

SEKIDENKO OR4000T AND OR4000E OPTICAL FIBER THERMOMETERS AND EMISSOMETERS

DELIVERING PRECISION TEMPERATURE MEASUREMENT
ACROSS MULTIPLE PROCESSES AND SUBSTRATES

Advanced Energy's OR4000 multi-channel optical fiber thermometers (OFTs) build on the highly successful OR2000 product family and provide industry-leading performance in non-contact temperature measurement for many temperature measurement applications. The OR4000T model provides multi-channel capability and supports read rates up to 2 kHz for the most demanding temperature measurements. Configured as an OR4000E model, it provides the added benefit of real-time emissivity compensation. The instrument is modular in design and is readily tailored to meet the unique requirements of each process application.



FEATURES

- Improve temperature measurement accuracy
- Enhance wafer-to-wafer and within-wafer uniformity
- Increase productivity, yield, and throughput

TYPICAL APPLICATIONS

- In-situ, non-contact temperature and emissivity measurement
- Multiple wavelengths within one instrument
- Industry-leading temperature and emissivity read rates
- Highly flexible, module-based platform architecture
- RS-232/422/485, Ethernet, and analog interfaces with trigger and synch capabilities included

IMPROVE TEMPERATURE MEASUREMENT ACCURACY

Advanced Energy's OR4000T and OR4000E multi-channel optical fiber thermometers (OFTs) deliver accurate, non-contact temperature and emissivity measurements in a compact, modular platform designed to meet each unique application's requirements. AE's OFTs are ideally suited to measure temperature in the most tightly controlled applications where uniform, repeatable temperatures are required to enable process success.

Depending on the application, the following choices are available:

- The OR4000T model is used in RTP, laser annealing, HDP-CVD, MOCVD, ALD, UV Cure, solar cell packaging, and HDD processing.
- The OR4000E model is used in Epi, CVD, MOCVD, and other processes with changing substrate emissivity.

ENHANCE REPEATABILITY AND MINIMIZE VARIATION

Traditional thermocouple measurement is unsuitable for many applications where physical contact with the substrate will cause damage and inaccuracy due to heat transfer effects. The OR4000T and OR4000E OFTs measure direct target temperature in situ—without contacting the object to be measured—for enhanced point-to-point uniformity and improved accuracy in temperature readings.

Each OFT system consists of a controller, an optical sensor, and optical fiber cables. The sensor detects emitted near-infrared (NIR) light from the target, typically a substrate. A fiber optic cable then transmits the NIR light from the sensor to the controller, where the collected light is converted to a temperature reading. The use of a fiber optic cable allows for remote positioning of the controller in a controlled environment away from the process chamber. Each sensor is custom-designed to meet the functional and mechanical requirements of the unique, individual application. The results: reliable measurements, higher repeatability, and increased yield.

INCREASE PRODUCTIVITY, YIELD, AND THROUGHPUT

Both the OR4000T and OR4000E models deliver high-speed performance with read rates up to 2 kHz, enabling accurate tracking of rapid temperature changes. In dynamic applications, this enables closed-loop temperature control and optimizes process yield.

INCREASE STABILITY AND RELIABILITY ACROSS MULTIPLE CHAMBERS AND SUBSTRATE MATERIALS

The OR4000T model provides multi-channel temperature measurement utilizing up to four independently operating channels tailored to specific operating requirements. This feature enables uniform, integrated measurements within multiple chambers.

The OR4000E model offers dual-channel capability, with real-time emissivity monitoring to provide accurate and repeatable temperature measurements in film growth applications. Typical processes that benefit from this capability are CVD processes and thermal annealing processes where significant material change occurs. The OR4000E model measures emissivity and temperature simultaneously by pulsing incident radiation on the substrate and determining its reflectivity, then measuring the radiant energy that the target emits when the source of radiation is off. The result: accurate and repeatable real-time temperature measurements, regardless of the substrate emissivity.

SPECIFICATIONS

Feature	OR4000T	OR4000E
Description	Multi-channel capability, high-speed performance, and read rates up to 2 kHz	Real-time, dual-channel emissivity compensation measurement and read rates up to 2 kHz
Channel Configurations	1 to 4 channels of temperature measurement capability utilizing selectable/ fixed emissivity; channels individually configurable	1 to 2 channel, real-time, emissivity-corrected temperature via pulsed emitter(s); channels individually configurable
Temperature Range(s)	50 to 3500°C	
Real-Time Emissivity Range	N/A	0.03 to 1.0
Filter Range	UV to 2300 nm	
Read Rate	Up to 2 kHz temperature read rate	Up to 2 kHz temperature read rate Up to 500 Hz read rate for real-time, emissivity-corrected temperature
Accuracy	±1.5°C	
Resolution	Up to 0.001°C	
Control/Repeatability	±0.1°C typical	
Display	Internal, 4 x 20 LCD with keypad entry	
Data I/O	RS-232, RS-422/485, and Ethernet	
Analog Output	0 to 10 V or 4 to 20 mA outputs	
Control Interface	External trigger input, synchronization output, high and low alarms	
Power Requirements	AC: 90 to 263 VAC; 47 to 63 Hz DC: +24 VDC	
Power Supply Line Current	< 0.7 A at 100 VAC	
Environmental	Operational: 5 to 40°C (41 to 104°F)	
Physical Dimensions	8.6 cm (H) x 15.2 cm (W) x 21.8 cm (D) 3.4" (H) x 6.0" (W) x 8.6" (D)	
Weight	4.5 lb (2 kg)	
Mounting	M5 X 0.75 threaded inserts in case bottom (consult manual for more information)	
Response Sample	< 2 ms at 2 kHz sampling rate (temperature only)	



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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

PRECISION | POWER | PERFORMANCE

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