

## Infrared Sensors

### Raytek® Family

#### Noncontact Temperature Measurement

Watlow offers a wide variety of Raytek® infrared thermometers that monitor and control temperature in various manufacturing processes. These thermometers measure temperature of fast moving processes quickly and efficiently. They measure the temperature of the product directly, instead of the oven or the dryer. This allows you to quickly adjust to process parameters to ensure top product quality.

Infrared thermometers are easily integrated into existing process control systems and have the following benefits:

- Non-destructive: the product is never touched or contaminated
- Fast and reliable: moving objects are measured accurately and quickly
- Flexible: temperature measurements can be made of a large area or a small spot

#### Small Size, Big Features

These products may be compact, but do not compromise on features. Using advanced micro-fabrication techniques, the cost and size of these sensors remain small while retaining sophisticated features such as emissivity, signal conditioning and t-ambient processing. The wide temperature range in each model allows you to detect process variations and monitor start-up performance.

#### Infrared Thermocouples

If you are looking for a low-maintenance solution for infrared thermocouples, consider the MI™ or CI™. The MI™, a two-piece system with miniature sensing head and separate electronics, features adjustable emissivity and selectable peak hold, valley hold and averaging.

The CI™ is a compact, integrated unit with the same output impedance as a thermocouple. It functions accurately—without offset errors—when used in conjunction with the thermocouple break protection circuitry in most controllers, displays and transmitters.

Both the MI™ and CI™ have rugged stainless steel housings to ensure continuous, long-term performance, even in environments with high ambient temperatures.

#### An Affordable Solution for Your Process

The miniature size and low cost of the MI™ (shown above) make it an ideal configuration for installation at multiple points along your process. The sensor is isolated from the electronics box which allows it to withstand ambient temperatures up to 200°C (392°F) with cooling accessories.

Whether you choose a modular system based on the GP™ monitor, or the MI™ or CI™, we have a compact, value-priced infrared thermometer to meet your needs. Cooling jackets, air purge collars and other accessories are available to ensure accurate performance regardless of your environment.



#### Raytek® Service Ensures Long Use

With over 30 years experience, Raytek® knows infrared temperature measurement. Application specialists are available to help answer your technical questions. Each product includes a two year warranty. In addition, maintenance, training, calibration and other customized services are available to ensure that you receive the maximum benefits from your Raytek® infrared, noncontact thermometer.

For more information on Raytek® infrared temperature measurement solutions, contact your Watlow sales agent or applications specialist today.

| Product             | Temperature Range                          | Accuracy  | Signal Processing | Display | Power Supply  | Outputs                              |
|---------------------|--------------------------------------------|-----------|-------------------|---------|---------------|--------------------------------------|
| GP™ Monitor w/ GPR™ | -18 to 540°C<br>(0 to 1000°F)              | 1 percent | Adjustable        | Yes     | 110-220V~(ac) | Thermocouple<br>4-20mA<br>& 2 Alarms |
| GP™ Monitor w/ CI™  | 0 to 500°C<br>(0 to 1000°F)<br>w/ 2 models | 2 percent | Adjustable        | Yes     | 110-220V~(ac) | Thermocouple<br>4-20mA<br>& 2 Alarms |
| MI™                 | -40 to 600°C<br>(-40 to 1112°F)            | 1 percent | Adjustable        | No      | 12-24V=(dc)   | 4-20mA,<br>J or K T/C,<br>or mV      |
| CI™                 | 0 to 500°C<br>(32 to 932°F)<br>w/ 2 models | 2 percent | N/A               | No      | 12-24V=(dc)   | *J or K T/C,<br>or mV                |

\*Must specify at time of order.

Raytek® is a registered trademark of the Raytek Corporation. MiniTemp™, ST ProPlus™, GP™, CI™ and MI™ are trademarks of Raytek Corporation.

