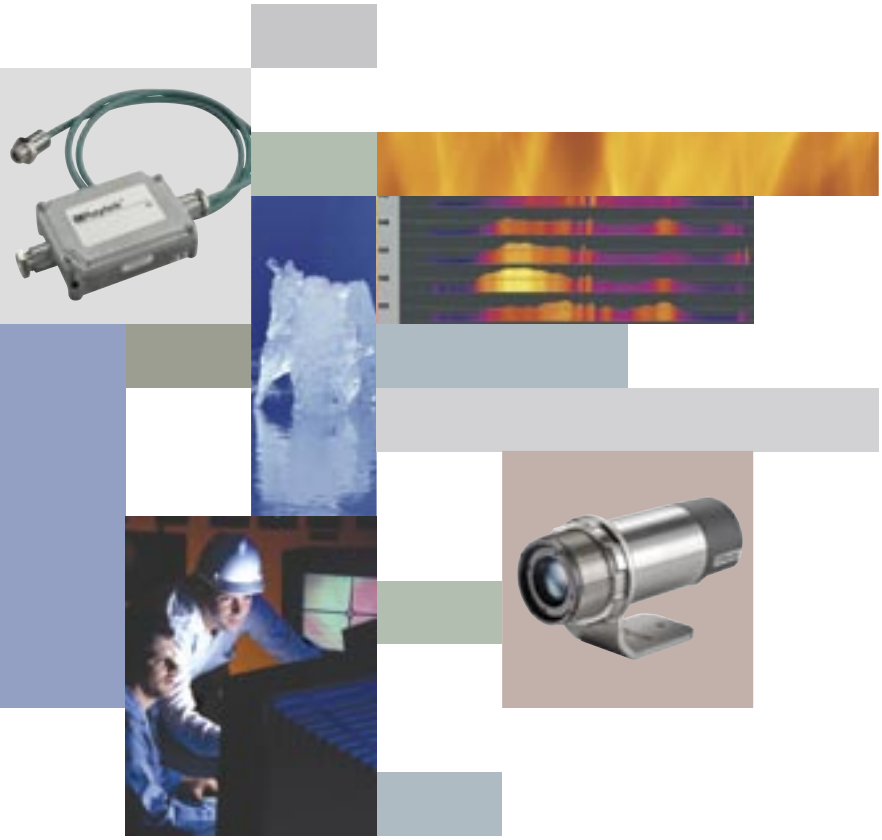
Raytek Industrial Automation Products

A Worldwide Leader in Noncontact Temperature Measurement



Raytek®
A Fluke Company

Noncontact Temperature Measurement:

Impressive benefits...

Infrared (IR) thermometry measures energy that is naturally emitted from all objects, without actually touching them. This allows quick, safe measurement of the temperature of objects that are moving, extremely hot, or difficult to reach. Where a contact instrument could alter the temperature, damage, or contaminate the product, a noncontact thermometer safely allows accurate product temperature measurement.

These sensors are also used in applications where the high temperature of the target could damage or destroy a contact temperature sensor.

...and measurable results...

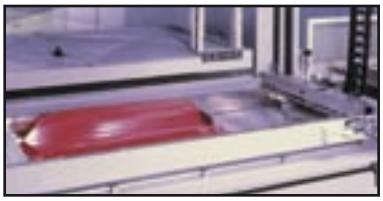
Raytek sensors are integrated into industrial processes to provide continuous temperature monitoring. Our smart, digital systems allow process engineers to configure sensors and monitor temperatures remotely. From miniature, single point sensors to sophisticated imaging systems with custom user interfaces, Raytek process sensors provide accurate, reliable temperature monitoring for demanding industrial processes.

...equal tangible return on investment.

Raytek industrial sensors deliver dependable, cost-effective, easy to use solutions for temperature monitoring. Our commitment to worldwide service and support provides a solid foundation on which we build lifetime partnerships with our customers. By decreasing down-time and waste and improving process efficiency and output, our products ensure immediate and substantial savings in time and money.

Applications for IR Measurement

During coating processes, the MP50 process imager produces a temperature profile of the fusion areas of the melt curtain, and detects defects caused by improper viscosity or impurities.



