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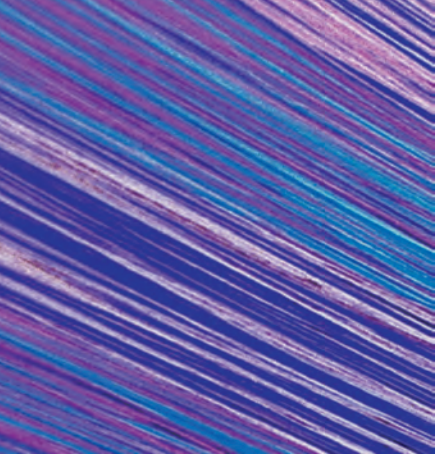
DYNAFIL ME+

Dynamic Thermal Analyzers



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DYNAFIL ME+

Filament yarns are key players in many textile and technical applications. Textechno's universal filament yarn tester **DYNAFIL ME+** has been developed to measure their most important properties in an easy and precise manner. The basic measurements with **DYNAFIL ME+** relate to the inner regularity and consistency of the yarns and their behaviour under elevated temperature. In contrast to a capacitive evenness tester, the **DYNAFIL ME+** determines a CV-value AND an absolute mean value. While the CV-value is a good indicator for process stability, the mean value gives further information on package-to-package homogeneity. The mean value relates to inner properties of the yarn such as – on POY - the molecular orientation in the amorphous regions and crystallinity.

The following tables give an overview over the test methods for different yarn types and their meaning:

Yarn Type: POY		
Test method	***Process***	***Application***
Draw-force testing	Process stability, quenching behaviour	Inner evenness, regular dye-up-take of later DTY
Friction force testing (Nylon mainly)	Detect packages with low OPU (spin finish)	Avoid problems in texturizing
Broken-filaments testing at critical draw-ratio	Predict appearance of broken filaments on short yarn length tested	Avoid problems in texturizing

Yarn Type: DTY		
Test method	***Process***	***Application***
Crimp (force) testing (e.g.) in combination with interlace testing)	Detect stability of texturizing such as twist uptake e.g.	Avoid unregular appearance of fabrics
Shrinkage (force) testing	Detect problems in heaters	Avoid bad dye uptake

Yarn Type: FDY		
Test method	***Process***	***Application***
Shrinkage (force) testing	Assure constant heat uptake in process	Inner evenness, regular dye-up-take
Extension force testing	Assure constant heat uptake in process	Inner evenness, regular dye-up-take

Yarn Type: BCF		
Test method	***Process***	***Application***
Crimp and shrinkage testing in combination with interlace testing	Assure correct heat transfer of godets and proper texturizing	Avoid streakiness in carpets. Assure correct pole height
Friction force testing (Nylon mainly)	Detect packages with low OPU (spin finish)	Avoid problems in tufting due to high friction

Yarn Type: IDY		
Test method	***Process***	***Application***
Shrinkage (force) testing	Assure process stability in relaxation zone	Avoid puckering of coated fabrics

Yarn Type: ATY		
Test method	***Process***	***Application***
Extension-force testing with low extension	Regularity and amount of air texturizing	Homogeneous appearance of fabrics
Shrinkage (force) testing	Assure constant heat uptake in process	Regular behaviour in down-stream processes with elevated temperature

Yarn Type: Textured glass yarns		
Test method	***Process***	***Application***
Extension-force testing with low extension	Regularity and amount of texturizing	Regular ap-pearance of wallpaper etc.

All mentioned test methods on one type of yarn can be combined to one test in which the different methods are executed one after the other in a fully automatic way. A high-temperature heater ranging up to 500°C and godet speeds up to 1000 m/min allow very fast and efficient testing. Figures 1 and 2 show examples of high-speed draw-force testing on PET-POY.

Figure 2 shows how limits can be set for the mean value of a measured parameter. Limits for the standard deviation can be set, too. The combination of both allows an automatic grading and sorting of packages.

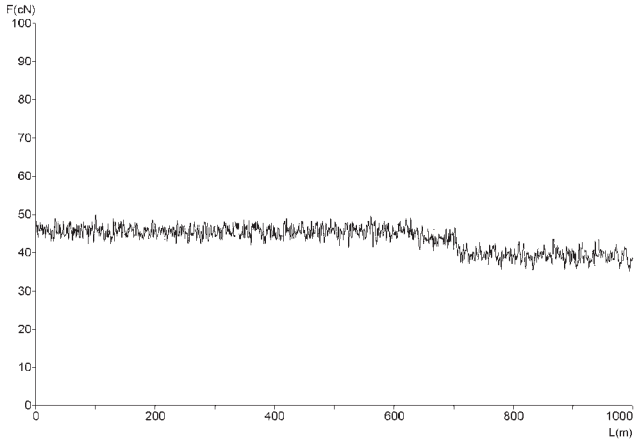

Figure 1: Draw-force versus yarn test length diagram of Polyester POY 290 dtex; 400 °C, 60 %, 400m/min.

