MXIR Single Sided Coat Weight Measurement

Product Information Note

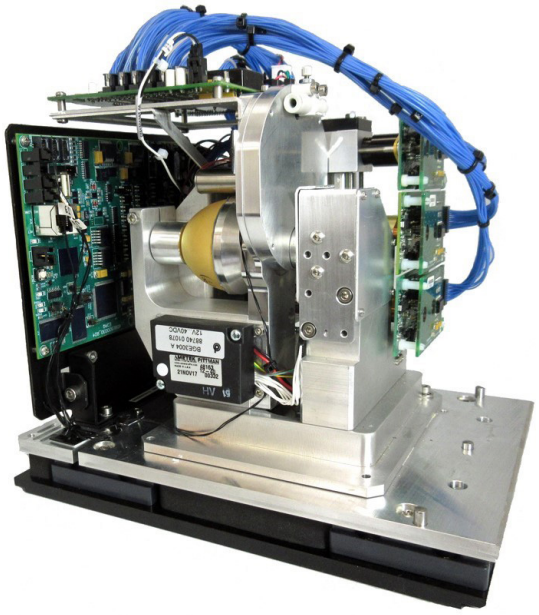
Latex, Clay, $CaCO_3$, and surface moisture measurement for Experion MX. Easy to use, maintain, and service, with low cost of ownership.

The Q4406 family of Single Sided Infrared (SSIR) Coat Weight Measurement sensors operate on the principle of selective absorption of infrared energy to provide scanning coat weight measurement on a moving paper or paperboard sheet. The sensors measure the weight of latex, clay, or calcium carbonate and combine this with the ratio of coating components to total dry coating solids to provide fast, accurate coat weight measurement.

The compact sensor design uses Honeywell's EDAQ based MXIR architecture, which allows the sensor to be mounted in-board on the Experion MX Q4000 O-Frame scanner.

In many applications, the SSIR Coat Weight Measurement resolves the coat weight profile accurately in a single scan. This capability is made possible by the sensor's low-noise infrared operating principle, "Same-Spot" measurement technology, sensitivity to specific coating components, and insensitivity to the basis weight of the sheet.

It is also possible in many applications where there are multiple coatings on one side of the sheet to use a single sensor to read each layer's coat weight independently, as well as the total coat weight. Honeywell expertise is available to assist in optimizing your measurement configuration to meet your most complex coating configurations.



The compact sensor design uses Honeywell's EDAQ based MXIR architecture, which allows the sensor to be mounted in-board on the Experion MX Q4000 O-Frame scanner.

Measurement Principle

The Q4406 MXIR Single Sided Coat Weight sensors use selective absorption of infrared energy to provide coat weight and optional surface moisture measurement of a moving sheet. The coat weight measurement is based on the principle

FEATURES & BENEFITS

- Measures the coat weight profile in a single scan
- All detectors measure the same spot on the sheet, providing insensitivity to sheet formation.
- Coat weight measurement is insensitive to base-sheet basis weight variations.
- Better accuracy than differential dry weight measurement for basis weights above 100 g/m2.
- The coating formulation (ratio of component weight to total dry coating solids) used to calculate coat weight is stored for each grade.
- Optional surface moisture measurement available.
- Less costly than other coat weight measurement techniques; does not require transmission basis weight, moisture or x-ray sensors.
- In-board mounting requires no additional machine direction space.
- Automatic standardization ensures long-term measurement accuracy.

that latex, clay, and calcium carbonate in the coating absorb certain infrared wavelengths in proportion to the amount of component present. The coat weight is obtained by dividing the weight of the measured component by the ratio of the component to the total dry coating solids. The component ratio is stored in Experion MX by grade, and can be easily modified to reflect changes in production.

Sensor Design

The basic sensor components are a long-life halogen light source, a light chopper, a detector assembly, and an Ethernet Data Acquisition (EDAQ) board which controls parameters such as lamp power, chopper frequency, sensor gain, and detector cooling. The EDAQ also provides Ethernet communication between the sensor and the Q4000 scanner's Measurement Support System (MSS) computer.

The source emits broadband infrared energy at an angle of 12º from normal to the plane of the sheet. This geometry minimizes sensitivity to sheet flutter and changes in the sheet's surface characteristics. In the detector assembly, beam splitters distribute the reflected light to multiple filter/detector pairs. This highly efficient arrangement enables the sensor to support up to six filter/detector channels for measurement of coat weight components and surface moisture.

Each detector consists of an infrared energy-sensitive cell (InGaAs or PbSe), mounted on a solid-state, two-stage, Peltier cooler. Temperature control down to -25 °C [-13 °F] provides extremely fast 1 kHz response and highly stable measurement performance. At least two filter / detector pairs are used for each component being measured. One corresponds to the narrow-band absorption spectrum for the coating component, while the other provides a reference. The reference is set to a section of the IR spectrum close to, but not in, the absorption band of the component to be measured. This scheme allows the reference and measurement to be made simultaneously.

All detectors receive their signal from the "same spot" on the sheet, which makes the measurement insensitive to variations in the base sheet. This technique also provides a fast sensor response that is critical for superior accuracy and high-resolution profile measurement at fast scanning speeds.

By comparison, sensor designs in which samples of measured spectral bandwidths are separated in time by a rotating infrared filter wheel, require slower scanning or extensive filtering. As the sheet moves through the sensor, the spectral bandwidths used for a measurement originate at different points on the sheet. Because of formation and other point-to-point differences in paper quality, this "separate-spot" approach can result in "noisy" measurements that require averaging multiple measurements over time to improve accuracy.

