

innovative infrared temperature sensors



An ISO 9001 Certified Company



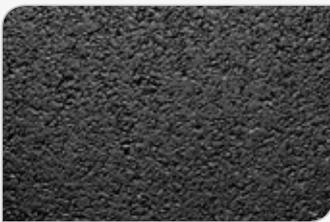
choosing a sensor



INTRODUCTION

The sensor detects the infrared radiation emitted by an area of the target surface, and converts this into a useful temperature measurement. There are 3 main factors affecting the accuracy of the measurement:

Type of Material

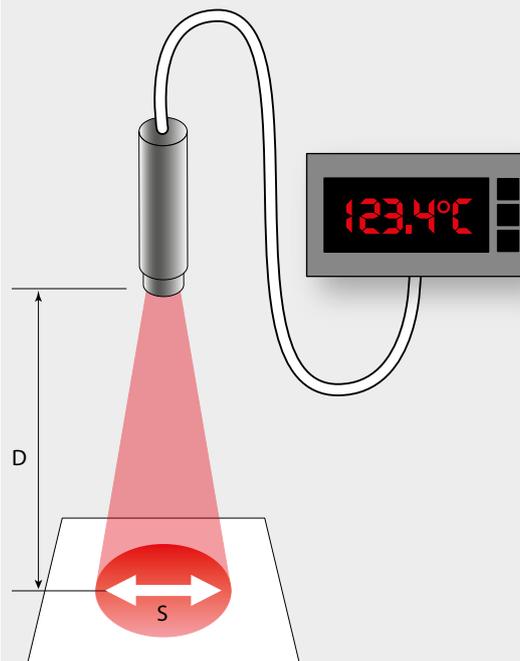


Most non-reflective materials, such as paper, cardboard, asphalt, food, plastics, rubber and painted surfaces are easy to measure with a general-purpose, long-wavelength sensor.



Some materials, such as silicon and reflective metals, may require a specialised short or very short wavelength sensor for accurate results.

Target Size and Distance



The sensor measures the average temperature within an area on the target surface. The size of this area depends on the sensor's optics.

A choice of optics is available for most sensors. The size of the target and the measurement distance determine which optics should be chosen.

For each choice of optics, the spot size at any given distance can be determined using the D:S (Distance to Spot Size) ratio.

Ambient Conditions



In normal room-temperature conditions, a simple, uncooled sensor may be used. For hotter environments, high-ambient-temperature models, or models with air or water cooling, are available.



Obstructions such as dust, steam and smoke can affect the reading, and specialised sensors are available for accurate readings in very damp or dirty conditions. However if the air looks clear, then it should be easy to get good results with a general-purpose sensor.

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	PyroCouple	PyroEpsilon	PyroBus	ExTemp	PyroUSB	PyroUSB 2.2
	Page 6	Page 8	Page 10	Page 12	Page 14	Page 16
						
	Simplest, lowest-cost general-purpose sensor	Sensor with adjustable emissivity setting	Networkable sensor with digital output	Intrinsically Safe sensor	Configurable sensor with analogue and USB outputs	
Temperature Range	-20 to 500°C			-20 to 1000°C	-40 to 1000°C	45 to 2000°C
Spectral Response	Long Wavelength 8 to 14 µm					Short Wavelength 2.2 µm
Optics (distance : spot size ratio)	2:1 15:1 30:1 Close Focus (Ø5 mm @ 100 mm)			15:1 30:1 Close Focus (Ø5 mm @ 100 mm)		15:1 25:1 75:1 Close Focus (Ø7.5 mm @ 500 mm)
Emissivity Setting (see page 34)	Fixed 0.95	Adjustable via 4-20 mA input	Adjustable via Modbus	Adjustable via software		
Supply Voltage (measured at sensor)	6 to 28 V DC		6 to 13 V DC	12 to 24 V DC	6 to 28 V DC	11 to 26 V DC
Operating Temperature (without cooling)	0 to 70°C					
Air or Water Cooling	Option			No	Option	
Output Options	4-20 mA Type J t/c Type K t/c Type T t/c 0-50 mV	4-20 mA	RS485 Modbus	4-20 mA USB via adapter	4-20 mA & USB	0/4-20 mA & USB
Features						
Sensor Body Temperature Reading	Yes (4 wire models)	No	Yes	No	Yes	
Peak or Valley Hold Processing	No			Yes		
Averaging	No			Yes		
Reflected Energy Compensation	No			Yes		
Data Logging	No	Option (via PM180)		No	Yes (CalexSoft)	

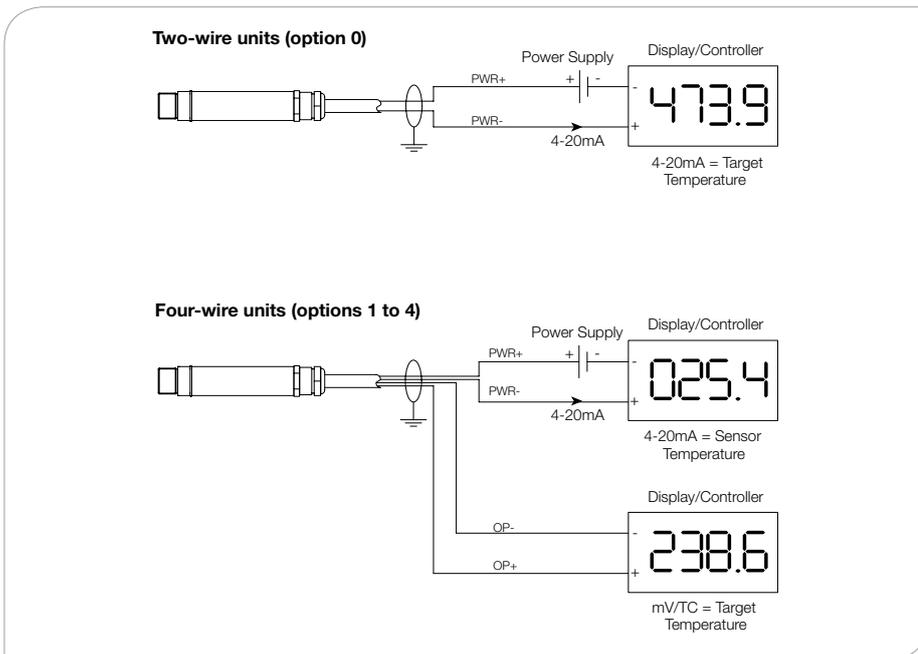
PyroMini	PyroMini 2.2	PyroMini 0.9	PM180	DLSB	PyroPen
Page 18	Page 22	Page 26	Page 30	Page 32	Page 33
					
Miniature configurable sensor with optional touch screen interface			6-channel display for PyroMini and PyroBus	Mounting bracket with laser sighting	High-performance handheld infrared thermometer
-20 to 1000°C	100 to 2000°C	350 to 2000°C	-	-	-20 to 500°C
Long Wavelength 8 to 14 µm	Short Wavelength 2.2 µm	Very Short Wavelength 0.9 µm	-	-	Long Wavelength 8 to 14 µm
2:1 15:1 20:1 30:1 Close Focus (Ø5 mm @ 100 mm)	15:1 25:1 75:1 Close Focus (Ø7.5 mm @ 500 mm)	12:1 25:1 75:1 Close Focus (Ø7.5 mm @ 500 mm)	-	-	8:1
Adjustable via switches, touch screen or Modbus			Adjustable via touch screen	-	Fixed or Adjustable
24 V DC			10 to 30 V DC		2 x AAA Batteries
0 to 60°C 0 to 120°C 0 to 180°C	0 to 60°C			-10 to +60°C	0 to 50°C
No			-	-	-
4-20 mA RS485 Modbus Alarm relays			RS485 Modbus Via separate modules: 4-20 mA 0-20 mA 0-5 V 0-10 V Alarm Relays	-	USB (U model)
Option (via screen or Modbus)			Yes	-	No
Option (via screen or Modbus)			Yes	-	No
Option (via screen or Modbus)			Yes	-	No
Option (via screen or Modbus)			Yes	-	No
Option (via touch screen or PM180)			Yes	-	Option (U model)

PyroCouple

Compact Non-Contact Temperature Sensor with optional Dual Output



- Temperature range: -20°C to 500°C
- Emissivity setting: fixed at 0.95
- Two-wire 4-20 mA output or four-wire voltage/thermocouple output
- Four-wire unit also provides internal sensor temperature
- Field of view: 2:1, 15:1, 30:1 or close focus
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets

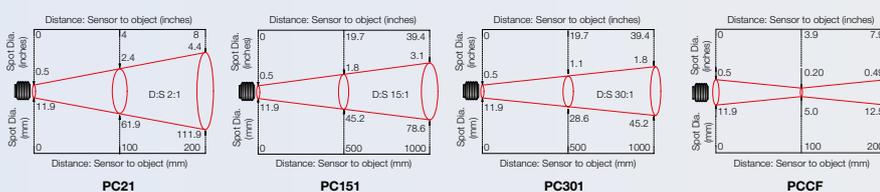


The PyroCouple Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

Two-wire PyroCouple sensors transmit the target temperature as a 4-20 mA output and offer a simple solution for most non-contact temperature measurement applications.