# Infrared Sensors

## Raytek® Family

### Product Offering

| Infrared Thermocouples                     | Description                                                                                                             |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Raytek® MI™</b><br><b>RAYMID10LTCB3</b> | MI electronics and sensing head with 10:1 optics and 9.8 ft (3 m) cable                                                 |
| RAYMID10LTCB8                              | MI electronics and sensing head with 10:1 optics and 26 ft (8 m) cable                                                  |
| <b>XXXMIACAB</b>                           | Adjustable bracket for MID                                                                                              |
| <b>XXXMIACAJ</b>                           | MI air purge jacket (no cooling)                                                                                        |
| XXXMIACCJ                                  | MI air cooling and purging system with 2.8 ft (0.8 m) insulated air hose                                                |
| <b>XXXMIACCJ1</b>                          | MI air cooling and purging system with 9.2 ft (2.8 m) insulated air hose                                                |
| <b>XXXMIACFB</b>                           | MI sensor head fixed mounting bracket                                                                                   |
| <b>XXXMIACMN</b>                           | MI sensor head mounting nuts (5)                                                                                        |
| <b>Raytek® CI™</b><br><b>RAYCI1A</b>       | Type J output sensing head w/1 m cable, ± 3°C accuracy 0 to 115°C (± 5.4°F, 32 to 240°F)                                |
| <b>RAYCI1A10L</b>                          | Type J output sensing head w/3 m cable (MAX 105°C, 220°F), ± 3°C accuracy 0 to 115°C (± 5.4°F, 32 to 240°F)             |
| <b>RAYCI1B</b>                             | Type J output sensing head w/1m cable, ± 3°C accuracy 100 to 500°C (± 5.4°F, 202 to 932°F)                              |
| <b>RAYCI1B10H</b>                          | Type J output sensing head w/3m high temp cable (MAX 260°C, 500°F), ± 3°C accuracy 100 to 500°C (± 5.4°F, 202 to 932°F) |
| <b>RAYCI1B10L</b>                          | Type J output sensing head w/3m cable (MAX 105°C, 220°F), ± 3°C accuracy 100 to 500°C (± 5.4°F, 202 to 932°F)           |
| RAYCI2A                                    | Type K output sensing head w/1m cable, ± 3°C accuracy 0 to 115°C (± 5.4°F, 32 to 240°F)                                 |
| RAYCI2A10L                                 | Type K output sensing head w/3m cable (MAX 105°C, 220°F), ± 3°C accuracy 0 to 115°C (± 5.4 F, 32 to 240°F)              |
| RAYCI2B                                    | Type K output sensing head w/1m cable, ± 3°C accuracy 100 to 500°C (± 5.4°F, 202 to 932°F)                              |
| RAYCI3A10L                                 | Linear voltage output sensing head w/3m cable (MAX 105°C, 220°F), ± 3°C accuracy 0 to 115°C (± 5.4°F, 32 to 240°F)      |
| <b>XXXCIACAP</b>                           | Air purge collar for CI                                                                                                 |
| <b>XXXCIACFB</b>                           | Fixed bracket for CI                                                                                                    |
| <b>XXXCIACMN</b>                           | Mounting nuts (2) for CI                                                                                                |
| <b>XXXCIADJB</b>                           | Adjustable bracket for CI                                                                                               |
| XXXCIAP                                    | Air purge collar (aluminum) for CI                                                                                      |
| <b>XXXCIDCPS</b>                           | 24V=(dc), 125mA switching power supply (110/220V input)                                                                 |
| Temperature Monitoring System              | Description                                                                                                             |
| <b>Raytek® GP™</b><br>RAYGPC               | GPC panel-mount meter with standard 5V=(dc) alarm outputs, 110/220V~(ac) power input                                    |
| RAYGPRSF                                   | GPR standard focus sensing head with 8-14 micron spectral response and 35:1 optical resolution                          |
| XXXGPACFB                                  | GPC mounting bracket for sub-panel mounting of monitor                                                                  |
| XXXGPRCB15                                 | 50 ft (15 m) 5 conductor cable with 5-pin bayonet connector                                                             |
| Hand Held IR Thermometers                  | Description                                                                                                             |
| <b>MiniTemp™</b><br><b>RAYMT4U</b>         | Enhanced MiniTemp MT4 model with class 2 laser sighting                                                                 |
| <b>RAYMTAPK</b>                            | Nylon carrying pouch with belt clip                                                                                     |
| <b>ST™ Pro</b><br>RAYST20XBUS              | ST 20 Pro™ eXtra-Bright                                                                                                 |
| <b>ST™ ProPlus</b><br>RAYST60XBUS          | ST 60 ProPlus™ eXtra-Bright                                                                                             |
| RAYST80XBUS                                | ST 80 ProPlus™ eXtra-Bright                                                                                             |
| RAYST80XBUS-IS                             | ST 80 ProPlus™ eXtra-Bright intrinsically safe                                                                          |

Items in **bolded green** type are stocked for immediate availability.

## Hand Held MiniTemp™

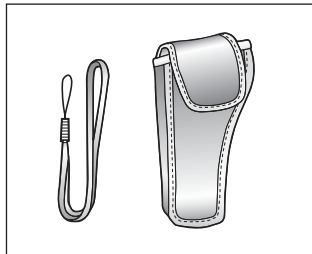
The Raytek® MiniTemp™ is pocket-sized and easy to use—just point, shoot and read the temperature on the large backlit display. When you need a fast, easy and safe way to measure surface temperature, you need a MiniTemp™ noncontact thermometer. Use MiniTemp™ at work, at home, anywhere.

### Choice of Models

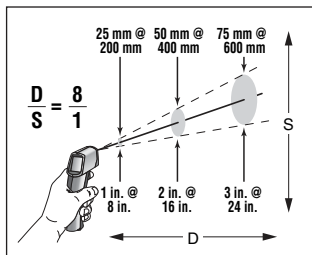
Choose between MiniTemp™ MT2, no laser sighting, or MiniTemp™ MT4, with laser sighting. Both models are powered by a 9V battery and display temperatures in either °C or °F. An accessory pack including a pouch and wrist strap is also available.

- Blown film extrusion
- Cast film extrusion
- Originally oriented film extrusion
- Sheet extrusion
- Extrusion coating
- Laminating and bossing
- Thermoforming

### Soft Pouch with Wrist Strap



### Target Spot Sizes



D:S = 8:1 at focal point



|                                          |                                                                                                           |          |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------|
| <b>Temperature range</b>                 | -18 to 275°C (0 to 525°F)                                                                                 |          |
| <b>Accuracy</b>                          | -1 to 275°C (30 to 525°F) ±2% or ±2°C (±3.5°F), whichever is greater, -18 to -1°C (0 to 30°F) ±3°C (±5°F) |          |
| <b>Repeatability</b>                     | ±2% of reading or ±2°C (±3°F), whichever is greater                                                       |          |
| <b>Response time</b>                     | 500mSec, 95% response                                                                                     |          |
| <b>Spectral response</b>                 | 7-18 μm                                                                                                   |          |
| <b>Emissivity*</b>                       | Pre-set 0.95                                                                                              |          |
| <b>Ambient operating range</b>           | 0 to 50°C (32 to 120°F)                                                                                   |          |
| <b>Relative humidity</b>                 | 10-95% RH non-condensing, @ up to 30°C (86°F)                                                             |          |
| <b>Storage temperature</b>               | -20 to 65°C (-4° to 150°F) without battery                                                                |          |
| <b>Weight/dimensions</b>                 | 0.5 lb (227g); 6 X 4 X 1.5 in. (152 X 101 X 38 mm)                                                        |          |
| <b>Power</b>                             | 9V Alkaline or NiCd battery (included)                                                                    |          |
| <b>Battery life (Alkaline)</b>           | 22 hours                                                                                                  | 12 hours |
| <b>Laser Class II</b>                    | —                                                                                                         | √        |
| <b>Distance to spot size</b>             | 8 : 1                                                                                                     |          |
| <b>Typical distance to target (spot)</b> | Up to 4 ft (1.5 m)                                                                                        |          |
| <b>Display hold (7 seconds)</b>          | √                                                                                                         | √        |
| <b>LCD backlight</b>                     | √                                                                                                         | √        |
| <b>Temperature display</b>               | °C or °F selectable                                                                                       |          |
| <b>Display resolution</b>                | 0.2°C (0.5°F)                                                                                             |          |
| <b>Options/accessories</b>               | Nylon holster                                                                                             |          |
| <b>Warranty</b>                          | 1 year**                                                                                                  |          |

\*\*U.S. only. Warranty duration may vary by country.

