

Non-contacting online layer-thickness measurement of foils

In foil production online process monitoring guarantees constant product quality. MICRO-EPSILON's KS5 combination sensor measures the layer thickness on foils in a non-contact and thus non-wearing process.

Measuring process

The measurement of coatings on foils (e.g. adhesive layer on self-adhesive foils) is based on the capacitive principle. A non-contact capacitive displacement sensor is positioned at a fixed distance from a metal surface (e.g. transport roller). The foil passes through the measuring gap and as a dielectric changes the capacity of the sensor. With constant foil thickness the output signal only depends on the layer thickness.

Compensation of measurement uncertainty

In addition to the capacitive displacement sensor an eddy-current displacement sensor is also integrated in the sensor housing and arranged in the same measuring axis. Measuring coil and measuring electrodes are of concentric design, which means they both measure against the same target surface. The eddy-current displacement sensor measures the distance from the transport roller and thus compensates mechanical changes of the system (e.g. thermal expansion, or vibration). The signals of both measuring principles are combined arithmetically. This combination sensor principle guarantees that the measured thickness value is not influenced by possible distance changes.

Cross-profiles by way of traversing

If a cross-profile is necessary during production, this requires a sturdy mechanical construction with a traversing facility. The sensor position is measured with a MICRO-EPSILON cable-pull sensor. The combination sensor guarantees that inaccuracies in the mechanical construction (e.g. bending, eccentricity) are compensated in the measurement. This allows accuracies of 1 μm in the layer thickness. Traversing unit, sensor, measuring channels, and computer-based signal processing are all provided by MICRO-EPSILON.

Reasons for choosing the system

- Non-contacting, non-wearing measuring process
- Exact, non-destructive test
- Compensation of thermal expansion, eccentricity uncertainty
- Cross profile by way of traversing
- Adjustable tolerance limits
- Scalable display

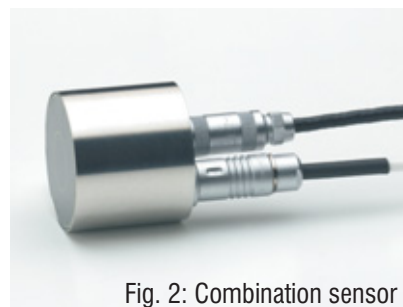
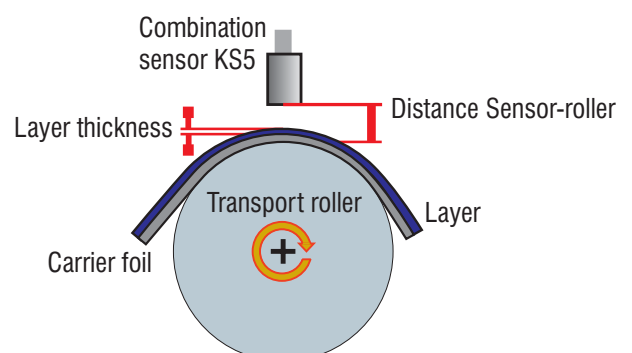


Fig. 2: Combination sensor



Application

Limit values and data archiving

The AZ801.02 function module with integrated zero setting and adjustable limit switch makes it possible to detect only changes of the layer thickness. Foil sections lying outside of pre-set tolerances can thus be marked. At the output of the measuring system a data acquisition box is connected for data collection and transfer to a PC.

System configuration

RS 584 - 8-channel table-top housing with power supply unit, display, oscillator/ demodulator for capaNCDT - PA 601 Pre-amplifier capaNCDT
DT119.10-KS5A - eddyNCDT with oscillator/ demodulator

CU 805 - Arithmetic combination of the two channels

AZ 801.02 - Zero-setting and limit switch

KS5 - Combination displacement sensor, measuring range 5 mm

DD1605 - Digital display unit

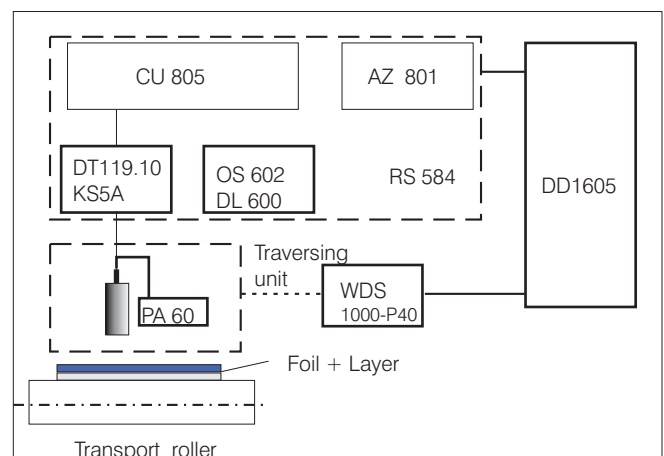
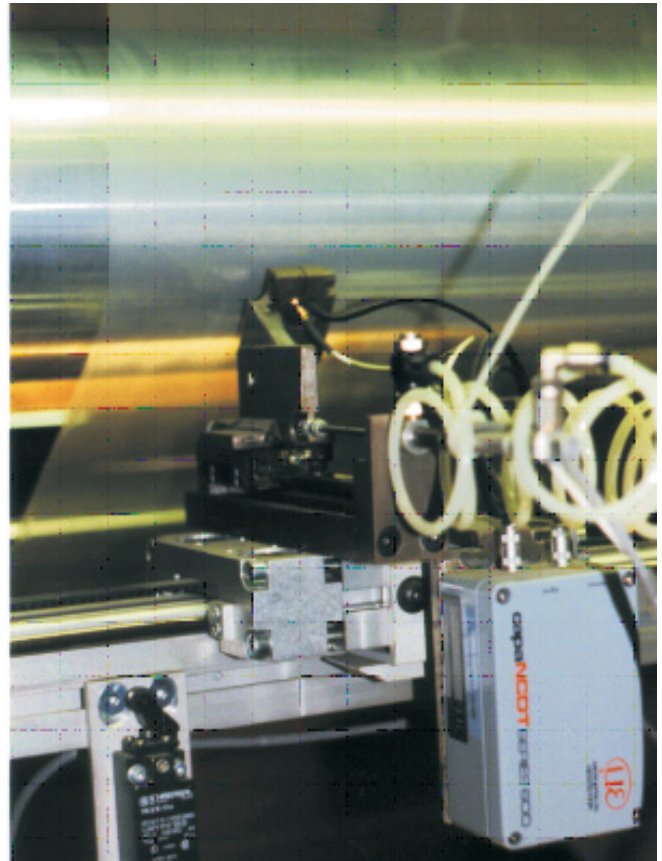
WDS-1000-P40 - Draw-wire displacement sensor, output 0 - 5 VDC

Technical details

- Measuring range: 5 mm
- Linearity: $\pm 0.02\%$
- Thermal stability: $\pm 0.02\%/K$

Ambient conditions

- Operating temperature: 50-95°C
- Medium: air
- Target: electrical conductor
- Interference fields: acc. to IEC 1000-4-1
- EMC: acc. to EN 50 081-2 and EN 50 082-2
- Constant dielectric figures of carrier foil and layer.



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