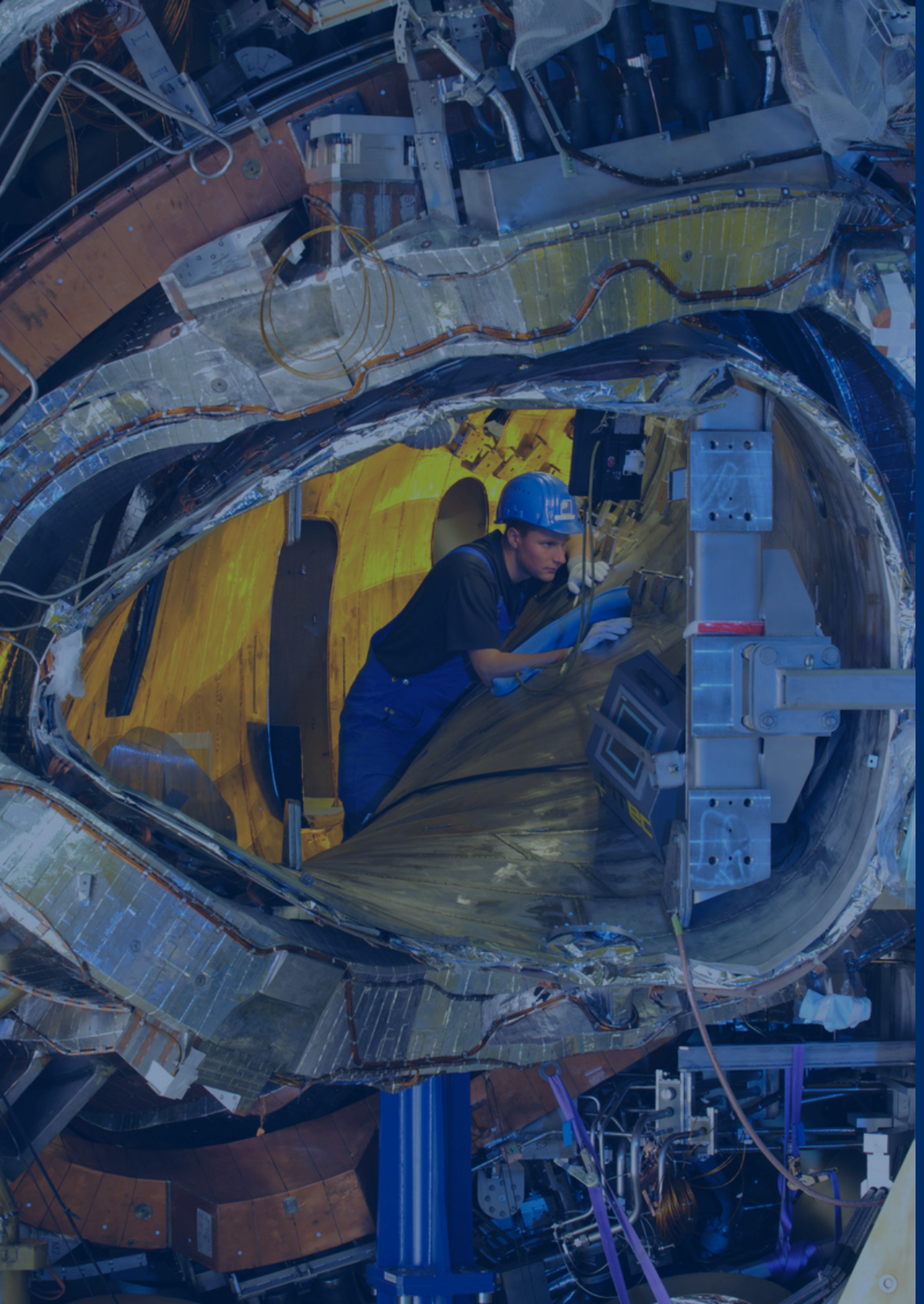


ASG SUPERCONDUCTORS

COMPANY PROFILE
FUSION ENERGY

www.asgsuperconductors.com

ASG SUPERCONDUCTORS

LEADING /SUPERCONDUCTING/ TECHNOLOGY

We improve everyday life creating real value for the world of research, energy, med-tech and industry by developing superconducting magnets, wires, cables and innovative systems.

www.asgsuperconductors.com

ASG AT A GLANCE

For 70 years, ASG Superconductors has been at the forefront of superconductive technology. From magnets that enabled the discovery of the Higgs Boson to record-setting superconducting wires for energy transmission, we have contributed to the world's largest international research projects.

