Arc Interconnection – Welding and first Experience

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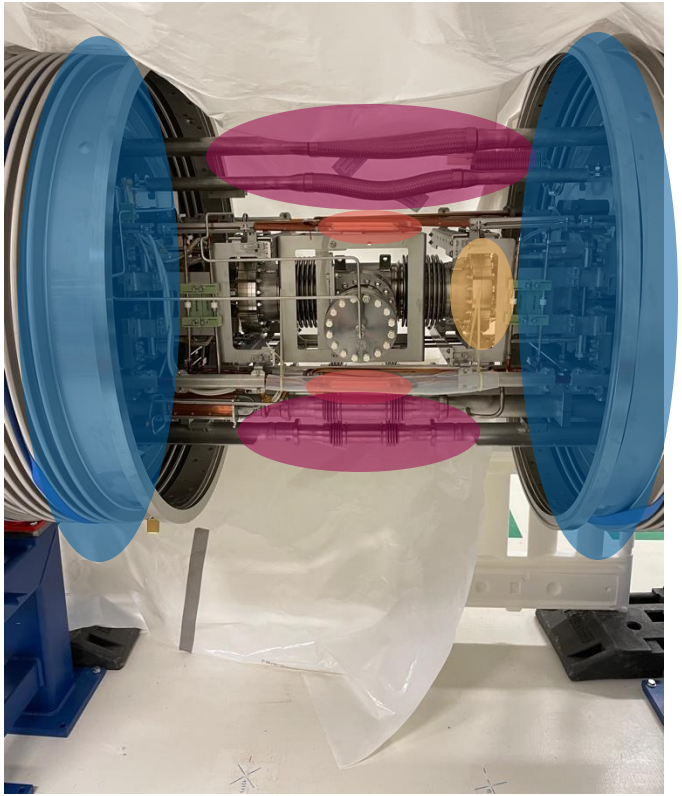
Interconnection – How does it look like

Which components are in an interconnection and how are the connections made?

- UHV – screwed flanges
- Sc BusBars – soldered
- **Process pipes – welded**
- Thermal Shield – overlapping of thermal shield, screwed
- Insulation vacuum – screwed teleskopic bellows



Process Pipes

Two types of connection hardware:

- Metal hose
  - Shield supply
  - Beam chamber supply
  - angular, lateral and “longitudinal” compensation

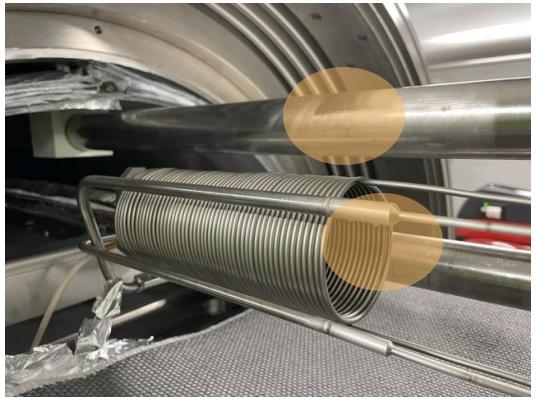
- Universal compensation bellow
  - Shield return
  - Magnet supply
  - Common return
  - Angular, lateral and longitudinal compensation

