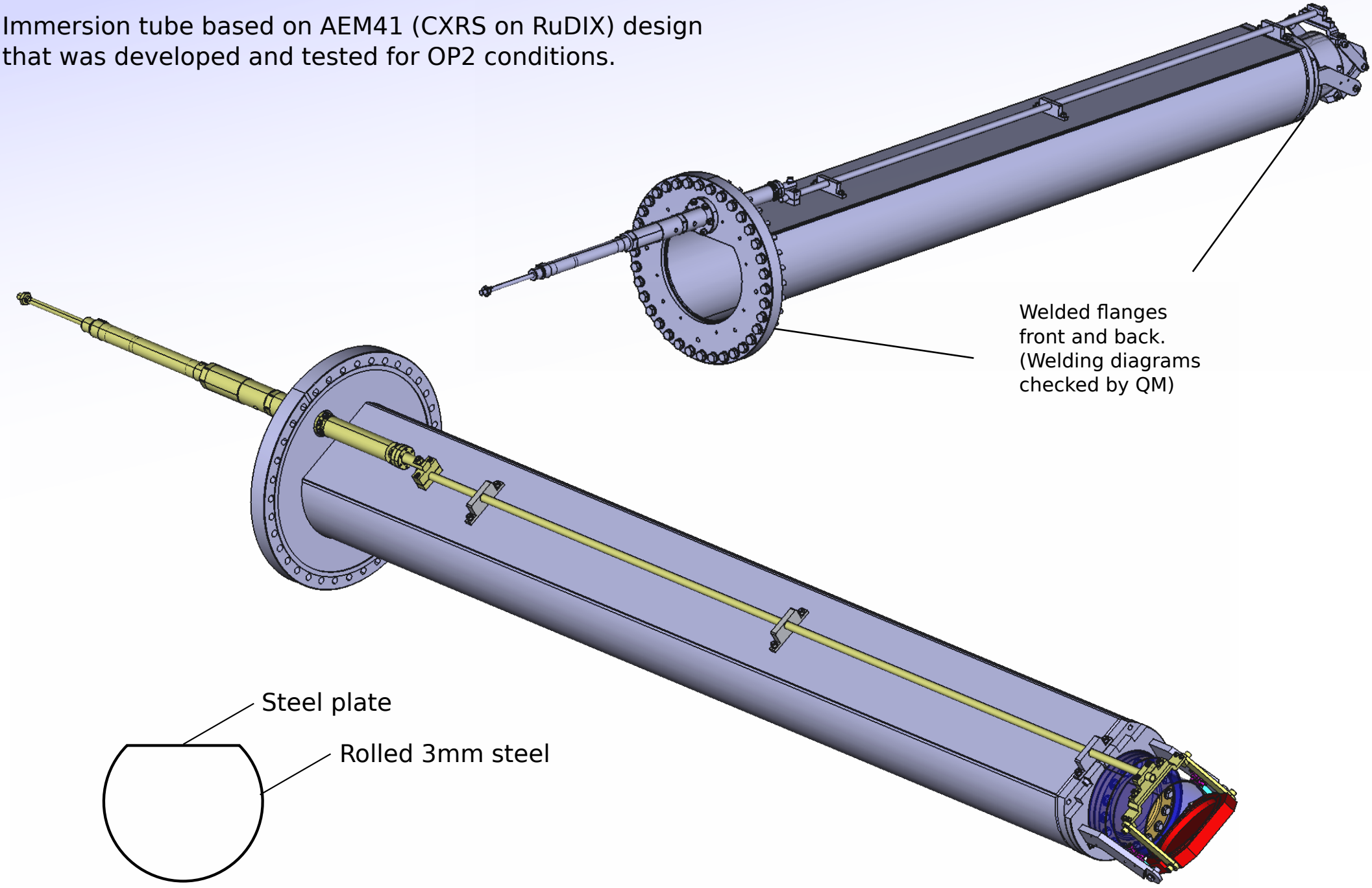
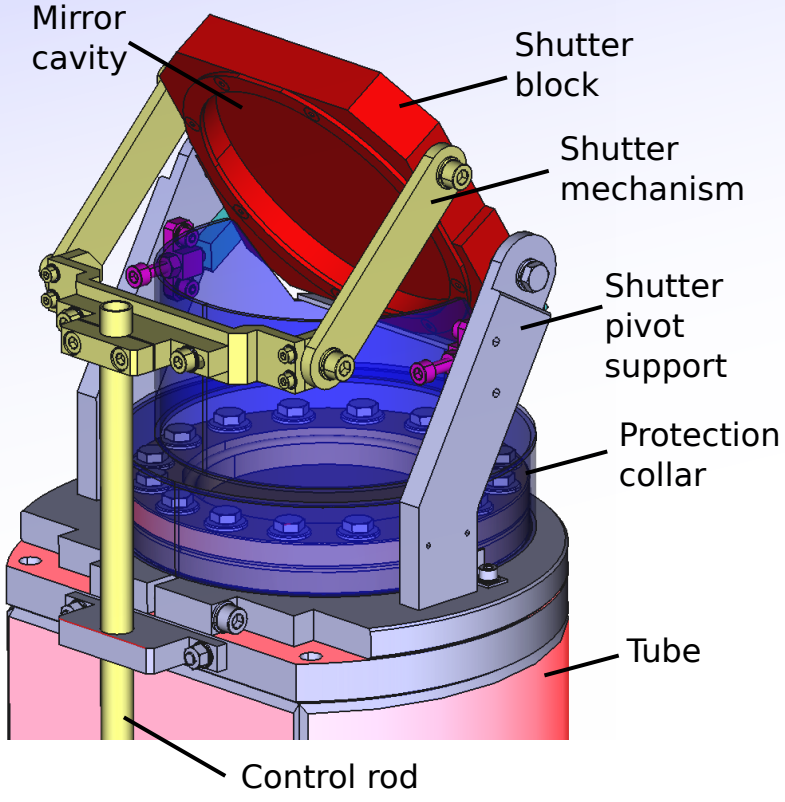
Immersion Tube

