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Metrology in process control for the European Toroidal Field Coil project

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To guarantee the required performances stringent dimensional requirements have been defined for the ITER TF coils.
The assembly of the European magnets from its components, the Winding Pack (WP) and the stainless steel Coil Cases (CC), is currently under responsibility of SIMIC SpA in the framework of a Fusion For Energy contract.
The process has been divided in the following stages: reception of the parts, insertion of the WP into the CC, closure welding, gap filling and final machining.
At each of the production stages, metrological surveys are carried out in order to check the compliance with the defined requirements: fiducials positions, gap evaluation, virtual fit, welding distortion.
In particular, one of the key elements of the magnets is the position of the Current Center Line (CCL), the coil theoretical representation of the magnetic field.
The CCL has to be kept under control during the production and linked to the external TF coil case interfaces.
A rigid metrology process has been put in place, assuring reliable results in terms of repeatability and accuracy of the measurement. Laser tracking, sided when possible by photogrammetry technologies, have been chosen for the scope.
This article aims at introducing the main metrology controls and analyses in the manufacturing process, giving an overview of the technology adopted together with the procedures deployed to cope with requirements.

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