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Laboratory setup for quality testing of yarns, rovings and fibre tapes using microwave resonator technology

The microwave measuring setup for quality control of textile threads, yarns and pre-yarn tapes has the following properties (see also patent specification of TEWS-Elektronik EP 1 371 979 B1, resp. US 6,897,659 B2):

- ◆ Independent mass and moisture measurement, whereby the mass signal is independent of fluctuations in yarn moisture and the moisture signal is independent of fluctuations in yarn mass. This means there are no waiting times from climatisation of the yarn being tested, but close-to-production quality control.
- ◆ Calibrations for mass and moisture are essentially independent of material variations within a product type, i.e. very low calibration workload. There is no aging of calibration. Calibrations can be transferred from one unit to the next, i.e. calibration curves can be collected at a central point, and all devices for known products can be supplied pre-calibrated.
- ◆ Different sensors can be used for different yarn thicknesses, depending on the measuring range: 1 sensor for yarns 1-100 tex, 1 sensor for yarns 50-500 tex, 1 sensor for rovings 0.5 ktex - 12 ktex, 1 sensor for wool products up to 80 ktex. Every sensor has its own calibration.
- ◆ Several sensors can be connected to an evaluation unit via coaxial multiplexer. This saves both space and costs because for this configuration only one microwave evaluation unit is needed.
- ◆ Data output at the evaluation unit takes place via analog outputs or CAN bus.

The housing for the electronic evaluation unit in the new design is much smaller, with power supply provided by a 24V plug.



In all the different microwave resonators, the material being tested can be introduced at the side. The devices have clearly different mechanical dimensions depending on the measuring range.

In the lowest range, sensors are possible with less than 0.5 mm measuring gap width with local resolution of 5 mm in the yarn direction, while tape or thread diameters of 10 mm to 25 mm can be measured for the largest masses.

The following picture shows two of these sensors: in one case the measuring gap is 0.5 mm wide, in the other case 10 mm (up to 30 mm is possible).



The resonators of the same type are very similar in their characteristic data, so that the same resonator can be connected to different microwave evaluation units without having to make any changes to the hardware. Changeover from one resonator type to the other is also automatic.

The following diagram shows the possible set-up of a test station for yarns and tapes of many differing masses, with 3 resonators that can be connected to a microwave evaluation circuit by a coaxial switch. It is also possible to use just 2 resonators, for example if there is no roving measurement.

