



Products for fusion reactors

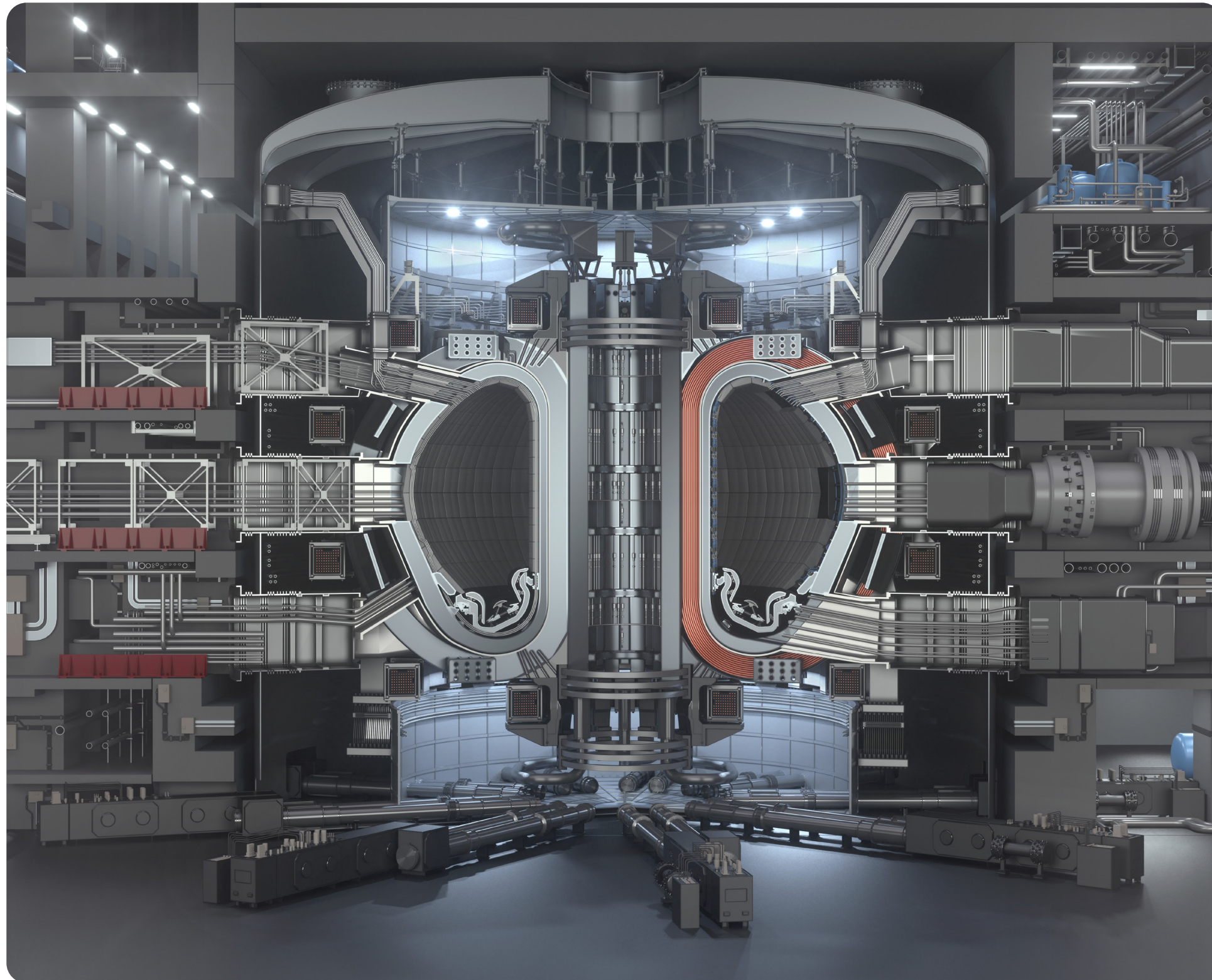
Bespoke copper products to the most precise needs

LUVATA
Partnerships with a Promise

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A Group Company of  MITSUBISHI MATERIALS





Solutions to the most demanding needs

Fusion energy is safe, clean, and affordable energy source and it has the capability to bring carbon neutral energy available to everyone. We have seen unprecedented surge for investments and growth in fusion development. Global scientific background in ITER and other earlier devices is now turning to local projects with a clear target to bring electricity to the grid.