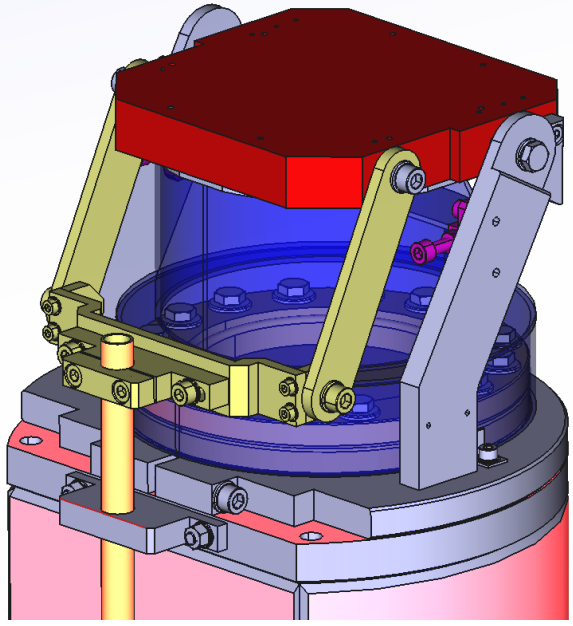
Immersion tube based on AEM41 (CXRS on RuDIX) design
that was developed and tested for OP2 conditions.