As society moves toward electrification and sustainability, superconductivity is becoming increasingly viable for cost-effective industrial and everyday applications, thanks to advances in materials and expertise.

Our magnetic systems and superconducting cables-including our advanced high-temperature superconductor MgB_2 - are designed and manufactured in Italy, leveraging robust physical, engineering, and manufacturing know-how. With a team of 200 highly specialized employees and subsidiaries in Italy, France, the USA, and the UK, ASG Superconductors is a global leader in superconductive technology.

BIG SCIENCE

SUPERCONDUCTING MAGNETIC SYSTEMS
SUPERCONDUCTING CYCLOTRONS
SUPERCONDUCTING MULTIPOLAR MAGNETS
SUPERCONDUCTING SOLENOIDS
SERVICE

"Big Science" refers to large-scale scientific research projects that require collaboration among many researchers and international institutions. These projects, such as those at CERN, Fermilab, GSI, JINR, and INFN, address fundamental scientific questions and rely on advanced technologies and interdisciplinary approaches.

ASG Superconductors has partnered with these institutions, providing a range of magnetic systems-from quadrupoles to cyclotrons and detectors-designed and built in-house. Our unique expertise, commitment to total quality, and close synergy between engineering and production have turned these collaborations into success stories.

We are ready to tackle future research challenges that demand even more sophisticated and energy-efficient magnetic systems.

FUSION ENERGY

TOROIDAL FIELD COILS FOR TOKAMAK
POLOIDAL FIELD COILS FOR TOKAMAK
NON-PLANAR COILS FOR STELLARATORS
COMPLEMENTARY MAGNETIC SYSTEMS
SUPERCONDUCTING CABLES FOR ZERO-LOSSES ENERGY TRANSMISSION
CONSULTANCY
SERVICE

The dream of replicating the energy of the sun and stars on Earth through fusion power plants is rapidly becoming a reality. More than a century after the discovery of superconductivity, advances in materials and knowledge from major international experiments are paving the way for fusion power plants to be connected to the electrical grid by around 2040.

ASG Superconductors has developed the magnetic core for the world's most important fusion research projects, including Tore Supra, JET, ITER, JT-60SA, DTT (Divertor Tokamak Test), and Wendelstein W7-X. We offer engineering, manufacturing, and technical support for the realization of core components for fusion reactors based on both tokamaks and stellarators.

INDUSTRY AND ENERGY

SUPERCONDUCTING CABLES
SUPERCONDUCTING STORAGE SYSTEMS
SUPERCONDUCTING FAULT CURRENT LIMITERS
MAGNETIC SYSTEMS
SERVICE

As global energy demand increases, efficient, low-loss cables are essential. Superconductivity offers a tangible, cost-effective solution for green energy generation, transmission, and storage. Our MgB_2 superconducting cables are already operational at CERN and are being tested in European projects such as V-ACCESS, Scarlet, Best Paths, and Cablegnosis.

We are also developing Europe's most powerful superconducting cable (1 GW capacity) in Italy with INFN. MgB_2 technology is ideal for nuclear plants, solar systems, trans-European links, energy-intensive industries, and compact high-energy applications. It offers a footprint reduction factor of 10 or more compared to conventional solutions and is fully compatible with liquid hydrogen temperatures.