## Infrared Sensors

### Hand Held

#### ST Pro™ 20 XB

Choose the ST Pro™ XB when you need a dependable professional tool for day-to-day applications. You won't find other noncontact thermometers with the temperature range, ability to measure so small an area and comparable laser sighting at this price. Simply point, shoot and read.

With a wide temperature range, MAX temperature display and choice of laser sighting options, the ST Pro™ makes temperature measurement a breeze. The ST20XB features rugged rubber overmolding and the ability to be tripod mounted.

Choose the infrared noncontact thermometer that millions of professionals use worldwide. Call today and discover the advantage—fast, easy and safe temperature measurement backed by over 40 years of experience.



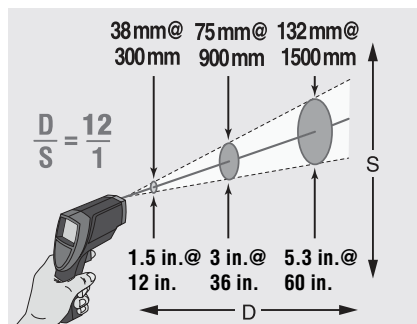
**Raytek® Infrared Noncontact Thermometers are the professional's choice for:**

- Blown film extrusion
- Cast film extrusion
- Originally oriented film extrusion
- Sheet extrusion
- Extrusion coating
- Laminating and bossing
- Thermoforming
- Hazardous locations (ST80-IS)

## Infrared Sensors

### Hand Held

#### ST Pro™ 20 XB



ST20XB Target Spot Sizes  
D:S = 12:1 at Focus Point

### Specifications

| Models                                                                    | ST20 XB                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Temperature range</b>                                                  | -32 to 535°C (-25 to 999°F)                                                                                                                                                                                                                            |
| <b>Accuracy</b><br>(Assumes ambient operating temperature of 23°C (73°F)) | -32 to 26°C (-25 to -15°F): ±3°C (±5°F)<br>-26 to -18°C (-15 to 0°F): ±2.5°C (±4°F)<br>-18 to 23°C (0 to 73°F): ±2°C (±3°F)<br>23 to 510°C (73 to 950°F): ±1% of reading or ±1°C (±2°F), whichever is greater<br>Above 510°C (950°F): ±1.5% of reading |
| <b>Repeatability</b>                                                      | ±0.5% or ≤ ±1°C (±2°F), whichever is greater                                                                                                                                                                                                           |
| <b>Response time</b>                                                      | ≤ 0.5 second (95% of reading)                                                                                                                                                                                                                          |
| <b>Spectral response</b>                                                  | 8-14 μm                                                                                                                                                                                                                                                |
| <b>Emissivity*</b>                                                        | Pre-set at 0.95                                                                                                                                                                                                                                        |
| <b>Ambient operating temp.</b>                                            | 0 to 50°C (32 to 120°F)                                                                                                                                                                                                                                |
| <b>Relative humidity</b>                                                  | 10-90% RH non-condensing at <30°C (86°F) ambient                                                                                                                                                                                                       |
| <b>Storage temperature</b>                                                | -20 to 60°C (-13 to 158°F) without battery                                                                                                                                                                                                             |
| <b>Weight/dimensions</b>                                                  | 11 oz (320 g), 8 X 6 X 2 in.<br>(200 X 160 X 55 mm)                                                                                                                                                                                                    |
| <b>Power</b>                                                              | 9V Alkaline or NiCd battery                                                                                                                                                                                                                            |
| <b>Battery life (Alkaline)</b>                                            | 10 hours w/laser & backlight on<br>20 hours w/laser & backlight off                                                                                                                                                                                    |
| <b>Laser (class II)</b>                                                   | Offset single point laser point XB                                                                                                                                                                                                                     |
| <b>Typical distance to target</b>                                         | Up to 6 ft (2 m)                                                                                                                                                                                                                                       |
| <b>Distance to spot (D:S)</b>                                             | 12:1 at focus point                                                                                                                                                                                                                                    |
| <b>MAX temp display</b>                                                   | √                                                                                                                                                                                                                                                      |
| <b>Display hold (7 seconds)</b>                                           | √                                                                                                                                                                                                                                                      |
| <b>LCD backlit</b>                                                        | √                                                                                                                                                                                                                                                      |
| <b>Temperature display</b>                                                | °C or °F selectable                                                                                                                                                                                                                                    |
| <b>Display resolution</b>                                                 | 0.2°C (0.5°F)                                                                                                                                                                                                                                          |
| <b>Hard carrying case</b>                                                 | √                                                                                                                                                                                                                                                      |
| <b>Tripod mounting</b>                                                    | √                                                                                                                                                                                                                                                      |
| <b>Warranty*</b>                                                          | 1 year                                                                                                                                                                                                                                                 |
| <b>Additional options/accessories</b>                                     | Nylon holster<br>NIST/DKD traceable calibration certificate (includes one year warranty)                                                                                                                                                               |

\*U.S. only. Warranty duration may vary by country.

## Infrared Sensors

### Hand Held

#### ST ProPlus™ 60/80 XB

When you need more features and higher specifications, choose the ProPlus™ for your most demanding applications. Advanced infrared technology for reading higher temperatures and powerful optics for measuring smaller areas (or from farther back), make the ProPlus™ the professional's choice for noncontact temperature measurement. Whether you choose the ST60 or the ST80, gathering temperature data has never been easier. Simply point, shoot and read.

Innovative features like extra bright laser sighting, adjustable emissivity, a wide temperature range and 12 point data logging, make any temperature measurement application a snap. This rugged unit with rubber overmolding also includes a jack for the optional Raytek® ST RTD temperature probe, and can be tripod mounted for hands-free operation. The ST80 is also available in a model rated "Intrinsically Safe" by Factory Mutual Research for use in hazardous locations.



