Toroidal Coils for ASDEX UG

MAGNETS FOR FUSION

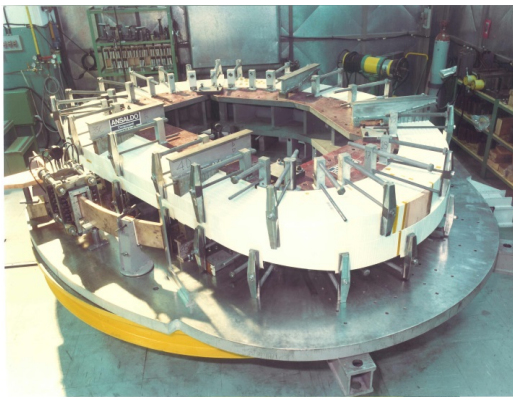
MAGNETS FOR HIGH ENERGY PHYSICS

MAGNETS FOR MEDICAL APPLICATIONS

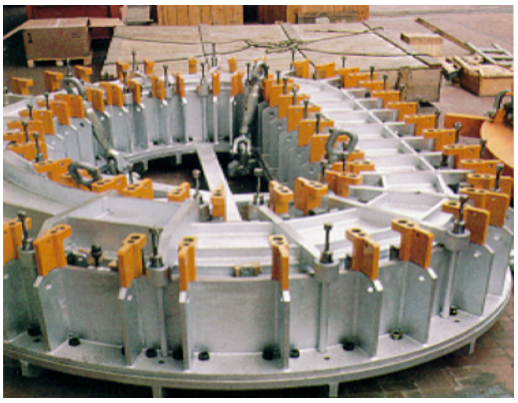
SYSTEMS FOR ENERGY

SERVICES & REPAIRS

The ASDEX-UG project was a continuation of ASDEX, with the aim of investigating problems regarding hot plasma, such as cleaning, heat exchange with the walls and checking on impurities. 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. Owing to the difficulties in cooling conductors with such large dimensions and variable cross section area, the Company approached the problem by bending the conductor with the aid of an NC calender, after a preliminary machining. Assembly was achieved on a fixed table using special tools for elastic deformation of the half turn, while ensuring, at the same time, a perfect alignment of the two sections to be brazed together by induction welding.
This latter method gave better results than the winding line. After the successful completion of the prototypes, the coils were completed and are still working.



Turns assembly on winding table



Coil inside impregnation mould

Toroidal coil ready for shipment

Type of winding	water-cooled double pancakes, 12 turns each, glass epoxy insulated
Maximum field in the center	4 T (peak)
Stored energy at Bo = 4 T	440 MJ
Nominal current at Bo = 4 T	85,900 A
Conductor	Oxygen-free copper, 180x32 mm^2 with three holes
Type of cooling	13 bar forced flow
Coil weight	9,500 Kg