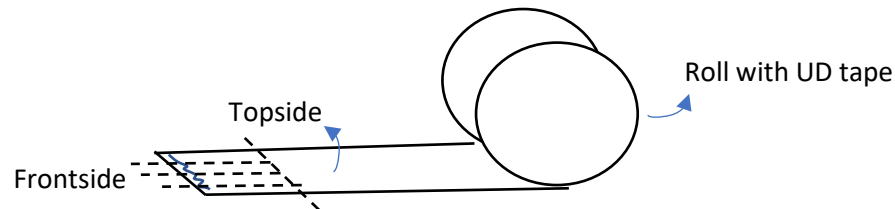


Notes on friction tests

Date: 24-aug-2020

Tape material: TC1200 UD C/PEEK, Ten Cate, produced: 17-apr-2020. Material cut: 50x250 mm² middle ply, 50x120 mm² outer plies (see schematic illustration in aforementioned paper). Metal foil (protection heating blocks): 55x120 mm² (as advised in Friction Tester protocol). Cutting convention:



Date: 27-aug-2020

Specimen lay-up: frontside at the upper (central ply) or bottom (side plies) clamps. First outer plies with topside faced on the table. Then central (or middle) ply with topside faced upwards and afterwards a second outer ply with topside facing upwards. Total contact length of 65 mm (overlap between sides and central plies). Plies are held together using paperclips, which are removed after mounting the specimen (before normal pressure is applied using the pressure platens).

Normal force correction value: -24.6 N (by carefully checking the spacing between the plates corresponding to specimen thickness, labeled as 'intrinsic stiffness').

⇒ Sum loadcell at 62.1 N (37.5+24.6 N) during test (for 15 kPa normal pressure on specimen)

Parallelism of pressure plates was checked.

Starting values: P: 15 kPa, U: 25 mm/min, T: 385 deg C.

Sp	Comments
2-1	Looks good, waiting time: 5 min
2-2	Specimen not completely straight
2-3	Fibers look a bit distorted; small amount of squeeze?
2-4	Proper alignment, overshoot in T (389) at start of test, seems okay
2-5	Overshoot in both p and T at start test, Note: during fixation of bottom clamp: metal foil bends out-of-plane, clamps fixed during waiting time period, again small wave during recovery, seems okay
-	BREAK (heaters shutdown)
2-6	5 mm/min, small overshoot in pressure (-66 N), bottom clamp fixed during waiting time (normally: bottom clamp directly after normal pressure application), different response?
2-7	2 mm/min, almost no recovery, waves in signal
2-8	1 mm/min, bottom clamp fixed right before test, again waves in signal, normal force adjusted to the setpoint halfway the test
2-9	75 mm/min, specimen hit the pressure plate during mounting, but alignment seems okay
2-10	125 mm/min
2-11	200 mm/min, bottom clamp fixed during waiting time
2-12	Stop&go experiments (not included)

Date: 2-9-2020

Metal foil cleaned with isopropanol. Normal correction found to be equal to previous series, -24.6 N, so 62.1 N in total during test (15kPa).

Sp	Comments
3-1	Waiting time: 5 min, 10 mm/min, seems good

3-2	10 mm/min, alignment not perfect, overshoot in p
3-3	15 mm/min, paperclips not removed, so data not usable! Excluded from dataset.
3-4	15 mm/min
3-5	7.5 mm/min, mounted a bit too far into the machine (specimen slightly curved during heating)
3-6	6 mm/min
3-7	5 mm/min, small increase in force during measurement, metal foil on specimen is rotated after testing (unclear when this happened) -> bad alignment?
3-8	5 mm/min
3-9	4 mm/min, logging started too late (during waiting time), metal foil slightly rotated on specimen, small increase force during test
3-10	3 mm/min, no peak, small increase during test
3-11	2 mm/min, no peak, small increase during test
3-12	1 mm/min, no peak, small increase during test, jump in cross head movement data in begin measurement (artificial or tightening of clamps (at 40 s)) -> removed for data analysis (disturbed selection of start and end of measurement)

Date: 20-5-2021

Logging via laptop (excluding temperature measurement; T checked regularly) to measure friction response with higher sampling rate. Same lay-up as earlier used. Location of prepreg tape from roll in width also tracked, with location 1 the left edge of the roll (when looking from the back to frontside) and location 6 the right edge of the roll. Get additional data points for series 2 & 3 data (higher V range).

