
Vessel Material, Austenitic Stainless Steel, Alloy	316Ti	
Cylindrical Vessel Wall thickness	10	mm
Torispheric Head Wall thickness	10.5	mm
Flange thickness, head to vessel (each)	4.15	cm
Bolt Diameter (Inconel 718), head to vessel flanges	16	mm
Bolt length, head to vessel flanges	11	cm
Number of Bolts, each head to vessel flange	132	
Mass, Vessel and both heads	1200	kg
Mass, Internal copper shielding, total (12 cm)	10000	kg
Total Detector and Vessel Weight	12000	kg

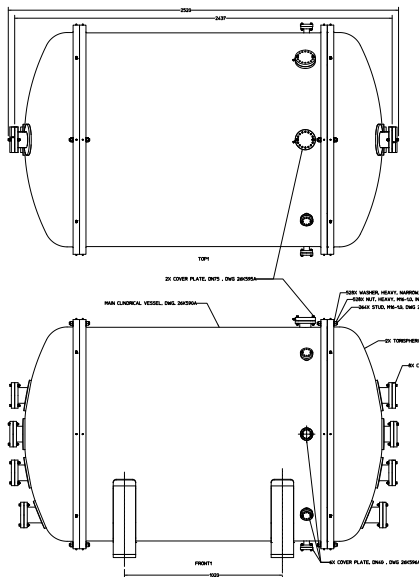




Double O-ring leak check port moved to heads, (no alignment issue)

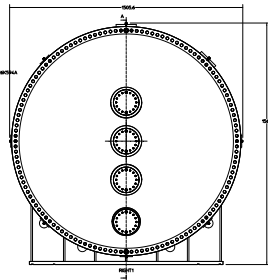






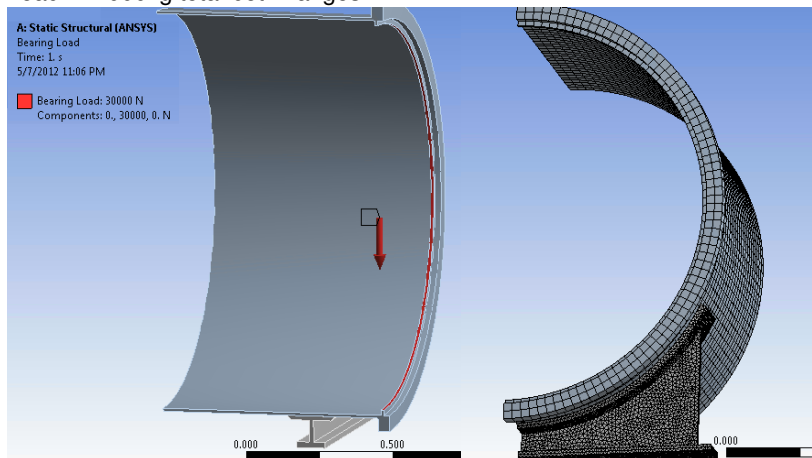
GENERAL NOTES:

1. THIS DRAWING IS A PART OF NEXT-100-PYI USER DESIGN SPECIFICATION
2. THIS DRAWING IS PRELIMINARY, AND SETS FORTH BOTH REQUIRED DIMENSIONS, AND PRELIMINARY DIMENSIONS TO BE CHECKED BY MANUFACTURERS.
3. ALL PARTS TO BE FABRICATED, INSPECTED AND TESTED IN ACCORDANCE WITH ASME BOILER AND PRESSURE VESSEL CODE SECTION VIII, DIV. 1 OR DU EQUIVALENT.
4. ADDITIONAL REQUIREMENTS APPLY CONCERNING CLEANING, PREPARATION, INSPECTION, WELDING, HEAT TREATING.
5. VESSEL IS FOR BOTH HIGH PRESSURE (10.4 BAR) AND HIGH VACUUM (10-6 TORR) SERVICE.
6. VESSEL SHALL BE DELIVERED IN CLEAN CONDITION, SERVICEABLE FOR HIGH VACUUM SERVICE.