For these applications, copper is critical in heat and electric control. Luvata product offering is well suited for fusion reactor builders and our oxygen-free copper is the basis for large variety of conductors and cables. We also produce superconductive magnet cables with over forty years of experience. Heat sinks made from high temperature resistant CuCrZr are needed in vessel components such as blankets and divertors.

Working closely with our customers

Luvata has been supporting fusion builders for decades; from visionary beginning to major advancements, they are making today. Luvata strives to meet the highest demands of this industry, working closely with customers. Many applications are created by tailoring to the precise needs of a reactor builder. This is possible as innovation is well built into the culture of our company.

"At Luvata we have been developing and producing technically demanding products to some of the most complex applications for decades. We have been proud to participate in the development of fusion energy and are committed to continue this work together with reactor builders."

Fusion technology plays an integral part in the development of a cleaner and more sustainable future. Luvata has stated to benefit the People, Society and the Earth and contributing to the development of sustainable energy sources reflects this commitment."

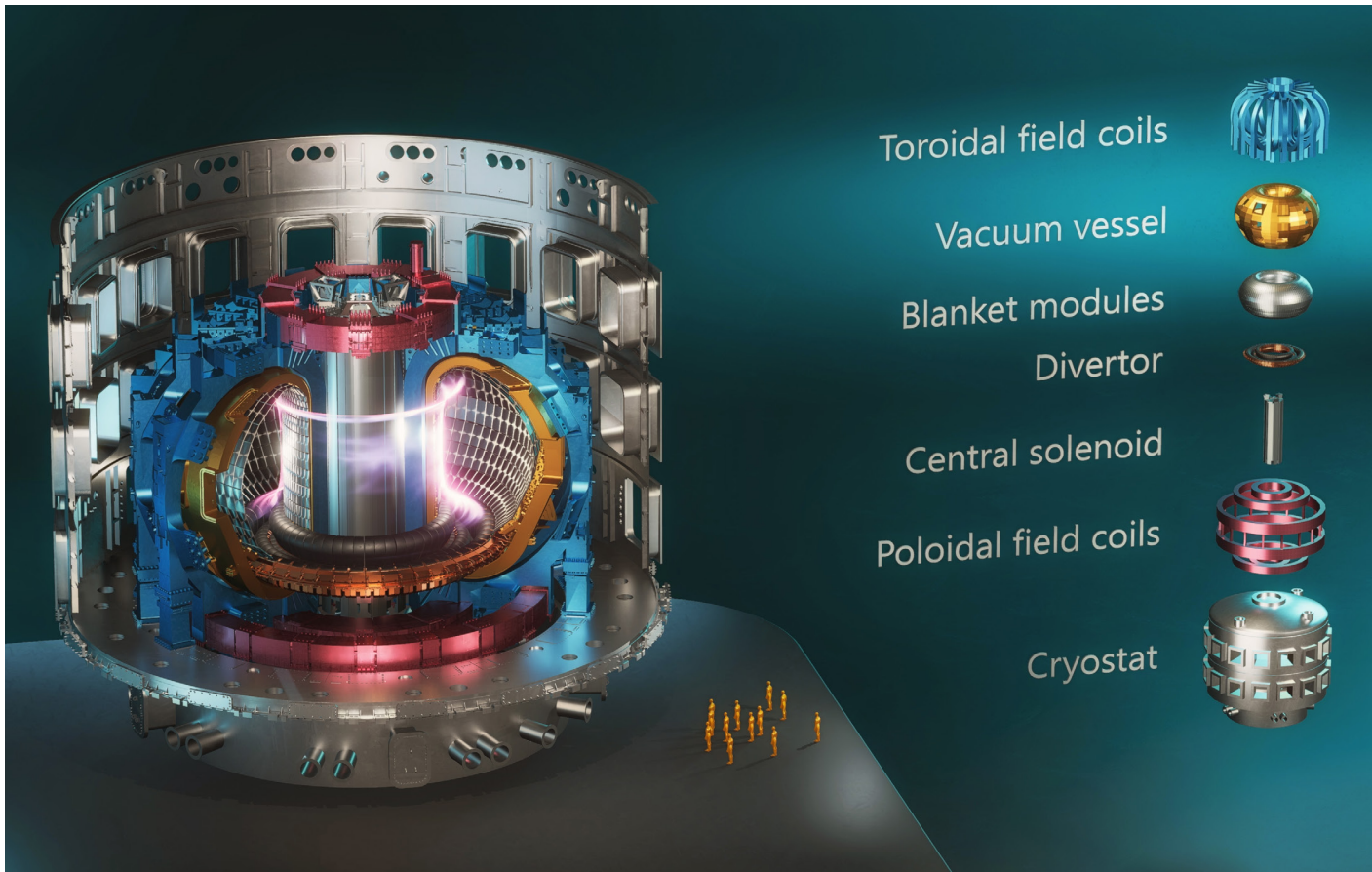
President & CEO
Pekka Kleemola

Reactor components

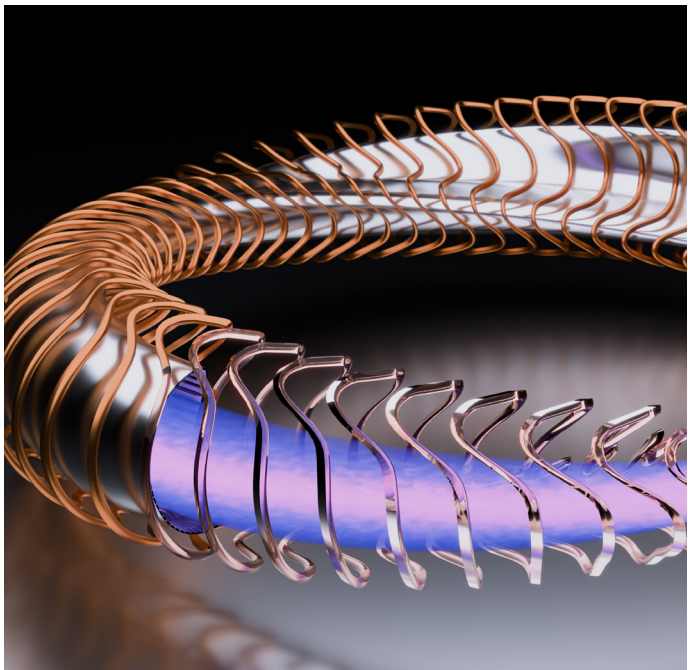
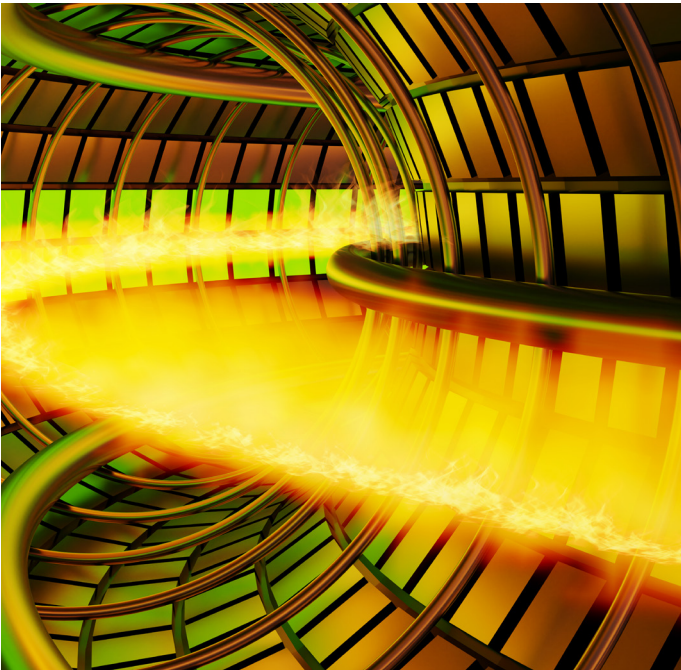
Luvata supplies products to the whole range of reactor components.