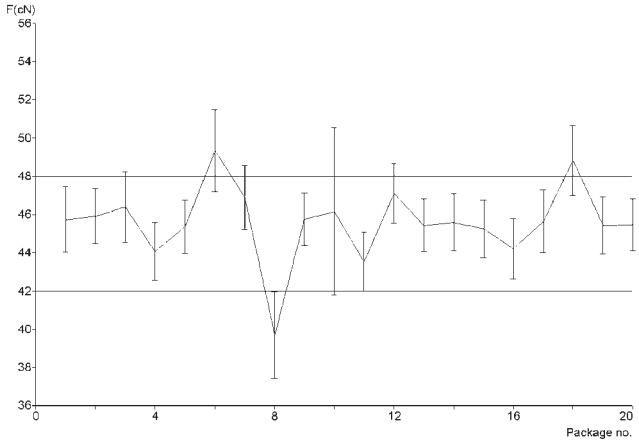

Figure 2: Results of draw-force tests - mean values, standard deviations and acceptance limits - for 20 packages Polyester POY 290 dtex.

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Picture contains various optional items

With the additional equipment COMCOUNT it is possible to carry out an **automatic linear-density (count) test** either in parallel or in serial. An optional item to the COMCOUNT is a collector for weighed samples. This option allows to automatically prepare samples for spin finish analysis etc.
For flat yarns, **the capacitive evenness tester COVAFIL+** is available as a further option. COVAFIL+ is placed such that the yarn runs through it for evenness testing before entering the DYNAFIL ME+ for further tests. Tests can be run in serial - or simultaneously if no mutual influence of the individual test methods is observed. The self-threading twister of COVAFIL+ facilitates threading a lot. For further details please refer to the leaflet of COVAFIL+.
With the optional Friction device, the coefficient of friction of yarn versus ceramics or metal can be measured including its regularity. This test can be used to check the influence of spin finishes on the frictional properties. In case of a considerable change of the coefficient of friction by the spin finish, the test can be used to determine if spin finish has been applied or not.
Interlaces are important for the processing properties of yarns but in many cases also for the appearance of a fabric or carpet. For this reason, an **optical interlace (entanglement)** sensor can be integrated into the DYNAFIL ME+ as a further option for simultaneous or serial counting of interlaces.

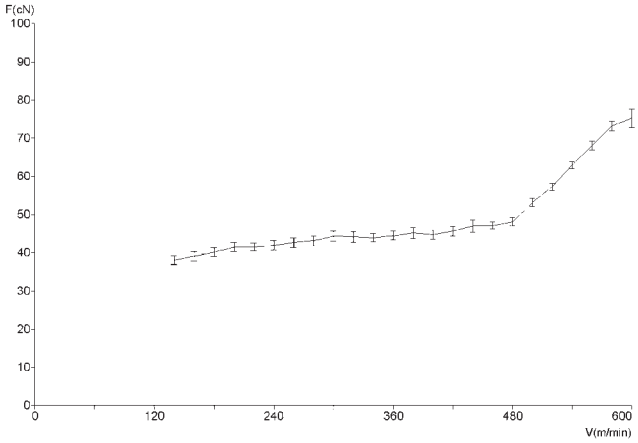


Figure 3: Draw-force versus test speed diagram of Polyester POY 290 dtex, automatically recorded.
Heater temperature 400 °C, extension 60 %.