#### **Raytek® Infrared Noncontact Thermometers are the professional's choice for:**

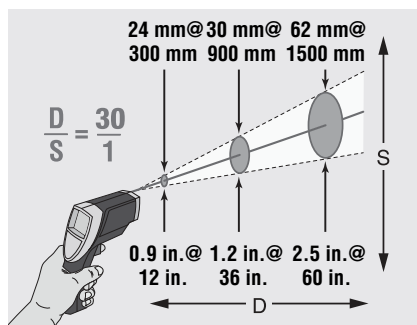
- Blown film extrusion
- Cast film extrusion
- Originally oriented film extrusion
- Sheet extrusion
- Extrusion coating
- Laminating and bossing
- Thermoforming
- Hazardous locations (ST80-IS)

#### **Options/Accessories**

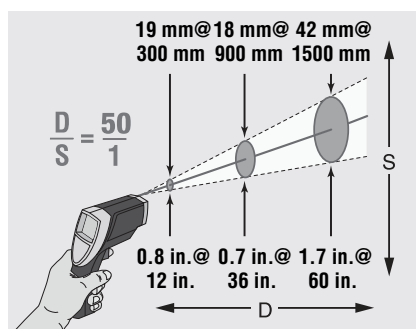
- RTD temperature probe
- Nylon holster
- NIST traceable calibration certificate
- Factory Mutual Research Intrinsically Safe Rated ST80-IS, including probe (Intrinsically Safe, Class 1 Division 1 Groups A,B,C,D Class I, Zone 0, AEx ia IIC, T4 at 50°C (122°F) when used with 9V alkaline battery)

## Hand Held

### ST ProPlus™ 60/80 XB



**ST60 ProPlus™ Target Spot Sizes**  
D:S = 30:1 at Focus Point



**ST80 ProPlus™ Target Spot Sizes**  
D:S = 50:1 at Focus Point

| Models                                                                    | ST60 XB                                                                                                                                                                                                           | ST80 XB / ST80 XB-IS*           |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Temperature range</b>                                                  | -32 to 600°C<br>(-25 to 1100°F)                                                                                                                                                                                   | -32 to 760°C<br>(-25 to 1400°F) |
| <b>Accuracy</b><br>(Assumes ambient operating temperature of 23°C (73°F)) | -32 to 26°C (-25 to -15°F): ±3°C (±5°F)<br>-26 to -18°C (-15 to 0°F): ±2.5°C (±4°F)<br>-18 to 23°C (0 to 73°F): ±2°C (±3°F)<br>For targets above 23°C (73°F): ±1% of reading or ±1°C (±2°F), whichever is greater |                                 |
| <b>Repeatability</b>                                                      | ±0.5% or ≤ ±1°C (±2°F), whichever is greater                                                                                                                                                                      |                                 |
| <b>Response time</b>                                                      | ≤ 0.5 second (95% of reading)                                                                                                                                                                                     |                                 |
| <b>Spectral response</b>                                                  | 8-14 μm                                                                                                                                                                                                           |                                 |
| <b>Emissivity**</b>                                                       | Digitally adjustable emissivity (from 0.1 to 1.0 by 0.01)                                                                                                                                                         |                                 |
| <b>Ambient operating temp.</b>                                            | 0 to 50°C (32 to 120°F)                                                                                                                                                                                           |                                 |
| <b>Relative humidity</b>                                                  | 10-90% RH non-condensing, at <30°C (86°F) ambient                                                                                                                                                                 |                                 |
| <b>Storage temperature</b>                                                | -20 to 60°C (-13° to 158°F) without battery                                                                                                                                                                       |                                 |
| <b>Weight/dimensions</b>                                                  | 11 oz (320 g); 8 X 6 X 2 in. (200 X 160 X 55 mm)                                                                                                                                                                  |                                 |
| <b>Power</b>                                                              | 9V Alkaline or NiCd battery                                                                                                                                                                                       |                                 |
| <b>Battery life (Alkaline)</b>                                            | 20 hours w/laser & backlight on 50%<br>40 hours w/laser & backlight off                                                                                                                                           |                                 |
| <b>Laser sighting (class II)</b>                                          | Extra bright laser point                                                                                                                                                                                          |                                 |
| <b>Typical distance to target</b>                                         | 15 ft (5 m)                                                                                                                                                                                                       | 25 ft (8 m)                     |
| <b>Distance to spot (D:S)</b>                                             | 30:1 at focus point                                                                                                                                                                                               | 50:1 at focus point             |
| <b>MIN, MAX, AVG, DIF temp display</b>                                    | √                                                                                                                                                                                                                 |                                 |
| <b>Data logging</b>                                                       | 12 points                                                                                                                                                                                                         |                                 |
| <b>Probe jack</b>                                                         | √                                                                                                                                                                                                                 |                                 |
| <b>Display hold (7 seconds)</b>                                           | √                                                                                                                                                                                                                 |                                 |
| <b>Hi/Low alarm</b>                                                       | √                                                                                                                                                                                                                 |                                 |
| <b>LCD backlit</b>                                                        | √                                                                                                                                                                                                                 |                                 |
| <b>Temperature display</b>                                                | °C or °F selectable                                                                                                                                                                                               |                                 |
| <b>Display resolution</b>                                                 | 0.1°C (0.1°F)                                                                                                                                                                                                     |                                 |
| <b>Hard carrying case</b>                                                 | √                                                                                                                                                                                                                 |                                 |
| <b>Locking trigger</b>                                                    | √                                                                                                                                                                                                                 |                                 |
| <b>Tripod mounting</b>                                                    | 0.25 in. (6.35 mm) 20 UNC threading                                                                                                                                                                               |                                 |

\*Approved by Factory Mutual Research for use in hazardous locations.

## Infrared Sensors

### Fixed Mount

#### Raytek® GP™ Sensor

The GP™ sensor is a versatile, two-piece temperature monitoring system which combines a compact, value-priced monitor with an infrared sensing head. The heart of the system is the ½ DIN GP™ monitor which provides advanced infrared processing capabilities including peak and valley hold, averaging and a user-adjustable offset. The rugged GPR sensor is available with standard- or close-focus optics and provides target temperature readings with one percent accuracy.

