

Basis Weight Measurement

X-Ray Backscatter Sensor

A new, non radioactive sensor for single sided measurement of basis weight with wide tolerance limits for web distance variations.

Principle of operation

In order to determine the basis weight of a fabric we measure and evaluate part of the backscattered fraction of in initial x-ray beam that is directed onto the material. The sensor houses a tunable x-ray tube and an x-ray detector together with their supply units.

Compared to measurement systems that use radioactive isotopes for beam generation, radiation protection issues are much safer and daily handling is simplified considerably.



A completely sealed and well insulated housing protects sensitive components against rough ambient conditions.

Special features

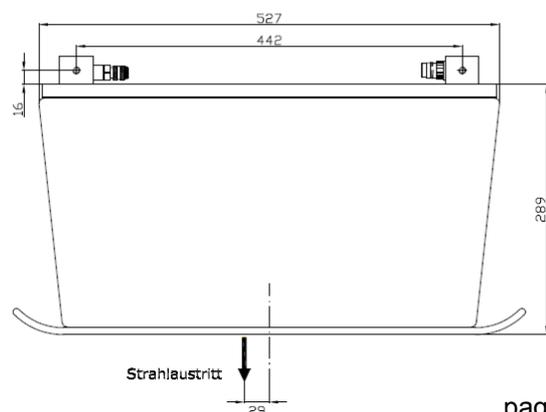
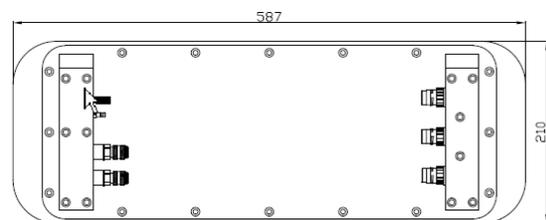
- Measurement takes place at one side of the web only. This opens the opportunity for new applications.
- Insensitive to web distance changes with in wide limits (special development, patented), no influence of web flutter or related effects. Possibility to measure thick materials also.
- X-ray spectrum that minimizes effects of material composition and maximizes the measurement range.
- No radioactivity.

- Measurements towards an impenetrable support like a conveyor belt, a calender or a cooling roller are feasible, e.g. in foil or sheet extrusion.
- Usable within an extreme wide measurement range due to the variable settings of the x-ray tube.
- Perfect measurement of structured material with holes, bars or slubs as e.g. nets or spacer fabrics, because of the great depth of penetration for x-rays.

Ideal employment

The functional properties of the sensor allow beneficial integration in a production line and support measurements of special materials and production processes.

- No strait measuring gap has to be passed; contact safe and low affinity to dirt; this makes it easy to feed in the web and is advantageous e.g. after a coating process.
- Measurements possible, where the opposite side of the material is not accessible, as e.g. in blown film or plastic tube extrusion.



Specifications

web displacement range	minimum distance to sensor	5 mm
	maximum distance to sensor	55 mm
measurement range	viable lower limit ¹⁾	ca. 100 g/m ²
	upper limit ²⁾	ca. 20000 g/m ²
accuracy ³⁾	fixed distance to sensor, 1s, 2 σ , 100 g/m ²	1%
	400 g/m ²	0.4%
	1600 g/m ²	0.2%
	6400 g/m ²	0.1%
	half the displacement range ⁴⁾	0.3 %
whole displacement range ⁴⁾	0.8 %	
x-ray tube	max. anode voltage	65 kV
	cooling (closed loop)	water
	leakage radiation	<10 μ Sv/h
	typ. width of beam spot on web (MD) ⁵⁾	15 mm
data update rate	typical	60 Hz
	maximum	200Hz
dimensions	height	290 mm
	length	520 mm
	width (dimension in MD)	210 mm
weight		25 kg

- 1) soft limit, motivated by the error increase at lower weights
- 2) material dependent
- 3) data taken at half of max. beam intensity
- 4) values contribute to error at fixed distance when displacement range is completely utilized (consider law of error propagation)
- 5) can be matched to particular requirements

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