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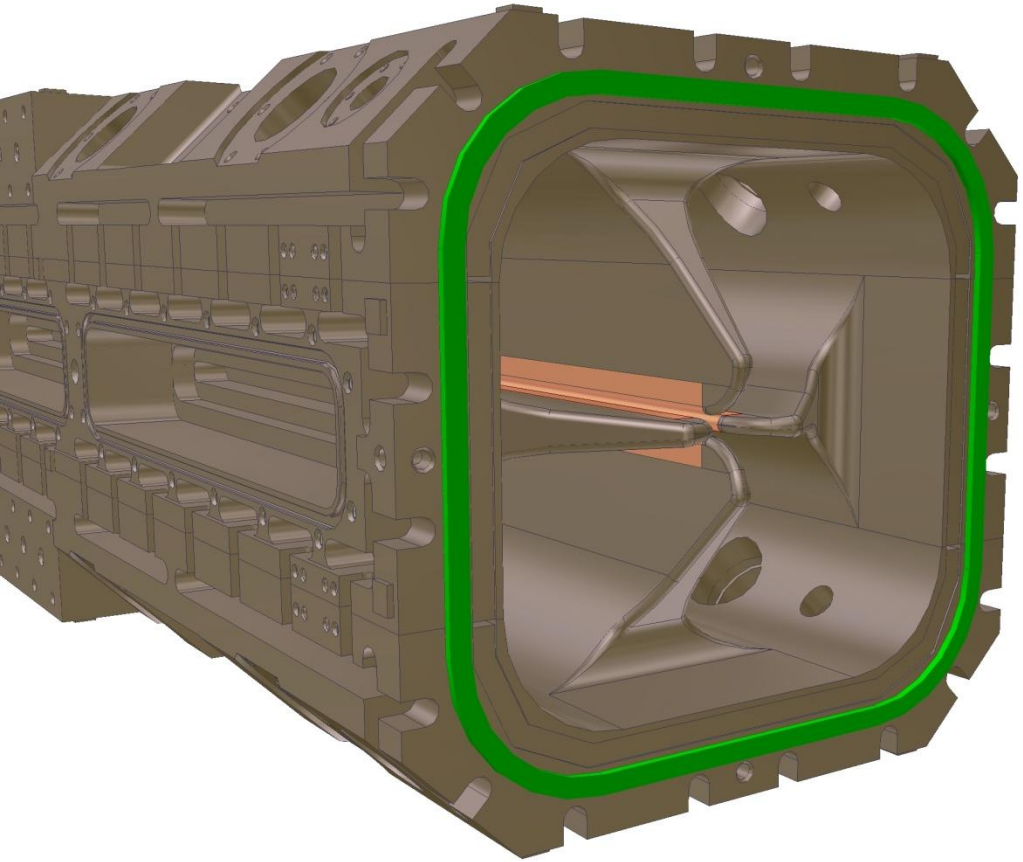
FETS RFQ End Flange Design MkIIIa & MkIIIb

28th February 2012

by Peter Savage

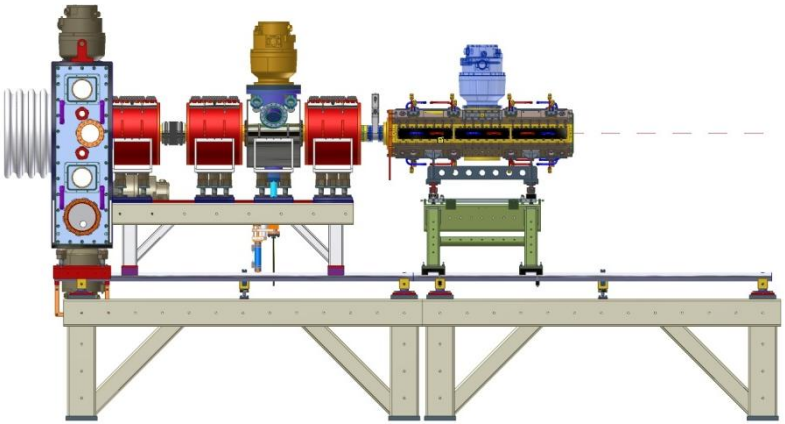
RFQ End Flange Assembly MkIIIa



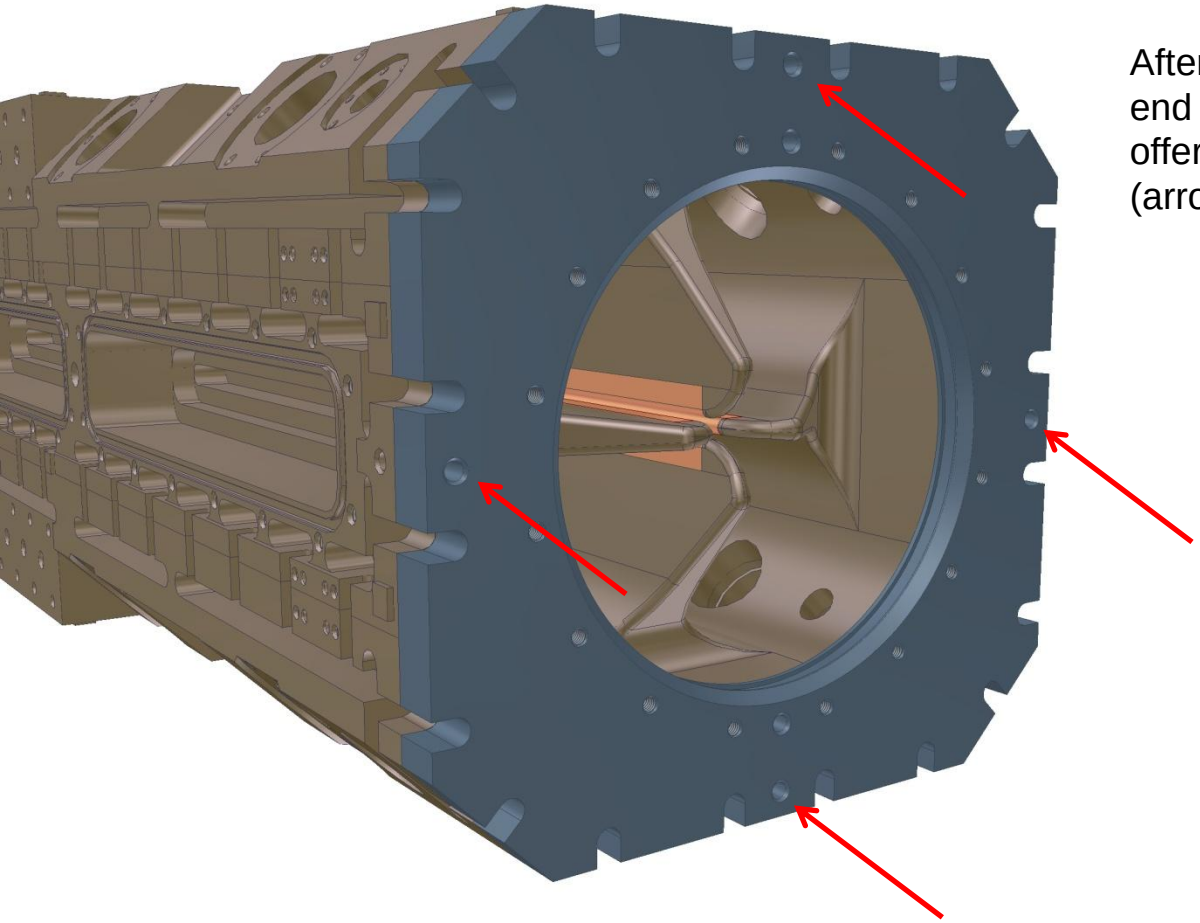
Assume that the RFQ is assembled to its dowelled position with the 3D O ring in place.