Along with its large four-digit LED display, the monitor provides a user-defined 4-20mA or thermocouple output. Two adjustable set points/deadbands control 5V alarm outputs or optional 3A mechanical relays. The GP monitor accepts universal 110-220V~(ac) power and provides a 24V=dc/50mA excitation voltage for loop power to external sensors. All monitor functions are configured via the front panel, including °C/°F switching.

The GP™ monitor provides adjustable emissivity when used with the GPR™ infrared sensor. This high performance, eight to 14 micron infrared sensor with detachable cable combines current loop driven signals with 35:1 optics.

The GP™ monitor also works with other Raytek® infrared sensors, including the CI™ and MID™.



#### Highlights

- Temperature range from -18 to 538°C (0 to 1000°F)
- Compact ½ DIN digital monitor with large four-digit display
- Monitor and sensor functions configured on front panel
- Signal processing capabilities typically found on much larger systems
- Adjustable emissivity
- Universal 110-220V~(ac) power
- User-defined 4-20mA or thermocouple output (J,K,E,N,R,S,T)
- Adjustable dual set points and deadband alarm outputs
- Choice of sensing head to match application requirements

- Standard- and close-focus optics available
- Accessories for cooling and air purging
- Field interchangeable sensing heads

#### Accessories/Options:

- Cooling housings for high ambient conditions
- Air purge fittings for sensing heads
- Adjustable mounting brackets and adapters
- External isolated solid state relays for alarm outputs (10 Amp AC)
- 3A mechanical output relays

## Infrared Sensors

### Fixed Mount

#### Raytek® GP™ Sensor

#### Measurement Specifications (Monitor with Sensing Head)

| Model                      | GPR                                                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature range          | -18 to 538°C<br>(0 to 1000°F)                                                                                                                                                              |
| Accuracy (mA output)       | ±1% of measured value or ±1°C (±2°F),<br>whichever is greater, @ 23°C ±5°C (73°F ±9°F)                                                                                                     |
| Repeatability              | ±0.5% of measured value or<br>±1°C (2°F), whichever is greater                                                                                                                             |
| Response time (95 percent) | 700mSec                                                                                                                                                                                    |
| Spectral response          | 8-14 μm                                                                                                                                                                                    |
| Emissivity                 | 0.1 to 1.09 digitally adjustable increments of 0.01                                                                                                                                        |
| Signal processing          | Peak/valley hold (up to 998 sec, 999=infinite<br>hold with external reset) Variable averaging<br>filter (up to 60 seconds) T-ambient: fixed<br>background ambient temperature compensation |

#### GPR Electrical Specifications

|              |                                                                                                                                                                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outputs      | 4-digit, 7 segment LED display, °C/°F selectable.<br>User configurable 4-20mA current or<br>thermocouple output (J, K, E, N, R, S, T).<br>Two adjustable set points with deadbands<br>controlling +5V alarm outputs or optional 3A<br>mechanical relay |
| Power supply | 110/220V~(ac), ±20 percent, 50-60Hz.<br>User configurable inputs for GPR, GPM, any<br>0.5V or 4-20mA sensor or thermocouple<br>(J, K, E, N, R, S, T).<br>External reset input to reset peak/valley hold<br>24V=(dc)/50mA excitation voltage            |

#### General Specifications

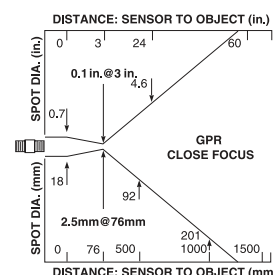
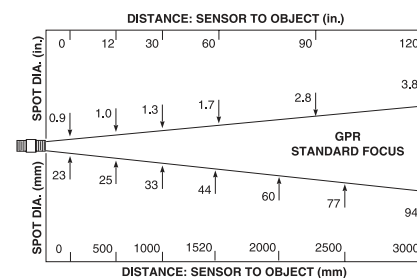
|                           |                                                               |                                                                                |
|---------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------|
| Environmental rating      | GP monitor front panel<br>GPR sensing head                    | IP 54 (IEC 529); NEMA-12<br>IP 65 (IEC 529); NEMA-4*                           |
| Ambient temperature range | GP monitor<br>GPR sensing head<br>with optional water cooling | 0 to 50°C (32 to 120°F)<br>0 to 65°C (32 to 150°F)<br>0 to 177°C (32 to 350°F) |
| Storage temperature       |                                                               | -30 to 65°C (-22 to 150°F)                                                     |
| Relative humidity         |                                                               | 10 to 95% non-condensing                                                       |
| GP monitor dimensions     |                                                               | 1.75 X 3.63 X 4.75 in. (¼ DIN X 120 mm)                                        |
| GP monitor weight         |                                                               | 0.7 lbs (320 g)                                                                |

\*GPR rated with adapter and compression fitting.

#### Sensing Head — Optical Specifications

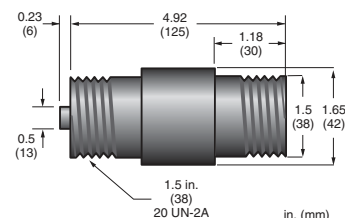
(Note: nominal spot size based on 90 percent energy)