Four-wire PyroCouple sensors transmit the target temperature as a 0-50 mV or thermocouple output (type J, K or T) plus the internal sensor temperature as a 4-20 mA output. This second output can be used to ensure that the sensor is being operated within the correct ambient temperature limits and prevent damage caused by overheating or overcooling. It can also be used to give an approximate indication of the air temperature surrounding the sensor.

DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



All PyroCouple sensors are fitted with precision Germanium lenses for accurate optics. Model PC21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PC151 is designed for small or distant targets and has an optical resolution of 15:1. Model PC301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PCCF is designed for targets as small as $\varnothing 5\text{mm}$ at a distance of 100mm from the sensor.

GENERAL SPECIFICATIONS

Temperature Range vs Field-of-View table

Field of View	-20°C to 100°C	0°C to 250°C	0°C to 500°C
2:1	PC21LT-x	PC21MT-x	-
15:1	PC151LT-x	PC151MT-x	PC151HT-x
30:1	PC301LT-x	PC301MT-x	PC301HT-x
ø5mm @ 100mm	PCCFLT-x	PCCFMT-x	PCCFHT-x

Note: -x denotes the output type, see table below

Output table

Model-X	Target Temperature Output	Sensor Temperature Output
-0	4-20 mA	Not available
-1	0-50 mV	4-20 mA
-2	Type T thermocouple	4-20 mA
-3	Type J thermocouple	4-20 mA
-4	Type K thermocouple	4-20 mA

e.g. Model PC151HT-4 has a 15:1 field of view and provides a type K thermocouple output representing target temperatures of 0°C to 500°C plus a 4-20 mA output proportional to internal sensor temperature. **For simplicity, the sensor temperature range is always set the same as the target temperature range**

Accuracy	±1% of reading or ±1°C whichever is greater
Repeatability	± 0.5% of reading or ± 0.5°C whichever is greater
Emissivity	Fixed at 0.95
Response Time, t₉₀	240 ms (90% response)
Spectral Range	8 to 14 µm
Supply Voltage	24 V DC (28 V DC max.)
Min. Sensor Voltage	6 V DC
Max. Loop Impedance	900 Ω (4-20 mA output)
Output Impedance	56 Ω (voltage/thermocouple output)

MECHANICAL

Construction	Stainless Steel
Dimensions	18 mm diameter x 103 mm long
Thread Mounting	M16 x 1 mm pitch
Cable Length	1m (longer lengths available to order)
Weight with Cable	95 g

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature Range	0°C to 70°C
Relative Humidity	95% max. non-condensing

ACCESSORIES

FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

AIR/WATER COOLED HOUSING



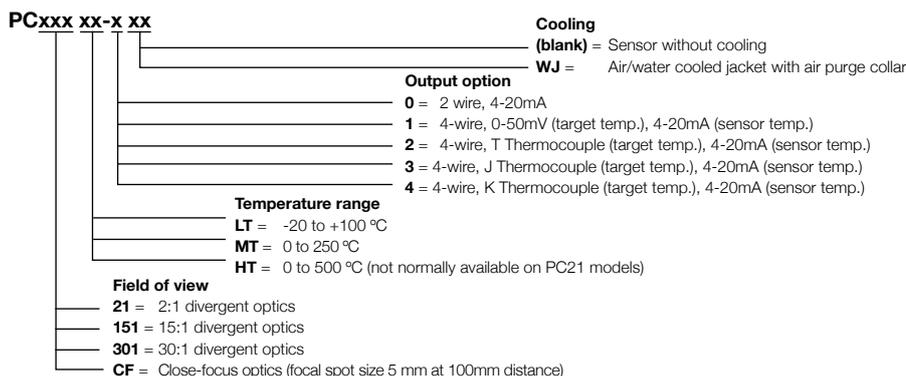
The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

MODEL NUMBERS

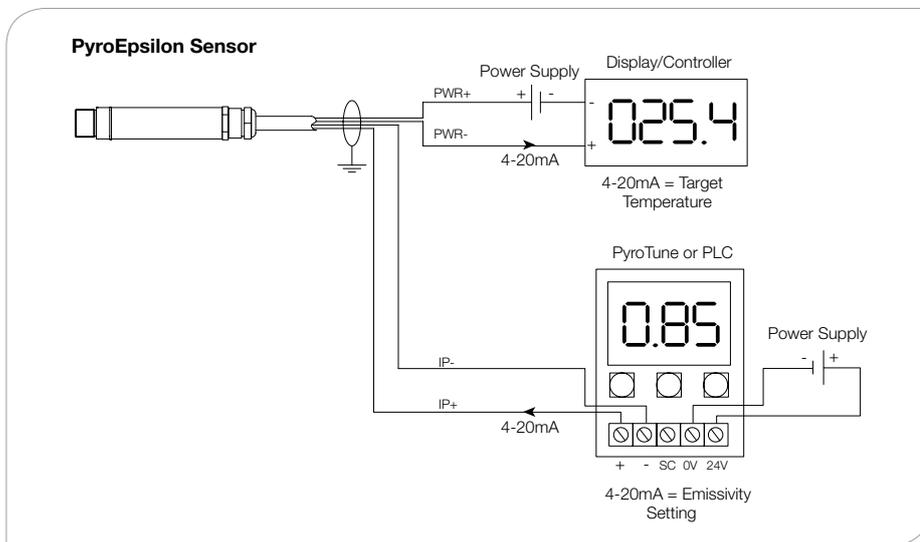


PyroEpsilon

Compact Non-Contact Temperature Sensor with Controllable Emissivity Setting



- Temperature range: -20°C to 500°C
- Two-wire 4-20 mA output proportional to target temperature
- 4-20mA input to control emissivity setting
- Optional PyroTune manual emissivity adjuster
- Field of view: 2:1, 15:1, 30:1 or close focus
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets

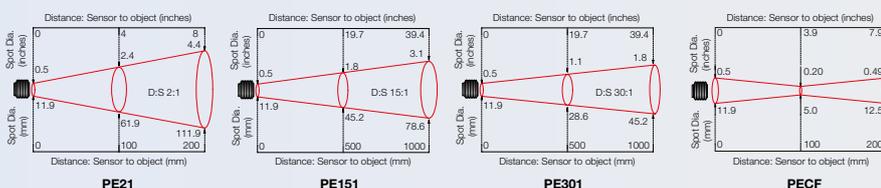


The PyroEpsilon Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

PyroEpsilon sensors transmit the target temperature as a 4-20 mA output.

The sensor's emissivity setting can be adjusted from 0.2 to 1.0 to cope with different target materials and is controlled by a 4-20 mA input. This gives the opportunity to adjust the emissivity setting automatically from a programmable logic controller (PLC). Alternatively the emissivity setting can be adjusted manually using the optional PyroTune module. If the 4-20 mA input is left open or short-circuit the emissivity setting defaults to 0.95.

DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



All PyroEpsilon sensors are fitted with precision Germanium lenses for accurate optics. Model PE21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PE151 is designed for small or distant targets and has an optical resolution of 15:1. Model PE301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PECF is designed for targets as small as $\varnothing 5$ mm at a distance of 100 mm from the sensor

PYROEPSILON SPECIFICATIONS

Temperature Range vs Field-of-View table

Field of View	-20°C to 100°C	0°C to 250°C	0°C to 500°C
2:1	PE21LT	PE21MT	-
15:1	PE151LT	PE151MT	PE151HT
30:1	PE301LT	PE301MT	PE301HT
ø5mm @ 100mm	PECFLT	PECFMT	PECFHT

Output	4-20mA
Accuracy	±1% of reading or ±1°C whichever is greater
Repeatability	± 0.5% of reading or ± 0.5°C whichever is greater
Emissivity	0.2 to 1.0 via 4-20mA input
Response Time, t₉₀	240 ms (90% response)
Spectral Range	8 to 14 µm
Supply Voltage	24 V DC (28 V DC max.)
Min. Sensor Voltage	6 V DC
Max. Loop Impedance	900 Ω (4-20 mA output)
Input Impedance	50 Ω

MECHANICAL

Construction	Stainless Steel
Dimensions	18 mm diameter x 103 mm long
Thread Mounting	M16 x 1 mm pitch
Cable Length	1m (longer lengths available to order)
Weight with Cable	95 g

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature Range	0°C to 70°C
Relative Humidity	95% max. non-condensing

PYROTUNE SPECIFICATIONS

Output	4-20mA
Supply Voltage	24 V DC (13 V to 28 V DC)
Display Format	3.5 digit LCD
Display Units	Emissivity (0.2 to 1.0) or current (4 - 20 mA)
Adjustment	Push-buttons (raise/lower/set)

MECHANICAL

Construction	Polycarbonate with gasket, transparent lid (PC) and quick release screws
Mounting	Surface
Dimensions	65 mm tall x 50 mm wide x 35 mm deep
Weight	72 g

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature Range	0°C to 70°C
Relative Humidity	95% max. non-condensing

ACCESSORIES



FIXED MOUNTING BRACKET

The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.



