S1-global module: KEK – INFN – ZANON agreed design

3rd February 2009

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GRP Design 1/2

- Final length of GRP (including reduction flange to 76.3 mm pipe) is 6000 mm.
- Final length of the GRP plus the reduced pipe is 7000 mm (500 mm reduced pipe for each side).

- GRP 312 mm pipe overlength from vacuum vessel end flange is 100 mm at each side. Reduced pipe overlength from vacuum vessel end flange is 600 mm at each side.

- KEK defines the thickness of the reduction flange from 312 mm pipe to 76.3 mm pipe.

- Zanon produces and installs the reduction (flange and pipe) to the 76.3 mm pipe (schedule 10 standard pipe).

GRP Design 1/2

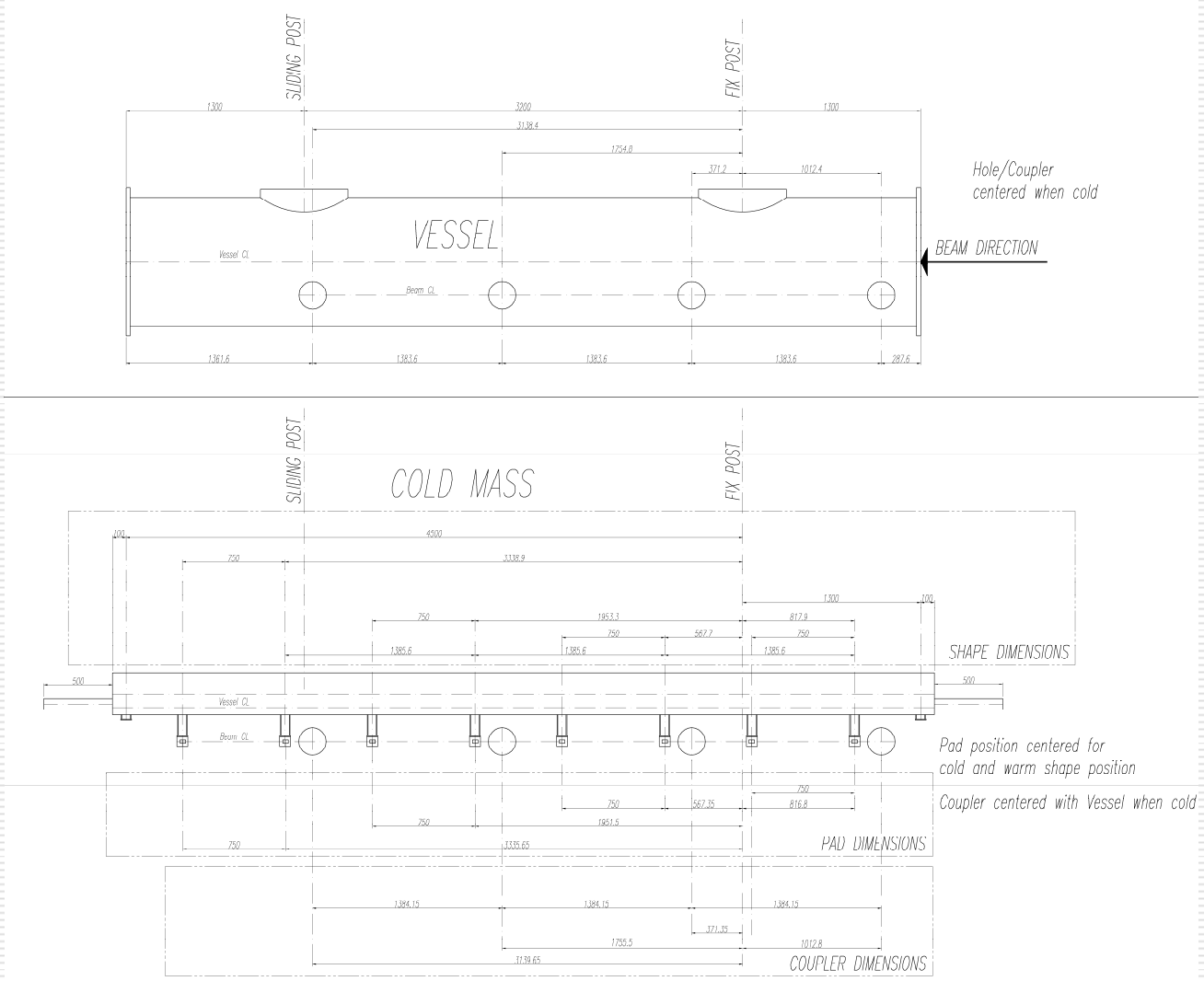
- Longitudinal position of the shapes on the GRP is calculated from the vacuum vessel coupler openings by INFN (see drawing).

