





















Fig. 12. Installation of the conductor insulation during CS winding

The stacking is performed in the assembly hall and requires the use of a special support able to withstand the weight of the CS plus temporary structures. The support must be very rigid as the key blocks must remain in a plane within 1 mm. The deformation should be such that the stacking of the modules remains perpendicular to the reference plan determined by the keyblocks. Slots are provided in the support to allow vertical movement of the modules with their busbar extensions. A template is first installed on the stacking support to simulate the 9 supports located at the bottom of the TF coils. Then the lower keyblocks are installed and bolted to the stacking support. The G10 buffer plates are installed after having determined the correct thicknesses of the lower and upper ones taking into account the real height of each module. Then they are machined in order to have the CS equatorial plane located with the correct offset to the machine equatorial plan at room temperature. The tolerances for the CS modules are given in Table 3 (see Fig 10 for notation).

TABLE 3: TARGET TOLERANCES FOR THE CS COILS MM

Each CS module	$\gamma_x$	$\gamma_y$	$\gamma_z$
Manufacturing	+/-2	+/-2	+/- 1
	$\delta_x$	$\delta_y$	$\delta_z$
Stack assembly *	+/- 3	+/- 3	+/- 0.5 (CS3L) linearly to +/-2 (CS3U)
Installation **	+/-2	+/-2	+/-0

\* Change in  $\delta_x$  and  $\delta_y$  between adjacent modules < 2 mm

\*\* extra  $\delta_x$ ,  $\delta_y$  identical for all modules at installation

The precompression system is then installed at the top of the CS assembly. A set of supernut bolts is used to apply the precompression by pulling simultaneously on all the tie plates. This is achieved by tightening progressively the bolts so that the tensile load is equal in all tie-plates. When enough gap is provided, shims are inserted between tie-plates and keyblocks. After insertion of the shims and tightening of the horizontal screws, the bolts are unscrewed to release the load on the threads.

## V. CONCLUSIONS

The main requirements, design and manufacturing routes for the ITER coil system have been described. Construction of the components is underway and the many technical challenges are being successfully solved.

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