

DYNAFIL HD

Draw force tester for coarse filament yarn and fibre tow

Fibre cable

The high variation in force and elongation measurements on fibre tows is a well-known phenomenon in the quality control of staple fibre productions. Histograms of breaking elongation obtained from large numbers of single fibre tests often show several clusters instead of a Gaussian distribution. In general these clusters are caused by differences between the individual spinning positions. Therefore, it makes sense to analyze the drawing properties of undrawn fibre tows from individual spinning positions. These measurements also help to find the optimum drawing conditions in later processing of the fibre tow. The DYNAFIL HD has been designed for draw-force tests on fibre tows up to 30.000 dtex, but has already been used for testing tows up to 70,000 dtex, too.

In case of an unstable polymer quality, e.g. in **PET-bottle recycling** the draw-ratio in the drawing part of the fibre production line has to be adapted quite often in order to allow the optimum drawing at a minimum number of broken filaments. A test with rising draw ratio in combination with the optional broken filament detector immediately shows the appropriate draw ration setting.

Filament yarn

Draw-force testing of LOY and POY filament yarn as well as shrinkage-force testing of industrial filament yarn on TEXTECHNO's dynamic thermal stress testers DYNAFIL M, C, and ME and the Lenzing Instruments DTI series are widely used in production control of filament yarn. However, the mentioned testers are limited to a maximum count of about 2,000 dtex. As the DYNAFIL HD is suitable for sample counts of at least 30,000 dtex, even the coarsest filament yarns in production nowadays can be tested.

Measuring principle

The DYNAFIL HD is equipped with the following devices along the yarn path:

A compensating tensioner together with a hysteresis brake apply a controlled and stable pretension to the yarn or cable.

The (optional) finish applicator is used to apply an additional finish similar to production. This device is especially used for fibre tow.

The heated intake godet increases the temperature of the yarn to a point several degrees below the glass transition temperature (in case of polyester), while the contact heater adds the additional energy to transform the polymer from the glassy to the rubbery state. The drawing point is located on the heater.

The force measuring rollers are arranged in such a way that the yarn path is taken back towards the front panel.

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The (optional) broken filament sensor can detect broken individual filaments, e.g. as a function of draw ratio, while the speed of the draw-off godet in relation to the speed of the intake godet determines the draw ratio.

A suction nozzle is used to feed the yarn into a waste container but can also be taken out of its mounting and used as a threading aid.

The actual software allows to execute the following tests:

- ***Draw-force or shrinkage-force test at constant speed and draw ratio:***

This is the commonly used test in production control. Draw-force level is evaluated with respect to mean value and coefficient of variation (CV %), as well as minimum and maximum values. Hence variability can be determined both from spinning position to spinning position and within each position.

- ***Draw-force test with constant draw ratio but rising speed***

This test is performed to evaluate the maximum testing speed, and it indicates at which speed the yarn temperature on the contact heater drops below the glass transition temperature. In case of shrinkage-force testing (draw ratio = 0 %) this test will show at which speed the maximum shrinkage-force is achieved.