The MP50 process imager profiles a thermoformed plastic sheet to ensure proper and uniform temperature distribution.

Accurate temperature measurement of slabs, billets, or blooms on a hot rolling mill ensures product uniformity.

Monitoring temperature of molten metal prior to and during pouring ensures correct metallurgical properties.

The advanced signal processing capabilities of TX smart sensors ensure accurate temperature measurement for glass bottles and other discrete processes.

Monitoring edge temperature and drying uniformity results in higher yields and reduced downtime during paper production.

Plastic Processing

Raytek has temperature measurement solutions for every aspect of the plastic manufacturing process – from the melt to packaging, from raw material to finished goods.

- Blown film Extrusion
- Cast Film Extrusion
- Biaxially-oriented Film Extrusion
- Sheet Extrusion
- Extrusion Coating
- Laminating and Embossing
- Thermoforming

Steel Processing and Manufacturing

Raytek provides temperature measurement solutions for every step in the steel making process, from coke ovens and blast furnaces to annealing and coating mills, and also has temperature measurement solutions for forging mills and heat facilities.

- Continuous Casting
- Reheating
- Rolling Mills
- Rod/Wire Mills

Primary and Secondary Glass Manufacturing

Raytek noncontact infrared sensors for glass applications are designed for real time monitoring and control of nearly aspect of glass processing.

- Melt Furnace
- Automobile & Safety Glass
- Lamps, Bulbs & Tubes
- Glass Fiber
- Molds & Plungers
- Flat Glass
- Bottles, Containers, Special Glass

Additional Application Areas

- Non-ferrous Metals
- Textiles
- Utilities & Electrical
- Printing, Paper & Converting
- Asphalt, Cement & Construction Materials
- Petrochemical
- Semiconductors

Process Imaging Systems

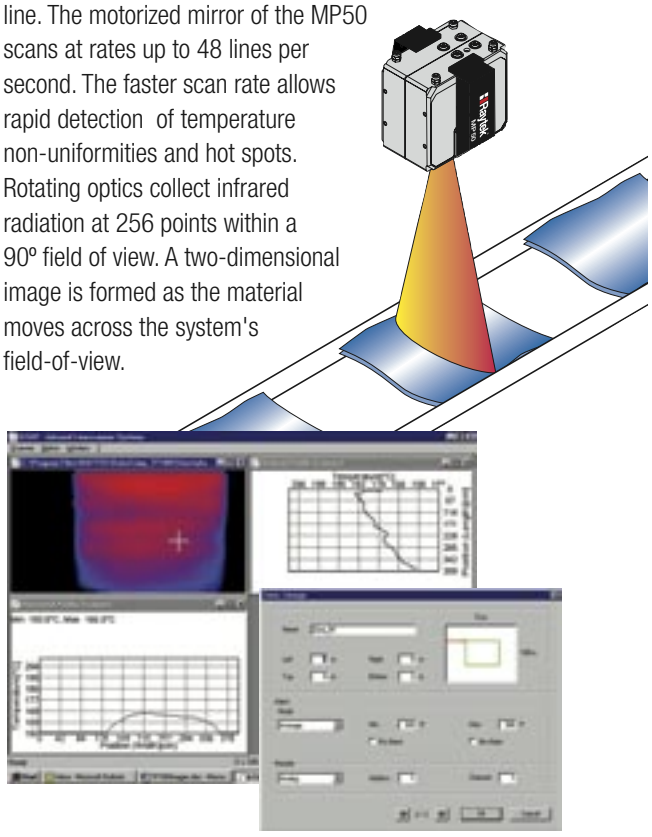
Linescanner MP50

The MP50 Process Imaging System is a family of advanced infrared linescanners that provide accurate, real-time, thermal imaging for a wide variety of industrial applications.
The MP50 scanner is surprisingly easy to install and manage. Pre-wired cables allow for fast, easy installation and connection to a standard PC. Versatile DataTemp DP software allows custom configuration of MP50 operating parameters and display of thermal images and temperature profiles. The MP50 is designed for realability and continuous operation in harsh industrial environments.

Rugged accessories for harsh industrial environments.

