Special materials

Pyrometers for special applications and materials

EMISSIVITY OF SPECIAL MATERIALS

LumaSense produces a wide range of specialized pyrometers beyond those described in the previous sections. These pyrometers are customized to address specific applications and materials, and are often available with the needed accessories to provide a complete solution package.

SOME EXAMPLE APPLICATIONS INCLUDE:

Measuring flame or gas temperature, by monitoring the CO_2 absorption line

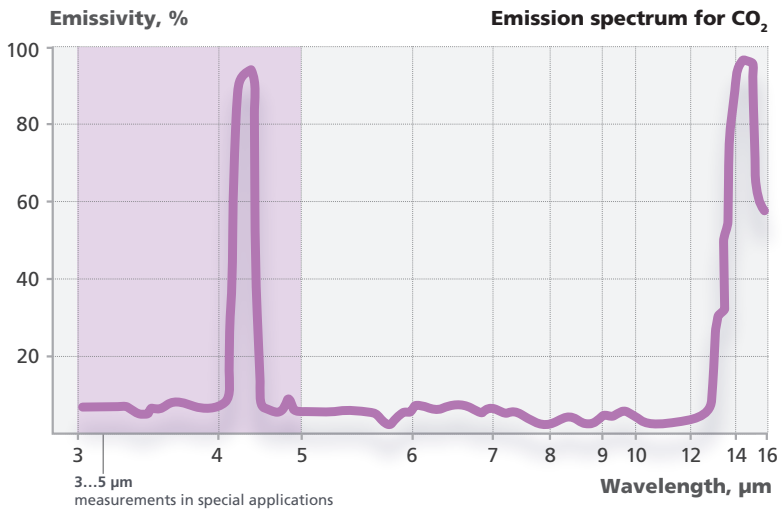
Measuring temperature on thin plastic films

Measuring Silicon and Sapphire wafers in Semiconductor & Compound Semi processes

To measure temperatures for these specialized applications, one must carefully understand the emissivity, reflectance, and transmissions of the objects to be measured. We then select the proper detectors and filters to maximize the detected signal. For example, when measuring the temperature of a combustion flame where there is expected to be significant CO_2 content, we select a narrow band filter at 4.5 µm where the emission from this gas is high (see figure).

If we instead choose a 3.9 µm filter, then we can effectively avoid the CO_2 and H_2O emission bands, and look through the flame.

If you have a specialized need, which is not covered with the pyrometers below, please consult our Applications Engineering Team.



APPLICATION CONSULTING AND SUPPORT

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Supporting Your Applications Needs

The LumaSense Global Applications Engineering team is staffed with Sr. Engineers to help develop new solutions for customers worldwide, with focus on core markets and challenging applications.

LumaSense Technologies is known for its ability to build products for custom applications using our temperature and gas sensing products to meet the stringent design requirements of the energy, industrial and clean technology markets.

Contact our dedicated Customer Care Team to request an application consultation.