RFQ section 1 is now added to the FETS and aligned to the beam axis.

The RFQ end flange can now be attached (note that space is tight).

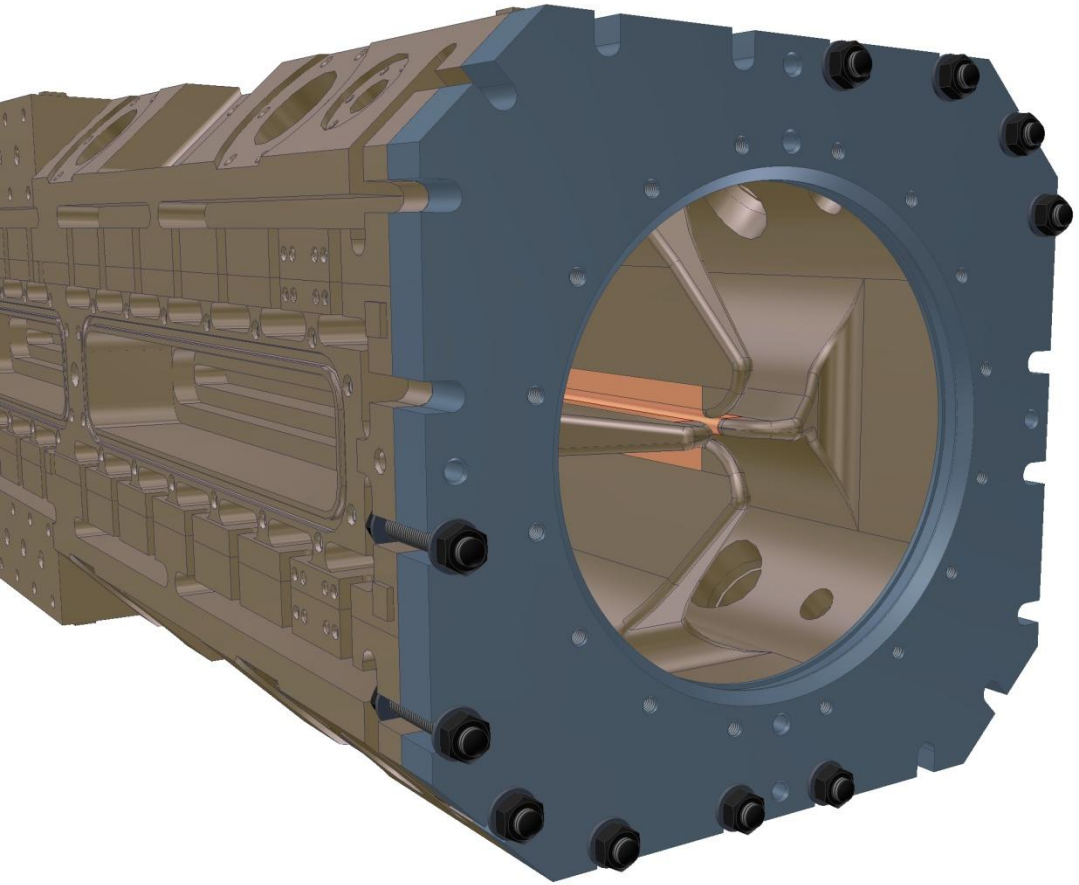


RFQ End Flange Assembly MkIIIa



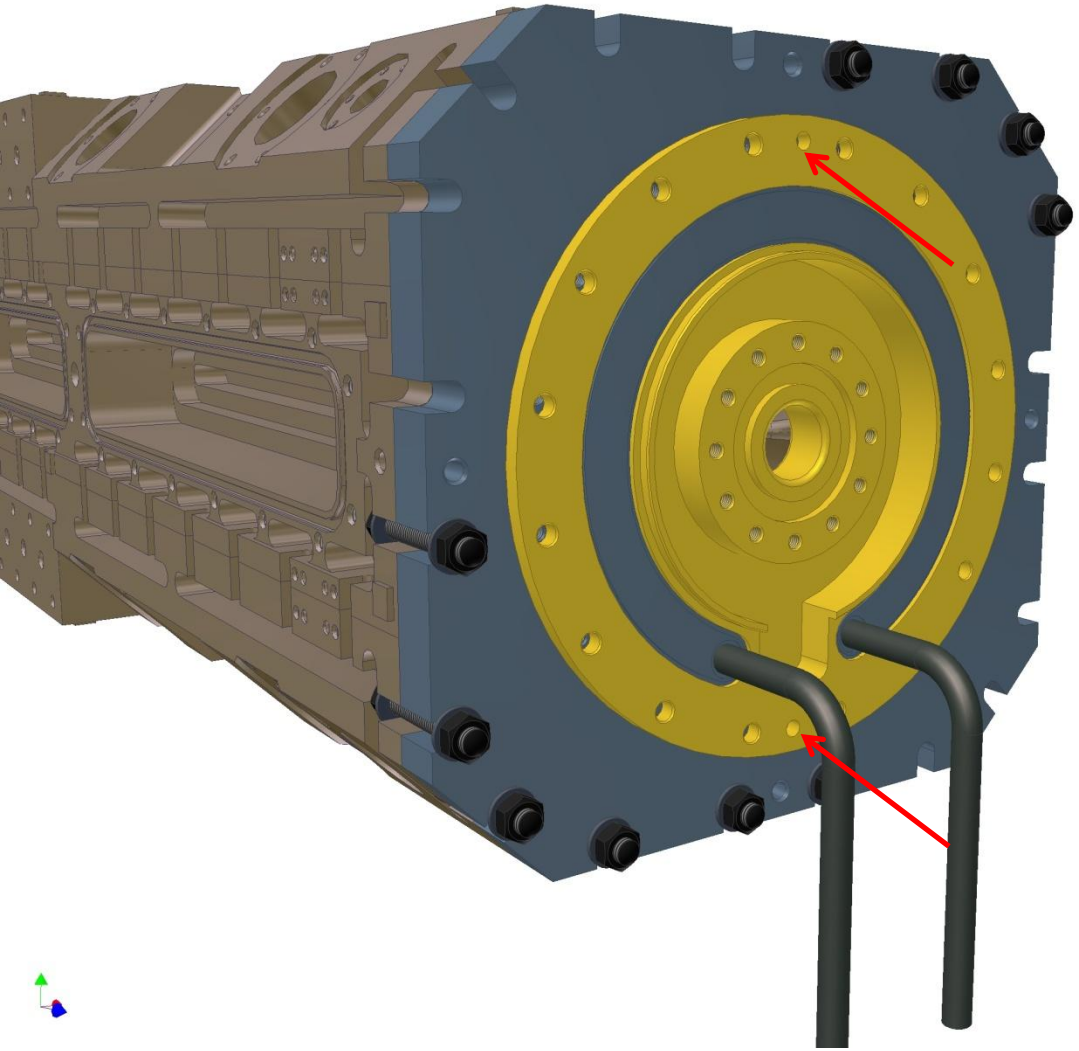
After inserting finger strip into the RFQ end face groove the end flange can be offered up and located using dowels (arrowed)

RFQ End Flange Assembly MkIIIa



The end flange can now be bolted up tight until the faces meet.

