4028 Series

RF DIRECTIONAL THRULINE®
PRECISION POWER SENSORS

- Achieves tighter, more consistent RF power measurements for improved yield.
- ±2% (2σ) accuracy at specified calibration frequencies and power levels.
- Direct, plug-in operation with the industry standard Bird Model 4421 RF Power Meter.
- Multiple sensors provide for measurement of 1 kW to 25 kW over a 250 kHz to 30 MHz frequency range.

Bird's new 4028 Series Power Sensors represent a family of sensors for use in high power LCD/TFT processing and other precision high power applications. Intended for use with the industry standard Bird Precision Laboratory Power Meter Model 4421, these products provide a threefold improvement in long-term unit-to-unit accuracy.

Application:

Periodically, power delivery systems used in high power LCD/TFT processes and other precision applications must be calibrated against an accurate RF power standard, incorporating a highly repeatable laboratory standard power meter. This calibration is used to correct for drift in the system power sensor. Typically, these calibration standard power meters are accurate to within ±3% (1σ) of reading, with measurement-to-measurement repeatability on the order of ±2% (1σ). Although these parameters are quite good, the LCD/TFT industry is requiring better performance from calibration systems, particularly in the area of long-term unit-to-unit uniformity and measurement repeatability. These more stringent system calibrations result in the best possible process yields.

Improvements in calibration system accuracy and long-term repeatability have a direct effect on process yields. The effects of RF calibration setpoint accuracy on process yields is related to the consistency with which the same amount of RF energy is applied to a process over many cycles. Generally, there is not a great deal of drift in the calibration sensor setpoint over time, but it is easy to see how the RF power delivery to the system chamber could be affected if two different calibration sensors, differing by as much as 6% were used to calibrate the RF generator.

This new family of power sensors allows for the tightening of the RF power calibration window from 6% to a calibration accuracy of ±2% (2σ). At the same time, these new techniques greatly reduce the possibility of time-related setpoint drift problems.

Ordering Information:

Order these new power sensors according to the frequency range and operating power level of your fabrication system. See the specification table for frequency ranges and power levels.

www.bird-technologies.com **440.248.1200/866.695.4569** sales@bird-technologies.com

4028 Series
Specifications

VSWR, Max.	1.05:1
Insertion Loss, Max.	0.05 dB (with female 7-16 DIN connectors)
Directivity, Min.	28 dB
Connectors	Customer specified from 7-16 DIN, LC, HN, and 7/8" flanged, appropriate for frequency and power.
Impedance, Nominal	50 ohms
Max. Allowable Terminating VSWR	2.00:1
Calibration Technique	Frequency-specific calibration factors stored in nonvolatile memory in each sensor. Sensor output corrected for frequency and temperature within specified ranges.
Calibration Cycle, Nominal	1 year
Accuracy, Rfl	= Fwd accuracy +(Fwd Power / 10^{directivity/10})
Accuracy, VSWR	Calculated from Fwd and Rfl power (VSWR = [1+Sqrt(Pr / Pf)] / [1-Sqrt(Pr / Pf)])
Sampling Rate, Nominal	2 readings / second
Operating Power	Supplied by power meter via sensor cable
Temp, Operating	0 to 50 °C (32 to 122 °F) (derate accuracy outside 25 ± 10 °C)
Temp, Storage	-20 to +70 °C (-4 to +158 °F)
Humidity, Max.	95% (noncondensing)
Altitude, Max.	10,000 ft (3,000 m)
Repeatability, multiple measurements, single sensor	± 0.3% (95% c.l.) (with female 7-16 DIN connectors)
Dimensions, Nominal	4.7"L x 3.2"W x 3.8"H (120 x 82 x 97 mm) (without connectors)
Weight, Nominal	A250K, A400K: 1.7 lbs (0.8 kg) All other models: 3.3 lbs (1.5 kg)

	Freq Range	RF Power	Calibration Freq., Typical	Calibration Power, Typical	Accuracy	Accuracy, Outside Cal. Power and Frequency
4028A250K	250 - 400 kHz	1.0 - 20 kW	250, 400 kHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A400K	400 - 550 kHz	1.0 - 20 kW	400 kHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A2M	1.5 - 2.5 MHz	1.0 - 25 kW	1.8, 2.0, 2.17 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A3M	2.5 - 3.5 MHz	1.0 - 25 kW	2.5, 3.2, 3.5 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A4M	3.5 - 4.5 MHz	1.0 - 25 kW	3.5, 4.0 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A10M	10 - 15 MHz	1.0 - 25 kW	10.0, 13.56, 15.0 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028A25M	25 - 30 MHz	1.0 - 25 kW	25.76, 27.12, 28.48 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028B10M	10 - 15MHz	1.0 - 25 kW	10.0, 13.56, 15.0 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)
4028C10M	10 - 15MHz	500 W - 50 kW	10.0, 13.56, 15.0 MHz	3.5 kW	± 2.0% (2σ)	± 4.0% (2σ)

**For rated accuracy, no more than 1% AM; harmonics –50 dBc or less. Add 2% to uncertainty below 15°C and above 35°C.*

www.bird-technologies.com 440.248.1200/866.695.4569 sales@bird-technologies.com