Edge-to-edge Temperature Measurement

Unlike point sensors that measure a single point, the MP50 linescanner measures multiple temperature points across a scan line. The motorized mirror of the MP50 scans at rates up to 48 lines per second. The faster scan rate allows rapid detection of temperature non-uniformities and hot spots. Rotating optics collect infrared radiation at 256 points within a 90º field of view. A two-dimensional image is formed as the material moves across the system's field-of-view.

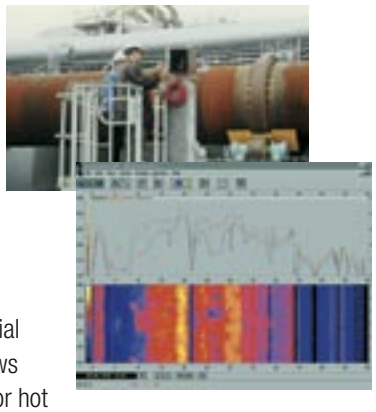


The easy to use Windows® system software display can be customized to meet your specialized process control requirements.

Application Specific Systems

Raytek offers customized process imaging systems to meet specific application requirements for kiln shell monitoring, gypsum, wall board production, thermoforming machine control, extrusion coating and glass processing:

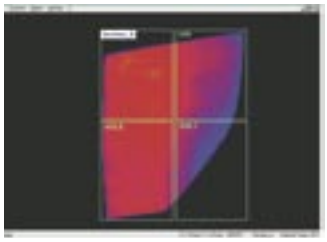
Cement/Lime Kilns—CS100

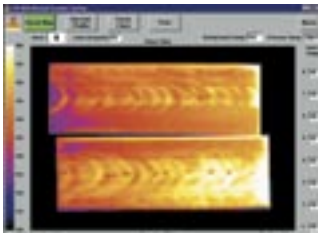


CS100 is a comprehensive temperature measurement system for monitoring, control and analysis of rotating kiln shells used in cement and lime production.
The system combines an environmentally-protected infrared linescanner and a powerful, industrial software program. The system allows you to accurately detect and monitor hot spots in refractory bricks in order to prevent costly kiln damage and to extend production runs.

Glass Processing—GS100

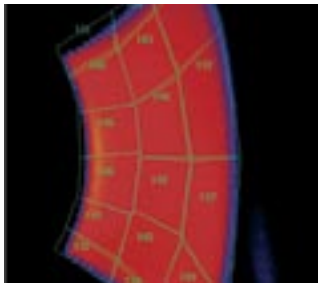
Thermal imaging and analysis for defect detection and quality improvement in glass annealing/ tempering and glass bending processes.





Wallboard—TIP450

Detailed dryer balance analysis and thermal mapping improves board quality, production, fuel savings, defect detection and scrap reduction.



Thermoforming—TF100

Thermal imaging and analysis to reduce scrap, improve product quality and operating economy of thermoforming processes.

Plastic Extrusion—EC100/ES100

Thermal imaging and analysis for real-time defect and quality improvement of plastic extrusion, coating and lamination processes.

Paper Manufacturing—SS100

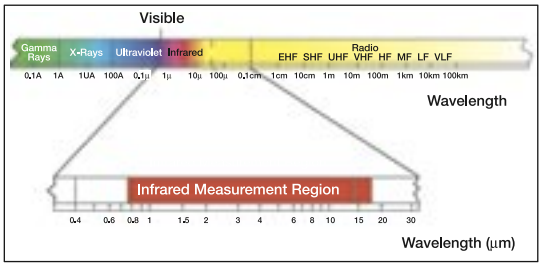
An automated temperature measurement system for detecting, measuring and classifying defects on the surface of fast rotating parts, like soft calendars in paper production or car tires on test stations.

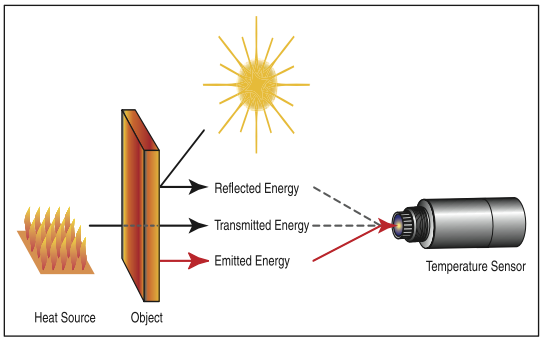
Things to Consider When Selecting a Sensor

- What is the temperature range of the target?
- What is the size of the target?
- How close to the target can the instrument be installed?
- Does the target fill the field of view?
- What is the target material?
- How fast is the target or process moving?
- Will you be measuring discrete objects or a continuous process?
- What is the ambient operating temperature?
- Are the ambient conditions contaminated (dust, smoke, steam)?
- Do you want to connect to existing control equipment?
- Do you need to keep records for audit or quality programs?