- Gate valve support shapes have XFEL design and are positioned at 100 mm from GRP 312 mm pipe end. **The position is fixed, while the design could be slightly modified together with cavity groups (at FNAL and DESY).**

- The shape profile will be slightly modified by Zanon to adapt to the new WPM position. KEK requires additional holes on the shapes.

- GRP has 5 layers of MLI. Any sensor needed by KEK has to be provided and installed at Zanon before the MLI installation.

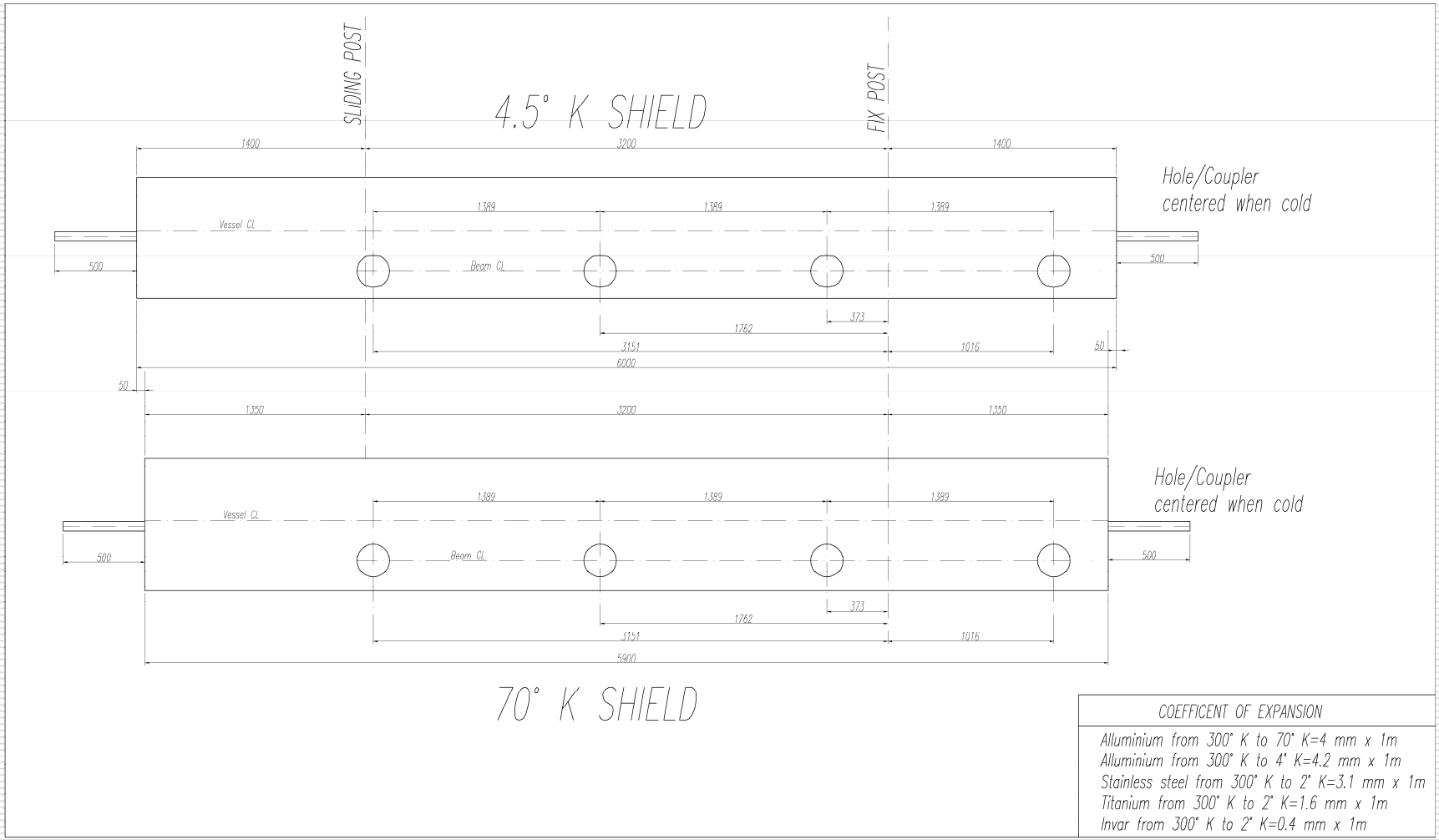
GRP Design: drawing



Thermal shields overlength

- Distance between 4.5 K shield and vacuum vessel: 100 mm at each end.
- Distance between 70 K shield and vacuum vessel: 50 mm at each end.
- The coupler openings on the shield lower parts are the same as TTF.
- The aluminum pipe overlength from each end of the two shields is 500 mm.