#### GPR Sensing Head Optical Charts



#### Dimensions

#### GPR Sensing Head



## Infrared Sensors

### Fixed Mount

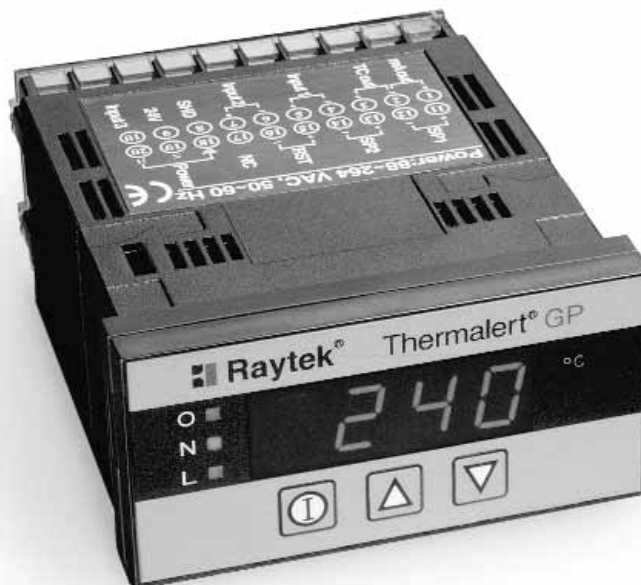
#### Raytek® GP™ Monitor

The GP™ monitor provides a compact, easy-to-use interface and display for process instruments. This low-cost ½ DIN digital panel meter comes standard with features which are optional on other panel meters in this price range. The GP™ monitor accepts inputs from any 0-5V sensor, 4-20mA sensor or thermocouple type J,K,E,N,R,S,T. In addition, the monitor can be used with many Raytek® noncontact, infrared temperature sensors.

Along with its large four-digit LED display, the monitor provides a user-defined 4-20mA or thermocouple output. Two adjustable set points/deadbands control 5V alarm outputs or optional 3A mechanical relays. The GP™ monitor accepts 110-220V~(ac) power and provides a 24V=(dc)/50 mA excitation voltage, capable of providing loop power to external sensors.

For signal processing requirements, the monitor provides peak hold, valley hold and averaging and a user adjustable offset. Best of all, there are no internal jumpers used for setup, as all monitor functions are configured via the front panel.

Versatile. Compact. Value-priced. All reasons to standardize on the GP™ monitor for your process monitoring requirements.



#### Highlights

- Accepts any 0-5V or 4-20mA sensor input
- Accepts Type J, K, E, N, R, S, T thermocouple inputs
- Compact ½ DIN monitor
- Large four-digit LED display
- Universal 110/220V~(ac) power
- Provides 24V=(dc) / 50mA excitation voltage
- User defined 4-20mA or thermocouple output (J,K,E,N,R,S,T)
- Adjustable dual set points and deadband controlling alarm outputs
- Signal processing: peak hold, valley hold, averaging
- User adjustable offset
- External reset input

## Infrared Sensors

### Fixed Mount

#### Raytek® GP™ Monitor

##### Measurement Specifications

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Resolution and accuracy</b>    | 0-5V input resolution 1 mV, accuracy @ $\pm 2$ mV.<br>4-20mA input resolution 0.01mA, accuracy @ $\pm 0.02$ mA. J, K, E, N, T thermocouple input, $\pm 0.05$ percent or $\pm 2^{\circ}\text{C}$ , whichever is greater. R,S thermocouple input, $\pm 0.5$ percent or $\pm 3^{\circ}\text{C}$ , whichever is greater. 4-20mA output resolution 0.014mA accuracy @ $\pm 0.02$ mA. J, K, E, N, T thermocouple output, $\pm 0.05$ percent or $\pm 2^{\circ}\text{C}$ , whichever is greater. R,S thermocouple output, $\pm 0.5$ percent or $\pm 4^{\circ}\text{C}$ , whichever is greater. |
| <b>Repeatability</b>              | $\pm 0.5\%$ of measured value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Response time (95 percent)</b> | 500mSec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Warmup time</b>                | 5 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Signal Processing</b>          | Peak hold, valley hold (up to 998 sec, 999=infinite hold with external reset).<br>Variable averaging filter (up to 60 seconds)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

##### Electrical Specifications

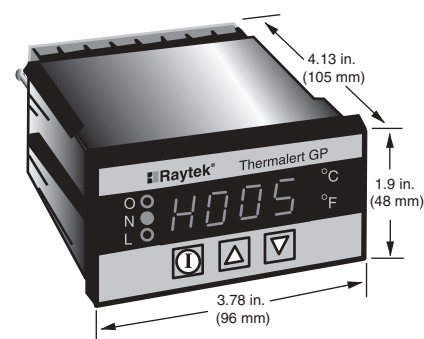
|                           |                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Inputs</b>             | User-configurable inputs for 0-5 V or 4-20mA or J, K, E, N, R, S thermocouple. External reset input to reset peak/valley hold circuit.                                                                                                                                                                                                       |
| <b>Outputs selectable</b> | 4-digit, 7 segment LED display, $^{\circ}\text{C}/^{\circ}\text{F}$ .<br>User-configurable 4-20mA current or thermocouple output (J, K, E, N, R, S, T).<br>Two adjustable set points with deadbands controlling +5V alarm outputs or optional 3A mechanical relays. 24V $\approx$ (dc)/50mA excitation voltage for powering external sensors |
| <b>Power supply</b>       | 110/220V $\sim$ (ac), $\pm 20$ percent, 50-60Hz                                                                                                                                                                                                                                                                                              |

##### General Specifications

|                                  |                                                                  |
|----------------------------------|------------------------------------------------------------------|
| <b>Environmental rating</b>      | GP front panel IP54 (IEC 529); NEMA-12                           |
| <b>Ambient temperature range</b> | 0 to $50^{\circ}\text{C}$ (32 to $120^{\circ}\text{F}$ )         |
| <b>Storage temperature</b>       | $-30$ to $65^{\circ}\text{C}$ ( $-22$ to $150^{\circ}\text{F}$ ) |
| <b>GP monitor dimensions</b>     | 1.75 X 3.63 X 4.75 in. ( $\frac{1}{8}$ DIN X 120 mm)             |
| <b>GP monitor weight</b>         | 0.7 lbs (320 g)                                                  |

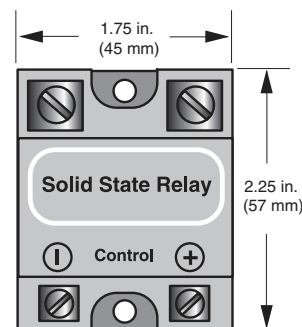
##### General Dimensions

Panel cut-out: 1.75 in. x 3.63 in.  
(92 mm x 44 mm)



##### Accessory — Solid State Relay

External isolated solid state relays for alarm outputs (10 amp AC)



## Infrared Sensors

### Fixed Mount

#### Raytek® MI™ Temperature Measurement System

The MI™ product is a two-piece infrared temperature measurement system with miniature sensing head and separate electronics. The sensor is small enough to be installed just about anywhere, yet performs as well as much larger systems. The MI™ electronics include a host of signal processing features which you won't normally find in systems in this price range, including emissivity, peak hold, valley hold and averaging, all of which are adjustable on the five-digit LCD interface.