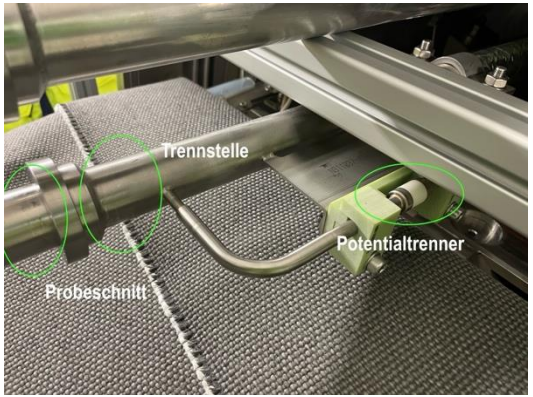
Metal hose

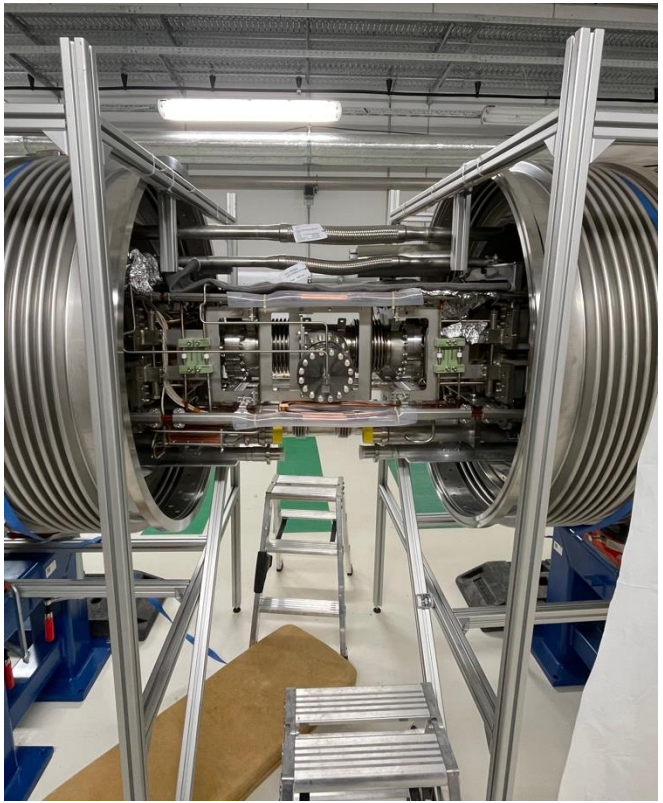
Preparation:

- Protection of components
- Cutting of module pipes to length
- Cleaning of pipes
- Purge gas connection

Cutting is a delicate operation!