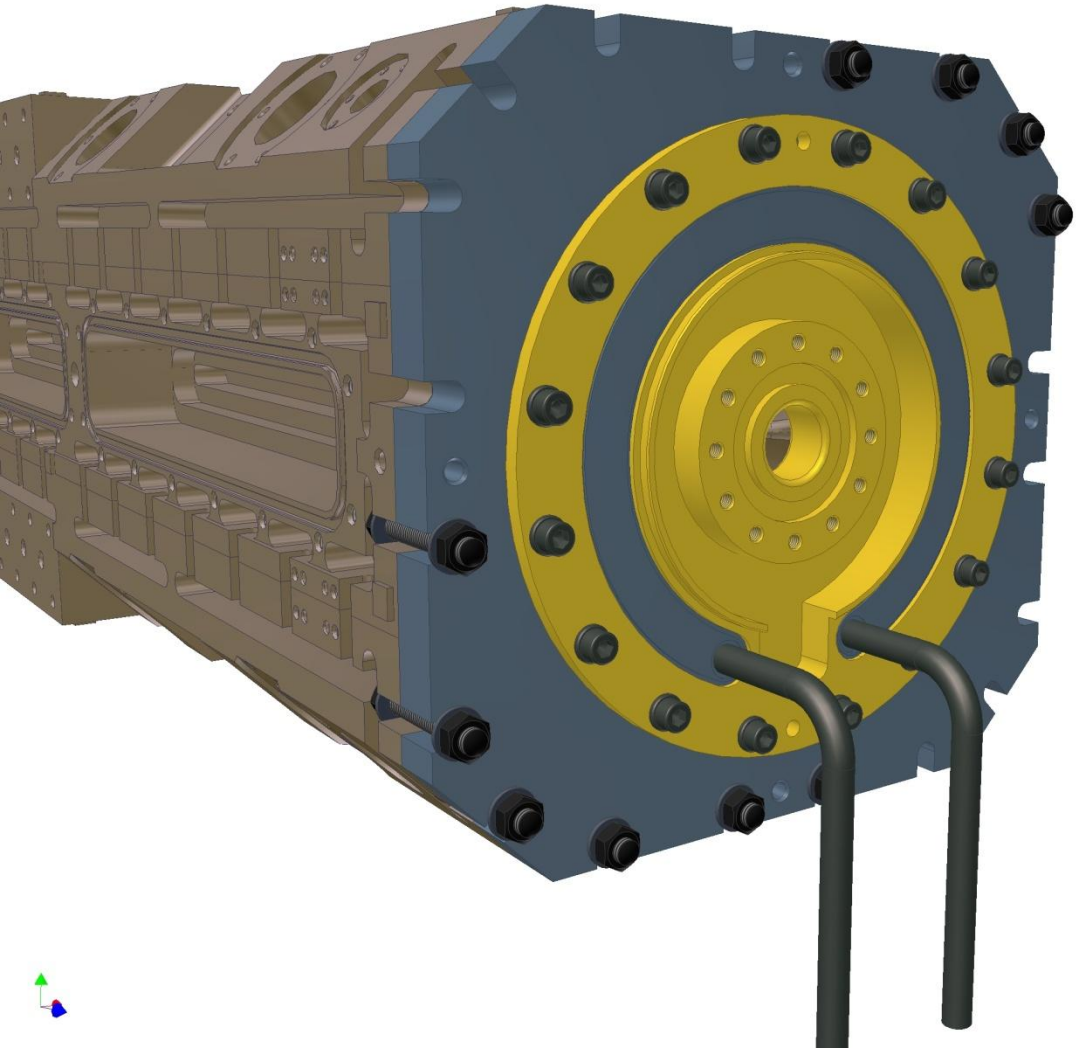
RFQ End Flange Assembly MkIIIa



The pre-brazed copper insert assembly has its O ring vacuum seal and copper fingers added.

Finger strip is placed in the circular groove of the end flange and then the insert assembly can be located on the dowels arrowed.

RFQ End Flange Assembly MkIIIa

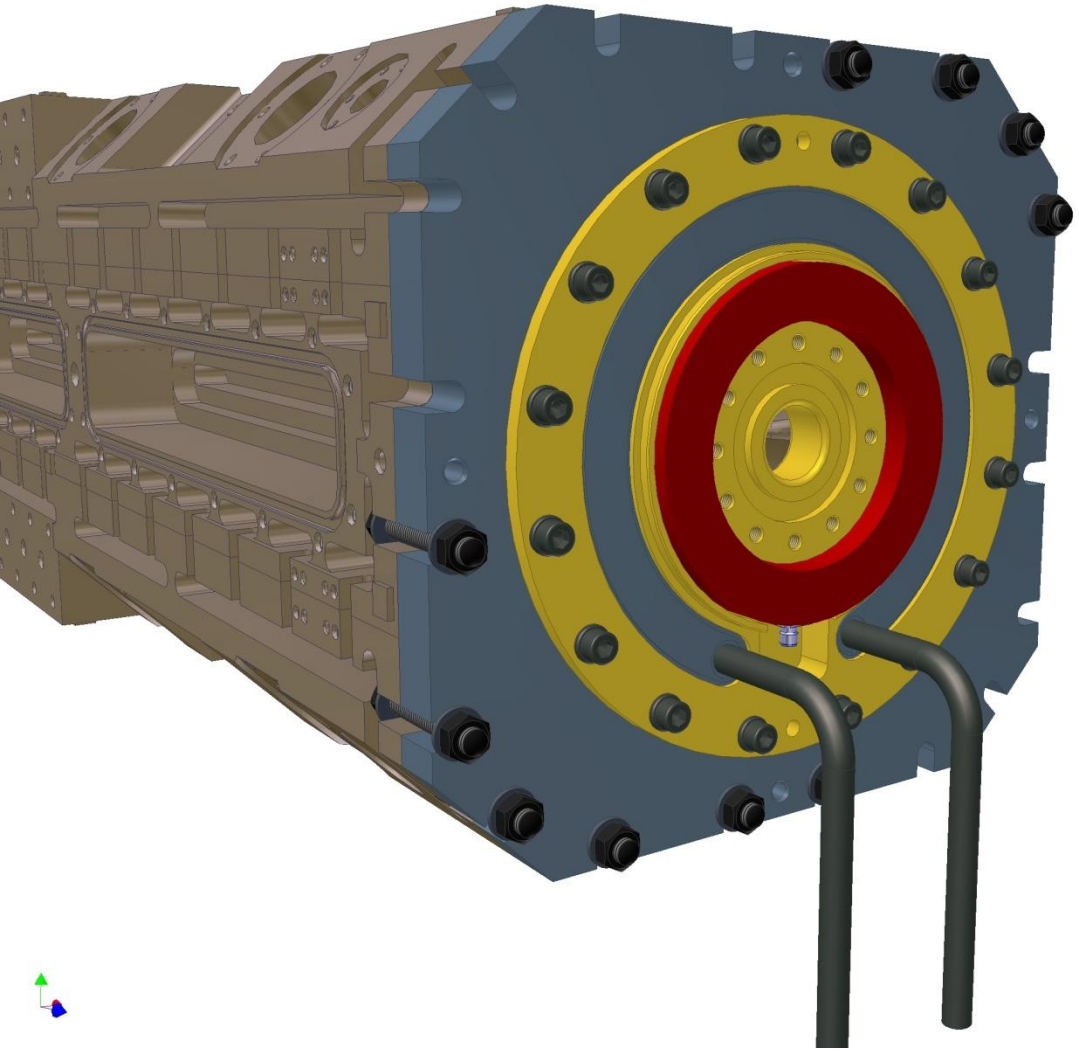


..... and bolted up tight.