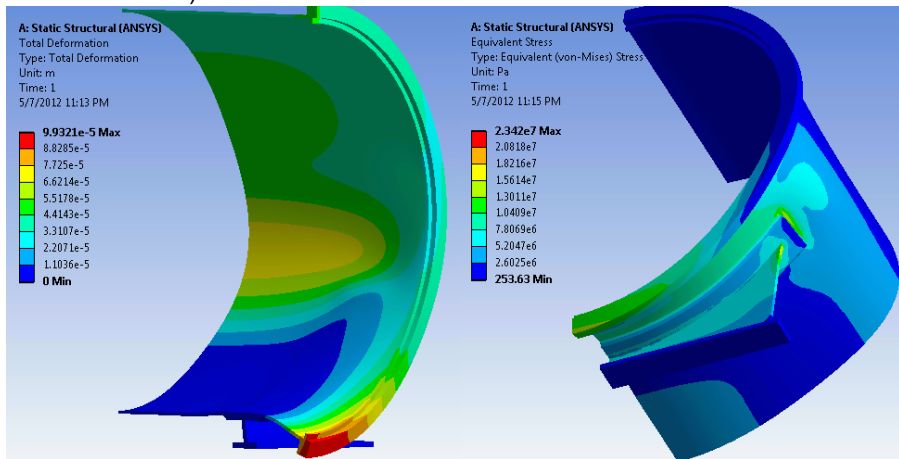
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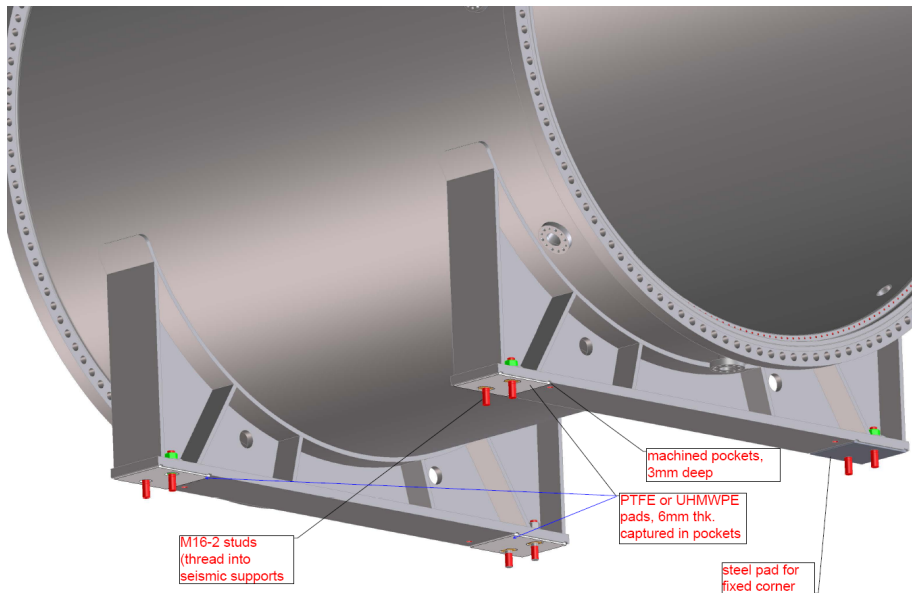
Is there significant stress and deflection from Copper shielding bars?