ADJUSTABLE MOUNTING BRACKET

The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.



AIR PURGE COLLAR

The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.



AIR/WATER COOLED HOUSING

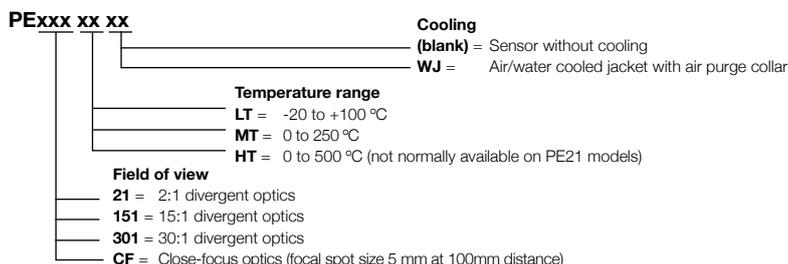
The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.



LASER SIGHTING TOOL

The Laser Sighting Tool screws onto the front of the sensor during installation and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

MODEL NUMBERS



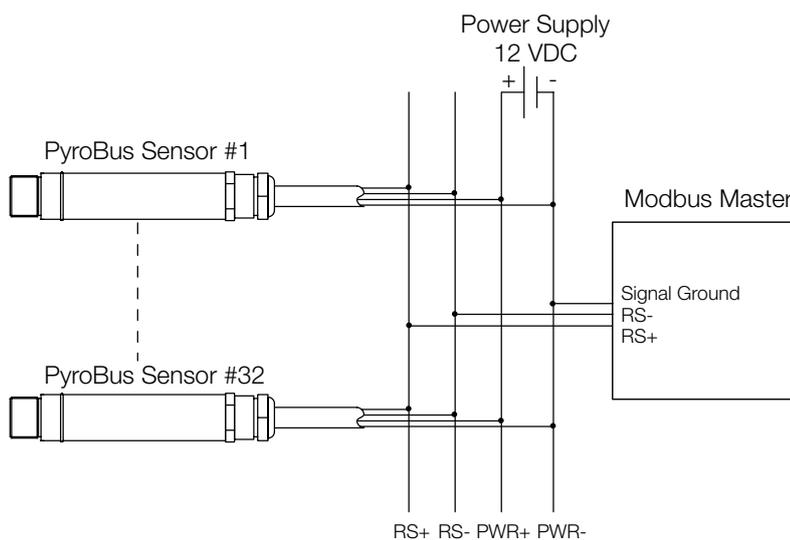
PyroBus

Non-Contact Temperature Sensor with RS485 Modbus Interface



- Wide temperature range from -20°C to 500°C
- Built-in RS485 Modbus RTU Interface
- Configurable emissivity setting and signal processing
- Max; min; average and instantaneous readings; peak or valley hold; reflected energy compensation
- 2:1, 15:1, 30:1 or close focus optics
- Fast response with high stability
- Stainless steel housing, sealed to IP65
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets
- Optional touch screen terminals for configuration, indication, alarm generation, and data logging from multiple sensors

PYROBUS WITH MODBUS MASTER



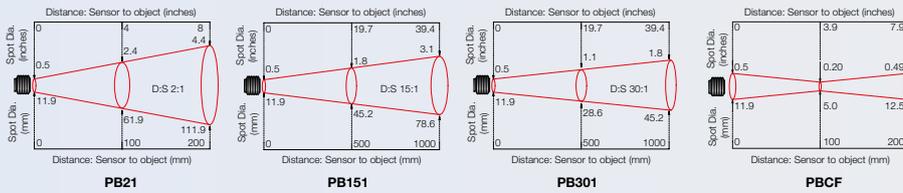
The PyroBus Series is a range of high quality, low cost, compact sensors which measure the temperature of inaccessible or moving objects and materials. They measure temperatures from -20°C to 500°C, accurately and consistently, with an outstanding response time of 240 ms.

Two-way digital communications via a built-in RS485 Modbus RTU interface enables the user to adjust the emissivity setting; compensate for reflected energy; apply filtering; select maximum, minimum, average or instantaneous readings; and peak or valley hold processing. Up to thirty two sensors can be installed on a single multidrop network.

All PyroBus sensors are fitted with precision Germanium lenses for accurate optics. Model PB21 has 2:1 optics making it suitable for most applications where the sensor can be mounted close to the target. Model PB151 is designed for small or distant targets and has an optical resolution of 15:1. Model PB301 is designed for very small or distant targets and has an optical resolution of 30:1. Model PBCF is designed for targets as small as $\varnothing 5\text{mm}$ at a distance of 100mm from the sensor.

These compact sensors are small enough to fit almost anywhere and their rugged stainless steel housings make them ideal for applications where cleanliness and hygiene are paramount.

DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



GENERAL SPECIFICATIONS

Temperature Range	-20°C to 500°C
Interface	RS485 Modbus RTU
Accuracy	±1% of reading or ±1°C whichever is greater
Repeatability	± 0.5% of reading or ± 0.5°C whichever is greater
Emissivity	0.2 to 1.0
Response Time, t_{90}	240 ms (90% response)
Spectral Range	8 to 14 μ m
Supply Voltage	12 V DC nominal (6 - 13 V DC)
Supply Current	50 mA max.
Baud Rate	9600 baud *
Format	8 data bits, no parity, 1 stop bit *

MECHANICAL

Construction	Stainless Steel
Dimensions	18 mm diameter x 103 mm long
Thread Mounting	M16 x 1 mm pitch
Cable Length	1m (longer lengths available to order)
Weight with Cable	95 g

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature	0°C to 70°C
Relative Humidity	95% max. non-condensing

* Other configurations available upon request

ACCESSORIES

FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

AIR/WATER COOLED HOUSING



The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor during installation and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

MODEL NUMBERS

PBxxx xx

Cooling

(blank) = Sensor without cooling
WJ = Air/water cooled jacket with air purge collar

Field of view

21 = 2:1 divergent optics
151 = 15:1 divergent optics
301 = 30:1 divergent optics
CF = Close-focus optics (focal spot size 5 mm at 100 mm distance)



- Suitable for hazardous areas, Zone 0, 1 and 2 (gas), and Zone 20, 21 and 22 (dust), with a suitable Intrinsically Safe isolator
- Temperature range: -20°C to 1000°C
- Two wire, 4-20 mA output
- Rescalable output and adjustable emissivity setting via optional USB adapter
- Fast response time and high stability
- Stainless steel 316 housing - ideal for offshore applications
- IP65 sealed
- Supplied with up to 25 m cable

GENERAL SPECIFICATIONS

Temperature range	See table of Model Numbers
Maximum Temperature Span	1000°C
Minimum Temperature Span	100°C
Output	4 to 20 mA
Field of View	See table of Model Numbers
Accuracy	± 1°C or 1%, whichever is greater
Repeatability	± 0.5°C or 0.5%, whichever is greater
Emissivity Setting Range	0.20 to 1.00 (pre-set to 0.95)
Emissivity Setting Method	User configurable via USB interface
Response Time, t_{90}	240 ms (90% response)
Spectral Range	8 to 14 μ m
Supply Voltage	12 to 24 V DC \pm 5%
Maximum Current Draw	25 mA
Maximum Loop Impedance	See Application Guide (available separately)

MECHANICAL

Construction	Stainless Steel 316
Major Dimensions	\varnothing 20 x length 150 mm (see Dimensions)
Mounting	M20 x 1.5 mm thread, length 46 mm, supplied with two mounting nuts
Cable Length	5 m, 10 m or 25 m as standard (custom lengths also available)
Weight with 5 m Cable	475 g

ENVIRONMENTAL

Environmental Rating	IP65 (NEMA 4)
Ambient Temperature Range	0°C to 70°C (Operating range)
Relative Humidity	Max. 95% non-condensing
CE Marked	Yes
RoHS Compliant	Yes

