Contribution ID: **576** Type: **Poster Presentation (120m)**

Insertion thermometry experience at CERN

Wednesday 24 July 2024 14:00 (2 hours)

CERN cryogenic facilities have an extremely large quantity of temperature measurement points, most of them are performed by using non-removable sensors installed either in the fluid or in the insulation vacuum side of reservoirs or pipes; the mounting of these sensors, is standardized in most of CERN equipment and provide very reliable results.
On the other hand, insertion thermometry is present in industrial supplier's equipment, desirable for low pressure gaseous cold helium environment due to the poor heat transfer coefficient between the fluid and the pipe wall complicating the measurement on the insulation vacuum side. Insertion thermometry requires a capillary that, in the case of CERN equipment, has a wide variation of both inner diameter and overall length. Furthermore, the capillary is prone to inner pipe restrictions due to inappropriate bending or solder joints. The main advantage of insertion instrumentation is the exchangeability of damaged sensors; however, installation can be extremely difficult in presence of restrictions and it is not trivial to ensure that the temperature sensor end-location reached the end of the capillary inside the cold fluid's vessel.
The wide variation of the insertion capillary parameters is due to the fact that CERN's equipment is specified for turn-key operation, and it is provided by a variety of manufacturers. An effort was therefore made to analyse and document all variations for the insertion capillaries existing in the 8 LHC (Large Hadron Collider) cryogenic plants to design a new type of insertion thermometer. It is based in a sufficiently rigid wire with centring beads that permit pushing, along the capillary, the temperature sensor corresponding to the standard types used in the LHC. All poorly working insertion thermometers were replaced during the long shutdown maintenance on the LHC cryogenic plants, as well as on the CMS detector associated cold-box during nominal operation.
In addition, a new insertion thermometer has been developed with the insertion wire replaced by a PCB (Prototype Circuit Board) of which various widths have been manufactured. At the end of the PCB, a spring probe acting as an electrical contact is attached to ascertain that the capillary is fully inserted, assuming that the capillary as well as the cryogenic equipment are made of electrically conducting material. The thermometer and spring contact signals are routed with copper tracks on the PCB. The insertion PCB length can be reduced in 25 mm increments by cutting the excess length.
The paper presents the design of both wire and PCB based insertion thermometers, application examples and the field operational feedback.

Submitters Country

Switzerland

Authors: NOLY, Florian (CERN); CASAS-CUBILLOS, Juan (CERN); BORA, Matteo; VAUTHIER, Nicolas (CERN)

Presenter: VAUTHIER, Nicolas (CERN)

Session Classification: Wed-Po-2.4

Track Classification: Tracks ICEC 29 Geneva 2024: ICEC 11: Instrumentation and process control