LMQXFBT001: 1st MQXFB prototype Assembly and welding activities

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MQXFB splicing

Procedure, tooling and components used for the MQXFS

Ongoing work to:
- Increase the distance between the cables
- Increase the distance to the HX tubes
- Increase the stiffness along the routing
- Standardize the tooling and procedures
Alignment blocks and backing strip assembly

One issue over the full length, a pin was not properly inserted ⇒ the block had to be machined to fit the default.
Upper instrumented installation and tack welding to the alignment blocks

n x 30 x 228
Transfer to the rotation bench and rollover
Transfer to the welding press conveyor
Geometrical and alignment measurements

Excellent alignment kept from the initial assembly bench up to the press conveyor cradles.

⇒ The shell inertia is transmitted to the magnet, it prevents twist and longitudinal misalignment.
Thermometers installation
Upper shell installation, alignment and tack welding

Restrains in the extremities to contain the welding shrinkage need to be improved. Spare aluminum shells with sharp corners will be adapted and used.

Excellent fitting between the stainless steel shells and the aluminum one
Longitudinal welding

Welding without additional pressure than the one given by the cradles weight

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Shell azimuthal and coils induced stress after welding - very preliminary -

Shell welding

- The measured LHVe stress after welding ranging between 110 Mpa-175 Mpa
  - Only 5 out of 12 measuring points
- The measured delta coil pole stress is around -18 Mpa
  - Consistent with the computation
- According to the model during cooldown around 80 Mpa is lost from the LHVe
  - The LHVe should be in contact if one has more than that -> contact ensured

Courtesy of Eelis Tapani Talaka
Cold mass after longitudinal welding
Transfer to the “finishing area”
Extremities cutting
Magnetic axis measurements
Alignment to the supports

0.x mm/m alignment reached after two trials

Tooling to be enhanced to improve angular adjustment
⇒ Minimizing friction and effects
⇒ Improving tooling alignment from one vertical position to the other
Next Steps

For LMQXFBT001 cold mass

- Supports welding after final alignment
- 18kA and CLIQ leads extensions
- Mechanical instrumentation signals routing out of the cold mass
- Weld preparation machining for the end covers
- Cold mass closure aligning the various components
- Final magnetic
- Pressure/leak test

In view of the series production

- Connection box improvement
- QH and V-taps wires routing and fixation
- Tooling improvements
- Orbit corrector alignment bench in line with the MQXFB one
- Busbars installation procedure to be defined
- Welding procedures qualification
- …