

DATASHEETS

SEKIDENKO OR400M | SEKIDENKO OR400T

SEKIDENKO OR400M—PRECISION OPTICAL IR PYROMETERS

3.3 AND 5.2 μM MEASUREMENT WAVELENGTHS PRECISION TEMPERATURE
MEASUREMENT FOR THIN-FILM SOLAR, GLASS, AND ADVANCED
SEMICONDUCTOR PROCESSES PRECISION

Advanced Energy®'s OR400M optical pyrometer extends the flexibility of the Sekidenko product family into the mid-IR wavelengths at 3.3 and 5.2 μm . The OR400M unit offers single-channel temperature measurement, supports RS-232 and analog data interfaces, and, because of its compact design, can be easily integrated to meet the unique requirements of many process applications.

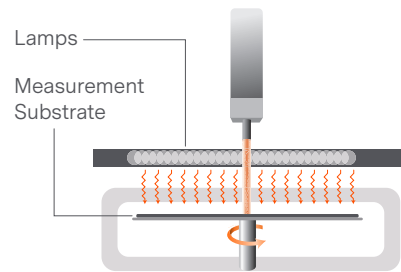
PRODUCT HIGHLIGHTS

- Improved substrate uniformity
- Integrated measurement
- High-speed, solid-state detectors
- Configurable filter, detector, and optical delivery system
- In-situ measurement of thin-film PV manufacturing steps

ADVANCED MEASUREMENT FOR ADVANCED SEMICONDUCTOR APPLICATIONS

The OR400M optical pyrometer is an ideal single-point measurement tool for semiconductor applications that require longer wavelengths, such as measurement of quartz within a vacuum chamber. It can be installed outside the chamber, through a viewport, for non-contact measurement.

It also provides a cost-competitive alternative to thermocouple-based measurements with the added benefit of non-contact, in-situ temperature measurement and immunity from RF noise. Because of its compact design, the OR400M optical pyrometer can be easily integrated into your system to meet the unique requirements of your process application.

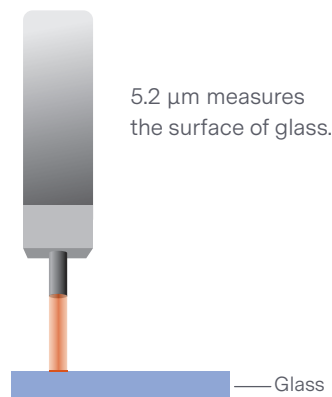


Measurement in Lamp Heated Reactor

DIRECT MEASUREMENT OF GLASS

Due to the unique transmission properties of glass, temperature must be measured at longer wavelengths, usually above 5 μm. These wavelengths allow the pyrometer to “see” the glass substrate, rather than looking through the glass and measuring the emission of an object or film on the opposite side. The OR400M design takes accurate measurements at 5.2 μm for glass-based applications, including difficult applications with high stray-light backgrounds.

OR400M—5.2 μm



SELECTIVE WAVELENGTH MONITORING

Within a single manufacturing line, such as a CdTe solar PV glass cell, each deposition layer in the stack will have changing transmission properties based on film composition and thickness. To ensure correct measurement of a specific deposition layer, a new wavelength may be required to ensure correct measurements as you move from one manufacturing step to another.

The OR400M optical pyrometer is designed for this unique challenge and can be customized for each manufacturing step with the choice of a different wavelength and working distance for each process step. A complete manufacturing cell may employ multiple OR400M units set at process-step-specific wavelengths for accurate and timely temperature measurement.

Some points may require a longer wavelength to measure the substrate itself, such as glass, while other manufacturing steps should be measured by looking through the glass to monitor a specific layer of the stack. Because glass is insulating, large temperature gradients are possible. Using the OR400M optical pyrometer provides a more accurate temperature reading and ensures measurement of the correct layer.

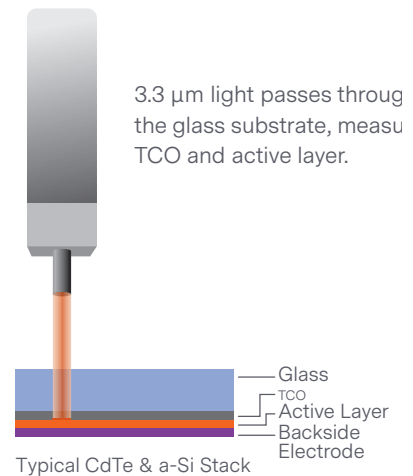
EXTENDED WAVELENGTH MEASUREMENT RANGE FOR SOLAR APPLICATIONS

The OR400M optical pyrometer measures temperature from the near-IR to the mid-IR wavelengths at 3.3 μm and 5.2 μm . For photovoltaic (PV) solar applications, the unit's range of wavelengths is perfectly suited to measure specific layers within a PV stack. PV cell layers require in-situ measurement, including TCO (transparent conductive oxide) layers, molybdenum backside contact layers, as well as CIGS (copper indium gallium selenide) or CdTe (cadmium telluride) deposition layers. To choose the correct wavelength to measure each of these layers, the following must be considered:

- Transmission properties
- Thickness
- Emissivity
- Effects of stray light within the measurement background

The OR400M can be customized for individual applications, making it ideally suited for PV cell layer measurement.