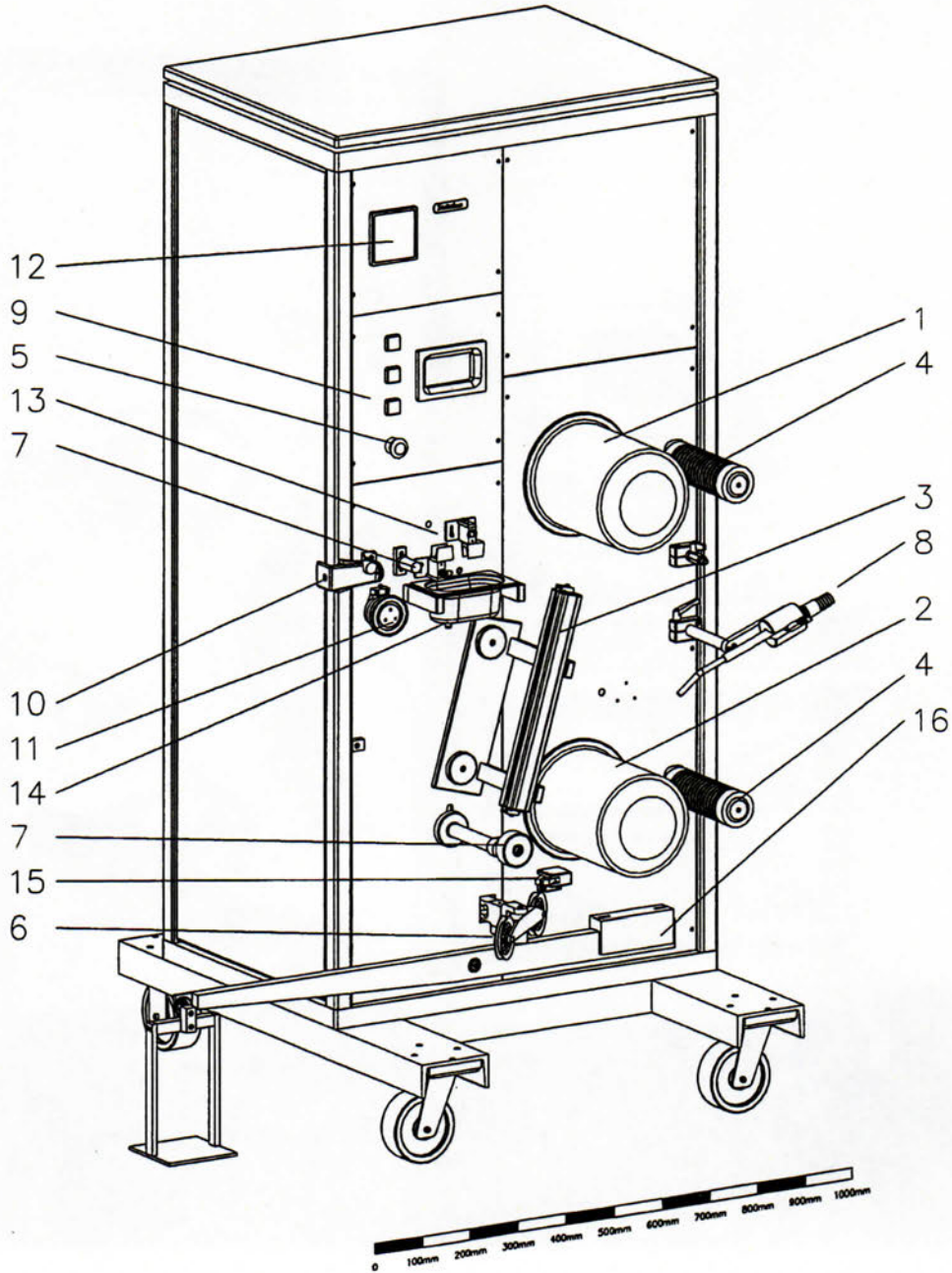
- ***Draw-force test with constant speed but rising draw ratio***

This test is interesting especially in combination with the optional broken filament sensor. It shows at which draw ratio the yarn or fibre cable can be drawn in a process without generating too many filament breaks.

All these tests make the DYNAFIL HD a useful tool for both research and production control in filament and staple fibre production.

Technical Data:

godet speed (intake and draw-off godet)	: 0.1 ... 100 m/min
surface temperature of intake godet	: ambient to 100°C (can be extended to 250° C)
temperature of contact heater	: ambient to 200° C (can be extended to 240° C)
force measuring range	: 0 ... 600 N
draw ratio	: 0,1 ... 6,0 (can be extended)



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|---|-------------------------------------|----|-------------------------------------------|
| 1 | Intake godet, heated | 9 | control unit |
| 2 | draw-off godet, cold | 10 | compensating tensioner |
| 3 | contact heater | 11 | hysteresis tensioner |
| 4 | thread laying roller | 12 | temperature controller |
| 5 | emergency switch | 13 | spin-finish applicator (optional) |
| 6 | force measuring roller | 14 | spin-finish waste basin (optional) |
| 7 | yarn guide roller | 15 | filament break sensor (optional) |
| 8 | suction and threading nozzle | 16 | calibration lever (optional) |



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