Luvata and its predecessors have been involved in fusion research since 1970's. JET tokamak was one of the first devices to demonstrate feasibility of fusion energy and already then, the first deliveries there were made from Finland. Luvata has been part of many public research projects like ITER where, in cooperation with other companies, universities and research institutes, solutions to ongoing challenges have been worked on.

Still today we work closely with the fusion ecosystem in Finland in FinnFusion and in Europe in European Fusion Business Forum. Luvata has also worked with VTT Technical Research Centre of Finland. They specialize in fusion in plasma physics, material research and remote handling device development. Working together with a wide range of experts in different fields enables Luvata to always be in the forefront of the development and manufacture of fusion energy related copper products.



Reactor components



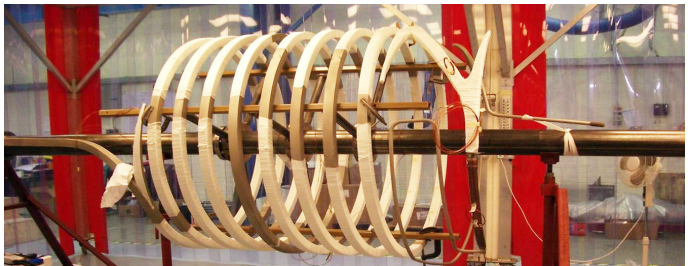
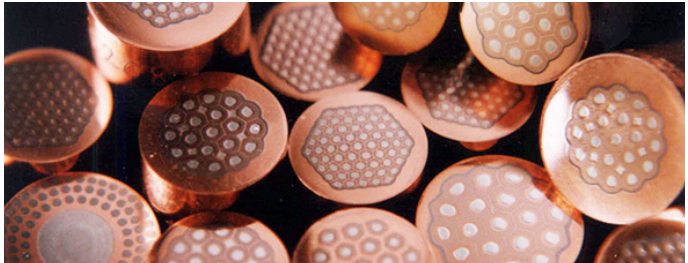
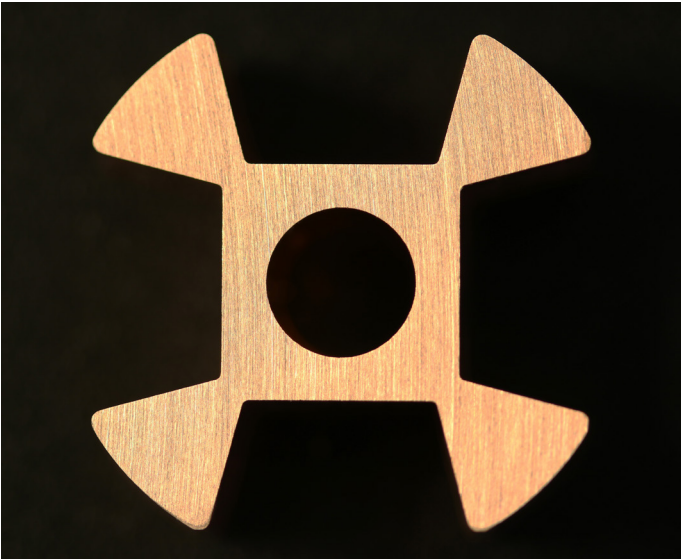
Magnet technology for fusion devices

Magnets can be used to confine particle beams and plasma. Many different types of magnets are used in fusion devices to keep particles from hitting the exterior structures. Toroidal field coils, poloidal field coils and central solenoid are magnets used in ITER and other tokamaks. Magnet technology is developing rapidly, and stronger magnet fields are made to reduce the size of the reactors. Stellarator is another type of fusion reactor where magnet coils are asymmetric and more complex. All these types of magnet coils are built either from superconductors or resistive copper conductors, and therefore Luvata supports all different approaches to fusion.

