

## 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.

## 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.

## Ideal employment

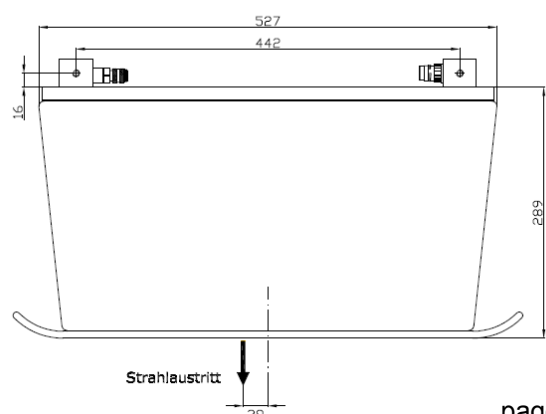
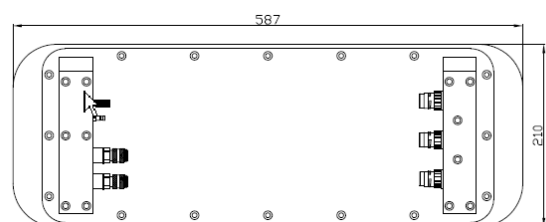
The functional properties of the sensor allow beneficial integration in a production line and support measurements of special materials and production processes.

- 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.



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

- 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.



## Specifications

web displacement range	minimum distance to sensor	5 mm
	maximum distance to sensor	55 mm
measurement range	viable lower limit <sup>1)</sup>	ca. 100 g/m <sup>2</sup>
	upper limit <sup>2)</sup>	ca. 20000 g/m <sup>2</sup>
accuracy <sup>3)</sup>	fixed distance to sensor, 1s, 2 $\sigma$ , 100 g/m <sup>2</sup>	1%
	400 g/m <sup>2</sup>	0.4%
	1600 g/m <sup>2</sup>	0.2%
	6400 g/m <sup>2</sup>	0.1%
	half the displacement range <sup>4)</sup>	0.3 %
whole displacement range <sup>4)</sup>	0.8 %	
x-ray tube	max. anode voltage	65 kV
	cooling (closed loop)	water
	leakage radiation	<10 $\mu$ Sv/h
	typ. width of beam spot on web (MD) <sup>5)</sup>	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

### ZAP Systemkomponenten GmbH + Co. KG

- Werkstatt 2 -

Europaring 4

94315 Straubing – Sand

phone: +49 9421 785 230

fax: +49 9421 785 235

CEO: Dr. Ludwig Zerle

e-mail: lzerle@z-ap.de

www.z-ap.de