Measurement Applications

The Q4406 SSIR sensors can be used for two different measurement applications: profiling and absolute coat weight.

For profiling, a single after-coater sensor provides a direct measurement of the coat weight profile for cross direction profile control. The sensor's fast response and insensitivity to base-sheet MD variability is well suited to this application, and a base sheet coat weight measurement is not required.

For absolute measurement, both base sheet and after-coater measurements are required to eliminate the effects of coating components (latex, clay, or calcium carbonate) that may be present in the base sheet on the total coat weight measurement.

Comparison to Differential Dry Weight

When using differential dry-weight to measure coat weight for products of any basis weight, profile measurement errors may occur when the base sheet exhibits significant high-frequency machine direction variability, especially if the base-sheet and after-coat scanners are not synchronized to measure the same spot on the sheet. SSIR coat weight sensors measure the coating components directly, so are not affected by base-sheet MD variability. SSIR measurement provides a fast response, low noise and highly stable coat weight profile for superior profile control. This is especially true for sheets with basis weights greater than 100 g/m^2.

QCS Support Services

Experion MX comes with worldwide, premium, support through Honeywell's Lifecyle Solutions and Services organization.

Honeywell provides a complete portfolio of service offerings to extend the life of your QCS and provide a cost-effective path forward to the latest technology. Honeywell services include:

- Software installation services
- Project Execution
- Migration services
- Scope expansion services
- Performance baseline and tuning services
- Customized training

SPECIFICATIONS – COAT WEIGHT SENSORS			
MODEL	Q4406-70	Q4406-73	Q4406-76
MEASUREMENTS	Clay / Latex	Clay / $CaCO_3$	Latex / $CaCO_3$
CHANNELS	4	5	5
DETECTORS	PbSe / InGaAs	PbSe	PbSe / InGaAs
BASIS WEIGHT RANGE	Any		
COAT WEIGHT RANGE	0 - 20 g/m^2		
COAT WEIGHT MEASUREMENT REPEATABILITY, 100 MS	0.05 g/m^2 (2σ) on internal optical standard 0.1 g/m^2 (2σ) on static samples		
COAT WEIGHT MEASUREMENT STATIC ACCURACY[1]	0.25 - 0.5 g/m^2 (2σ)		
COAT WEIGHT MEASUREMENT DYNAMIC ACCURACY[2]	0.25 - 1.0 g/m^2 (2σ)		
NOMINAL SHEET DISTANCE	5 mm [0.2 in]		
FLUTTER SENSITIVITY[3]	For passline variation of +/- 5 mm [0.2 in]: 0.15 g/m^2 component weight error		
MEASUREMENT SPOT DIMENSION, CD	13 mm [0.5 inch] for 70% of response		
FREQUENCY RESPONSE, -3DB	1 KHz (response time is 1 ms)		
MAXIMUM AMBIENT TEMPERATURE	100ºC [212 ºF] for Q4000-80 scanner		

SPECIFICATIONS - COAT WEIGHT & MOISTURE SENSORS			
MODEL	Q4406-80	Q4406-83	Q4406-86
MEASUREMENTS	Clay / Latex Moisture	Clay / $CaCO_3$ Moisture	Latex / $CaCO_3$ Moisture
CHANNELS	6	6	6
DETECTORS	PbSe / InGaAs	PbSe / InGaAs	PbSe / InGaAs
BASIS WEIGHT RANGE	Any		
COAT WEIGHT RANGE	0 - 20 g/m^2		
COAT WEIGHT MEASUREMENT REPEATABILITY, 100 MS	0.05 g/m^2 (2σ) on internal optical standard 0.1 g/m^2 (2σ) on static samples		
COAT WEIGHT MEASUREMENT STATIC ACCURACY[1]	0.25 - 0.5 g/m^2 (2σ)		
COAT WEIGHT MEASUREMENT DYNAMIC ACCURACY[2]	0.25 - 1.0 g/m^2 (2σ)		
MOISTURE RANGE	0 - 20 %		
MOISTURE MEASUREMENT REPEATABILITY, 100 MS	0.005 % moisture (2σ) on internal optical standard 0.01 % moisture (2σ) on Aclar-bagged samples		
MOISTURE MEASUREMENT STATIC ACCURACY	0.25 % moisture (2σ) on Aclar-bagged calibration samples		
MOISTURE MEASUREMENT DYNAMIC CORRELATION	0.25 % moisture (2σ), or better with proper dynamic testing procedure		
FLUTTER SENSITIVITY[3]	For passline variation of +/- 5 mm [0.2 in]: 0.15 g/m^2 component weight error 0.05 % moisture error		
NOMINAL SHEET DISTANCE	5 mm [0.2 in]		
MEASUREMENT SPOT DIMENSION, CD	13 mm [0.5 inch] for 70% of response		
FREQUENCY RESPONSE, -3DB	1 KHz (response time is 1 ms)		
MAXIMUM AMBIENT TEMPERATURE	100ºC [212 ºF] for Q4000-80 scanner		

Notes

1. Dependent on application & accuracy of lab coat weight verification technique. This specification includes sensor, calibration, sampling, and lab errors that may occur with proper sampling and laboratory techniques.
2. Dependent on application & precision of verification technique. Measurement of the base sheet may be required to meet the specified dynamic accuracy.
3. For best accuracy, the sheet should be as stable as possible.

For more information

Learn more about how Honeywell's Experion MX QCS can improve your business performance, visit our website www.honeywellprocess.com, or contact your Honeywell Account Manager.

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