The concept behind the insert assembly is that we can change the fingers or indeed the whole insert assembly without disturbing the main RFQ 3D seal.

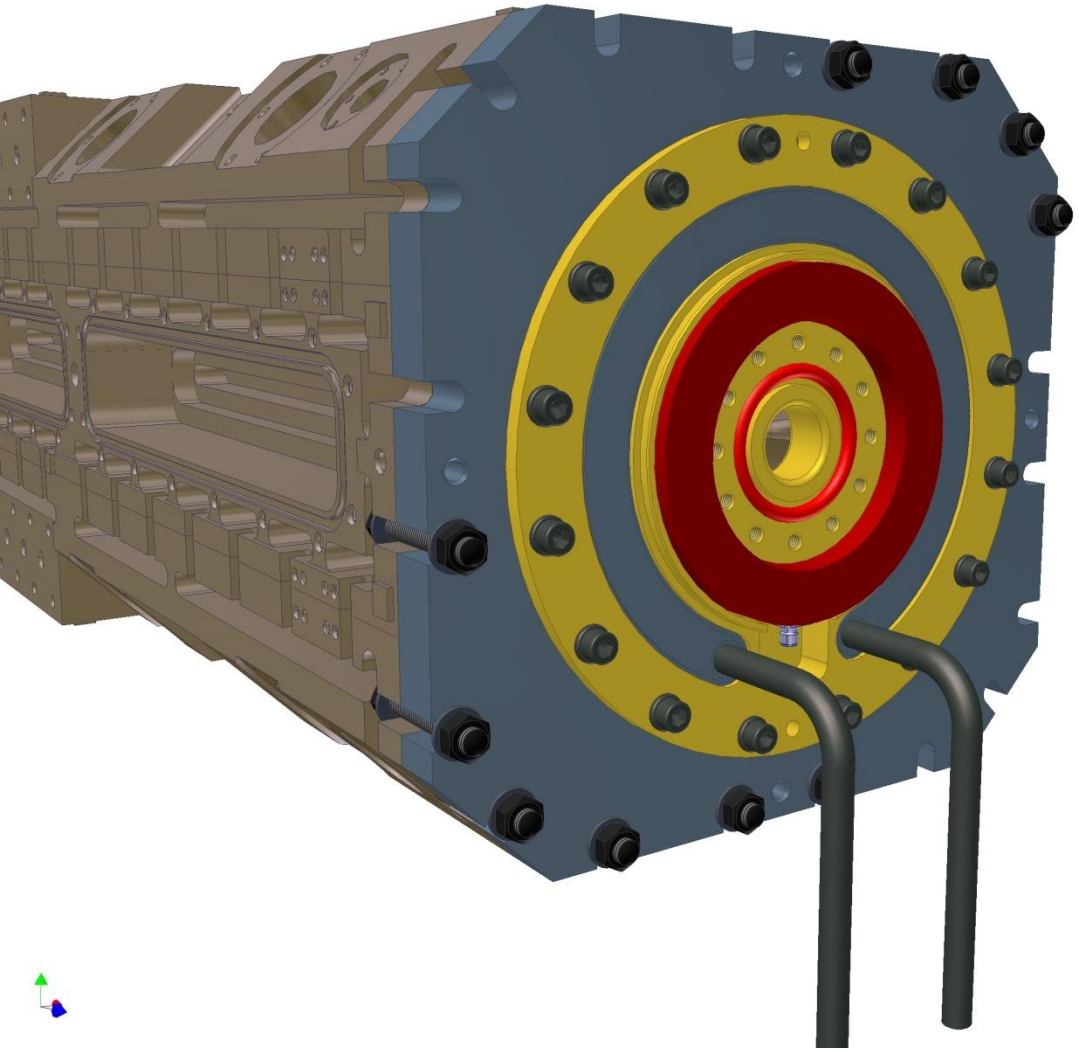
The price is the introduction of (yet) another seal and a small reduction in thermal conductivity.

RFQ End Flange Assembly MkIIIa



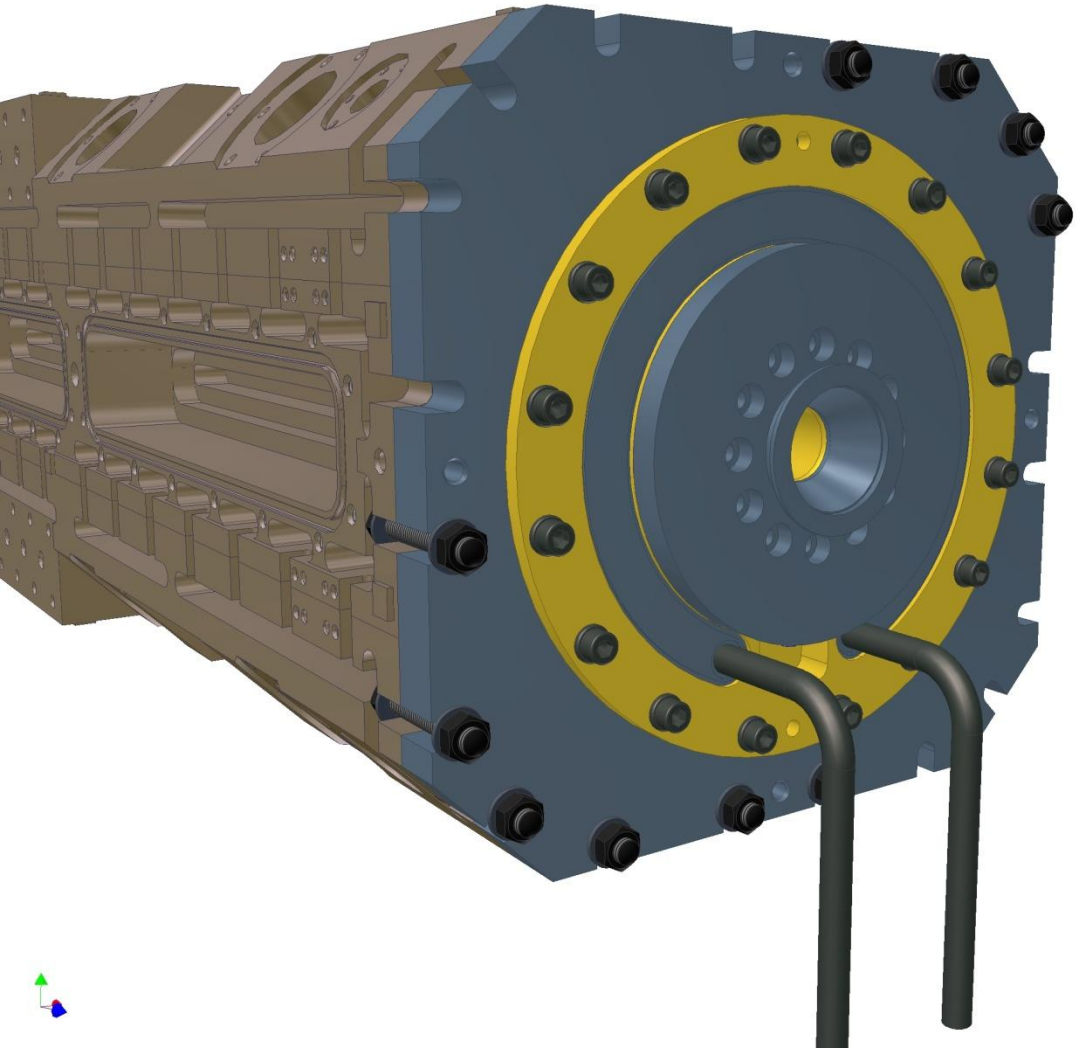
The toroid is placed into its pocket.