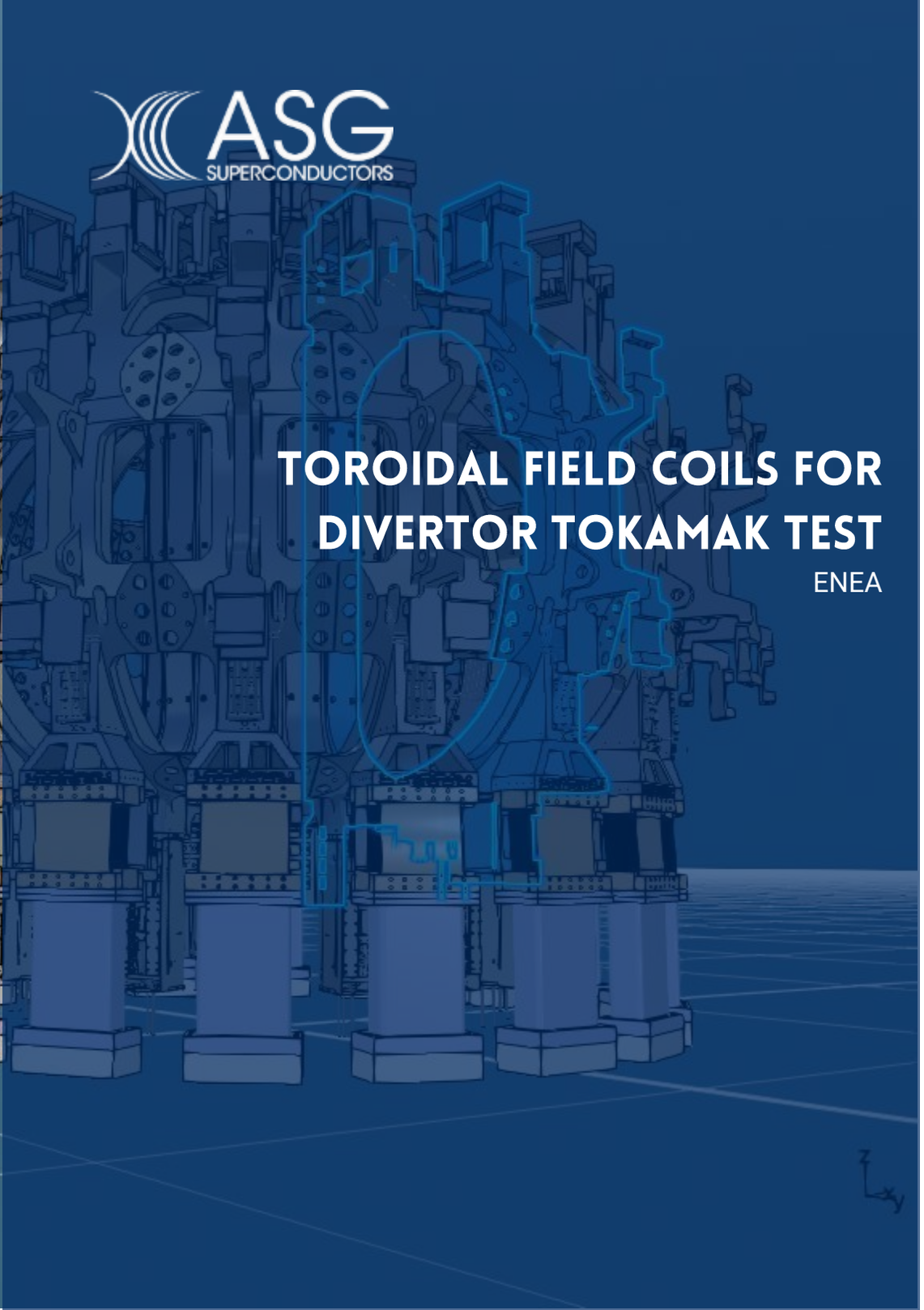
HEALTHCARE

OPEN MRI CRYOGEN FREE SYSTEM: MROPENEVO
MRI SYSTEM MAGNETS
HADRON THERAPY, RADIOTHERAPY, AND PROTON THERAPY MAGNETS
ULTRA HIGH FIELD MAGNETS
SERVICE

Superconductive technology has always played a vital role in the medical field. At ASG Superconductors, we use our expertise to develop patient-centered solutions. Our MgB_2 technology powers the world's only truly open, cryogen-free MRI system-MROpenEVO-and supports advanced applications like real-time MRI imaging for proton therapy.

Our magnetic and superconductive expertise also extends to hadron therapy, cyclotrons for cancer treatment, and the development of sophisticated high-field UHF magnets. We offer complete systems, components, and services to companies active in the medical sector.