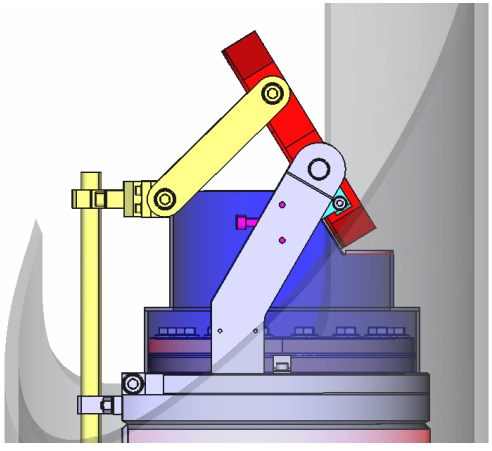


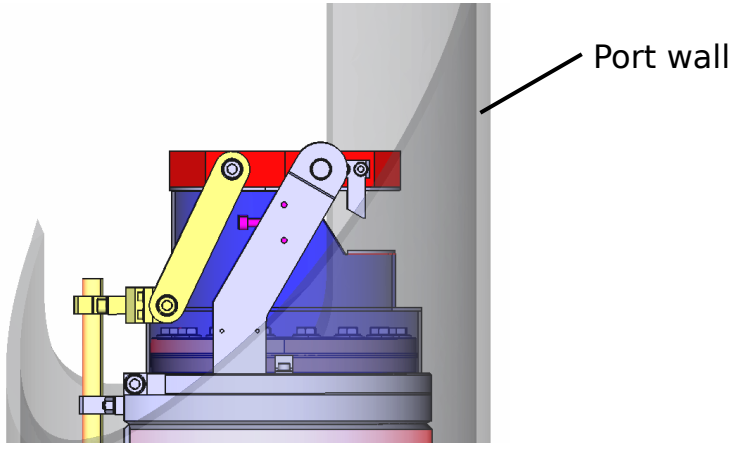
Shutter

Mirror is mounted to a steel block used as the shutter.