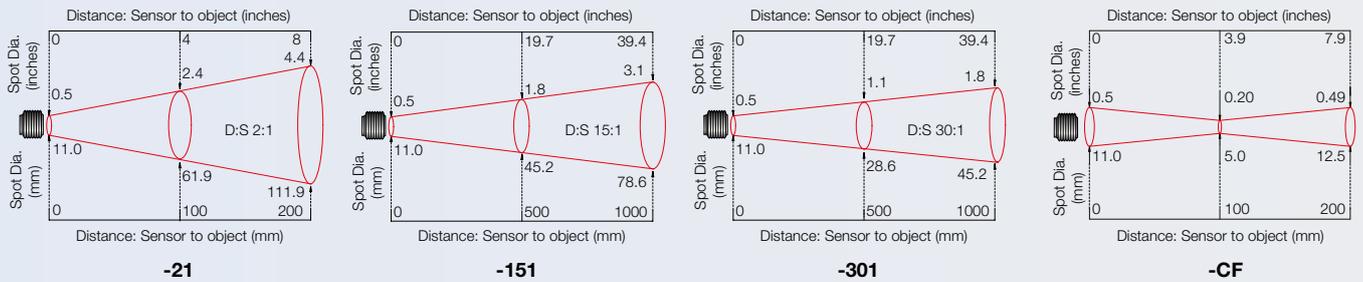
HAZARDOUS AREA CLASSIFICATION

ATEX Classification	Ex II 1GD
IECEX Classification (Gas)	Ex ia IIC T4 Ga
IECEX Classification (Dust)	Ex ia IIIC T135°C IP65 Da
Ambient Temperature Rating	-20°C \leq Ta \leq 70°C
Maximum DC Input Voltage	Ui = 28 V
Maximum Input Current	Ii = 93 mA
Maximum Input Power	Pi = 650 mW
Maximum Internal Capacitance	Ci = 8 nF
Maximum Internal Inductance	Li = 0 mH
ATEX Certificate Number	CML 14ATEX2079
IECEX Certificate Number	IECEX CML 14.0032

MODEL NUMBERS

EX-FFF-TT-C-LL	
_____	Cable Length
_____	5 = 5 m
_____	10 = 10 m
_____	25 = 25 m
	Custom lengths also available
_____	User Configurable
	C = Configurable via optional USB adapter
_____	Temperature Range
_____	LT = -20°C to 100°C
_____	MT = 0°C to 250°C
_____	HT = 0°C to 500°C
_____	XT = 0°C to 1000°C
_____	ST = Special temperature range
	Temperature range may be re-scaled between limits -20°C and 1000°C via optional USB adapter and software
_____	Field of View
_____	21 = 2:1 divergent optics
_____	151 = 15:1 divergent optics
_____	301 = 30:1 divergent optics
_____	CF = Close focus optics (Spot \varnothing 5 mm at distance 100 mm)

DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



CONNECTIONS

Hazardous Area
(All Zones IIC and IIIC)

ExTemp sensor

Ground the sensor at one point only

Safe Area
(Non-Hazardous)

Certified Intrinsically Safe Isolator
(e.g. MTL model 5541)

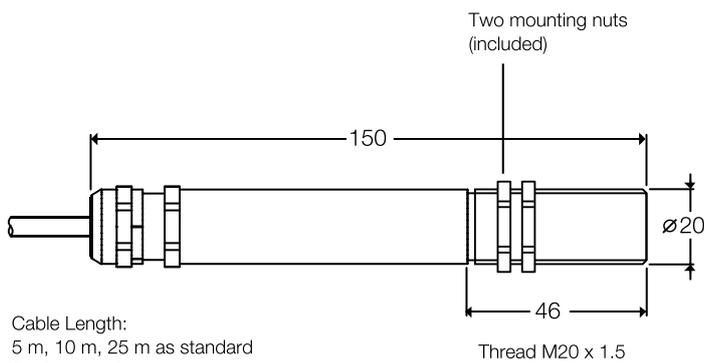
ExTemp USB Adapter
PC with software

Optional

Measurement instrumentation

Power supply

DIMENSIONS (mm)



Cable Length:
5 m, 10 m, 25 m as standard
Custom lengths also available
User may extend cable subject to safety requirements

CONFIGURATION

The ExTemp sensor may be connected to a PC via the optional USB adapter and included Windows software.

Configurable settings include the emissivity setting, 4-20 mA temperature range, averaging, peak and valley hold processing and reflected energy compensation.



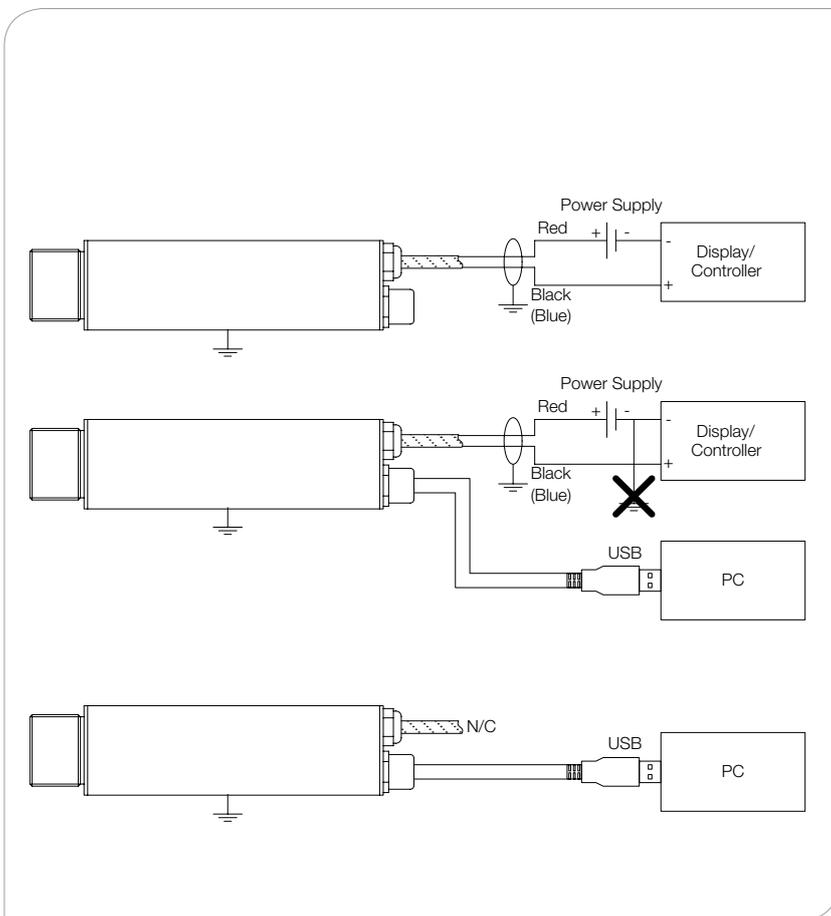
ACCESSORIES

- FBL** Fixed mounting bracket (1-axis rotation)
- ABL** Adjustable mounting bracket (2-axis rotation)
- APMW** Air purge collar (for 2:1 optics)
- APMN** Air purge collar (for all other optics)
- CALCERTA** Calibration certificate, 3 temperature points, UKAS traceable
- LCT** USB adapter and configuration software

PyroUSB PC Configurable Non-Contact Temperature Sensor with 4 to 20 mA Output



- Configurable temperature range, emissivity setting etc. from a PC via CalexSoft software and USB cable (supplied)
- Features max; min; average and instantaneous readings; peak or valley hold; reflected energy compensation
- OPC Server capabilities
- Temperature range -40 to 1000°C
- Emissivity: 0.1 to 1.0
- Response time: 240 ms to 90%
- Stainless steel housing, sealed to IP65
- Field of view: 15:1, 30:1 or Close Focus
- 4 to 20 mA output
- Quick and easy installation
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets



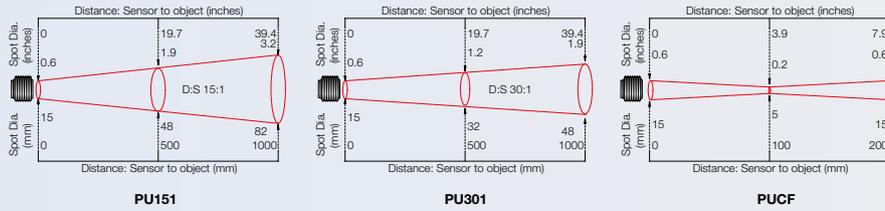
The PyroUSB Series measures temperatures from -40°C to 1000°C accurately and consistently, with an outstanding response time of 240 ms. The 4 to 20 mA output is compatible with almost any indicator, controller, recorder, data logger etc. without the need for special interfacing or signal conditioning.

Model PU151 has 15:1 optics making it suitable for most applications. PU301 is specially designed for distant targets and has an optical resolution of 30:1. PUCF is designed for small targets and measures a spot size of $\varnothing 5\text{mm}$ at 100mm distance.

All PyroUSB Series sensors are fully configurable from a PC using the CalexSoft software and USB cable supplied. This user friendly software enables the user to set the range and emissivity, compensate for reflected energy; apply filtering; select max, min, average or instantaneous readings; and peak or valley hold processing. These features can also be monitored and adjusted by an OPC Client. Other features include Data Acquisition, Alarms and a Scrolling Graphical Display.

The sensor will operate with either the 4 to 20 mA cable connected, the USB cable connected, or both. The USB cable has an IP65 connector at the sensor end. An IP65 cap protects the sensor when the USB cable is not connected.

DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD



GENERAL SPECIFICATIONS

Temperature Range

-40°C to 1000°C

Field-of-View

15:1 (PU151)

30:1 (PU301)

ø5mm @ 100mm (PUCF)

Output

4 to 20 mA (linear with temperature)

Configuration

Via PC port conforming to USB 2.0

Accuracy

±1% of reading or ±1°C whichever is greater

Repeatability

±0.5% of reading or ±0.5°C whichever is greater

Emissivity

0.1 to 1.0

Response Time, t_{90}

240 ms (90% response)

Spectral Range

8 to 14 μ m

Supply Voltage

24 V DC (28Vdc max)

Sensor Voltage

6 V DC min

Max Loop Impedance

900 Ω

Maximum Span

1000°C

Minimum Span

100°C

MECHANICAL

Construction

Stainless Steel

Dimensions

25 mm diameter x 106.5 mm long

Thread mounting

M20 x 1 mm pitch

Weight with Output Cable

175 g

Output Cable Length

1 m

USB Cable Length

1 m

ENVIRONMENTAL

Environmental Rating

IP65

Ambient Temperature Range

0°C to 70°C

Relative Humidity

95% max. non-condensing

ACCESSORIES

FIXED MOUNTING BRACKET



The L-shaped fixed mounting bracket offers a rigid support for the sensor and allows fine adjustment in a single plane.

ADJUSTABLE MOUNTING BRACKETS



The adjustable mounting bracket consists of a fixed mounting bracket plus another L-shaped bracket. When assembled as shown the adjustable mounting bracket offers a rigid support for the sensor and allows fine adjustment in two planes.

AIR PURGE COLLAR



The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens. Air flows into the fitting on the side and out of the aperture at the front.

AIR/WATER COOLED HOUSING



The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other. To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.

LASER SIGHTING TOOL



The Laser Sighting Tool screws onto the front of the sensor and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

MODEL NUMBERS

PUxxx xx

Cooling

(blank) = Sensor without cooling

WJ = Air/water cooled jacket with air purge collar

Field of view

151 = 15:1 divergent optics

301 = 30:1 divergent optics

CF = Close-focus optics (focal spot size 5 mm at 100 mm distance)

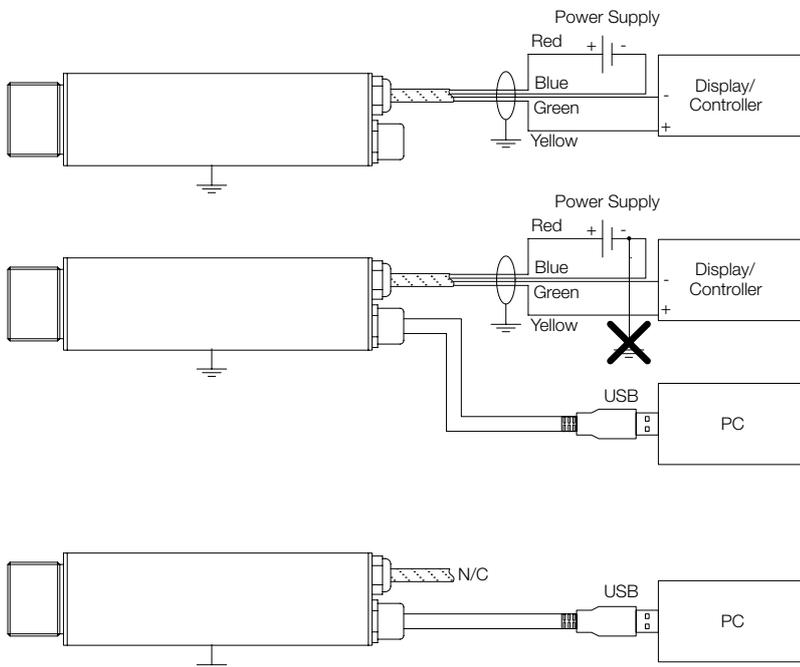
PyroUSB 2.2

PC Configurable Infrared Temperature Sensor for Demanding Applications



- Short-wavelength measurement for low-emissivity targets such as steel rollers and other metal surfaces, even at low temperatures
- Configurable temperature range, emissivity setting etc. from a PC via CalexSoft software and USB cable (supplied)
- Features max, min, average and instantaneous readings; peak or valley hold; reflected energy compensation
- OPC Server capabilities
- Temperature ranges from 45°C to 2000°C
- Emissivity: 0.1 to 1.0
- Stainless steel housing, sealed to IP65
- Field of view: 15:1, 25:1, 75:1 or Close Focus
- Selectable 0 to 20 mA or 4 to 20 mA output
- Optional air/water cooled housing, air purge collar, laser sighting tool and mounting brackets

SENSOR CONNECTION



Note: The sensor must be grounded at only one point, either the cable shield or the sensor housing.

The PyroUSB 2.2 Series of infrared pyrometers measures temperatures from 45°C to 2000°C accurately and consistently, with an outstanding response time.

The selectable 0 to 20 mA or 4 to 20 mA output is compatible with almost any indicator, controller, recorder, data logger etc. without the need for special interfacing or signal conditioning.

Models with temperature range 45°C to 300°C, or 100°C to 400°C have 15:1 optics.

For models with temperature range 250°C to 1000°C, or 450°C to 2000°C, a choice of optics is available:

PU251-2.2 models have 25:1 optics and are suitable for most target sizes and distances.

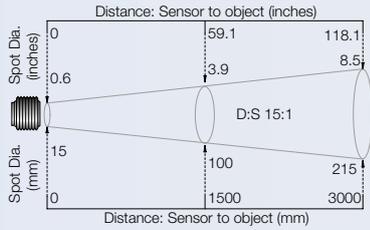
PU751-2.2 models are specially designed for distant targets and have an optical resolution of 75:1.

PUCF-2.2 models are designed for small targets and measure a spot size of \varnothing 7.5 mm at 500 mm distance.

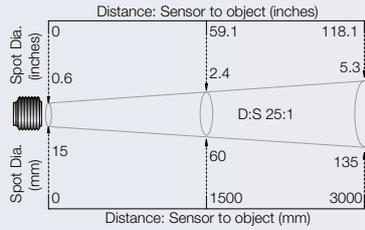
All PyroUSB 2.2 Series sensors are fully configurable from a PC using the CalexSoft software and USB cable supplied. This user-friendly software enables the user to set the temperature range and emissivity setting, compensate for reflected energy; apply filtering; select max, min, average or instantaneous readings; and configure peak or valley hold processing. These features can also be monitored and adjusted by an OPC Client. Other features include data acquisition, alarms and a scrolling graphical display.

The sensor will operate with either the 4 to 20 mA cable connected, the USB cable connected, or both. The USB cable has an IP65 connector at the sensor end. An IP65 cap protects the sensor when the USB cable is not connected.

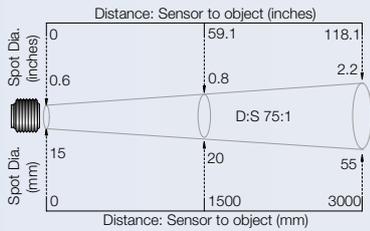
DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD (90% ENERGY)



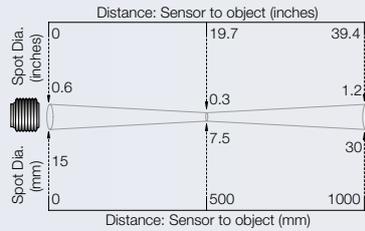
PU151-2.2



PU251-2.2



PU751-2.2



PUCF-2.2

GENERAL SPECIFICATIONS

Temperature Range	LT: 45°C* to 300°C (PU151LT2.2 only) PT: 100°C to 400°C (PU151PT2.2 only) MT: 250°C to 1000°C HT: 450°C to 2000°C
Field-of-View	15:1 (PU151LT or PT) 25:1 (PU251MT or HT) 75:1 (PU751MT or HT) ø7.5mm @ 500mm (PUCFMT or HT)
Output	Selectable 4 to 20 mA or 0 to 20 mA (linear with temperature)
Configuration	Via PC port conforming to USB 2.0
Accuracy *	±1% of reading or ±2°C, whichever is greater
Repeatability *	±0.5% of reading or ±0.5°C, whichever is greater
Emissivity Setting	0.1 to 1.0
Response Time, t₉₀	≥240 ms (90% response)
Spectral Range	2.0 to 2.4 μm
Supply Voltage	24 V DC (26 V DC max)
Sensor Voltage	11 V DC min
Max Loop Impedance	900 Ω @ 24 V DC
Maximum Span	Full temperature range (up to 1550°C)
Minimum Span	100°C

* Object temperature > T_{min} (see graph of Minimum Measurable Temperature)

MECHANICAL

Construction	Stainless Steel
Dimensions	25 mm diameter x 106.5 mm long
Thread mounting	M20 x 1 mm pitch
Weight with Output Cable	175 g
Output Cable Length	1 m (longer cable available to order)
USB Cable Length	1 m

ENVIRONMENTAL

Environmental Rating	IP65
Ambient Temperature	0°C to 70°C
Relative Humidity	95% max. non-condensing

ACCESSORIES



FIXED AND ADJUSTABLE MOUNTING BRACKETS



AIR PURGE COLLAR
The air purge collar is used to keep dust, fumes, moisture and other contaminants away from the lens.