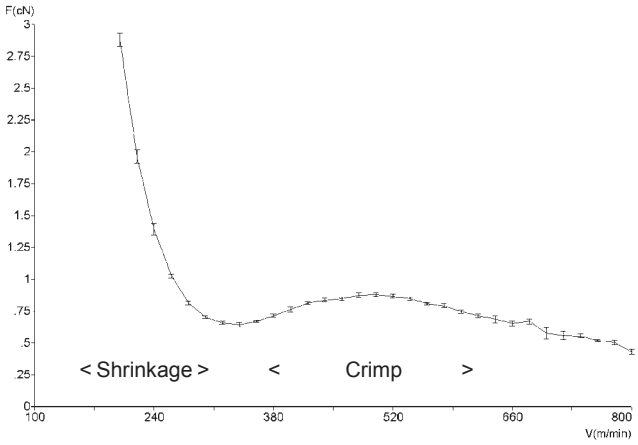
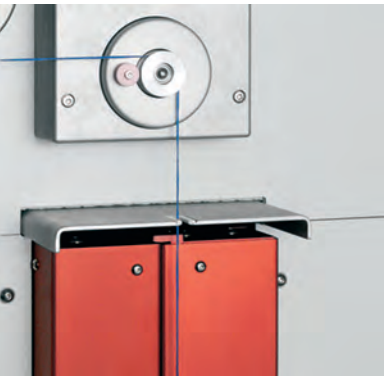
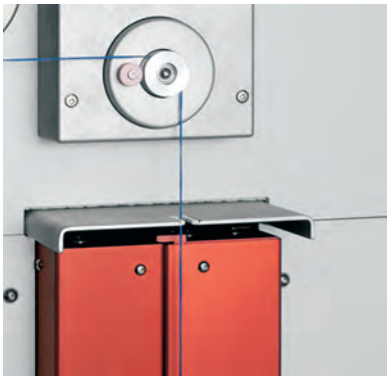
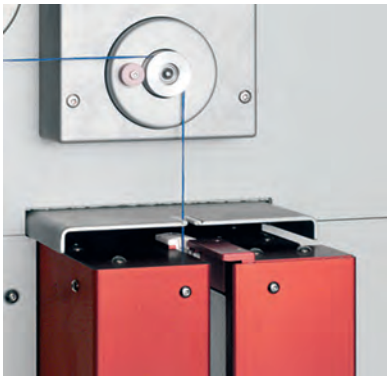
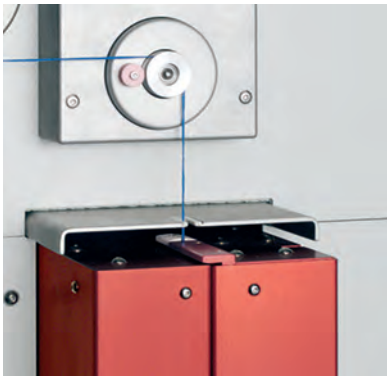


Figure 4: Shrinkage- and crimp-force versus test speed diagram of textured Polyester yarn 167 dtex. Heater temperature 400 °C, overfeed 5 %.

The optical sensor is recommended for textured yarns such as DTY, ATY, and BCF.
For further automation of testing an automatic package changer is recommended. The Textechno package changers model ASW SM and ASW+ for feeding 2 or 20 yarn ends respectively operate on the principle of splicing the running yarn and show an outstanding reliability of operation.
The combination of DYNAFIL ME+ with COMCOUNT, COVAFIL+ (flat yarn, only) and an automatic package changer reduces the amount of operator‘s time and influence on the result to an absolute minimum.

While the regular tests with DYNAFIL ME+ are those of force or contraction/extension as a function of yarn length, further tests methods are available:

– **Test with variable testing speed:**
  Since the temperature which a yarn reaches when running through a heater depends on the testing speed, a test with variable testing speed can reveal the contractive behaviour of the yarn from room temperature to heater temperature. For PET-POY, e.g., the measured so-called speed curve (Figure 3) starts with a flat area – all filaments reach the glass transition temperature. If this is no longer the case at higher testing speed, the speed curve starts rising. This is thus an indication that the glass transition temperature is no longer reach, at least not for all filaments. It is recommended to use testing speeds below this point.

For PET-DTY as another example, the speed curve (Figure 4) shows the clear separation of speed (and yarn temperature) where shrinkage occurs and where the crimp development is at the optimum.

– **Test with variable contraction or extension**
  A test with variable contraction shows the dependence of shrinkage- or crimp force from the allowed contraction. The surface below this curve is related to the contractive energy of the yarn. As a special version of the test with variable contraction the so-called **Reference test** tells the DYNAFIL ME+ how to adjust the electronic gear between the two godets to keep the tension constant. Because of this test it is not necessary to perform any adjustments on the machine which starting tests with constant force.
  A test with variable extension can be considered as a dynamic tensile test. The resulting curves in general look similar to those of a static tensile test.
– While on most DTY yarns a separation of shrinkage- and crimp properties is possible by different testing speeds, this does not work so well for BCF-carpet yarns. One reason is that the temperature distribution on such coarse yarns is less even than in the finer DTY yarns. For this reason, Textechno has developed a version of **DYNAFIL ME+ with a third godet especially for BCF**. After applying a pretension which pulls the yarn crimp flat when entering the first godet, the yarn is allowed to contract at very low pretension in the heater, thus between godets 1 and 2. The third godet pulls the yarn flat again. The speed ratios of the three godets allow to calculate shrinkage and crimp as well as the total contraction at one single speed.
  It is strongly recommended to combine tests of shrinkage and crimp with interlace tests, since the interlaces have a direct impact on the measured crimp.

Technical data

Mains supply:
220 V, 50 (60) Hz, current requirement approx. 10 A (DYNAFIL ME+).
Compressed air supply:
5 bar, 150 l/min.
Lacquer finish:
RAL 9006/5002.
Dimensions, weight:
Height 1680, width 820, depth 720 mm, approx. 270 kg (DYNAFIL ME+);
Height 1680, width 840, depth 650 mm, approx. 180 kg (COVAFIL+, COMCOUNT)
Height 980, width 800, depth 550 mm, approx. 80 kg (ASW+)

The technical contents are subject to changes by Textechno.

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