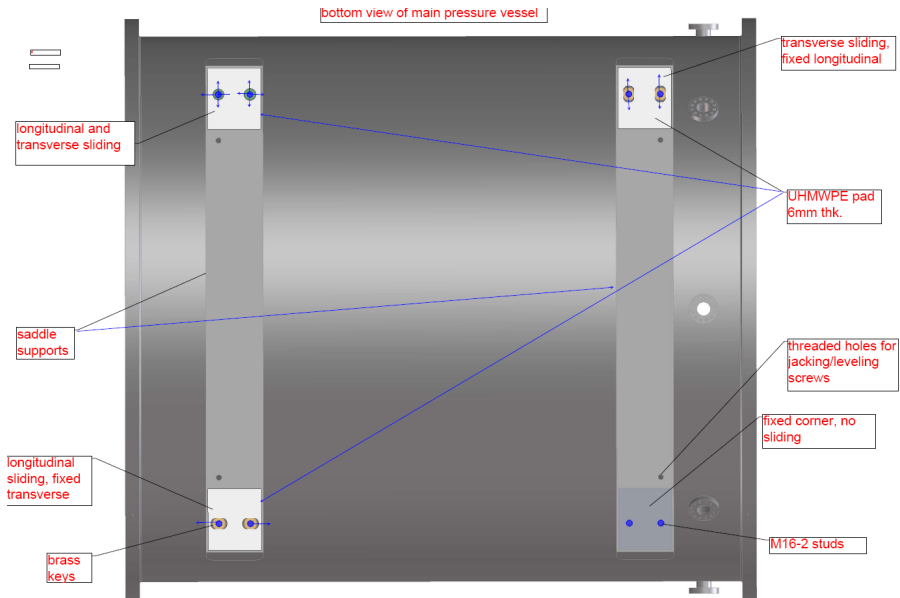
Load= 12000kg total both flanges

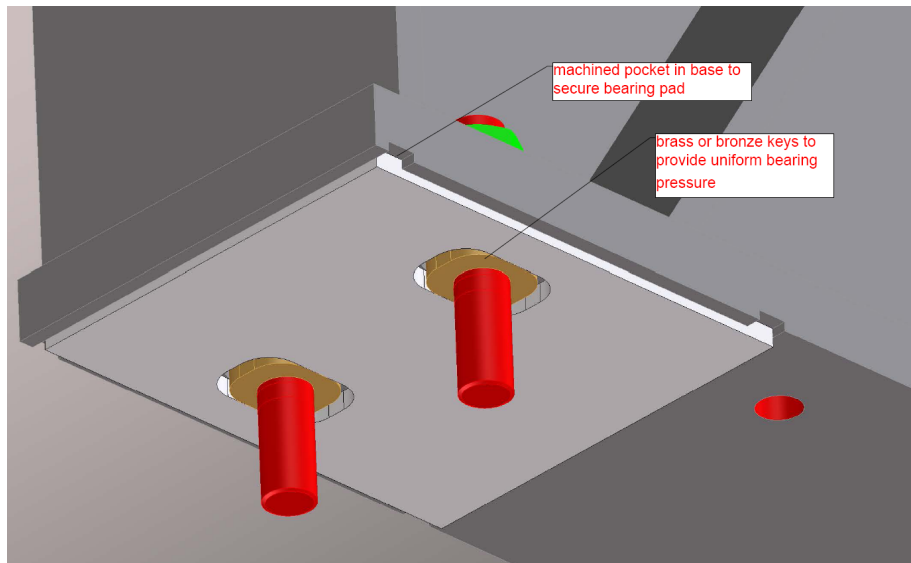


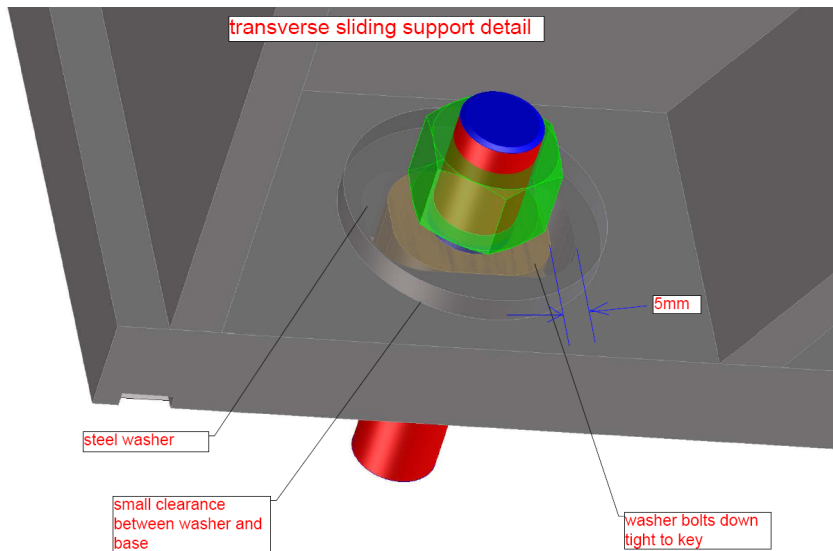
Deflection (0.1mm) and stress (2.E7 Pa) are minimal (14.E7 Pa max allowable)