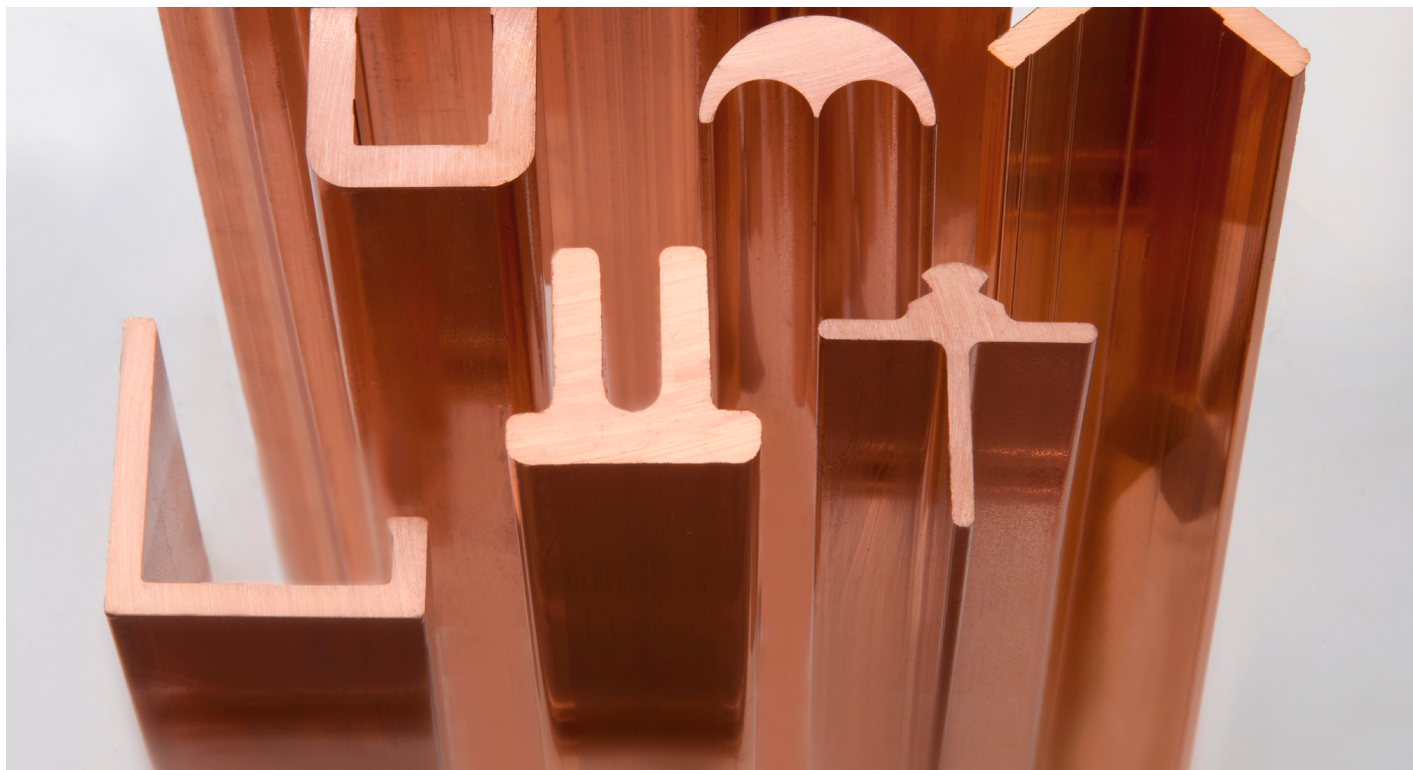
Conductors made from copper are often vital parts in the magnets. Luvata's high purity oxygen-free copper is used in hollow conductors and tailor-made profiles that form the

supporting conductive structure of the High Temperature Superconducting (HTS) cables. Our own tool modelling and manufacture produces new shapes fast, and Luvata has expert knowledge in optimizing long continuous conductors.