How Infrared Temperature Sensors Work

Infrared radiation is just one part of the electromagnetic spectrum that also includes radio waves, microwaves, visible light, and ultraviolet light, as well as gamma rays and X-rays. The infrared range of the electromagnetic spectrum falls between the visible portion of the spectrum and radio waves. Infrared wavelengths are usually expressed in microns (10^{-6}m or µm), with the infrared spectrum extending from 0.7 microns to 1000 microns. Only the 0.7 to 18 micron band is used for infrared temperature measurement.





As shown in the figure left, an object reflects, transmits, and emits energy. The intensity of an object's emitted infrared energy increases or decreases in proportion to its temperature. Emissivity is a term used to quantify the energy-emitting characteristics of different materials and surfaces.

Most Raytek infrared sensors have adjustable emissivity settings, usually from 0.1 to 1.0, which allow accurate temperature measurements of various surface types.

An infrared sensor detects the energy emitted from an object and focuses that energy onto one or more detectors. The detector converts the infrared energy to an electrical signal, which is in turn converted into a temperature value based on the sensor's calibration equation and the emissivity setting. This temperature value can be displayed on the sensor, output as an analog signal, or — in the case of a smart sensor — converted to a digital output and displayed on a computer terminal.

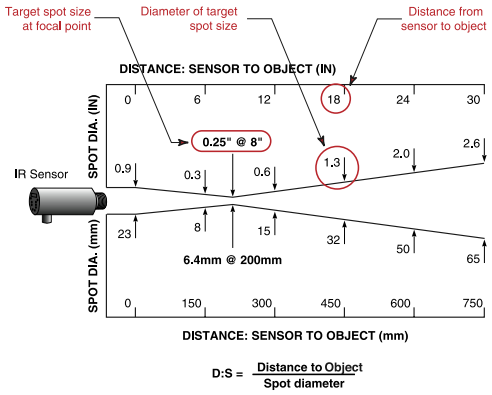
More Than Specifications:

Selecting The Right Infrared Temperature Sensor For Your Application

What is the temperature range of your process? How big is the measurement spot? How far away is that spot from the sensor? These are the first questions to ask to identify the right Raytek temperature sensor for your application. Environmental and operating conditions will determine other sensor specifications (e.g., ambient temperature, display and output, and protective accessories).

Raytek offers a variety of products with specific temperature measurement features. Single wavelength infrared temperature sensors need a clear line of sight between the instrument and the target. Sighting optics allow the user to aim the sensor on the target. Some instruments have a built-in laser that pinpoints the target, which is especially helpful with small targets or in dark or inaccessible areas.

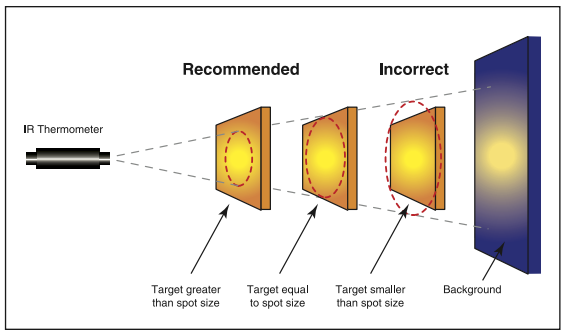
A two-color or double wavelength instrument is most effective when the target is very small, partially obstructed or is moving in and out of the field of view. A fiber-optic unit, where the cable can snake around obstructions, is best if a direct line of sight between the instrument and the target is otherwise impossible.



Optical charts help determine the spot size at a specific distance. The smallest spot this instrument can measure is 0.25 inches at a distance of 8 inches. In variable focus instruments, the spot size can be adjusted.