AIR/WATER COOLED HOUSING
The air/water cooled housing allows the sensor to withstand ambient temperatures which exceed the normal 70°C limit. Air or water (depending on the degree of cooling required) flows into one of the fittings on the side and out of the other.

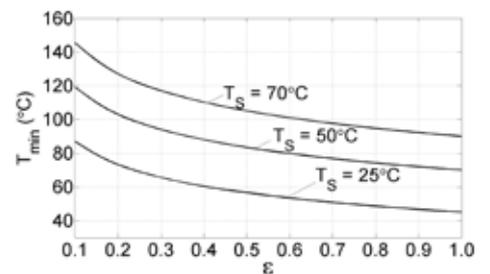
To prevent condensation forming on the lens, the air/water cooled housing is supplied complete with an air purge collar. Please note, the air/water cooled housing must be ordered with the sensor and cannot be fitted by the user.



LASER SIGHTING TOOL
The Laser Sighting Tool screws onto the front of the sensor during installation and indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

indicates precisely where the sensor is aiming. Once the sensor has been aimed at the centre of the target and locked in position the Laser Sighting Tool can be removed. The laser is activated by means of a push button on the front of the tool which has a latching mechanism.

MINIMUM MEASURABLE TEMPERATURE (PU151LT2.2 only)



Graph showing the minimum measurable object temperature (T_{min}), determined by surface emissivity (ε) and sensor temperature (T_s).

MODEL NUMBERS

PUxxx xx 2.2 xx

- Cooling**
 - (blank) = Uncooled sensor
 - WJ = Air/water cooled jacket with air purge collar
- Temperature range**
 - LT = 45 to 300 °C (model PU151LT2.2 only)
 - PT = 100 to 400 °C (model PU151PT2.2 only)
 - MT = 250 to 1000 °C
 - HT = 450 to 2000 °C
- Field of view**
 - 151 = 15:1 divergent optics (model PU151LT or PT)
 - 251 = 25:1 divergent optics (model PU251MT or HT)
 - 751 = 75:1 divergent optics (model PU751MT or HT)
 - CF = Close-focus optics (focal spot size 7.5 mm at 500 mm distance) (model PUCFMT or HT)

PyroMini

Miniature Infrared Temperature Sensor with Optional High-Ambient Sensing Head and Touch Screen



Model shown includes optional touch screen

- Miniature sensing head and configurable electronics module
- Touch screen (optional) for temperature indication and configuration. Screen changes colour in alarm condition for maximum visibility
- High-ambient sensing heads (optional) withstand up to 120°C or 180°C without cooling
- Adjustable emissivity setting on all models - suitable for a wide range of target materials such as paper, plastics, food, painted surfaces, and many more
- Data logging to MicroSD Card (optional) on touch screen models
- Resistant to interference from movement of sensing head cable - ideal for mounting on robot arms
- 4 to 20 mA or RS485 Modbus outputs
- Alarm relay outputs rated 24 V DC (optional) - no need for separate trip amplifier
- Temperature ranges from -20°C to 1000°C
- Maximum, minimum, average and instantaneous readings, peak or valley hold, reflected energy compensation
- Optional mounting brackets, air purge collar and laser sighting tool
- Sensing head sealed to IP65

GENERAL SPECIFICATIONS

Temperature Range

See table of Model Numbers

Maximum Temperature Span (-CRT models)

1020°C

Minimum Temperature Span (-CRT models)

100°C

Output

4 to 20 mA or RS485 Modbus*

Field of View

See table of Model Numbers

Accuracy

± 1°C or 1%, whichever is greater

Repeatability

± 0.5°C or 0.5%, whichever is greater

Emissivity Setting Range

0.20 to 1.00

Emissivity Setting Method

-CB models: via two rotary switches in electronics box

-BB and -BRT models: via RS485

-CRT and -BRT models: via touch screen

Response Time, t_{90}

240 ms (90% response)

Spectral Range

8 to 14 μ m

Supply Voltage

24 V DC \pm 5%

Maximum Current Draw

100 mA

Maximum Loop Impedance

CB and -CRT models: 900 Ω (4 to 20 mA output)

Alarm Relays (-CRT and -BRT models)

2 x Single Pole Changeover alarm relays rated

24 V DC, 1 A, isolated 500 V DC

* Up to 247 sensors may be installed on a single Modbus network.

MECHANICAL

	Sensing head	Electronics Module
Construction	Stainless Steel 316	Die-cast Aluminium
Major Dimensions	\varnothing 18 x 45 mm (see diagram)	98(w) x 64(h) x 36(d) mm (see diagram)
Mounting	M16 x 1 mm thread	Two M4 screws for wall mounting (see diagram)

Cable Length (sensing head to electronics module)

1 m (standard), up to 30 m (optional)

Weight with 1 m Cable

390 g (approx)

Cable Connections

Removable screw terminal blocks (see Connections)

Conductor size: 28 AWG to 18 AWG

Suitable for cable diameters 3.0 to 6.5 mm

Output Cable Gland

ENVIRONMENTAL

	Sensing head	Electronics Module (without touch screen)	Electronics Module (with touch screen)
Environmental Rating	IP65 (NEMA 4)	IP65 (NEMA 4)	-
Ambient Temperature Range	See table of Model Nos	0°C to 60°C	0°C to 60°C
Relative Humidity	Maximum 95% non-condensing	Maximum 95% non-condensing	Maximum 95% non-condensing
CE Marked	Yes	Yes	Yes
RoHS Compliant	Yes	Yes	Yes

ELECTROMAGNETIC COMPATIBILITY STANDARDS:

Class	Standard	Description
EMC Directive	EN61326-1:2006	Electrical equipment for measurement, control and laboratory use – Industrial
- Immunity	IEC 61000-4-2	Electrostatic Discharge Immunity
	IEC 61000-4-3	Electromagnetic Field Immunity
	IEC 61000-4-4	Burst Immunity
	IEC 61000-4-5	Surge Immunity
	IEC 61000-4-6	Conducted RF Immunity
- Emissions	EN 55022A	RF Emissions Class A
	EN 55022B	RF Emissions Class B

TOUCH SCREEN (-CRT AND -BRT MODELS)

The optional backlit touch screen interface mounted in the lid of the electronics module provides a large, bright display of the measured temperature, as well as controls allowing full configuration of the sensor. The graph view shows the history of the measured temperature.

In alarm conditions, the display changes colour to provide an immediate and obvious alarm indication. Alarm modes and levels can be configured via the touch screen.

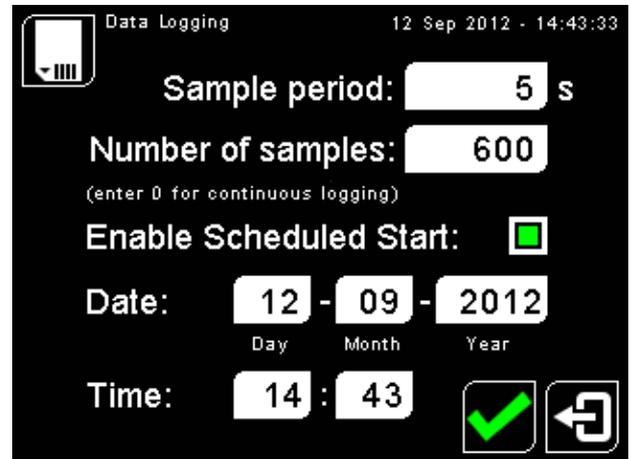
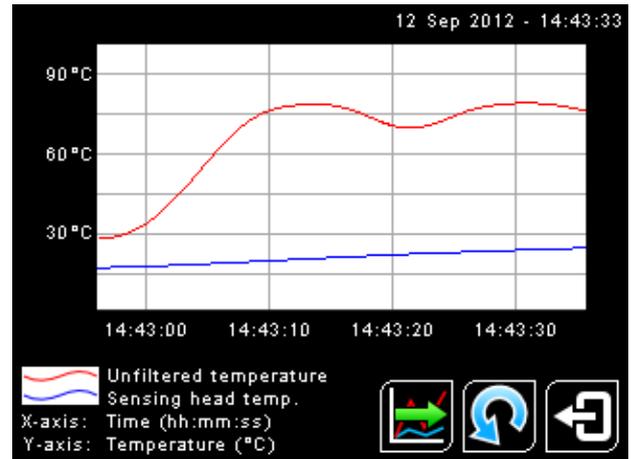
TOUCH SCREEN SPECIFICATIONS

Touch Screen Display Format	2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit
Configurable Parameters	Temperature range, temperature units, emissivity setting, reflected energy compensation, alarms, signal processing, Modbus address (-BRT models), date and time, data logging
Temperature Units	°C or °F configurable
Temperature Resolution	0.1°
Alarm Configuration	Two alarms with adjustable level, individually configurable as HI or LO. Alarm 2 can be set to target temperature or sensing head internal temperature
Signal Processing	Average, peak hold, valley hold, minimum, maximum

EXAMPLE SCREENSHOTS



Screen shown with red background to indicate alarm condition



DATA LOGGING SPECIFICATIONS

Data Logging Interval	1 to 86,400 seconds (1 day)
MicroSD Card	Max. capacity: 2 GB (not included)
Internal Clock Battery	1 x BR 1225 3V (not included)
Variables Logged	Target temperature, sensing head temperature, electronics module temperature, max, min, average, emissivity setting, reflected energy compensation temperature, alarm events
File format	.csv
Configurable Parameters	Sample period, number of samples, scheduled start date and time

DATA LOGGING (-CRT AND -BRT MODELS)

The PyroMini can be used as a standalone data logger.