Designed for applications where the target temperature is in the -40 to 600°C (-40 to 1112°F) range, the sensor is housed in a rugged stainless steel enclosure to ensure long term performance, even in harsh industrial environments with ambient temperatures up to 85°C (185°F) without cooling.

Although the MI™ system is small in size, it still has the features you need, with one percent accuracy and 10:1 optics, with user selectable output signals. And the MI's™ response time is as fast or faster than many high-end systems.

The MI's™ system's miniature size and low cost make it ideal for installation at multiple points along your process. Accurate. Easy to install. Affordable. With the MI™ system, precision infrared temperature measurement is now an economical alternative.



#### Highlights

- Small sensing head fits where other sensors cannot
- Ambient operating range to 85°C (185°F) without cooling
- Five-digit backlit LCD interface
- Adjustable emissivity, peak hold, valley hold and averaging
- One percent accuracy from -40 to 600°C (-40 to 1112°F)
- 10:1 optics
- Powered by 12-24V $\overline{\text{dc}}$  at 100 mA
- Accessories for cooling and air purging
- Remote electronics box
- User selectable output signals
- Optional RS232 or RS485 communication

# Infrared Sensors

## Fixed Mount

### Raytek® MI™ Sensor

#### Measurement Specifications

|                                |                                                                                                                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Temperature range</b>       | -40 to 600°C (-40 to 1112°F); -25 to 600°C for J thermocouple output                                                                                                             |
| <b>Accuracy</b>                | ±1% of reading or ±1°C (±2°F), whichever is greater @ 23°C ±5°C (73°F ±9°F). Thermocouple output accuracy ±1% of reading or ±2.5°C, whichever is greater @ 23°C ±5°C (73°F ±9°F) |
| <b>Spectral response</b>       | 8 to 14 microns                                                                                                                                                                  |
| <b>Optical resolution</b>      | 10:1                                                                                                                                                                             |
| <b>Repeatability</b>           | ±0.5% of reading or ±0.5°C (1°F), whichever is greater                                                                                                                           |
| <b>Temperature coefficient</b> | 0.15K per K or 0.15% per K, whichever is greater                                                                                                                                 |
| <b>Temperature resolution</b>  | 0.3°C (0.5°F)                                                                                                                                                                    |
| <b>Response time</b>           | 150ms (95%)                                                                                                                                                                      |
| <b>Emissivity</b>              | 0.100 to 1.100 digitally adjustable increments of 0.001                                                                                                                          |
| <b>Transmission</b>            | 0.100 to 1.100 digitally adjustable increments of 0.001                                                                                                                          |
| <b>Signal processing</b>       | Peak hold, valley hold, variable averaging filter, adjustable up to 998 seconds                                                                                                  |

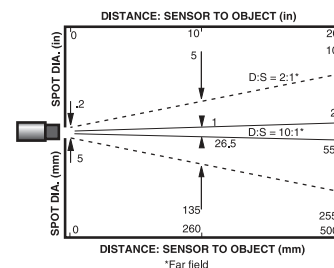
#### Electrical Specifications

|                                           |                                                                                 |
|-------------------------------------------|---------------------------------------------------------------------------------|
| <b>Outputs</b>                            | Scalable 4-20mA, 0-20mA, 0-5V, J or K thermocouple, 10mV/°C head ambient signal |
| <b>Cable length</b>                       | 3.2 ft (1 m) standard, 9.8 ft (3 m) optional                                    |
| <b>Output impedance (T/C output)</b>      | 20 ohm                                                                          |
| <b>Minimum lead impedance (mV output)</b> | 100K ohms                                                                       |
| <b>Maximum loop impedance (mA output)</b> | 500 ohms with 24V=(dc) power supply                                             |
| <b>Current draw</b>                       | 100mA                                                                           |
| <b>Power supply</b>                       | 11-26V=(dc)                                                                     |

#### General Specifications

|                                  |                           |
|----------------------------------|---------------------------|
| <b>Environmental rating</b>      | NEMA-4 (IP 65)            |
| <b>Ambient temperature range</b> |                           |
| Sensing head                     | 0 to 85°C (32 to 185°F)   |
| With air cooling                 | -18 to 200°C (0 to 392°F) |
| Electronics housing              | 0 to 65°C (32 to 150)     |
| <b>Storage temperature</b>       | -18 to 85°C (0 to 185°F)  |
| <b>Relative humidity</b>         | 10 to 95% non-condensing  |
| <b>Construction</b>              |                           |
| Sensing head                     | Stainless steel           |
| Electronics housing              | Zinc, die-cast            |
| <b>Weight</b>                    |                           |
| Sensing head (w/1 m cable)       | 1.75 oz (50 g)            |
| Electronics housing              | 9.5 oz (270 g)            |

#### Nominal Optical Specifications



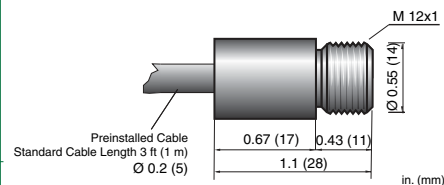
D:S is the optical resolution expressed as a ratio of the distance to the resolution spot divided by the diameter of the spot.

Optical resolution for the MID is 2:1 and 10:1.

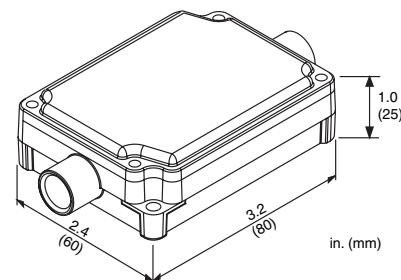
Nominal spot size based on 90 percent energy.