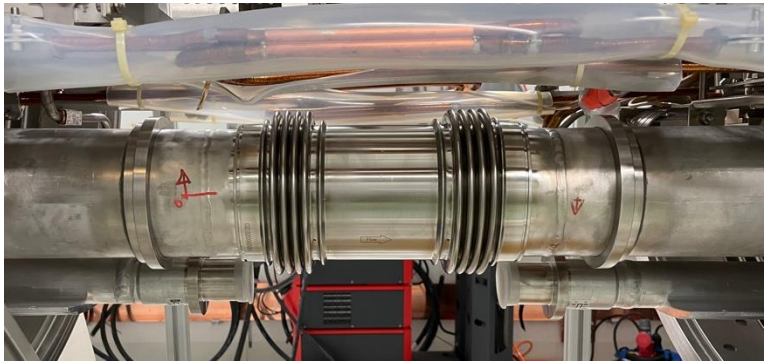


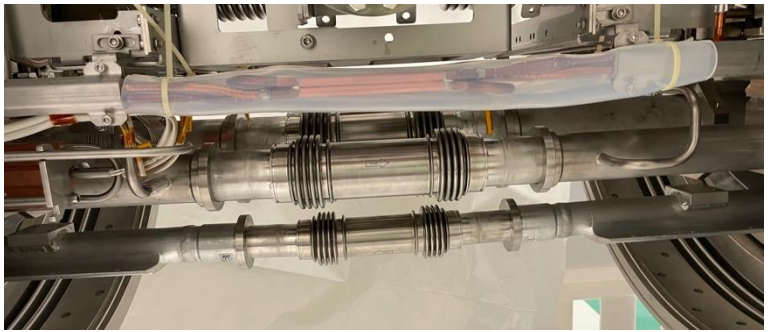




Universal compensation bellow

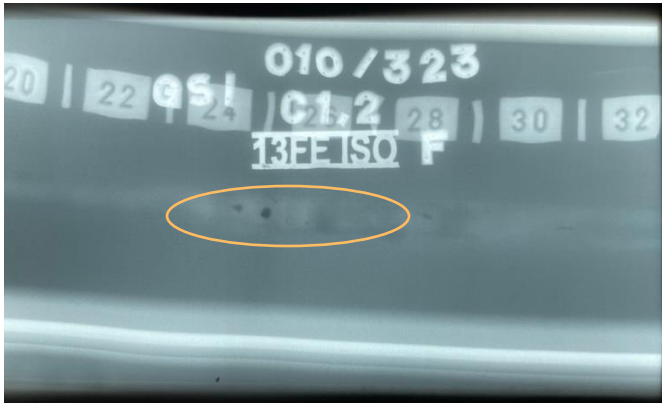
- Preparation:
- Cut bellows to size
- Pipe cleaning
- Purge gas connection
- **Welding**
  - Space constraints require a specific order.
  - This **limits repairability**!

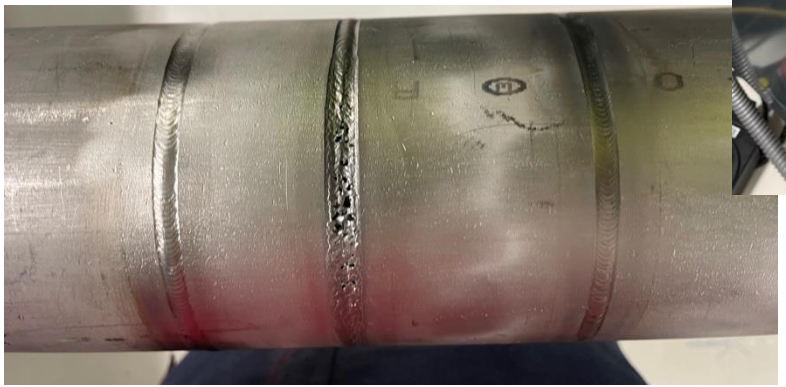




Issues so far

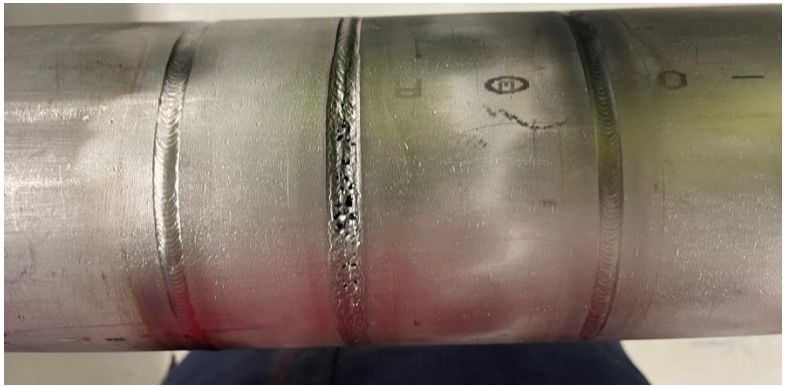
- Space:
  - Welding guns need to heavily modified on order to fit
  - Hand welding (done for repairs) is possible but takes a lot longer than orbital welding
- Welding quality:
  - Affected by wall thickness, some pipes were **0.4 mm** out of spec.
  - Material quality is sometimes problematic, pores in weld found by radiography





Issues for the future

- Purge gas:
  - Pipe lengths get longer and time to get to <30 ppm O2 increases (already 20min for 108x3)
- Testing:
  - Endoscopic inspection is not possible anymore once the QDM get positioned and connected.
  - Internal faults have already happened, see picture, up to now no explanation
  - Repairs can lead to shavings inside the pipes
  - We need to be sure of the welding process, since we can't perform inner inspections anymore.
- Longitudinal compensation:
  - < 5 mm when "compressed"
  - < 3 mm when "extended"



- **First steps** are successfully done and we have solved a lot of technical issues to get to this point.
- Without the flexibility and knowhow of MEW and especially Jens Holluba we would not be at this point!

- We still have our work cut out for us in the coming years and I am not talking about acceleration.