RFQ End Flange Assembly MkIIIa



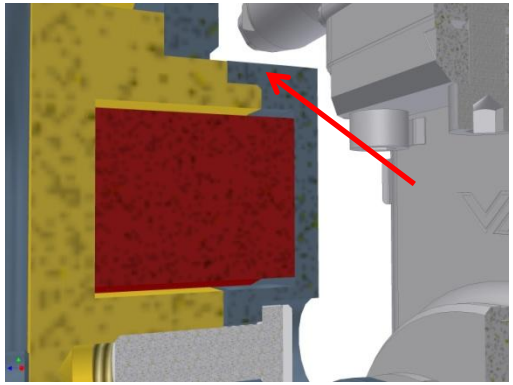
And the vacuum seal is placed in its groove.

RFQ End Flange Assembly MkIIIa

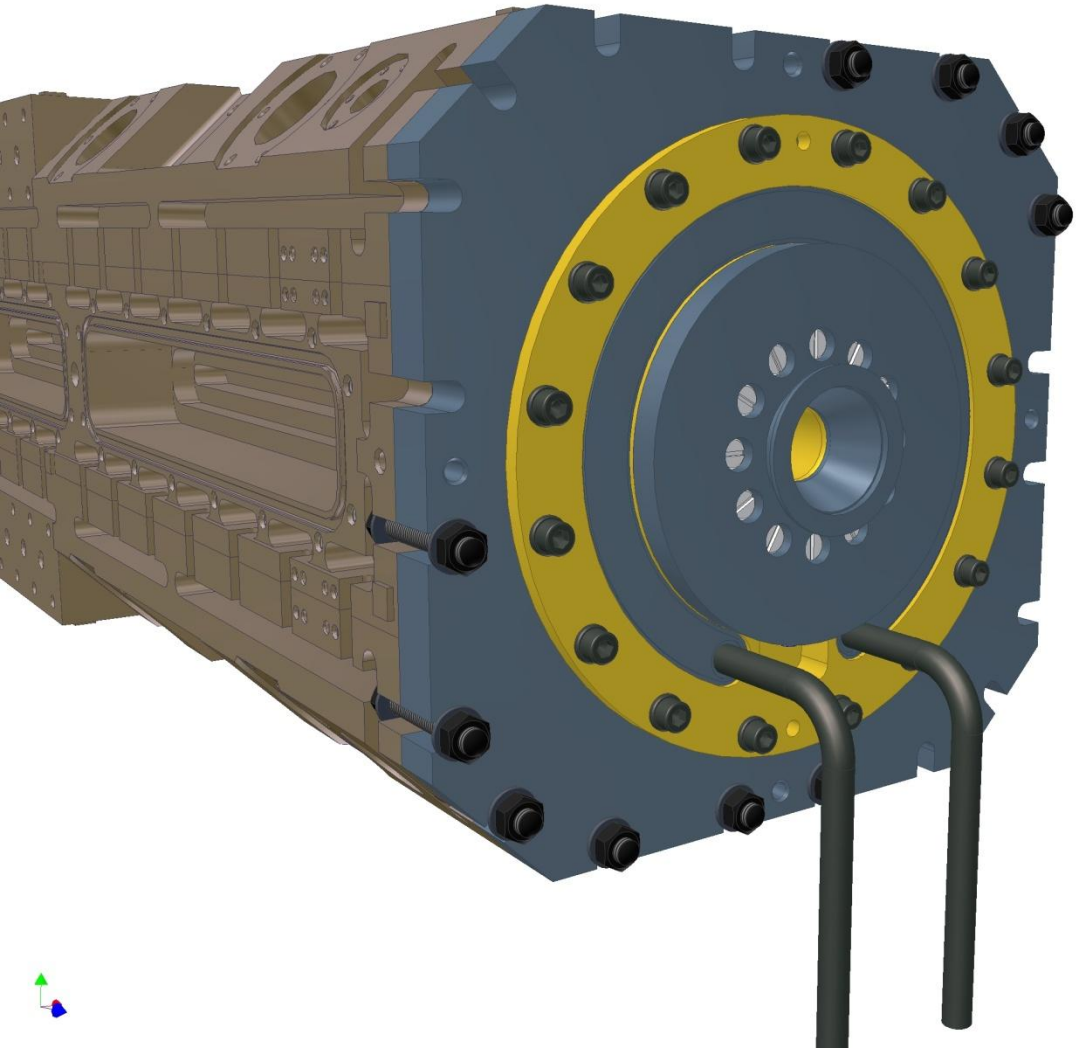


And now the stainless steel toroid cover can be added and tightened until the faces meet. Note that the cover locates on a small lip (arrowed) so that it distributes the vertical load due to the weight of the VAT valve.

Why is this important?.....