Target Size and Material

For single wavelength sensors, the measurement target should be larger than the field of view by 50%. If the target is smaller than the field of view, background objects (for example, a furnace wall) will influence the temperature reading. The target material's temperature range, emissivity, and surface characteristics



For accurate temperature measurement the target size should be greater than the instrument's field of view, or spot size. If the instrument's spot size is larger than the target, the instrument will also measure energy emitted from the background or surrounding objects.

determine the response or wavelength needed in a sensor. Highly reflective metals with different alloy compositions may have low or changing emissivities. The optimum wavelength for measuring high-temperature metal is around 0.8 to 1.0 micron. Since some materials are transparent at certain wavelengths, select a wavelength at which the material is opaque. A good choice for surface measurement of glass is 5 microns. Plastic films have transmission coefficients that vary according to the wavelength of the sensor and the thickness of the materials. Choosing 3.43 microns for polyethylene or polypropylene or 7.9 microns for polyester allows measurement of thin films. The recommended spectral response for low temperature applications is 8 to 14 microns.

Fast Response Time

Raytek infrared temperature sensors reach 95% of the final temperature reading — a common definition of response time — much faster than contact temperature sensors (such as thermocouples). This is particularly important when measuring quickly heated or moving objects. Newer Raytek infrared technology brings sensor response times down to one millisecond.

MI

Signal Processing Needs Vary

Discrete processes, such as parts manufacturing, require instruments with signal processing (e.g., peak or valley hold and averaging). For example, using peak hold when measuring the temperature of discreet items on a conveyor prevents the temperature/sensor from reading the background temperature.

GP Infrared System

Ease of Use

Raytek infrared temperature sensors are easy and intuitive for plant operators to use. Depending on the model, a sensor's output temperature can be seen directly on the unit, on a separate panel display, or on a PC monitor.

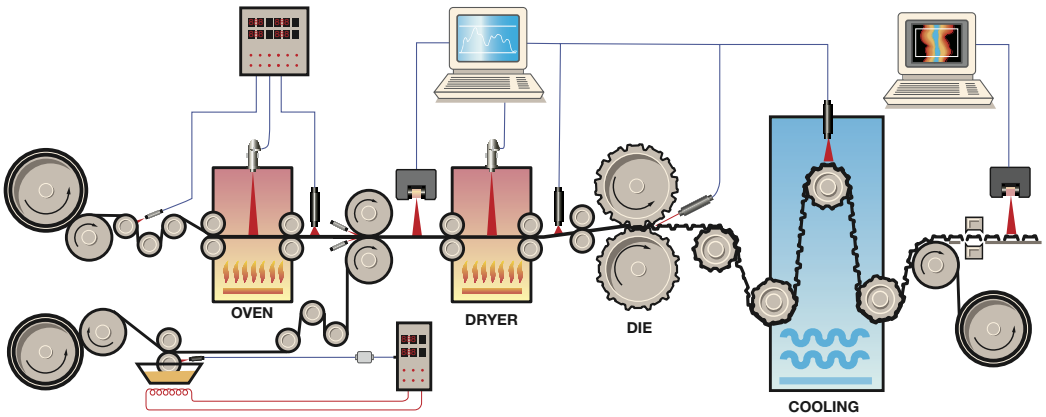
Digital Output

Digital output eases sophisticated temperature variation analysis. DataTemp MultiDrop software allows remote sensor configuration and temperature data acquisition. This data can be exported to other software applications. Temperature information can easily be archived, graphed, or printed to fulfill documentation needs with minimum expense.

Thermojacket

Environmental Considerations

Raytek sensors are specified for performance within certain ambient temperature ranges. Dust, gases, or vapors can cause inaccuracies in measurement or can damage sensor lenses. Electrical noise, electromagnetic fields, and vibration are other conditions to consider before installation begins. A protective housing, air purging, or air or water cooling systems can protect the sensor and ensure accurate measurements. When steam, dust, or other particles degrade the measurement signal, choose a Raytek two-color instrument. Fiber-optic sensors, where the optical head is separated from the sensor electronics with a fiber-optic cable, also provide a solution around electromagnetic fields or other harsh environments.