Thermal shields: drawing



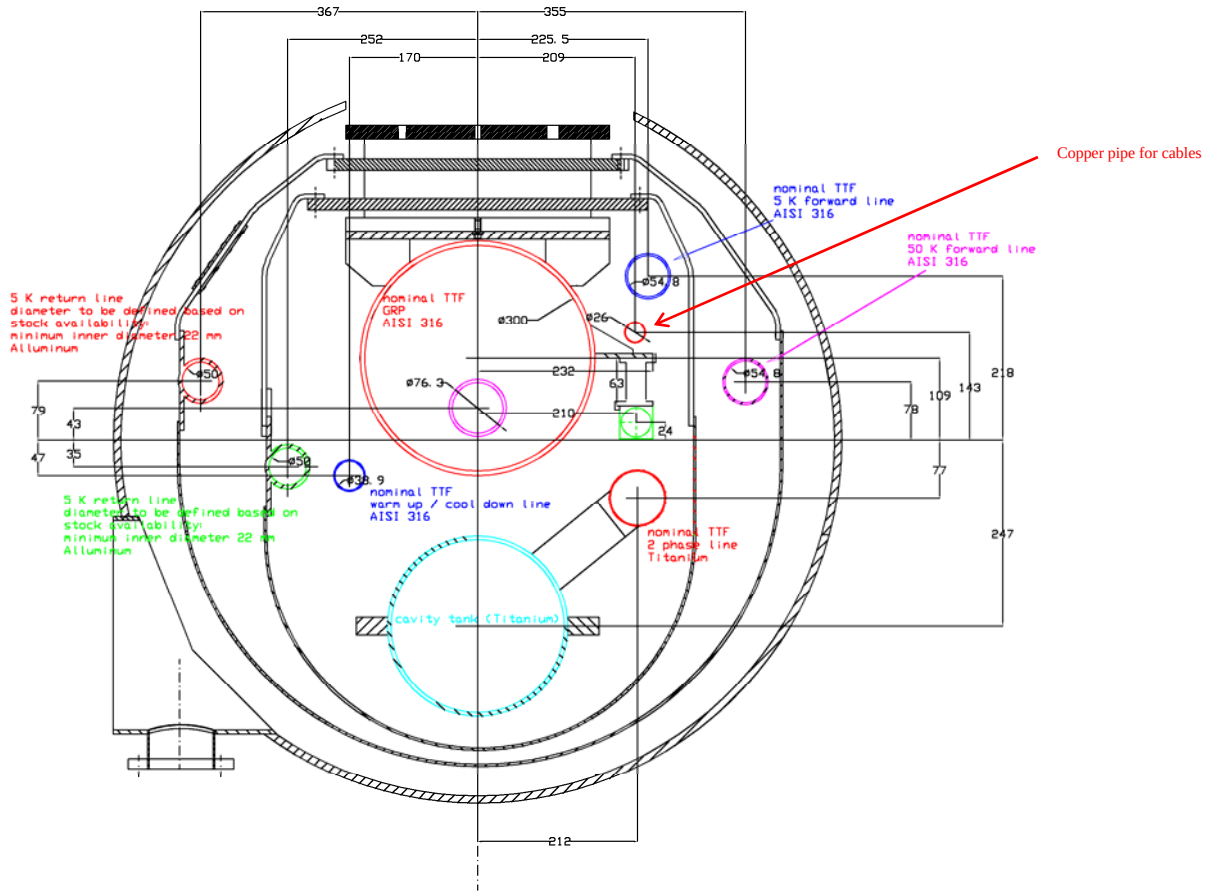
COEFFICENT OF EXPANSION
Alluminium from 300° K to 70° K=4 mm x 1m
Alluminium from 300° K to 4° K=4.2 mm x 1m
Stainless steel from 300° K to 2° K=3.1 mm x 1m
Titanium from 300° K to 2° K=1.6 mm x 1m
Invar from 300° K to 2° K=0.4 mm x 1m

Piping and module cross section

Main changes with respect to TTF type 3+:

- WPM position
- 5 K forward line and copper cable pipe position
- 5 K and 70 K return line (Al pipes) diameter can be reduced (> 22 mm) or profile can change (different fin design).
- 2.2 K forward line has been removed.
- Pipes standard overlength is 500 mm from the vacuum vessel end flange on both sides.