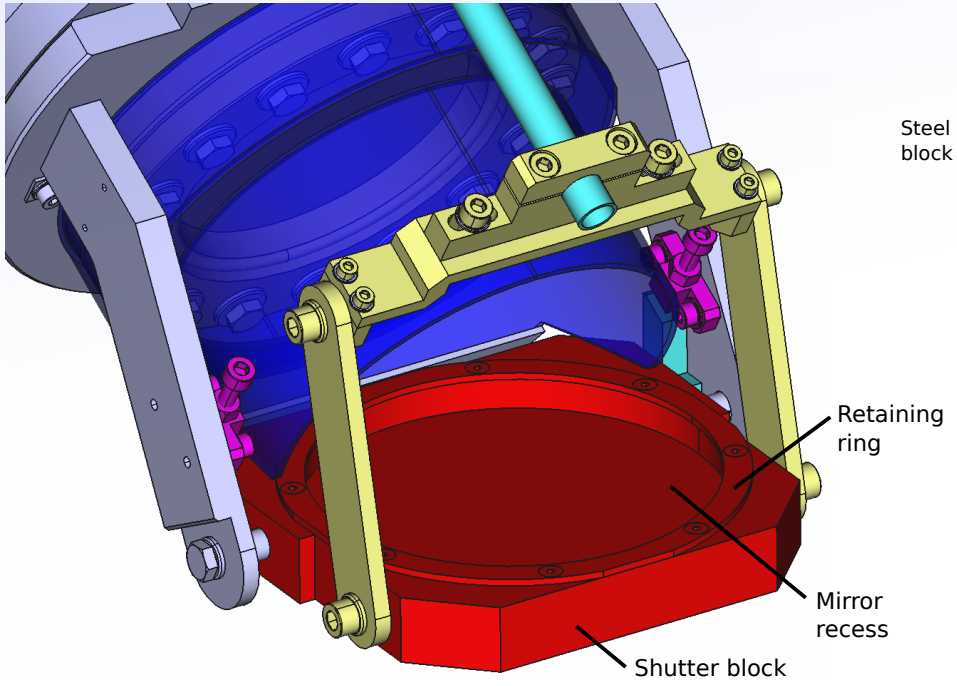


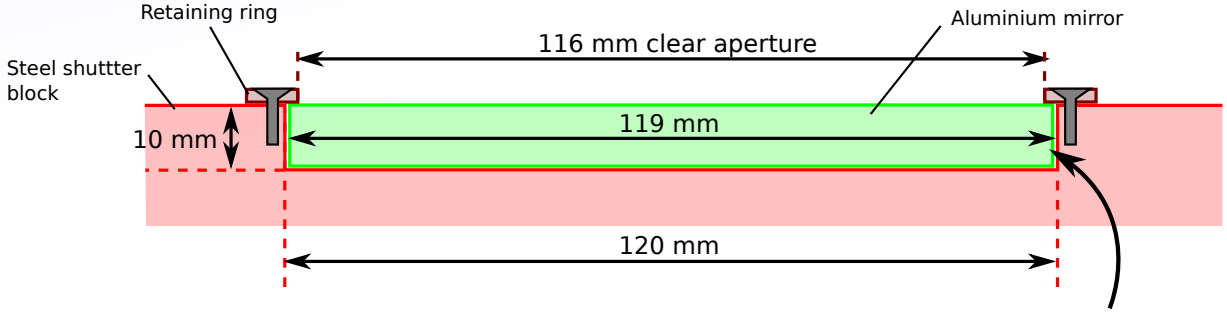




Mirror

Material selection:
- Aluminium or silver for required reflectivity < 400nm.
- No dielectric coating - causes arcing and damage to layer.
--> Aluminium, polished to optical quality.





Space for thermal expansion up to > 300'C and thick mirror to avoid bending when hot.

Solid Aluminium:
- Requires material exception for plasma exposed use.
- Non-magnetic, vacuum compatible, no significant issue with radiation.
- Used as ASDEX Upgrade for CXRS, no significant problems (built themselves and polished externally).
- Expect slow loss of reflectivity due to coatings from plasma.

High temperature tolerant (up to 300'C), polishing friendly aluminium alloys (RSA-205) available.
Status: Ordered, Delivery 25/01/2017.

Mirror Materials

Aluminium alloys:

A) RSA-905 AE

Good properties up to 300'C.
Good machining ability for optical surfaces.

87.4% Aluminium
5.0% Nikel
2.5% Iron
2.5% Copper
1.0% Manganese
0.8% Molybdenum
0.8% Zirconium

Tested with magnet by RSP-Technologies:
'*No sign of magnetism, non-magnetic as far as we know*"

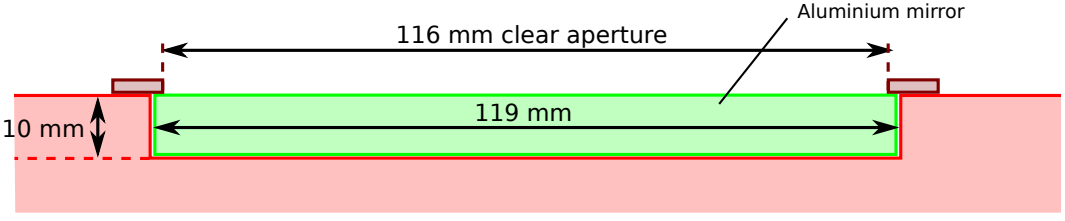
B) AW-6061-T6

Standard alluminium, ok for optical surfaces.

> 96% Aluminium
< 1.2% Manganese
< 0.8% Silicon
< 0.7% Iron
< 0.4% Copper
< 0.35% Chromium
< 0.25% Zink

Backup option in-case RSA-905 is too magnetic.

Location (W7X coords):
x=-520.731, y=5407.642, z=1049.967 mm



Mirror/Shutter thermal consideration.

Calculated heating of mirror and shutter for 100kW m^{-2}, 10s shots, 10 minute pause.
- Mirror surface max 30'C above bulk.
- Bulk temperature equilibriates at max 250'C (worst case scenario)
- Cools before start of next day.