PyroMini models -CRT and -BRT include a MicroSD card slot for data logging, which can be configured via the touch screen interface. The user can select the sample rate and the number of samples to be taken and schedule the data logging to start at a certain time.

With a 2 GB card, the user can store 28.4 million readings, which provides almost 1 year's worth of data at the fastest possible sample rate of 1 per second.

Data is stored on the MicroSD card in .csv format and can be viewed and edited easily using spreadsheet software. Alarm events can also be logged to the MicroSD Card.

A MicroSD card with SD card adapter is available as an optional accessory.

The MicroSD card slot and battery holder are located on the touch screen circuit board in the lid of the PyroMini. Readings are time and date stamped using the sensor's internal clock. The clock is reset when the power is disconnected, or it will continue if the optional battery is fitted.

MODEL NUMBERS

Series	Sensing Head Operating Temperature Range	Field of View	Measurement Temperature Range	Output and Interface
PM	MA	21 151 301 CF	LT MT HT XT	CB
			CT	CRT BB BRT
	HA JA	201	HT XT	CB
			CT	CRT BB BRT

SERIES PM



PyroMini infrared temperature sensor with miniature sensing head and separate electronics module

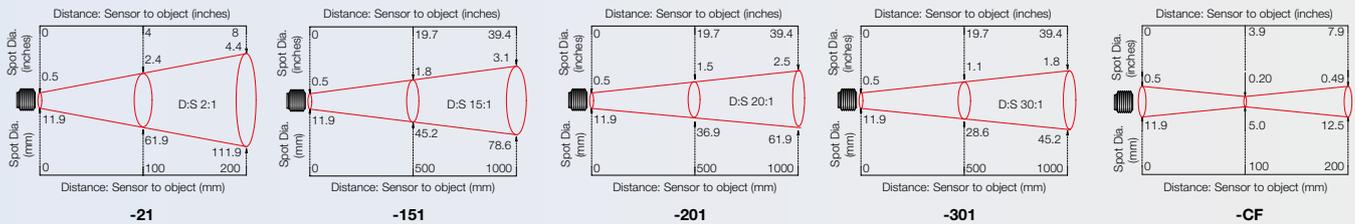
SENSING HEAD OPERATING TEMPERATURE RANGE

- MA** 0°C to 60°C
- JA** 0°C to 120°C
- HA** 0°C to 180°C

The sensing head on -JA and -HA models is able to withstand ambient temperatures of up to 120°C (-JA) and 180°C (-HA) without cooling. Both models are available with 20:1 optics.

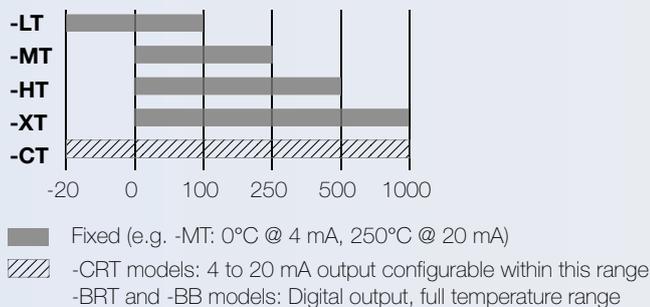
There is no need to supply cooling air or water, and the miniature sensing head is much smaller than bulky, cooled sensors.

FIELD OF VIEW



Diameter of target spot measured versus distance from sensing head - 90% energy

MEASUREMENT TEMPERATURE RANGE (°C)



OUTPUT AND INTERFACE

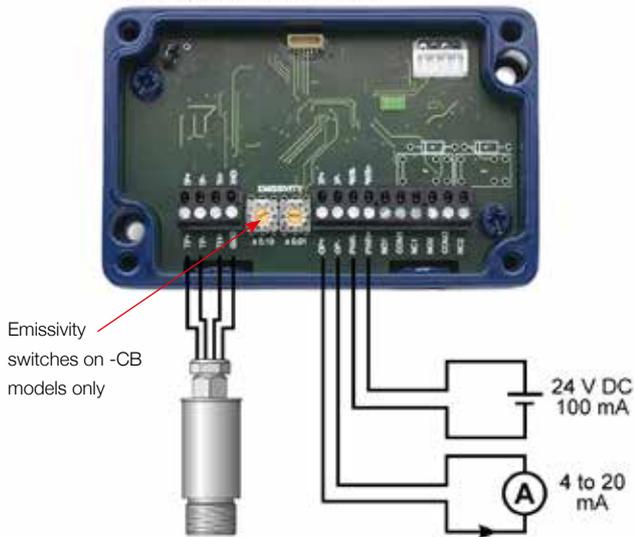
- CB** 4 to 20 mA output, no screen
- CRT** 4 to 20 mA output and two alarm relay outputs, with touch screen
- BB** RS485 Modbus output, no screen
- BRT** RS485 Modbus output and two alarm relay outputs, with touch screen

EXAMPLE: PM-MA-301-CT-BRT

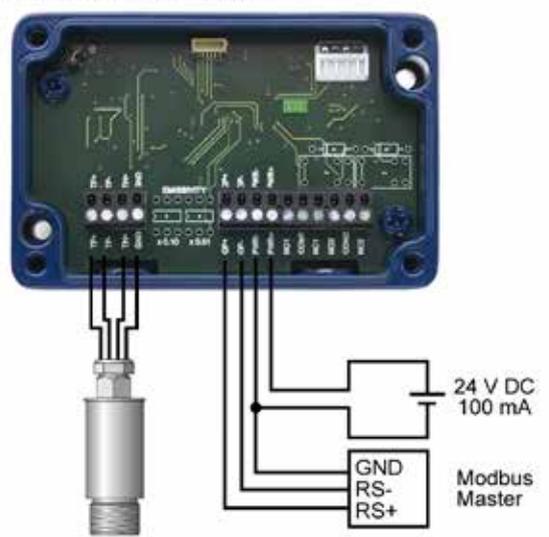
Series	Sensing Head Operating Temperature	Optics	Temperature Range	Output and Interface
PM PyroMini	-MA 0°C to 60°C	-301 30:1 divergent	-CT Digital output, -20 to 1000 °C	-BRT RS485 Modbus output and two alarm relay outputs, with touch screen

CONNECTIONS

-CB and -CRT models

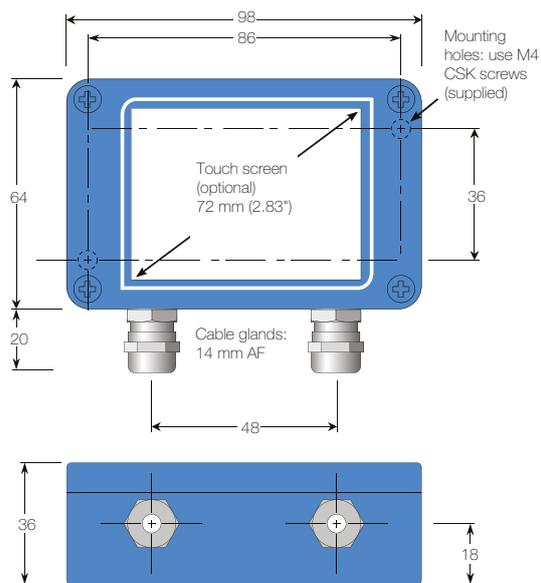


-BB and -BRT models

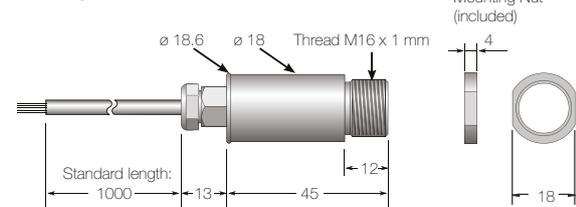


DIMENSIONS AND ACCESSORIES

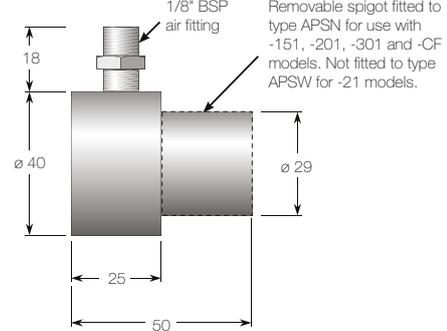
Electronics Module



Sensing Head



Air Purge Collar



All dimensions in mm

ACCESSORIES ALSO AVAILABLE

MicroSD Card with SD Card adapter: stores logged data (-CRT and -BRT models) **MSD**