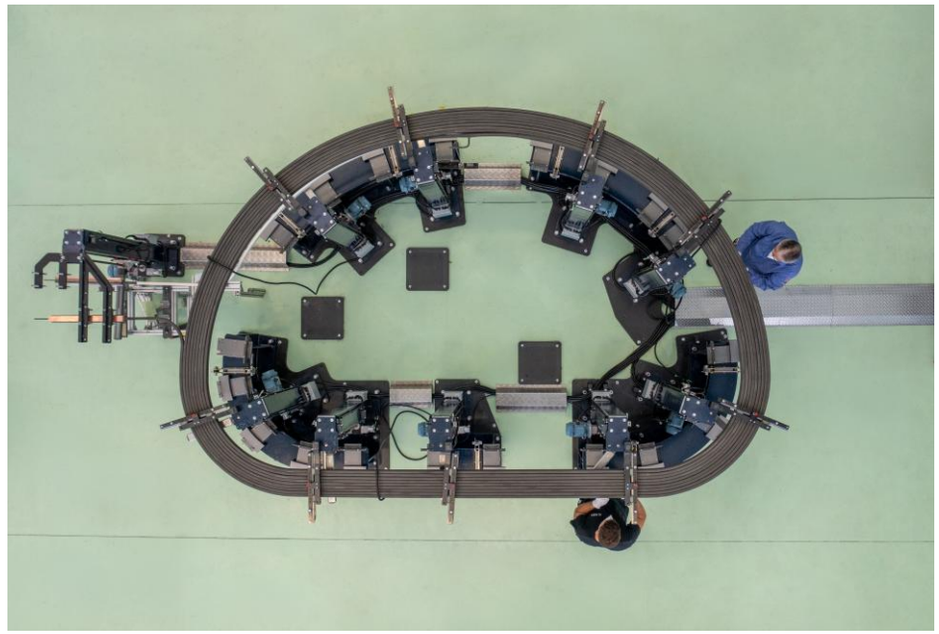
RECENT KEY PROJECTS AND ACHIEVEMENTS



TOROIDAL FIELD COILS FOR DIVERTOR TOKAMAK TEST

ENEA

Italy is working on the future of fusion energy with the goal of producing renewable and safe energy with the same process as the sun and stars: the machine called DTT – Divertor Tokamak Test is under construction in the ENEA Centre in Frascati and ASG Superconductors is manufacturing its magnetic heart composed of 18 superconductive toroidal coils.



POLOIDAL FIELD COILS FOR ITER TOKAMAK

FUSION FOR ENERGY

ASG has successfully manufactured 4 of the 6 Poloidal Field Coils in Cadarache, as their diameter exceeds 24m.

* Picture courtesy of F4E

ASG SUPERCONDUCTORS

TOROIDAL FIELD COILS FOR ITER TOKAMAK

FUSION FOR ENERGY

ASG successfully completed the manufacturing of 10 Toroidal Field Coils generating each an 11T field intensity, with a current of 68kA. All the TFCs have been positively tested and are currently being installed at ITER site.

TOROIDAL FIELD COILS FOR JT-60SA TOKAMAK

ENEA

The Italian contribution to the project, managed by ENEA, involves ASG in the construction of 10 toroidal field coils, each consisting of a superconducting winding inside in the relative steel containment casing.

ASG SUPERCONDUCTORS

NON-PLANAR COILS FOR WELDENSTEIN 7-X STELLARATOR

IPP

W7-X is the only stellarator in operation in EU. It is constituted by 60 superconducting NON-planar coils, 36 of which have been manufactured by ASG.