Luvata's Low Temperature Superconductors (LTS) are used in larger fusion reactor installations. Luvata has a long history of producing superconductors from niobium-titanium (NbTi) superconducting wires as well as niobium-tin (Nb₃Sn) composite wires. Superconductor products are always made according to customer's own design, however, Luvata offers its experience to further develop solutions for many different applications. Luvata offers many types of LTS: enameled monolithic wire in round and rectangular configurations, wire in-channel or cable in-channel integrated conductors and Nb-Sn conductors by internal tin and bronze methods.



Reactor components



Cryogenics

LTS and HTS superconductors both need extremely cold environment which is maintained in cryostats. All the conductors use copper, and it is often best to use cryogenic or electronic copper grades. Specific measurable in these products is RRR value. Residual resistivity ratio RRR value is the room temperature and 0 K temperature ratio of resistivity. When RRR value is high, both electrical and thermal resistivity remain on a good level in low temperatures. High RRR value is associated with high purity and optimal grain structure. Luvata has a long experience in modelling and tailoring products in a way that ensures high RRR values.

Vessel components

Opposite to magnet environment, the operating space in the reactor is extremely hot. Fusion reaction itself produces energy as heat flux that must be conducted away from the first wall and divertor. Luvata produces CuCrZr equivalent to ITER Grade CuCrZr. It has tight chemical composition and optimal grain structure, and it has proven to withstand irradiation without losing its conductivity and strength.



Luvata produces CuCrZr in large scale of shapes and dimensions of forgings and castings. Also finished components can be made by machining. Fusion reactor vessel components such as first wall blankets and divertors must be cooled down continuously. In final components they are often joined together with other materials by advanced joining techniques.

Neutral beam and electron cyclotron

High amount of current is fed in, to form and manipulate the neutral beam that makes the plasma. High purity oxygen free copper is made by Luvata to a large scale of components in these current feeder systems. Forging expertise is used to form complex parts with homogeneous grain structure and with no orientation of the material.

High energy charged electrons needed are propelled with particle accelerators such as electron cyclotron. Particle accelerators are one high energy technology field where Luvata has a long experience. Hollow conductors are typically also part of these structures.

Luvata - Partnerships with a Promise

Working for People, Society and the Earth

We all want to ensure a sustainable future for our planet. As a manufacturer, we know that we have both an opportunity and a responsibility to contribute positively to the changes needed to secure that future. We have stated that our vision is to be the leading provider of copper solutions that benefit people, society and the earth, and this is a serious commitment. We are active in markets such as e-mobility, healthcare, electrification and the green transition, all of which have a need for copper products. We believe that our innovations will help drive these markets forwards, making green solutions more easily accessible to all.

We also recognize the need for our operations to be sustainable. To this end, we are striving to reduce greenhouse gas emissions, aiming to be using 100% renewable electricity by 2035 and to be fully carbon neutral by 2045.

Helping our customers grow and thrive

We have always worked in partnership with our customers, getting to know their businesses and collaborating on custom-made solutions. We take great satisfaction in seeing our customers thrive, and knowing that we played a part in their success.

Where we believe we can make a real difference is in sharing our robust manufacturing capabilities, technology and material knowledge, and by using our unique expertise to develop technically-demanding products. Together with an emphasis on lean production, innovation and value-added solutions, we work hard to ensure that we are the partner of choice for our customers, every time.

Partnerships with a Promise

At Luvata, we deliver on our promises. We have pledged always to treat people with respect, keep an open mindset and work together with others.

Our global footprint stretches across four continents. Our diversity of locations, cultures and markets gives us access to a wealth of knowledge and expertise that continues to grow. It also means that we are local to our customers, wherever they are, so we can continue to forge the strong relationships we are known for.



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About Luvata

Luvata is a world leader in copper manufacturing and related engineering services. It brings together people, innovation and technology to create solutions in areas such as e-mobility, healthcare, and in electrification & the green transition. The company's success is driven by innovation, lean production and value-added sales, and its vision is to provide copper solutions which benefit people, society and the earth. Employing over 1,400 staff on four continents, Luvata works in partnership with customers such as ABB, CERN and Siemens. Luvata is a group company of Mitsubishi Materials Corporation.



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