RFQ End Flange Assembly MkIIIa

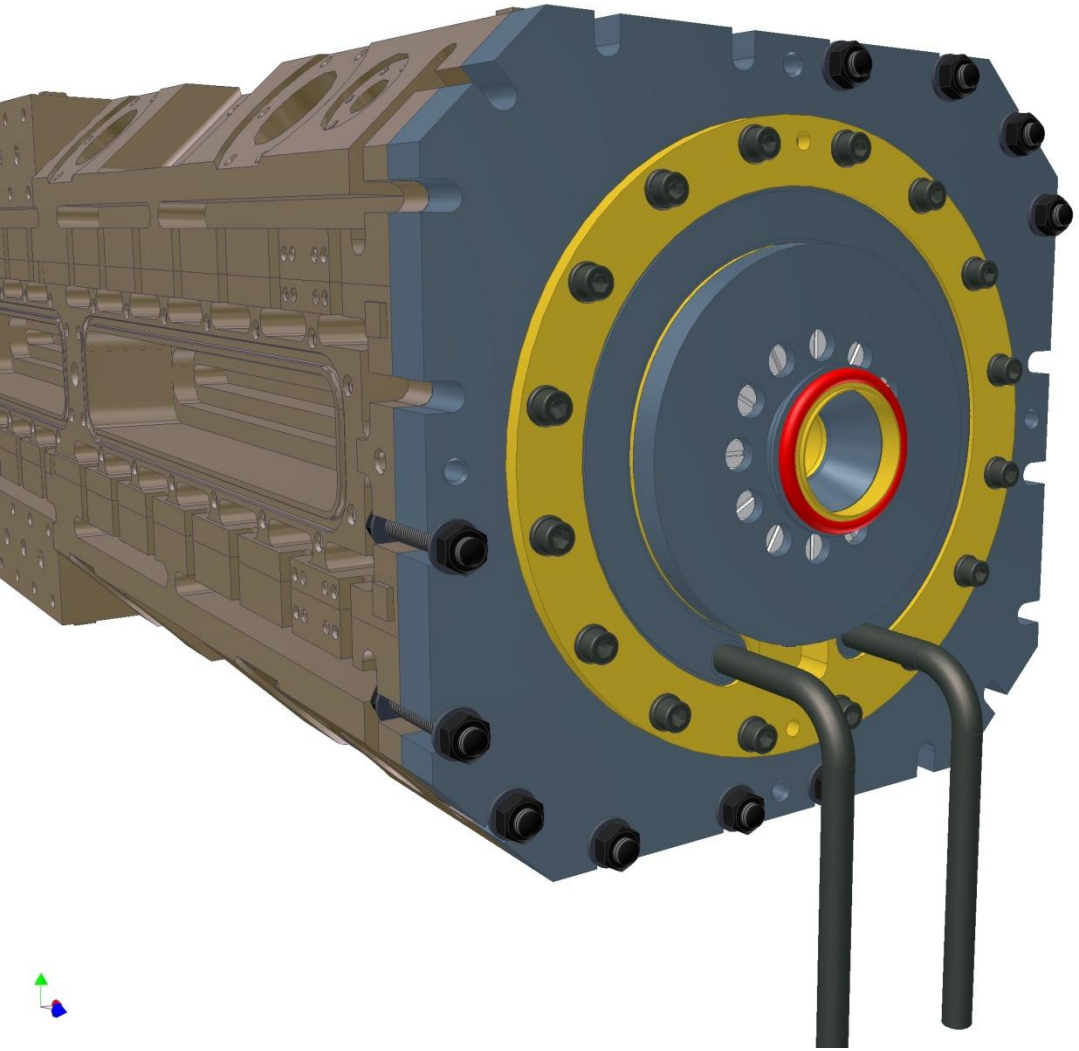


Because the cover is secured using Nylon screws! The screws must be electrically non-conductive to avoid short cutting the current path.

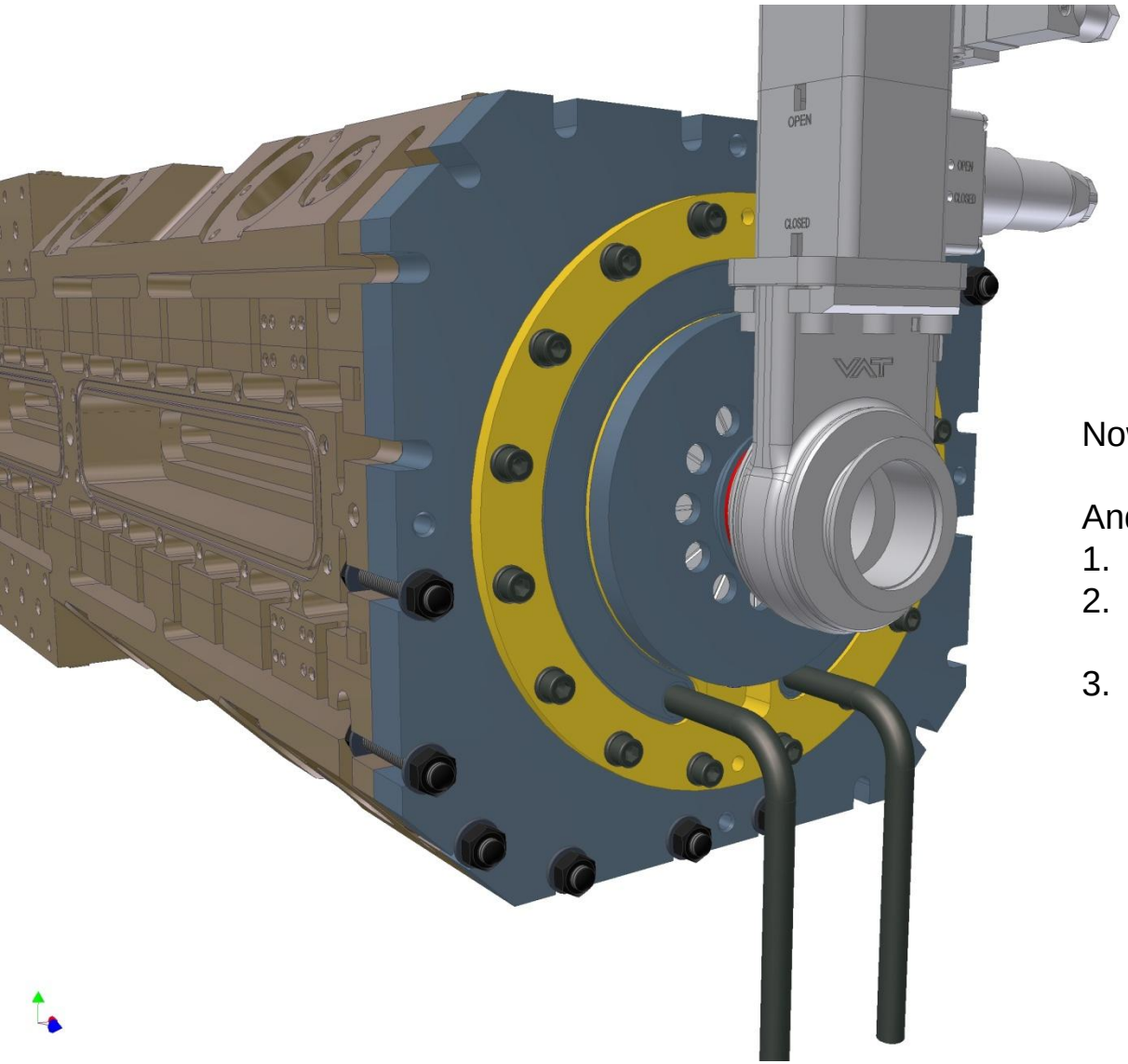
If the Nylon screws are not taking the weight of the valve* their only function is to provide enough force to squash the O ring to make the vacuum seal.

* Also, some of the valve weight will be carried by the beam pipe (albeit with bellows) on the opposite side of the valve.

RFQ End Flange Assembly MkIIIa



The KF40 O ring seal is added.

