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P3.183 Design prototyping and manufacturing of Johnston Couplings for the Cryopump for the MITICA test facility

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The ITER project will require large cryopumps of flat-geometry to pump the Heating Neutral Beam Injectors (NBI), and similar cryopumps to pump the diagnostic Neutral Beam (DNB). The cryogenic supply uses supercritical Helium for the cryopanels and gaseous Helium for the thermal shields of the cryopumps. The cryogenic fluids will be produced by a large cryogenic plant, and then distributed by means of cryolines from the Cold Valves Boxes (CVB) to the cryopumps.
The first ITER Neutral Beam ITER cryopump will be built for the full-scale prototype of the ITER heating neutral beam injector (MITICA experiment at PRIMA-NBTF), under realization in Padua, Italy.
In order to facilitate repair or removal of a cryopump, cryogenic removable connections (named Johnston Couplings) in an ITER specific design are conceived as interfaces between the cryopumps and the cryogenic distribution system of the MITICA test facility. These Johnston couplings when used on ITER will have a nuclear confinement function and hence require to be built to allow fully volumetrically examinable welds on the confinement boundary. This coupled with the need to achieve low cryogenic heat loads and be able to be installed in different orientations has led to a highly innovative design.
This paper deals with the development of Johnston Couplings (8 pairs) to be used for the very first ITER NBI cryopumps of the MITICA test facility. The design, validation, manufacturing, and factory acceptance testing activities are described, as well as the issues faced and technical solutions adopted to fulfil the ITER requirements.

Co-authors: ROUSSEAU, Aurelien (CPFC FUSION FOR ENERGY); Dr MORA VALLEJO, Luis (F4E)

Presenter: Dr MORA VALLEJO, Luis (F4E)

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