Raytek sensors measure the temperature of hot, moving, or inaccessible materials safely, accurately, and with repeatability you can count on. As part of a process control loop, a Raytek sensor can help you improve and maintain product quality and provide the data needed to optimize throughput and minimize downtime.

Process Imaging Series

Production Lines, Moving Objects, Discrete Processes, Kilns

MP50

Linescanner provides continuous temperature measurement and imaging of rotating, indexing or web-based processes; System software with OPC interface; Remote Monitoring

Spectral Response	
1.0µm	5.0µm
1.6µm	3-5µm
3.43µm	7.9µm
3.9µm	

Temp. Range

20°C-1200°C (68°F to 2192°F)

Optical Resolution*

up to 100:1 256 points across a 90° or 45° field of view

Accuracy

±2% or ±2°C

Repeatability

±1% or ±1°C

Scan Rate

Up to 48 Hz

Outputs

4-20mA RS-485 Mechanical Relay

Application Specific Systems

Our process imaging systems have been specifically designed for detailed, accurate and reliable monitoring, alarming and control of industrial processes.

CS100—Cement/Lime Kilns
Thermal imaging, analysis, and alarming for continuous monitoring of rotating kiln shells and predictive maintenance of refractory linings.

TIP450—Wallboard
Detailed dryer balance analysis and board mapping improves board quality, production, fuel savings, defect detection, and rework reduction.

TF100—Thermoforming
Thermal imaging and analysis to reduce scrap, improve product quality and operating economy of thermoforming operations.

ES100/EC100—Plastic Extrusion and Coating
Thermal imaging and analysis for real-time defect detection and quality improvement of plastic extrusion, coating, and lamination processes.

GS100—Glass Processing
Thermal imaging and analysis for defect detection and quality improvement for glass annealing/tempering and glass bending processes.

SS100—Synchronized Imaging
Thermal imaging system for continuous hot spot detection on rotating targets like paper machine calendar rolls, tire testing, etc.

Marathon Series

Induction Heating, Heat Treating, Welding, Forging, Casting, Molten Glass, Metal Extrusion, Furnaces, Ovens, Curing Equipment, Plastics Processing

MR	MM	FR	FA
Ratio measurement can be used for targets obscured by dust or steam	High-performance infrared thermometer with video sighting, broad temperature range; high optical resolution; System software	Fiber-optic sensing head brings ratio measurement into the harshest environments	Single color fiber-optic sensing head provides a low-cost solution to the toughest applications
Spectral Response			
1µm Ratio	8-14µm 3.9µm 5µm 1.6µm 1µm	1µm Ratio	1.0µm 1.6µm
Temperature Range			
600°C to 3000°C (1112°F to 5430°F)	-40°C to 3000°C (-40°F to 5430°F)	500°C to 2500°C (932°F to 4532°F)	250°C to 3000°C (482°F to 5430°F)
Optical Resolution*			
Focusable optics, up to 130:1 (95% Energy)	up to 300:1 (90% Energy)	up to 65:1 (95% Energy)	up to 100:1 (95% Energy)
Accuracy			
±0.75% full scale	±0.3% ± 1°C	±0.3% ± 1°C	±0.3% ± 1°C
Repeatability			
±0.3% full scale	±0.1% or ±0.1°C	±1°C	±1°C
Response Time (95%)			
10 mSec	1 mSec**	10 mSec	10 mSec
Outputs			
0/4-20mA RS-485 Mechanical Relay includes Windows® software	0/4-20mA RS-485 Mechanical Relay includes Windows® software	0/4-20mA RS-485 Mechanical Relay includes Windows® software	0/4-20mA RS-485 Mechanical Relay includes Windows® software

*Unless otherwise noted, optical resolution specified at nominal 90% energy. All specifications subject to change without notice. Please contact your local Raytek Representative for the most current information.