* Picture courtesy of IPP

PAST IN TIME PROJECTS AND ACHIEVEMENTS

GYROTRON FOR ITER EC

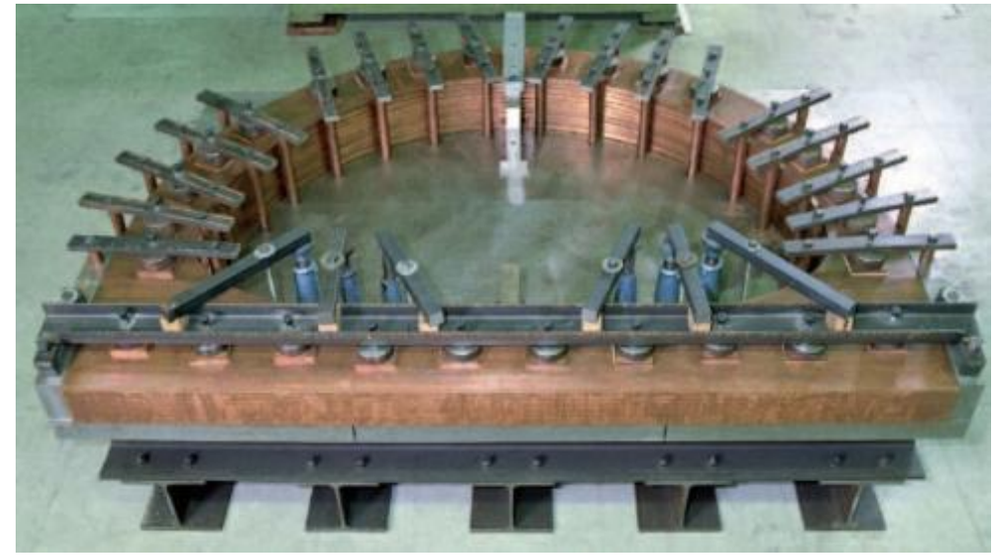
ENEA

Supply contract for the delivery of a superconducting magnet system, in the framework of the development of a 2 MW, CW, coaxial cavity gyrotron at 170 GHz for the ITER Electron Cyclotron (EC) system, a joint development effort undertaken by associations and industry adhering to the EFDA Technical Work Programme. The scope of supply, completed in 2007, included a superconducting magnet system consisting of the magnet itself, realized in NbTi, its cryostat containing several superconducting windings, cryogenic control system, quench protection system and their relative ancillary systems necessary to operate the magnets reliably at the desired performance.

IGNITOR TOROIDAL COIL PROTOTYPE

ENEA

The IGNITOR tokamak envisages 24 toroidal coils: the prototype coil was manufactured in 1995 under a contract of ENEA in Frascati.