SERIES 5, 6 — SERIES 12

Model	IN 5/9 plus	ISR 6 Advanced	IS 12-Al, 12-Al/S	IS 12-Si
Brief Description	Digital pyrometer especially designed for measurement of sapphire. With analog output, digital interface, max. / min. value storage, different optics, laser targeting light.	Highly accurate digital, fast pyrometer in 2-color design (switchable to mono mode) with analog output and digital interface, focusable optics, and integrated LED display.	Special version of the IS 12, designed for the measurement of Aluminum. IS 12-Al/S with built-in scanner, scanning angle adjustable between 0...4°, scanning frequency between 0...10 Hz.	Dedicated version of the IS 12, designed for measuring silicon wafers.
Temperature Ranges	0…1500 °C	600…1400 °C 700…1800 °C 800…2500 °C 1000…3000 °C	350…900 °C 400…1050 °C	350…1000 °C 400…900 °C 400…1300 °C 500…1800 °C
Spectral Range	8…9.7 µm	Ch. 1: 0.9 µm Ch. 2: 1.05 µm	Aluminum absorption filter	Silicon absorption filter
Measurement Uncertainty	0.6% oR or 3 °C	< 1500 °C: 0.3% oR + 2 °C > 1500 °C: 0.6% oR	0.3% oR + 1 °C	< 1500 °C: 0.3% oR + 1 °C > 1500 °C: 0.5% oR
Repeatability	0.3% oR or 0.6 °C	0.15% oR + 1 °C	0.1% oR + 1 °C	0.1% oR + 1 °C
Optics	6 fixed optics: a = 95 mm a = 112 mm a = 160 mm a = 280 mm a = 400 mm a = 620 mm	Manually focusable between 210…5000 mm	MB 9 5 fixed optics: a = 112 mm a = 240 mm a = 660 mm a = 1300 mm a = 5600 mm MB 10.5 6 fixed optics: a = 80 mm a = 160 mm a = 250 mm a = 660 mm a = 1300 mm a = 5600 mm	6 fixed optics: a = 80 mm a = 120 mm a = 250 mm a = 660 mm a = 1300 mm a = 5600 mm 3 focusable optics: 275…520 mm 385…1125 mm 540…9000 mm
Field of View (Minimum spot size Ø in mm)	60:1 (1.7 mm)	min. 350:1 (min. 0.6 mm) Option: line optics	min. 120:1 (1.1 mm)	Fixed Optics: min. 370:1 (0.6 mm) Focusable Optics: min. 130:1 (2.3 mm)
Alignment	Laser targeting	Laser targeting or through-lens-sighting or color TV camera	Laser targeting and through-lens-sighting	Laser targeting and through-lens-sighting
Exposure time t_{90}	180 ms, adjustable up to 30 s	2 ms, adjustable up to 10 s	< 1.5 ms, adjustable up to 10 s	10 ms, adjustable up to 10 s
Output	0/4…20 mA, RS232 (RS485 on request)	0/4…20 mA, RS485, (RS232 optional)	0/4…20 mA, RS232 or RS485 (switchable)	0/4…20 mA, RS232 or RS485 (switchable)

SPECIAL MATERIALS

FEATURED PRODUCT

IPE 140

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Pyrometers available with various dedicated filters for specific applications.

Next to the standard versions, these pyrometers are also available with specific filters to measure dedicated materials, including thin PE and PP foils, CO_2 or the measurement through clean combustion flames and gases.

SERIES 50 / SERIES 140

Model	IS 50-Si-LO plus	IS 50-Al-LO plus	IPE 140/34	IPE 140/45
Brief Description	Special version of the IS 50-LO plus with special wavelength for the measurement of silicon wafers.	Special version of the IS 50-LO plus with special wavelength for the measurement of Aluminum.	Special version of the IPE 140 for measurement of thin PE and PP foils with a minimum material thickness of only 30 µm.	Special version of the IPE 140 for measurement of combustion flames and hot gases containing CO_2. This pyrometer is used e.g. in the LumaSense FEGT system for continuous measurement of the Furnace Exit-Gas Temperature in boilers and furnaces.
Temperature Ranges	400…1300 °C 500…1600 °C	400…1000 °C	50... 400 °C 75... 500 °C	400…2000 °C
Spectral Range	Narrow band in the near infrared	Narrow band in the near infrared	3.43 µm	CO_2 absorption band for hot CO_2 gases
Measurement Uncertainty	< 1500 °C: 0.3% oR + 1 °C > 1500 °C: 0.5% oR	< 1500 °C: 0.3% oR + 1 °C > 1500 °C: 0.5% oR	< 400 °C: 2.5 °C > 400 °C: 0.4% oR +1 °C	<1300 °C: 0.6% oR >1300 °C: 0.8% oR
Repeatability	0.1% oR + 1 °C	0.1% oR + 1 °C	0.1% oR + 1 °C	0.1% oR + 1 °C
Optics	3 optical heads: Optics I: 3 fixed distances Optics II: 4 fixed distances Optics II: 6 focusable optics	3 optical heads: Optics I: 3 fixed distances Optics II: 4 fixed distances Optics II: 6 focusable optics	3 focusable optics: a = 100…142 mm a = 185…390 mm a = 305…1900 mm	3 focusable optics: a = 115…170 mm a = 210…500 mm a = 360…10000 mm
Field of View (Minimum spot size Ø in mm)	Optics I: 100:1 (1.2 mm) Optics II: min. 200:1 (0.45 mm)	Optics I: 35:1 (3.3 mm) Optics II: min. 85:1 (1.1 mm)	min. 50:1 (min. 2.1 mm)	min. 120:1 (min. 1.1)
Alignment	Laser targeting	Laser targeting	Laser targeting or through-lens-sighting	Laser targeting or through-lens-sighting
Exposure time t_{90}	< 1 ms, adjustable up to 10 s	< 1 ms, adjustable up to 10 s	1.5 ms, adjustable up to 10 s	1.5 ms, adjustable up to 10 s
Output	0/4…20 mA, RS232 or RS485 (switchable)	0/4…20 mA, RS232 or RS485 (switchable)	0/4…20 mA, RS232/ RS485 (switchable)	0/4…20 mA, RS232/ RS485 (switchable)