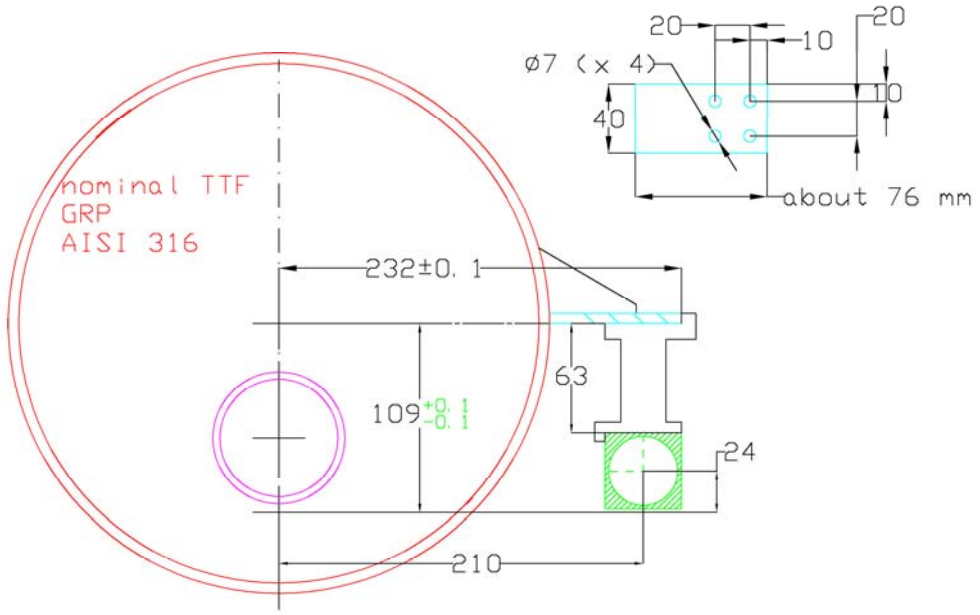
Piping and module cross section



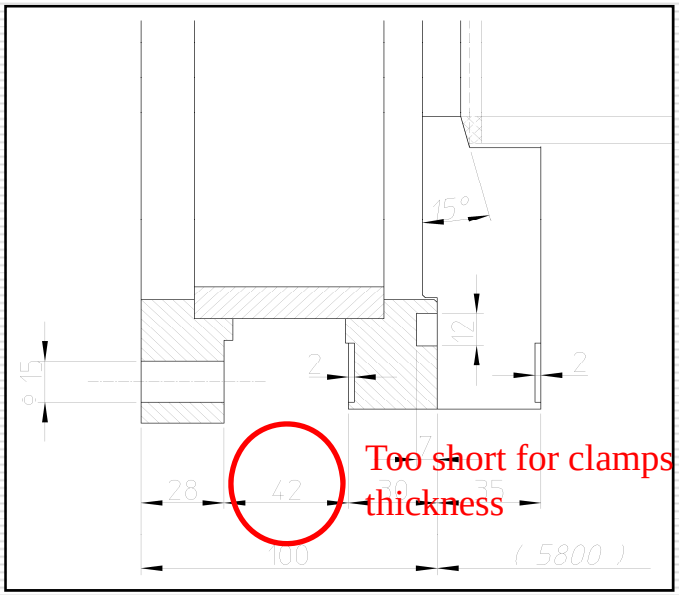
WPM position and support design

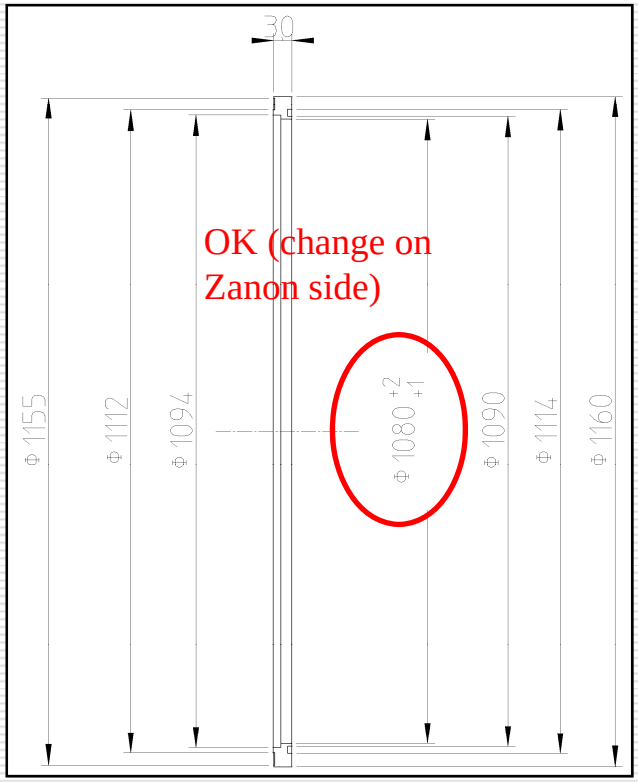
- Positioning of WPM support is fixed: machined horizontal plane is aligned with GRP axis, machined vertical plane is at 232 mm from GRP axis.

- WPM sensors, holders and connecting pipes are provided by KEK before final preassembly of the module in Zanon. WPM cables will be installed at KEK.



Vacuum vessel end flange and adaptor





Others

- The invar rod will be fixed to the shape (cavity support leg) closer to the fixed post.

- The vacuum vessel has 3 standard flanges ISO 160F; inner diameter of the opening is 139.8 mm.