DIVERTOR COILS FOR JET TOKAMAK

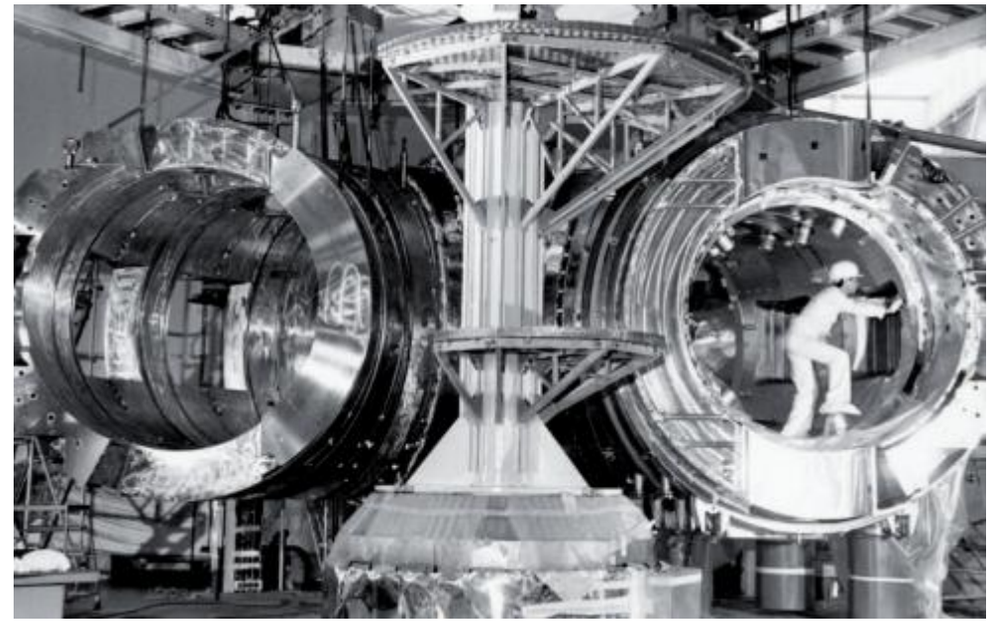
EURATOM

Four coils have been built and installed in 1992 by the Company in the JET vacuum vessel for the plasma containment. The coils are made of copper with glass epoxy insulation and are enclosed in vacuum tight Inconel case. At the Company's factory, the coil parts were manufactured and process techniques qualified. In the JET vacuum vessel the conductors bars were brazed to form the coils, which were inserted in the casings and impregnated and cured with epoxy resin. Such operations were performed in radioactive ambient.

TOROIDAL COILS FOR TORE SUPRA TOKAMAK

CEA

In 1986 ASG (acting as Ansaldo Magnet Division) manufactured all the toroidal field coils (TFC) for the French Tokamak TORE SUPRA, currently in operation at CEA-Cadarache. The Tokamak consists of 18 superconducting TFC wound with Nb-Ti conductor double pancakes, copper matrix and Cu-Ni barriers.