Thermalert Series

Heating, Forming, Thermoforming, Calendering, Embossing, Sealing, Converting, Bonding, Plastic Extrusion, Molding Processing

Compact Series

Ovens, Drying, Laminating, Coating, Paint Drying, Curing, Equipment Monitoring, Paving — ideal for OEM applications

3i Series

Metals Production, Glass MFG., Thin Film Plastics, Heat Treatment, Energy Inspection, Power Distribution

TX	CI	MI	GP	3i
Single piece sensor with various temperature ranges for specialized applications	Low cost, single piece stainless steel sensor	Miniature sensing head with setup display, providing many features	1/8th DIN panel meter provides multiple outputs and digital display	Hand held thermometer for specialty applications. Sighting: Single, dual or Crossed Laser, Scope, Scope with Single Laser
Spectral Response		Spectral Response		Spectral Response
8 -14µm 3.9µm 2.2µm 5.0µm 7.9µm	7-18µm	8-14µm	8-14µm	1.0µm 1.6µm 5µm 7.9µm 8-14µm
Temperature Range		Temperature Range		Temperature Range
-18°C to 2000°C (0°F to 3600°F)	0°C to 500°C (32°F to 932°F)	-40°C to 1200°C (-40°F to 2190°F)	-18°C to 538°C (0°F to 1000°F)	-30°C-3000°C (-22°F to 5432°F)
Optical Resolution*		Optical Resolution*		Optical Resolution*
up to 60:1	4:1	10:1	35:1 50:1	25:1 to 180:1
Accuracy		Accuracy		Accuracy
±1% or ±1.4°C	±2% or ±3°C	±1% or ±1°C	±1% or ±1°C	±1%
Repeatability		Repeatability		Repeatability
±0.5% or ±0.7°C	±1% or ±1°C	±0.5% or ±0.5°C	±0.5% or ±1°C	±1°C
Response Time (95%)		Response Time (95%)		Response Time
As fast as 100 mSec	350 mSec	150 mSec	As fast as 500 mSec	550 or 700mSec *Varies by model*
Outputs		Outputs		Data Logging
2-wire 4-20mA optional RS-232	Type J/K thermocouple 0-5V	Type J/K thermocouple 0-5V, 0/4-20mA RS-232 or optional RS-485	Type J/K/E/N/T/R/S thermocouple 0-5V 4-20mA Alarms	100 data points Outputs 1mV/ºC RS232

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Raytek Corporation

At Raytek, our commitment to the customer begins long before there is a sale. It starts with the way we do business.

Our mission is to provide superior infrared temperature measurement solutions — for industrial process applications — for industrial and commercial users around the world. This means offering a variety of innovative, rugged products that meet the diverse needs of a wide range of customers.

To reach our goals, we do more than provide high-quality products. We design cost savings into each of our products so that they are value-priced and fit virtually any budget. We introduce the benefits of infrared technology to new users by continually identifying new markets and applications for our products. By expanding our geographic reach with worldwide subsidiaries and qualified distributors, we ensure that support for our products is local, where our customers need it.

Our vision is global: to bring the benefits of infrared thermometry to every corner of the world. Every day, we discover new industries and applications for our products.

Compact CI		Temperature Range (°C)	Spectral Response
	CIA	0° 115°	7-18
	CIB	100° 500°	7-18
Compact MI			
	LT	-40° 600°	8-14
Compact GP			
	GP	-18° 538°	8-14
Thermalert TX			
	LT	-18° 500°	8-14
	MT	200° 1000°	3.9
	G5	250° 1650°	5.0
	P7	10° 360°	7.9
	HT	500° 2000°	2.2
Marathon			
	MR	600° 3000°	1.0
	FA	250° 3000°	1-1.6
	FR	500° 2500°	1.0
Marathon MM			
	LT	-40° 800°	8-14
	MT	250° 1100°	3.9
	G5L	250° 1650°	5.0
	G5H	450° 2250°	5.0
	2ML	300° 1100°	1.6
	2MH	450° 2250°	1.6
	1ML	450° 1740°	1.0
	1MH	650° 3000°	1.0
Process Imager MP50			
	LT	20° 300°	3-5
	MT	100° 800°	3.9
	G50	100° 600°	5.0
	G51	200° 950°	5.0
	P30	30° 250°	3.43
	P31	100° 350°	3.43
	P7	80° 700°	7.9
	1M	600° 1200°	1.0
	2M	400° 950°	1.6
3i			
	LT/LR	-40° 1200°	8-14
	G5	150° 1800°	1.6
	P7	10° 800°	7.9
	1M	600° 3000°	1.0
	2M	200° 1800°	1.6

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