FEATURED PRODUCT

UV 400 & UVR 400

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Next generation of temperature sensors developed specifically for GaN-based MOCVD epitaxy processes (metal-organic chemical vapor deposition).

Improve yield through true wafer temperature measurement

Setting new standards for LED production processes (reliable correlation between process temperature and final product wavelength)

Measure temperature directly on the GaN layer using UV wavelength instrumentation

Real time measurement of deposition thickness using a high-speed reflectometer (UVR 400)

M67S SERIES UV 400, 315

M67S 7.9 µm	**M67S** CO_2	**UV 400, UVR 400**	**PhotriX**	**IGA 315-K**
Analog 2-wire pyrometer with view finder. Special filter for thin plastic films or thin glass.	Analog 2-wire pyrometer with view finder. For measurement of combustion flames and hot gases containing CO_2.	Digital pyrometers with extremely short wavelength (in the UV spectral range) for true Wafer Surface Temperature and Reflectance Instrumentation for GaN-based MOCVD epitaxy processes. The UVR 400 includes an additional reflectometer at 635 nm with 0.5 kHz measurement speed. This enables measurement of deposition thickness. These pyrometers are also suitable for measurements on uncoated silicon wafers.	Digital, extremely sensitive pyrometer to measure small signals and lower temperatures. Configurable collection optics: lens optic, lightpipe optics, fiber optics to remote lens, fiber optics to lightpipe.	Portable pyrometer for non-contact temperature measurement of nozzle bricks and air stages in coking ovens at standard distances between 1 and 12 m.
0…300 °C 100…400 °C 150…600 °C	320…1200 °C 400…1400 °C 450…1900 °C 800…2200 °C	650…1300 °C	various ranges between 30…2600 °C	600…1600 °C
7.9 µm	CO_2 hot band	383...410 nm	5 ranges: 0.65 µm, 0.88 µm, 0.9 µm, 1.55 µm, 0.7…1.65 µm	1.58…1.8 µm
±0.5% of full scale or 1 °C	±0.5% of full scale or 1 °C	< 1000 °C: 3 °C > 1000 °C: 0.3% oR	±1.5 °C or 0.15% oR	0.75% oR
±0.2% of full scale span	±0.2% of full scale span	0.1% oR + 0.1 °C	0.1 °C	< 0.3% oR
1 focusable optics: 350 mm…∞ 1 fixed optics a = 50 mm	2 focusable optics: 350 mm…∞ 150…350 mm	fixed optics	Configurable collection optics: Fixed Optics, Lightpipe, or Fiber Optics with fixed optics or Lightpipe	Focusable optics: 1000…12000 mm
Focusable optics: min. 30:1 (11.9 mm) Fixed: min. 30:1 (1.5 mm)	min. 30:1 (1.8 mm)	min 8:1 (9.8)	Optics or lightpipes adapted to customers request (min 0.5 mm)	~ 300:1 (e.g. 30 mm @ 9 m distance)
Through-lens-sighting	Through-lens-sighting	—	—	Through-lens-sighting
100 ms	300 ms	Integration Time: Min of 8 ms	1 ms, adjustable up to 60 s	10 ms
4…20 mA	4…20 mA	0/4…20 mA, RS485	4…20 mA, 0…10 V, RS232, RS485	USB Interface adapter