

## Experimental methods friction tests

### *Equipment:*

New (nFT) and original friction tester (oFT) at University of Twente. See the schematic illustrations and pictures in the paper mentioned in README file.

### *Ply-ply friction test procedure oFT:*

- Check if pressure plates are parallel (adjustable through the springs with bolts at the back).
- Intrinsic stiffness:
  - o Bring the pressure blocks together up to spacing of around the specimen thickness by applying pressure: normal force measured is the correction value to be used as a correction factor to determine the actual pressure applied on a specimen during a real test.
- Sample preparation:
  - o Two metal foils (120 mm x 55 mm), cleaned with isopropanol
  - o UD pre-preg tape material (50 mm width), overlap region: 65 mm (see 'Notes on friction tests\_oFT' for detailed description).
  - o Metal foil at both sides of specimen to shield the pressure plates.
- Check displacement sensor (straightness (laser light) and proper working in range of interest)
- Activate heating elements and heat the setup to the desired temperature.
- Mounting specimen: middle ply clamped in upper clamp (removed from tensile tester for convenience). Alignment check of the specimen w.r.t. the upper clamp using a laser light. Upper clamp reassembled in universal testing machine and crosshead moved downwards to mount the outer plies (with the metal foils) in the bottom clamp, first tightened by hand. Logging started and paperclips were removed from specimen. Application of normal pressure, followed by firmly tightening of the bottom clamp as well.
- A certain waiting time was used before starting the test (5 min).
- After testing: normal pressure removed and bottom fixture untightened
  - o Data logging continued: force recording while specimens hangs at upper clamp used for correction of pulling force (zero the force).

### *Ply-ply friction test procedure nFT:*

- Sample preparation:
  - o Two metal foils (165 mm x 55 mm), cleaned with isopropanol
  - o UD pre-preg tape material (50 mm width), overlap region: 115 mm (see 'Notes on friction tests\_nFT' for detailed description).
  - o Metal foil at both sides of specimen to shield the pressure platens.
- Turn on the heating elements to heat up the pressure platens to the desired temperature.
- Zero the normal forces (to account for the weight of the assembly) via the routine in LabVIEW and zero the pull force load cell.
- Mounting specimen: clamp outer plies with metal foils on line clamp (upper plate) and align using laser lines. Remove paper clips. Close upper plate, such that pressure platens are facing. Apply normal pressure via LabVIEW program and move pull clamp towards the central ply that sticks out the pressure platens on that side. Tighten central ply in pull clamp.
- A certain waiting time was used before starting the test (5 min). Logging started around 30s before sliding action started.
- Loose pull clamp and move further backwards, open upper platen and remove specimen.