18 powerful superconducting magnets will confine the ITER plasma reaching 150 million °C. Powered with 60 kA they will generate a strong magnetic field of 11.8 Tesla (about 250 000 times stronger the magnetic fields of the Earth).

Europe will manufacture 10 of the TF coils and Japan 8 plus one spare. They will be the biggest Niobium-Tin (Nb₃Sn) magnets ever produced. More than 600 people from 26 companies have collaborated to produce the European TF coils.

Manufacturing steps

1. **Preparing a “Double Pancake”**
   - 750 m of conductor are bent into a double-spiral trajectory to fit into the grooves of a radial plate. To make the conductor superconductive it first needs to be heat treated at 650 °C in inert atmosphere.
   - The conductor is then inserted into the radial plate, a stainless steel structure with grooves on both sides in which the conductor nestsles. Its trajectory must match exactly that of the radial plate.

2. **Double Pancake**
   - The conductor is wrapped and electrically insulated using several layers of glass & Kapton tape. Cover plates are fitted and laser welded. At this stage it becomes a Double Pancake (DP). The DP is wrapped and electrically insulated with glass & Kapton tape before impregnation with epoxy resin.
   - A vacuum-pressure process is used to eliminate gaps or voids. Once cured the resin gives mechanical strength to the insulation and consolidates its electrical properties.

3. **Winding Pack**
   - Seven Double Pancakes are stacked and electrically jointed. They are wrapped, and electrically insulated with glass & Kapton tape to form a Winding Pack (WP) - the core of the magnet. The WP is heat-dried in vacuum at 110 °C to eliminate any humidity trapped and finally, resin is injected to fill in any gap in the electrical insulation.
   - After that, tests are done to reassure engineers that the component is in compliance.

4. **Final Toroidal Field coil**
   - Finally, the WP is inserted into a massive stainless steel case, weighing almost 200 tonnes, strong enough to resist the huge forces generated during operation.

Each coil is approximately:
- 14 m high
- 9 m wide
- 300 t with its case - the weight of a Boeing 747