TOROIDAL COILS FOR ASDEX-UG TOKAMAK

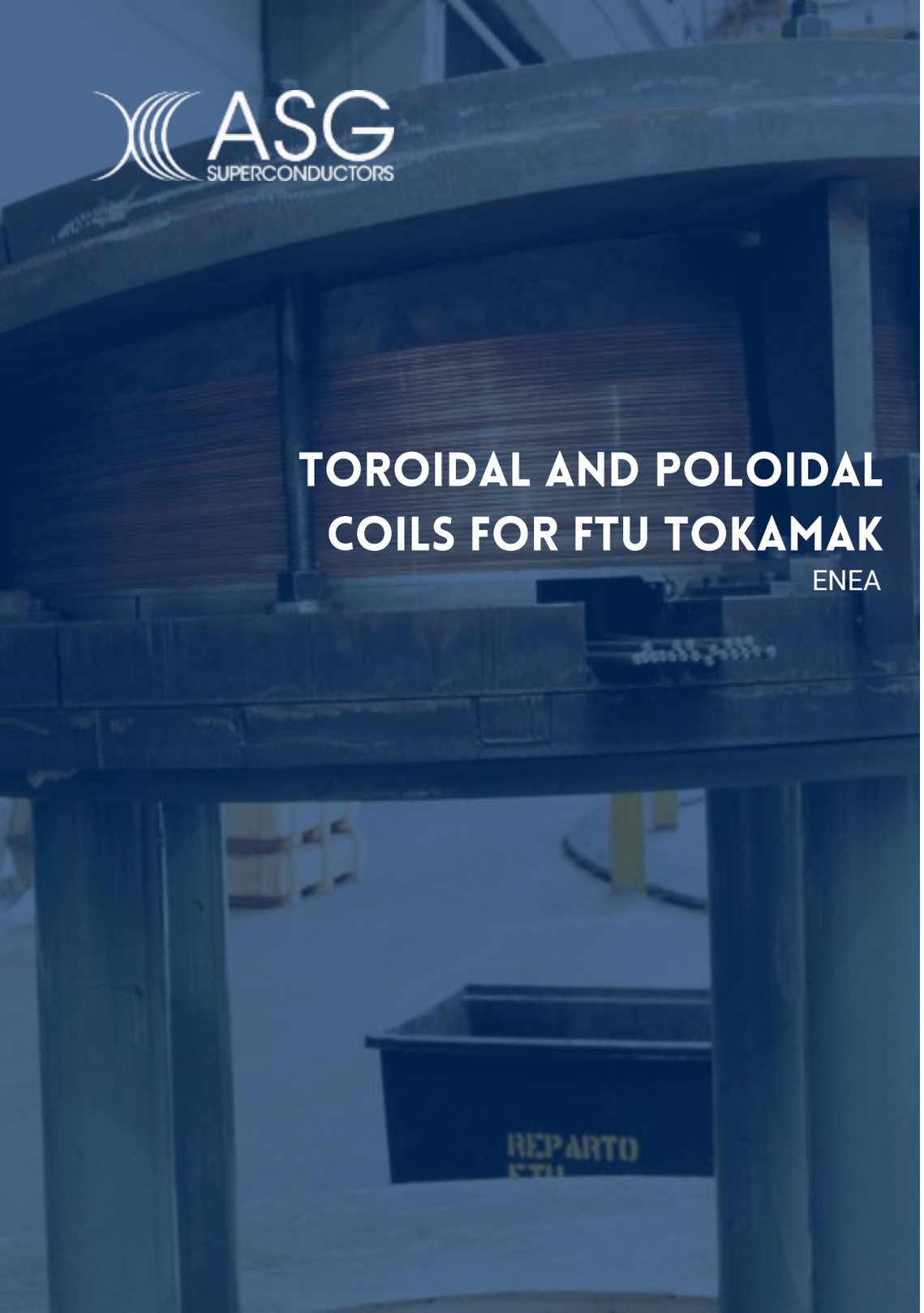
IPP

The magnet, completed in 1988, consists of 16 toroidal field coils for plasma confinement. The conductor is in work-hardened OFHC copper with holes for water cooling and has a large cross section area (180 x 32 mm). The dimensions of each coil are 2785 x 2665 mm and the weight 9500 Kg. Glass fibre tape or sheet is used for insulation and radiation proof epoxy resin ensures vacuum impregnation.

TOROIDAL AND POLOIDAL COILS FOR COMPASS TOKAMAK

UKAEA

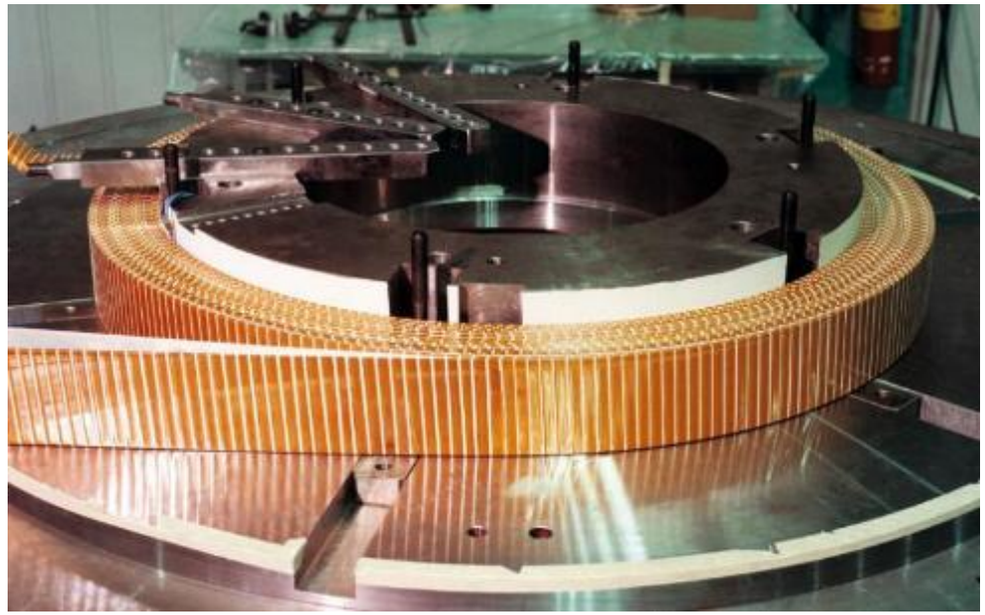
n 1987 the Company manufactured the poloidal and toroidal coils for the COMPASS Tokamak originally installed by UKAEA laboratories at Culham (UK) and mothballed in 2002 due to start of the MAST tokamak operation.



TOROIDAL AND POLOIDAL COILS FOR FTU TOKAMAK

ENEA

FTU is a tokamak for nuclear fusion research, installed at the ENEA Centre of Frascati in 1987. The Company manufactured all toroidal (26) and poloidal coils (14), the coupling transformer, the electrical connections and took care of the final integration of the load assembly. Each toroidal coil is obtained from 42 wedge shaped copper disks, cooled down to -195° C.



TOWARDS A SUPERCONDUCTING WORLD

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