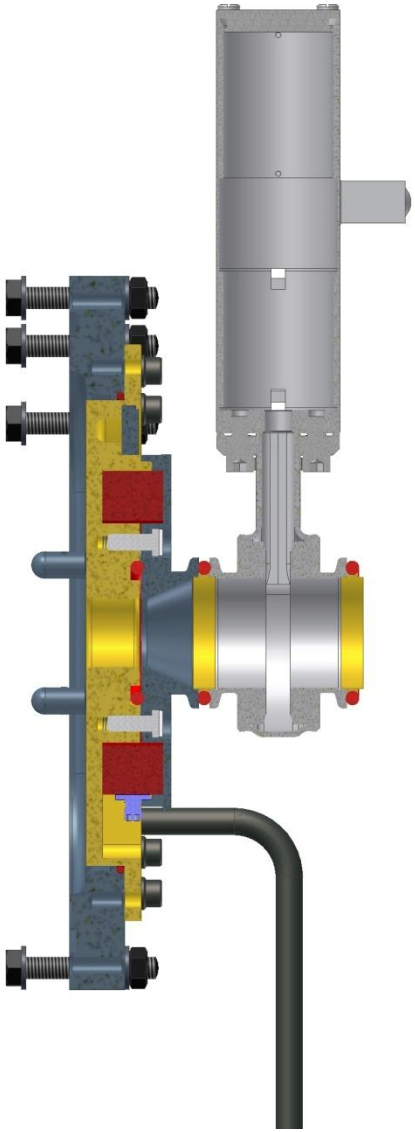


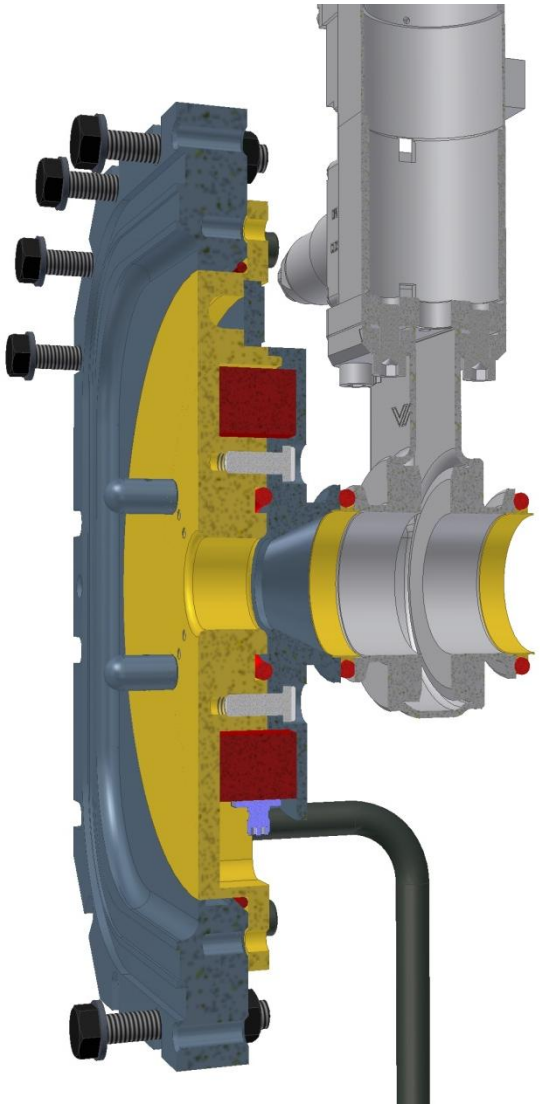
Now the valve can be attached.

And finally:

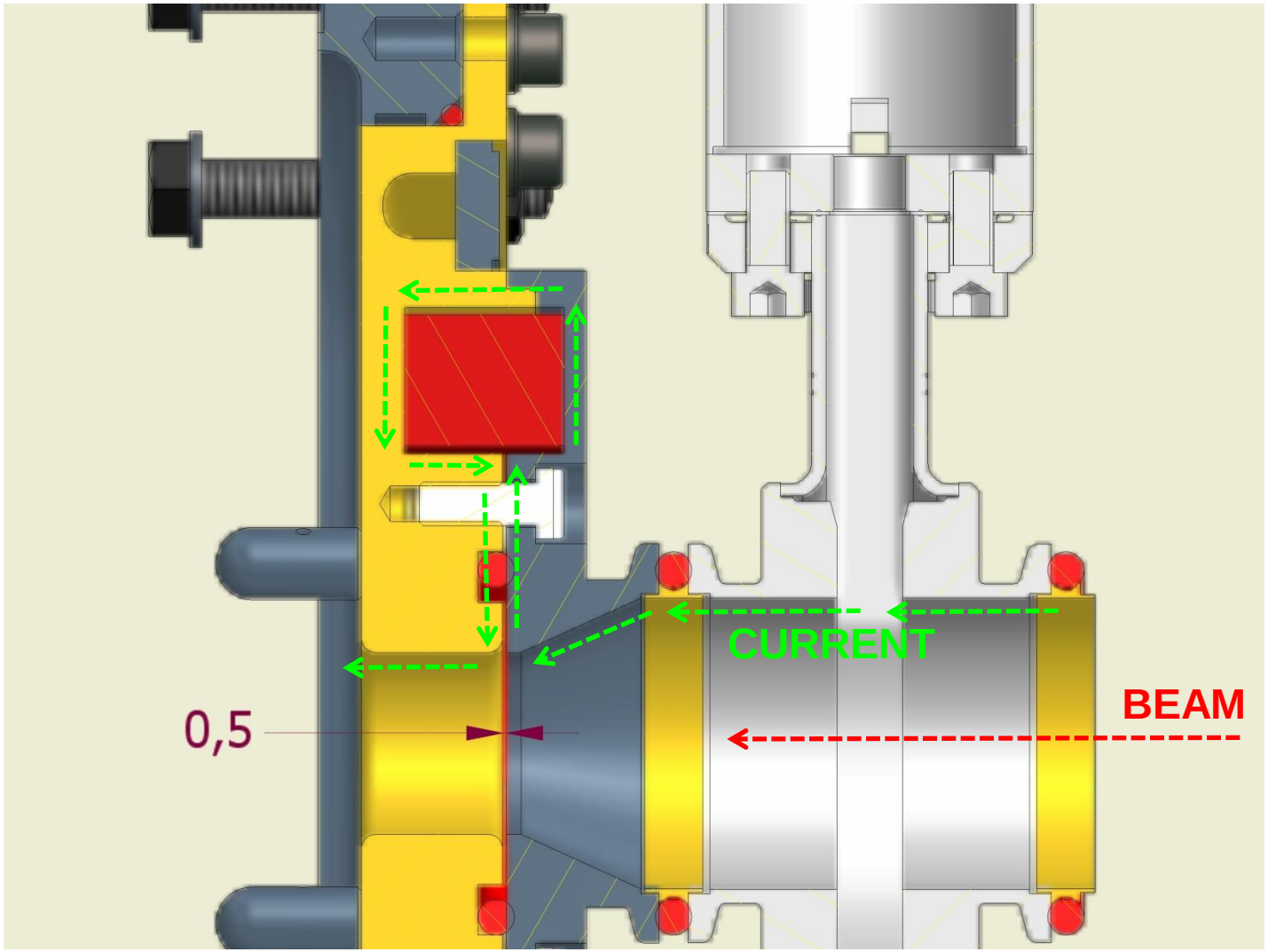
1. Connect the cooling.
2. Connect the valve to the pneumatics and power.
3. Job done.

