RFM-**1000** Series
Penetrative Radio Frequency Moisture Sensor

PROCESS SENSORS
CORPORATION

Penetrative
Radio Frequency
Moisture Sensor

Typical applications:

Board Manufacture

- Gypsum Board
- Plywood
- Oriented Strand Board
- Veneer
- Particle Board

Food Products

- Human Cereals
- Animal Feeds
- Nuts
- Coffee Beans
- Grains
- Caramel

Textiles

- Rugs
- Wovens
- Felts

Papers

- Cardboard
- Corrugated Boxes
- Laminates

FEATURES

- Product Calibration Software Included
- Standard Current and Voltage outputs (4-20mA, 0-10vdc)
- RS-232, RS-485
- Selectable bus interfaces, including Profibus, Devicenet, Wireless, etc
- Can operate as a smart, stand alone sensor
- Can be attached to an Operator Interface or PC
- High Temperature versions available
- Long Term Electronic Stability
- 200 measurements per second
- Measure total moisture
- Unaffected by pH or color changes
- 50 Calibration Channels
- Temperature and Density Compensation Inputs

RFM-1000 Series

How does the sensor work?

Water has a very high dielectric constant, usually 20 times greater than the dielectric of the solid material being measured. We use a radio frequency fringe field to measure the dielectric in the product/water combination.

The sensor with the product is set to a specific frequency, its 'resonant frequency'. As the water level changes, the dielectric value in the product changes. Therefore the 'resonant frequency' tuning changes up or down depending on the concentration of water. The sensor works by identifying and measuring this change in frequency and displaying the change as a moisture percentage.

Does the sensor need to touch the product?

No but it has to be in close proximity, Less than 1/4 inch (6mm) away.

Can the sensor look through a window?

Yes, however it should be non metallic, be stable in moisture and have an overall thickness of not more than 1/8 inch (3mm).

Does temperature affect the measurement?

It can but over a +/- 5 C not generally a problem.

Does change in color affect the measurement?

Not normally. However the presence of carbon black can create a problem. The high dielectric value of TiO2 can also create a problem.

Can a shifting component matrix affect the measurement?

Only if it affects the density. The change of raw ingredient normally will not as the dielectric will probably be similar.

Does density change affect the measurement?

Yes, it can. It is best to stick to constant volume products, if possible, for best accuracy and repeatability. It is possible to measure density and bring an input to the sensor for compensation.

What are typical applications?

Board products, wood such as lumber after a dryer, non homogeneous products like beans and grains, cooked products before processing like rice, corn, coffee beans, cereals.

What is the life of the sensor?

There are no moving parts so the sensor is very robust and reliable. You can expect many years of routine service.

What is involved in setting up a calibration?

The sensor needs to be compared to known moisture samples determined by a standard primary method. The relationship to moisture is linear so most products are already well understood and have standard calibration values that are inserted at the factory.

Do I have to vary the process to confirm a calibration?

Yes. This is always a good idea. To vary the moisture content of the product on line will easily confirm that the sensor is tracking moisture appropriately.

What sort of routine maintenance is required?

None other than to check that the sensor is not fouled in any way or coated on the measurement surface. It is also important to make certain that there is no build up of free water on the sensor.

The RFM-1000 Radio Frequency Moisture Sensor generates a Radio Frequency Fringe Field at less than 10 MHz. This field penetrates into the product being measured. As the total water content of the measured product changes, the RFM-1000 quantifies the resultant shift in frequency. This frequency shift is converted into a high resolution digital count value, directly proportional to the change in percentage total moisture. This operation is performed continuously at 200 measurements per second.

The RFM-1000 consists of an electrode, an oscillator circuit and a digital circuit. The sensor can be connected to a PSC processor with electronics display or to a host computer.

CONFIGURATION OF THE RFM SERIES

STAND ALONE SMART SENSOR:
The RFM-1000 sensor can operate with no proprietary processing electronics. The sensor makes the measurement and creates analog and digital outputs that can communicate directly with a PC, Controller, Recorder, Data Acquisition System or PLC.

SINGLE SENSOR AND PROCESSOR COMBINATION
The RFM-1000 sensor can be attached by a proprietary cable to a single PSC Processor. The Processor displays the moisture value and produces analog and digital outputs that can communicate directly with a PC, Controller, Recorder, DAS or PLC. Bus communication such as Profibus, Devicenet, Ethernet, Wireless, etc reside in the Processor.

MULTIPLE SENSOR AND PROCESSOR COMBINATION
Up to 4 RFM-1000 sensors can be attached to a single LCD based, touch screen PSC Processor. The Processor screen will display up to 4 moisture values simultaneously. All analog, digital and bus communications are generated at the PSC Processor.

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For more information on Process Sensors instruments and accessories, visit our website at:

www.processsensors.com

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MOISTURE MEASUREMENT

Accuracy/Ranges:	+/- 0.05%	0% to 1%
	+/- 0.1%	0% to 10%
	+/- 0.25%	10% to 30%
	+/- 0.5%	30% to 80%

Accuracies are product dependent and are for general guideline purposes.

SENSOR GENERAL SPECS

Operating Frequency:	3—7 MHz
Measurement Speed:	100, 200 or 400 measurements per second, user selectable
Antenna Styles:	8", 10", 24" and 48" open frame 3.5" and 5" circular
Materials of Construction:	Open Frame: Anondized aluminum with Teflon or ceramic spacers Circular: 3.5" Teflon and 316 Stainless Steel 5" ceramic and 316 Stainless Steel
Operating Temperature:	0° to 5°C (32° to 120°F) High Temperature version up to 250°C (500°F)

Outputs:	Dual isolated 4-20mA, RS232, RS-485
Optional Communication:	Ethernet, Profibus, Decivenet, Modbus (RTU & TCP/IP, Profinet)
Power:	15VDC or 90-260 VAC via remote power supply (supplied)
Input:	Product temperature sensor Product Loss/Presence photocells

PROCESSOR GENERAL SPECS

Materials of Construction	Powder Coat painted aluminum Optional Stainless Steel
Rating:	NEMA 4 (IP 65)
Display:	Touch Screen Color LCD or two line VFD with limited keypad
Power:	90-260 VAC

Circular Antenna

Flat Plate Antenna

Open Frame Antenna

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For more informatin on Process Sensors instruments and accesories, visit our website at **www.processsensors.com**

HEADQUARTERS
United States - Process Sensors Corporation
113 Cedar Street Milford, MA 01757 USA
Tel: (508) 473-9901 | Fax: (508) 473-0715
info@processsensors.com

Europe - Process Sensors Europe
Unit 4, Adelaide House Corbygate Business Park
Corby, Northants NN17 5JG United Kingdom
Tel: 01536 408066 | Fax: 01536 407813
infouk@processsensors.com

Eastern Europe - Process Sensors Polska
Biuro Informacyjne Techniki Promiarwej
03-980 Warszawa ul.Znaieckiego 16/23 Poland
Tel: (48) 22 6739526 | Fax: (48) 22 6739527
tomasz@processsensors.com