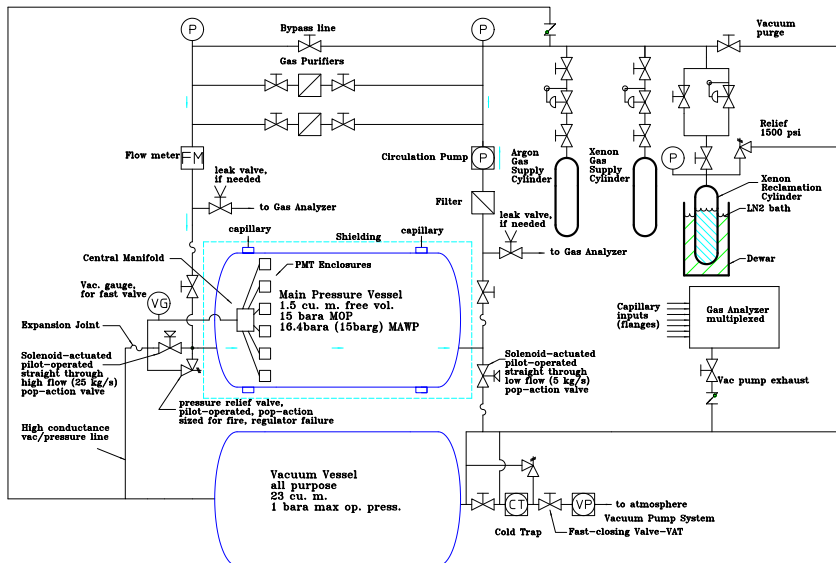




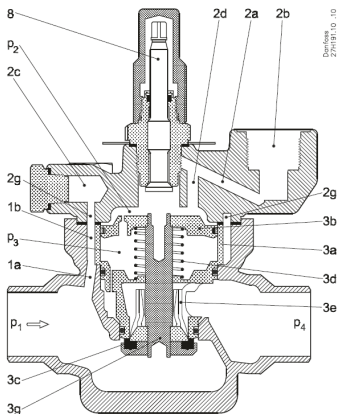






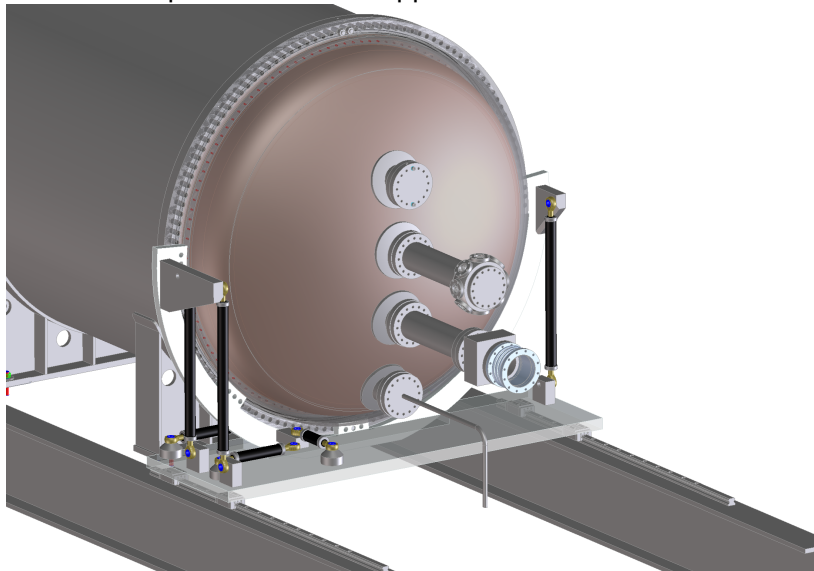


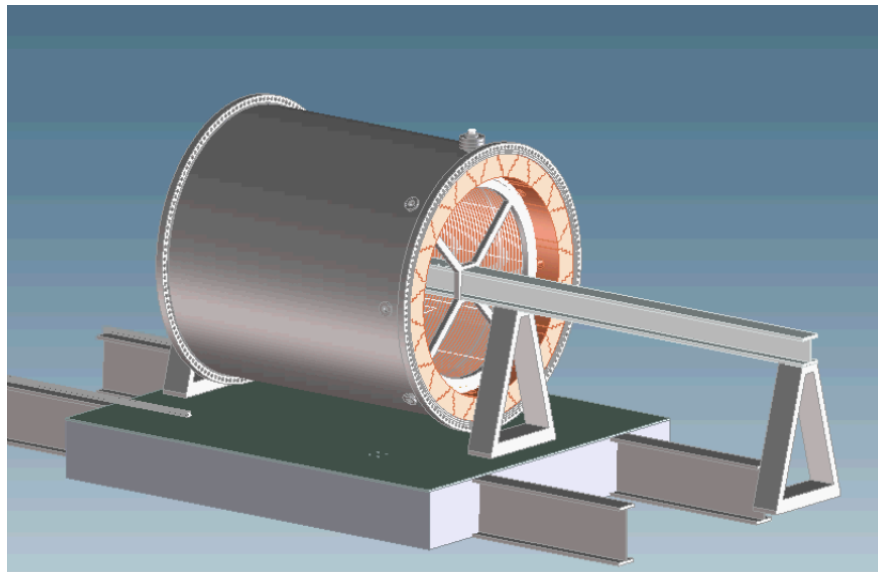
Straight-through fast vent valve (Danfoss) for refrigerants, inert gas



- solenoid actuated for anomalous pressure drop/rise, vacuum loss?
- pilot-operated - pressure on piston backside seals tighter at H.P
- pop-action - poppet opens fully upon action
- concern about permation through gaskets - make our own?

6 strut "hexapod" kinematic support fixture





Reactor Vessels for Food and Pharmaceutical Production



Manifolds for Turnkey Processing Systems



Large Vessel Capability



- Consult with Mfr. on Design
 - Flange, head dimensions achievable with mtl? calcs agree?
 - Get UDS certified
 - check: Helicoflex compatibility, seismic transverse load capacity
 - Review Mfr's construction plan, identify steps of inspection, cleaning, joint prep
 - Can they achieve the specified tolerances? heat treat cycles?
- Proceed with design of remainder of system
 - valve(s) specification
 - recovery vessel (1 or more vessels?, location? bakeable?)
 - expansion joint design - what is max pressure? max force on nozzle?
 - start control system specification- what are appropriate fast vent triggers
 - cold trap efficiency? Fast VAT valve appropriate