#### General Specifications

##### Sensing Head



##### Electronics Housing



#### Accessories/Options\*

Each standard MID package includes a sensing head, one mounting nut, 3.2 ft (1 m) of cable, die-cast housing with premounted electronics, and an operator's manual.

- Adjustable or fixed mounting bracket
- Air purge jacket
- Air cooling/purging system
- Longer cable: 9.8 ft (3 m)\*
- RS232 or RS485 communication\*

\*Must be specified at time of order

# Infrared Sensors

## Fixed Mount

### Raytek® CI™ Sensor

The CI™ sensor provides the advantages of infrared temperature measurement in a compact, low cost integrated sensor. Designed for easy integration into a standard four-wire system, the CI™ sensor can easily replace traditional contact probes with a Type J or Type K thermocouple output, or with a 0-5 volt output if your application is susceptible to noise or requires a longer cable run.

The CI™ sensor is designed to measure target temperatures ranging from 0 to 500°C (32 to 932°F). The CI's™ onboard electronics are protected by a rugged IP 65 (NEMA-4) stainless steel housing and the sensor can function in ambient temperatures to 70°C (160°F) without cooling. With water cooling, the CI™ sensor can withstand ambient temperatures to 260°C (500°F).

Because the CI™ sensor has the same 50 ohm output impedance as a thermocouple, it functions accurately—without offset errors—when used in conjunction with the thermocouple break protection circuitry in most controllers, displays, and transmitters.

Compact. Easy to install. Affordable. The CI™ sensor is ideal for both OEM and end-user applications.



#### Highlights

- Type J or K, or 0-5V output
- Two models cover temperature ranges from 0 to 500°C (32 to 932°F)
- IP 65 (NEMA-4) stainless steel electronics housing
- 4:1 optics at 90 percent energy
- 350 mSec (95 percent) response time
- Powered by 12-24V $\overline{\text{dc}}$  at 20mA
- Accessories for cooling and air purging

## Infrared Sensors

### Fixed Mount

#### Raytek® CI™ Sensor

##### Models and Temperature Ranges

| Models   | CI1                                                                                                                                              | CI2                 | CI3                                            |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------|
| Output   | Type J thermocouple                                                                                                                              | Type K thermocouple | 10 mV/°C linear voltage, scaled 0-5V (0-500°C) |
| Range A  | 0 to 350°C (32 to 662°F)                                                                                                                         |                     |                                                |
| Range B  | 30 to 500°C (86 to 932°F)                                                                                                                        |                     |                                                |
| Accuracy | ±2% or ±3°C (±6°F), whichever is greater, btw 0 to 115°C (32 to 240°F); ±5% or ±6°C (±10°F), whichever is greater, btw 30 to 100°C (86 to 212°F) |                     |                                                |

##### Measurement Specifications

|                        |                                                           |
|------------------------|-----------------------------------------------------------|
| Spectral response      | 7 to 18 microns                                           |
| System repeatability   | ±1% of measured value or ±1°C (2°F), whichever is greater |
| Temperature resolution | <0.5°C (1°F)                                              |
| Response time (95%)    | 350mSec                                                   |
| Emissivity             | Fixed at 0.95                                             |

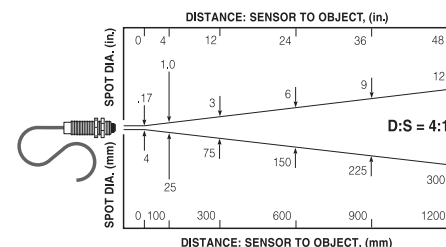
##### Electrical Specifications

|                        |                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------|
| Outputs                | User-selectable thermocouple output (model specific, either J or K) or voltage output 10mV/°C |
| head ambient signal    |                                                                                               |
| Cable length           | 3 ft (0.9 m) standard, longer cables optional                                                 |
| Output impedance       | 50 ohm                                                                                        |
| Minimum lead impedance | 50K ohms                                                                                      |
| Power supply           | 12-24V=(dc) (±2.5% ripple) @ 20mA                                                             |

##### General Specifications

|                           |                                                         |
|---------------------------|---------------------------------------------------------|
| Environmental rating      | NEMA-4 (IP 65)                                          |
| Ambient temperature range |                                                         |
| Sensing head              | 0 to 70°C (32 to 160°F)                                 |
| With air cooling          | 0 to 90°C (32 to 200°F)                                 |
| With water cooling        | 0 to 260°C (32 to 500°F)                                |
| Storage temperature       | -30 to 85°C (-22 to 185°F)                              |
| Relative humidity         | 10 to 95% non-condensing                                |
| Shock                     | IEC 68-2-27 (MIL STD 810D)<br>50 g's, 11 mSec, any axis |
| Vibration                 | IEC 68-2-27 (MIL STD 810D)<br>3 g's, any axis, 11-200Hz |
| Dimensions                | 3.4 L in. X 0.75 in. D (19 mm L X 87 mm D)              |
| Weight                    | 4.5 oz (130 g)                                          |

##### Nominal Optical Specifications

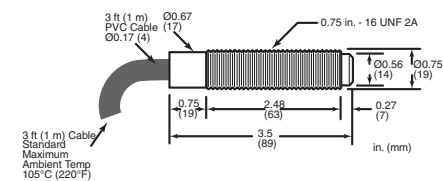


D:S is the optical resolution expressed as a ratio of the distance to the resolution spot divided by the diameter of the spot.

Optical resolution for the CI™ is 4:1.

Nominal spot size based on 90 percent energy

##### General Dimensions



##### Accessories/Options\*

Sensing head comes with a 3 ft (0.9 m) cable, two mounting nuts, and an operator's manual.

- GP monitor provides display, and 4-20mA output
- Air-/water-cooled housing\*
- High temperature cables (standard with air-/water-cooled housing)
- Adjustable or fixed mounting bracket
- Air purge collar
- Longer cables 10 ft (3 m)\*

\*Must be specified at time of order

## Notes