

RECORD PERFORMANCE FOR HTS WIRES: CURRENT CARRYING CAPACITY OF 1350 AMPERES REACHED

Ismaning, 12. August 2020 – THEVA has succeeded in more than doubling the current-carrying capacity of its Pro-Line superconductor wires. In test series, standard processes were used to produce wires that carry more than 1000 A of transport current at 12 mm width and 75 µm thickness. This corresponds to a current density of 1100 A/mm². The record level was as high as 1350 A, corresponding to 1500 A/mm². "To our knowledge, this is unique worldwide," says sales manager Dr. Markus Bauer happily. Good news, especially for the development of high-field magnets, for example for fusion reactors or medical applications.

Up to now THEVA has been able to produce and offer superconducting wires several hundred meters long with a guaranteed current carrying capacity of 500 A at standard measuring conditions in liquid nitrogen - that is at 77°K or -196°C. Thanks to the improvements that have become possible, conductors of up to 850 A can now be supplied. This almost 70 percent increase means that more current can be conducted over a smaller area. This is particularly important for high-field magnets, as coils with more powerful superconductors are wound "denser" in relation to the current, so that higher magnetic fields can be achieved - which also means that the price of superconductors will continue to fall.

This development was made possible by a unique feature of THEVA's manufacturing process. This process is characterized by a very simple layer structure using a MgO buffer layer with tilted orientation. The special growth mode makes it possible to produce even very thick HTS layers without degradation of the crystalline quality, so that the current carrying capacity scales linearly with the HTS layer thickness. Thus, it is possible to achieve high current carrying capacities by simply adjusting the coating processes. This enables THEVA to bring to market Pro-Line superconductors with significantly increased current-carrying capacity.

Extensive product tests are currently underway for these high-performance superconductors. In addition to electrical and magnetic performance, mechanical properties such as ductility and tensile strength are being examined in detail. It is planned to complete these tests in autumn.

This development represents a significant improvement for all users. It allows customers in the field of high-field magnets for top-level research to achieve even higher magnetic fields. In power engineering, e.g. for generators and high-current cables, the improved Pro-Line superconductors allow significantly more compact designs and higher power densities to be achieved, which in turn has an impact on the price.

Compared to conventional electrical conductors such as copper, high-temperature superconductors (HTS) exhibit enormously high current carrying capacity. With the value of over 1000 A/mm² now achieved, this is 200 to 400 times higher than that of a copper conductor. In almost all fields of application for HTS conductors, from high-field magnets to cables, the current density plays a decisive role in the performance of the overall system.

About THEVA Dünnschichttechnik GmbH:

With nearly 25 years' experience in coating technology and equipment engineering, and patented production technology, THEVA manufactures high-temperature superconductors (HTS) for the loss-free transmission of extremely high electric current. Today the company stands for a unique approach in superconductor production.

THEVA has invested over fifteen years in development to build Germany's first commercial HTS production plant. Thanks to its very high energy density, THEVA Pro-Line superconductor can replace conventional copper wire in high-performance applications. It opens entirely new scope for the design of electrical components. Manufacturers of cables, power switches, large electric drives and power rails can rely on the high quality and performance of the material. THEVA provides high-end solutions in coating technology and equipment engineering.

THEVA Dünnschichttechnik GmbH was founded in 1996 and today has around 50 employees. Headquartered in Germany and with representatives in Asia and the USA, the company has a global presence for its customers.

In 2012, with Target Partners and BayBG two powerful VC partners came on board. Since 2016 eCapital and Bayern Kapital have also been supporting the growth of the company. As of the third financing round in 2017 EnBW New Ventures is also among the investors.

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