## CURRENT LEADS

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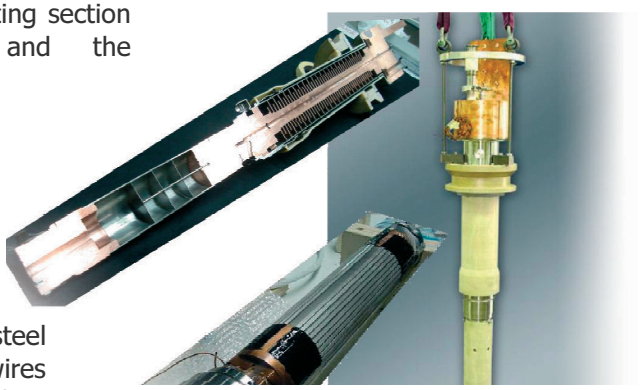
During our collaboration with CERN, the technology required for manufacturing and testing different types of current leads has been developed and customized according to the special requirements of critical applications. More precisely the following types of current leads were produced: 120A, 6000A and 13000A. The tooling and the technologies used for the production of these different types of current leads were designed and produced in collaboration with CERN, and many details of the production process were studied and refined on dedicated prototypes, in order to guarantee the best performances and the required repeatability for the series production. These components are designed in order to be installed within the cryostat of the relative superconducting magnet, leading the required current from the external power supplier to the magnet coil, which is maintained at the superfluid helium temperature. The current lead must transfer the current and guarantee the required separation between the inner part of the cryostat, containing superfluid helium, the vacuum gap of the cryostat, and the outer in-air region, in which the electrical connection to the power converter is provided.

120A conduction-cooled current leads was designed by CERN in such a way to fit into the space available within the vacuum gap of the cryostat. The special bending required the development of a suitable equipment and a great experience of operators. The most critical items related to the construction of conduction bars were the choice of materials and the required treatments: a copper-plated brass rod is inserted in a stainless steel pipe. The conductor bar and the stainless steel envelop pipe are electrically insulated by means of Kapton®. The conductor is then bended to obtain the required shape and welded to edge flanges. Special equipment were developed for performing the welding without damaging the Kapton®. The most relevant technologies involved with the production of these devices are: galvanic treatment, manual bending with special tooling and equipment, TIG welding and "Parylene C" coating.

**13000A High Temperature Superconducting (HTS) current leads** are characterized by a complex structure, which required the application of special technologies, such as electron-beam and TIG welding, vacuum brazing, vacuum soldering and Parylene coating. These devices can be mainly divided in three regions: a top normal conducting section (warm part), the heat exchanger, and the superconducting section (cold part).



The normal conducting section consists of a OFE copper block with brazed stainless steel inserts.

The manufacturing of the heat exchanger required the vacuum diffusion brazing process.

The superconducting section consists of two copper blocks vacuum brazed to a stainless steel cylinder, and hosting grooves, in which LTS wires are vacuum soldered by means of a suitable eutectic alloy. This technology has been used, with the required optimizations, for the 6000 A current leads.

References: **CERN, DESY**