OR400M—3.3 μm



SPECIFICATIONS

Description	Specification
Channel Configuration	Single-channel temperature measurement capability with selectable/fixed emissivity
Temperature Range(s)	50 to 1300°C
Measurement Wavelengths ¹	3.3 and 5.2 μm
Read Rate	Up to 250 Hz
Accuracy	$\pm 3^\circ\text{C}$
Resolution	Up to 0.01°C
Repeatability	$\pm 0.1^\circ\text{C}$ typical
Display	None; set up via RS-232
Data I/O	RS-232 at up to 115 kB
Analog Output	0 to 10 V or 4 to 20 mA
Power Requirements	AC: 90 to 263 VAC, 47 to 63 Hz DC: +24 VDC
Environmental	Operational: 15 to 40°C (59 to 104°F)
Physical Dimensions	32 mm (H) x 57 mm (W) x 235 mm (D) 1.26" (H) x 2.30" (W) x 9.26" (D)
Weight	0.39 kg (0.87 lb)
Mounting	Frame mount, mounting holes on mounting block; Consult manual for more information.
Power Supply Line Current	< 0.7 A at 100 VAC

¹ Customized wavelengths available



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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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SEKIDENKO OR400T PRECISION, SINGLE-CHANNEL OPTICAL FIBER THERMOMETER (OFT)

COST-EFFECTIVE, PRECISION TEMPERATURE MEASUREMENT IN A COMPACT FORM FACTOR



Advanced Energy®'s OR400T optical fiber thermometer (OFT) extends the flexibility of the OFT product family with a cost-competitive, non-contact solution for several high-volume semiconductor applications, including PECVD, LPCVD, PVD, and metal etch. The OR400T model offers a single-channel temperature measurement capability and supports RS-232 and analog data interfaces at up to 20 readings per second. Because of its compact design, the OR400T OFT can be easily integrated to meet the unique requirements of many process applications.

PRODUCT HIGHLIGHTS

- Improves temperature measurement accuracy
- Enhances wafer-to-wafer uniformity
- Provides a cost-competitive alternative to thermocouple-based measurements
- Increases productivity, yield, and throughput
- Compact, single-channel design
- In-situ, non-contact temperature measurement
- Supports RS-232 and analog data interfaces at up to 20 temperature readings per second
- Improved low-temperature performance

IMPROVES TEMPERATURE MEASUREMENT ACCURACY

Advanced Energy's OR400T optical fiber thermometer (OFT) delivers accurate, non-contact temperature measurements in a compact form factor. AE's OR400T OFT is ideally suited for several high-volume semiconductor applications, including:

- Epi
- PECVD
- LPCVD
- PVD
- MOCVD

Like all of AE's OFTs, the OR400T model provides extended-range, low-temperature measurements through improved optical signal gathering.

Enhances Wafer-to-Wafer Uniformity

Traditional thermocouple measurement is unsuitable for many applications where making physical contact with the substrate will cause damage and inaccuracy due to heat transfer effects. The OR400T OFT measures direct wafer temperature in situ—without contacting the wafer—for enhanced wafer-to-wafer uniformity and improved accuracy in temperature readings.

Each OFT system consists of a controller, an optical sensor, and an optical fiber. The use of a fiber optic cable allows for remote positioning of the controller away from RF and other sources of EMI. 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 light collected is converted to a temperature reading.

Each sensor is custom-designed to meet the functional and mechanical requirements of your unique application. The results: higher repeatability and increased yield.

Provides a Cost-Competitive Alternative to Thermocouples

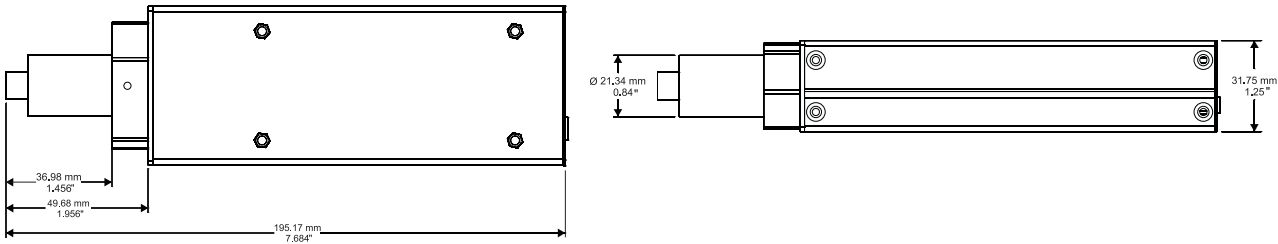
The OR400T model offers single-channel temperature measurement capability in a compact form factor.

The OR400T OFT provides a cost-competitive alternative to thermocouple-based measurements with the added benefit of non-contact, in-situ temperature measurement and immunity from RF noise. Because of its compact design, the OR400T OFT can be easily integrated to meet the unique requirements of your process application.

SPECIFICATIONS

Features	OR400T
Description	Cost-effective, precision temperature measurement
Channel Configuration	Single-channel temperature measurement capability with selectable/fixed emissivity
Temperature Range(s)	50 to 3500°C
Filter Range	600 to 1600 nm
Read Rate	Up to 20 Hz temperature read rate
Accuracy	±1.5°C
Resolution	0.001°C
Control/Repeatability	±0.1°C typical
Display	None; set up via RS-232
Data I/O	RS-232 @ up to 115 KB
Analog Output	0 to 10 V or 4 to 20 mA outputs
Power Requirements	AC: 90 to 263 VAC; 47 to 63 Hz DC: +24 VDC
Environmental	Operational: 10 to 40°C (50 to 104°F)
Physical Dimensions	55.7 mm (H) x 31.8 mm (W) x 195.2 mm (D) 2.2" (H) x 1.3" (W) x 7.7" (D)
Weight	0.73 lb (0.33 kg)
Mounting	M3 X 0.5 threaded holes in optical block (consult manual for more information)
Power Supply Line Current	<0.7 A @ 100 VAC

DIMENSIONAL DRAWINGS





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