15-7	125 mm/min, 385 deg C, 5 min waiting time, T ok
15-8	125 mm/min, T ok
15-9	125 mm/min, T ok

Date: 28-5-2021

15-10	20 mm/min, T ok
15-11	30 mm/min, not properly aligned (in friction tester itself)
15-12	35 mm/min
15-13	40 mm/min, not perfect aligned specimen, T ok
15-14	50 mm/min
15-15	60 mm/min, T ok
15-16	35 mm/min, material measured before (tests at room T; 15-1:6), mat loc 6
15-17	40 mm/min, earlier measured material, mat loc 5
15-18	60 mm/min, earlier measured material, mat loc 4, T good

Date: 25-6-2021

Toray C/LMPAEK ply-ply measurements, 365 degC, 15 kPa (-62.1 N in LabVIEW), range of sliding velocities, logging via laptop, lay-up as earlier (topside down, front at bottom clamp – topside up, front at upper clamp – topside up, front at bottom clamp) with 65 mm contact length and 5 min waiting time.

17-1	1 mm/min, T good, loc 6
17-2	1 mm/min, T good, loc 5
17-3	1 mm/min, specimen hit plates during lowering; specimen seems not be shifted; looks good after removal. Pull force increase after pressure removal, loc 4
17-4	5 mm/min, T good, loc 3

17-5	5 mm/min, slightly touched sides during lowering, too long slip distance, loc 2
17-6	5 mm/min, alignment not perfect in friction tester, started measurement first on position (instead of meas mode) -> seems not to have affected further measurement, loc 1
17-7	25 mm/min, T good, loc 6
17-8	25 mm/min, T good, loc 5
17-9	25 mm/min, loc 4
17-10	125 mm/min, no perfect alignment specimen, loc 3
17-11	125 mm/min, no perfect alignment specimen, loc 2
17-12	125 mm/min, problem with logging: error (already existing file) -> longer waiting time, slightly hit bottom clamp (lowered to far), loc 1
17-13	2 mm/min, T good, loc 6
17-14	3 mm/min, T good, loc 5
17-15	4 mm/min, loc 4
17-16	10 mm/min, T good, loc 3
17-17	15 mm/min, loc 2
17-18	40 mm/min, T good, loc 1
17-19	75 mm/min, T good, loc 6
17-20	200 mm/min, T good, loc 5
17-21	30 mm/min, loc 4
17-22	50 mm/min, not perfect in FT: tuned upper clamp to have better alignment (specimen already lowered in tester), loc 3
17-23	25 mm/min, 55 mm contact length (overlap) , no effect on friction response, but data not used for further analysis
17-24	25 mm/min, 55 mm contact length (overlap) , no effect on friction response, but data not used for further analysis

Date: 17-8-2021

Toray C/LM-PAEK ply-ply, additional intermediate velocity experiments (between 20 and 75 mm/min) to supplement earlier measured data. Laptop logging, T: 365 degC, p: 15 kPa, 5 min waiting time (-62.1 N in LabVIEW; intrinsic stiffness of -24.6 N checked after several measurements and found to be consistent and OK).

17-25	20 mm/min, loc 6, T good
17-26	25 mm/min, loc 5, T good
17-27	30 mm/min, loc 4, T good, alignment not good! (not checked in tester)
17-28	30 mm/min, loc 3, T good, again poor alignment (though checked in tester)
17-29	35 mm/min, loc 2, T good, good alignment
17-30	40 mm/min, loc 1, good alignment
17-31	Break, loc 6, again 40 mm/min, no displacement reading -> hence logging restarted during waiting time (17-31_0 and 17-31), lower response -> perhaps due to specimen location in width of prepreg roll (loc 6: at right side)?
17-32	40 mm/min, loc 5, T good, same response as previous one
17-33	50 mm/min, loc 4
17-34	60 mm/min, loc 3, T good
17-35	75 mm/min, loc 2
17-36	60 mm/min, loc 6, T good