Some cross section views





The current path around the toroid



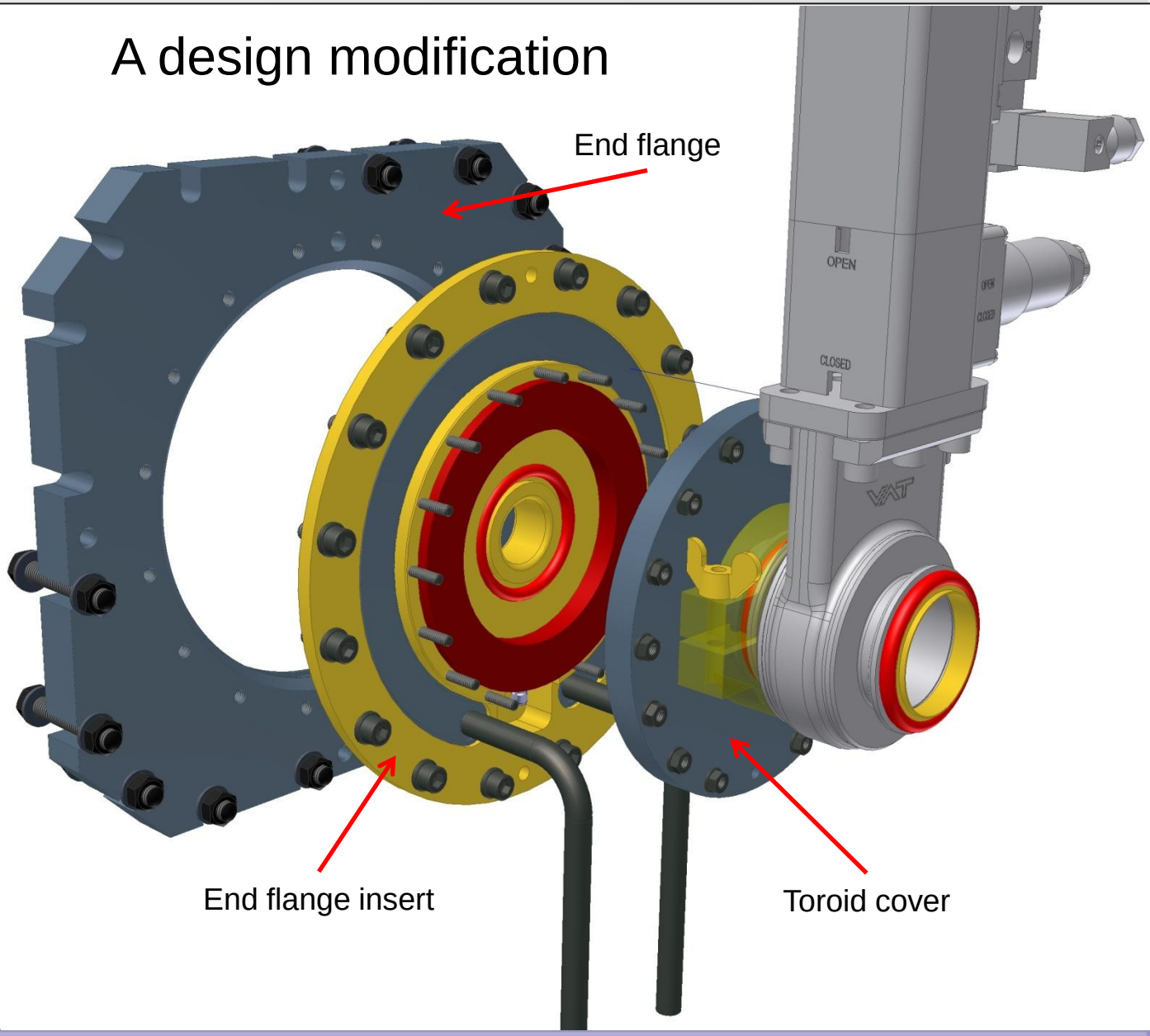
MkIIIb

A design modification

The toroid cover of the MkIII design secured onto the end flange insert via a thin lip and was then fixed in place using Nylon screws inside of the Toroid.

There were concerns with the dynamic load (due to the valve opening and closing) bearing on a thin copper lip and with creep of the Nylon over time leading to a vacuum leak.

The MkIIIb has a wider lip and space has been created for metal screws outside of the toroid.



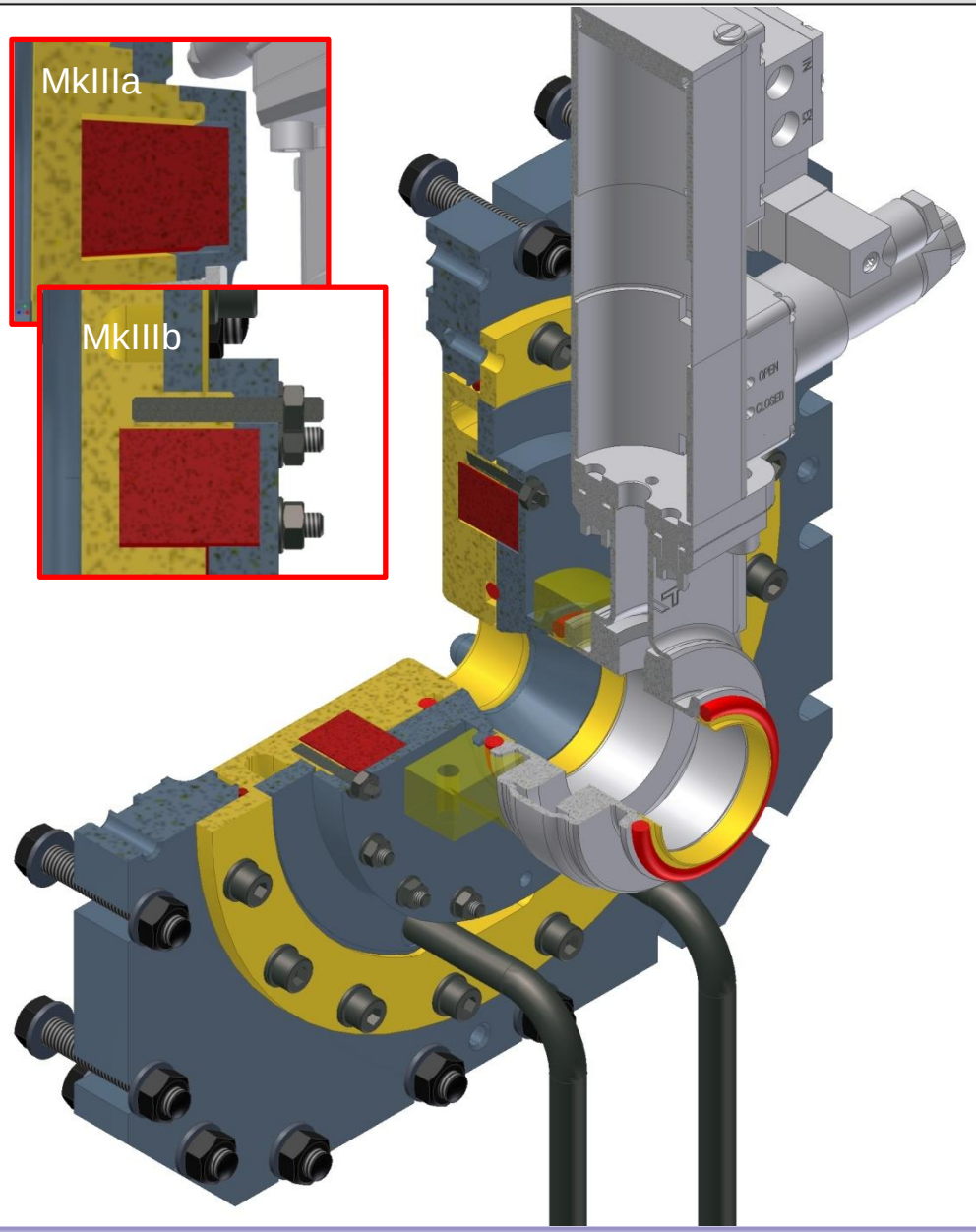
•The position of the M4 studs is not as close to the ‘O’ ring as one would like. However, the stiffness of the stainless steel toroid cover should transfer the load sufficiently to compress the ‘O’ ring. A second ‘O’ ring groove could be retro-machined if required.

Maintaining the 0,5mm gap relies on the fit of the toroid cover to the toroid. For this reason the toroid is being brought to Imperial for measuring.

A trial assembly will be made using plastic-gauge or similar to check that we have achieved the 0,5mm gap.

It is hoped that Imperial will be able to perform a vacuum test in-house following manufacture.

The proximity of the valve to the toroid cover will necessitate the use of a conventional nut on the KF40 flange instead of a wing nut.



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