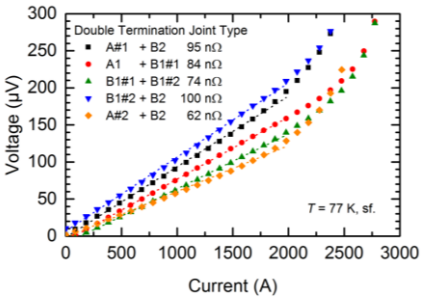
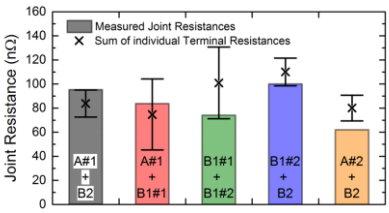
Connectors for supra-conducting power cables filters

Electricity generated in high-current processes such as fusion installations has to be transported to the users with minimum losses. Here, in addition to high-voltage direct current transmission, cables consisting of superconducting material offer a promising alternative. Superconductor enable direct current transmission without losses.

Description of the technology

The method commonly used nowadays to connect the cable sections consists of baring the superconducting cables at their ends and then soldering them to one another individually. However, this process is very time and cost intensive and is unsuitable for applications on an industrial scale. As an alternative, a connecting section made of copper is used into which the cable sections are laid from both sides so that they overlap. The disadvantage of this is the relatively large space required and the high resistance of the copper.





KIT scientists at the Institute for Technical Physics (ITEP) have developed a connector that consists of a copper body with recesses for the cables. Bands of superconducting material run along these recesses. The cables that are to be connected are closely aligned with the superconducting bands, enabling power transmission from one section to the next virtually without any losses. In order to fixate the connection, a liquid metal alloy is used as solder, and the connector is closed with a lid.

Innovation and advantages of the offer

The connectors can be used in high-current systems without energy loss and without problems such as excessive heat generation or weakening of the material. The compact copper body can be designed in a manner enabling it to link cables either in a straight line or at an angle.

Non-fusion Applications

One of the target applications of the connectors is in the current supply systems of fusion magnets, as well as in the energy output layer of fusion installations. The prototype was developed with inputs and feedback from the fusion installations at KIT. Energy transport (high current), electrolysis, output lines from offshore windparks, heavy DC electromotors (e.g. ships), fusion magnets, particle accelerators and similar high-current systems

EUROfusion Heritage

The technology was not specifically developed for fusion applications, but its TRL was advanced by using performance data from fusion energy in the study phase and development of the prototype. The fusion installations are among the technical installations involving the highest currents and therefore suitable as test environment, also in further development of the connectors.

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