Extended cable between sensing head and electronics module (-MA models) **PMCE**

(-HA models) **PMCEHT**

Calibration certificate **CALCERTA**

Laser sighting tool **LSTS**

Adjustable mounting bracket **ABS**

Fixed mounting bracket **FBS**

6-channel Modbus temperature indicator with data logging **PM180**



PyroMini 2.2

Miniature Infrared Temperature Sensor for Demanding Applications with Optional Touch Screen



- Short-wavelength measurement for low-emissivity targets such as steel rollers and many other metal surfaces
- Miniature sensing head and configurable electronics module
- Touch screen (optional) for temperature indication and configuration. Screen turns bright red in alarm condition for maximum visibility
- Temperature ranges from 100°C to 2000°C
- Adjustable emissivity setting on all models
- Data logging to MicroSD Card (optional) on touch screen models
- 4 to 20 mA or RS485 Modbus outputs
- Alarm relay outputs rated 24 V DC (optional) - no need for separate trip amplifier
- Resistant to interference from movement of sensing head cable - ideal for mounting on robot arms
- Maximum, minimum, average and instantaneous readings, peak or valley hold, reflected energy compensation
- Optional mounting brackets, air purge collar and laser sighting tool
- Sensing head sealed to IP65

GENERAL SPECIFICATIONS

Temperature Range

PT models: 100°C to 400°C
 MT models: 250°C to 1000°C
 HT models: 450°C to 2000°C

Maximum Temperature Span (-CRT models)

Full temperature range (up to 1550°C)

Minimum Temperature Span (-CRT models)

100°C

Output

4 to 20 mA or RS485 Modbus (up to 247 sensors may be installed on a single Modbus network)

Field of View

See table of Model Numbers

Accuracy

± 2°C or 1% of reading, whichever is greater

Repeatability

± 0.5°C or 0.5% of reading, whichever is greater

Emissivity Setting Range

0.10 to 1.00

Emissivity Setting Method

-CB models: via two rotary switches in electronics box
 -BB and -BRT models: via RS485
 -CRT and -BRT models: via touch screen

Response Time, t_{90}

≥240 ms (90% response)

Spectral Range

2.0 to 2.6 μ m

Supply Voltage

24 V DC ± 5%

Maximum Current Draw

100 mA

Maximum Loop Impedance

-CB and -CRT models: 900 Ω (4 to 20 mA output)

Alarm Relays (-CRT and -BRT models)

2 x Single Pole Changeover alarm relays rated 24 V DC, 1 A, isolated 500 V DC

MECHANICAL

	Sensing head	Electronics Module
Construction	Stainless Steel 316	Cast aluminium
Dimensions	Ø 18 x 45 mm (see diagram)	98(w) x 64(h) x 36(d) mm
Mounting	M16 x 1 mm thread	Two M4 screw holes for wall mounting (see diagram)

Cable Length (sensing head to electronics module)

1 m (standard), up to 30 m (optional)

Weight with 1 m Cable

390 g (approx)

Cable Connections

Removable screw terminal blocks (see Connections)

Conductor size: 28 AWG to 18 AWG

Suitable for cable diameters 3.0 to 6.5 mm

Output Cable Gland

ENVIRONMENTAL

	Sensing head	Electronics Module (without touch screen)	Electronics Module (with touch screen)
Environmental Rating	IP65 (NEMA 4)	IP65 (NEMA 4)	
Ambient Temperature Range	0°C to 70°C	0°C to 60°C	0°C to 60°C
Relative Humidity	Maximum 95% non-condensing	Maximum 95% non-condensing	Maximum 95% non-condensing
CE Marked	Yes	Yes	Yes
RoHS Compliant	Yes	Yes	Yes

ELECTROMAGNETIC COMPATIBILITY STANDARDS:

Class	Standard	Description
EMC Directive	EN61326-1:2006	Electrical equipment for measurement, control and laboratory use – Industrial
-Immunity	IEC 61000-4-2	Electrostatic Discharge Immunity
	IEC 61000-4-3	Electromagnetic Field Immunity
	IEC 61000-4-4	Burst Immunity
	IEC 61000-4-5	Surge Immunity
-Emissions	IEC 61000-4-6	Conducted RF Immunity
	EN 55022A	RF Emissions Class A
	EN 55022B	RF Emissions Class B

TOUCH SCREEN (-CRT AND -BRT MODELS)

The optional backlit touch screen interface mounted in the lid of the electronics module provides a large, bright display of the measured temperature, as well as controls allowing full configuration of the sensor. The graph view shows the history of the measured temperature.

In alarm conditions, the display changes colour to provide an immediate and obvious alarm indication. Alarm modes and levels can be configured via the touch screen.

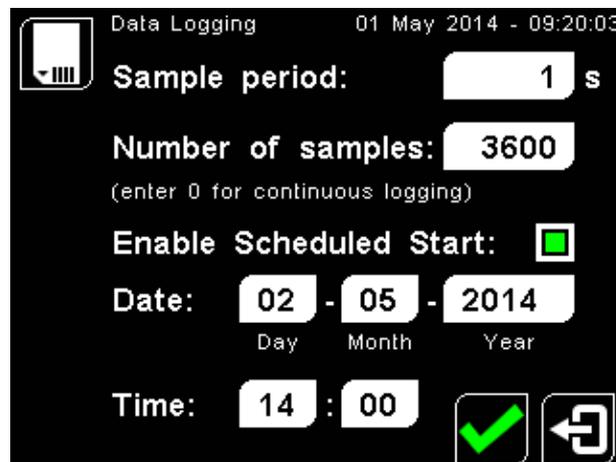
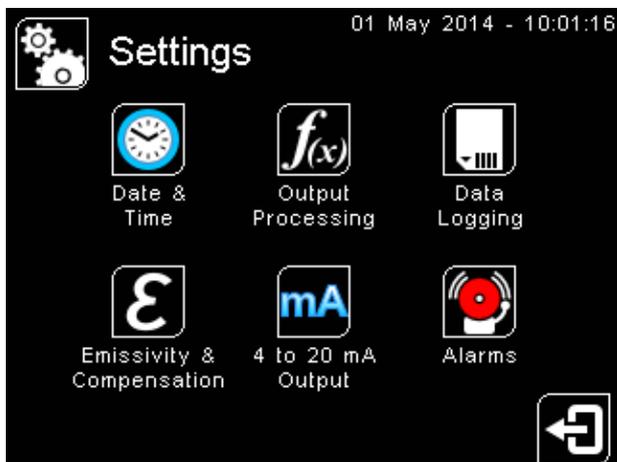
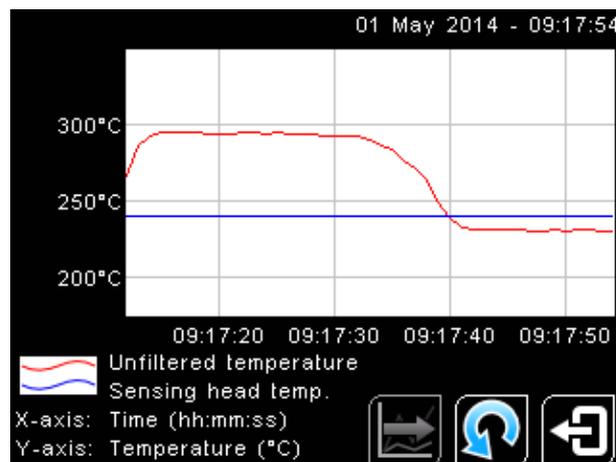
TOUCH SCREEN SPECIFICATIONS

Touch Screen Display Format	2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit
Configurable Parameters	Temperature range, temperature units, emissivity setting, reflected energy compensation, alarms, signal processing, Modbus address (-BRT models), date and time, data logging
Temperature Units	°C or °F configurable
Temperature Resolution	0.1°
Alarm Configuration	Two alarms with adjustable level, individually configurable as HI or LO. Alarm 2 can be set to target temperature or sensing head internal temperature
Signal Processing	Average, peak hold, valley hold, minimum, maximum

EXAMPLE SCREENSHOTS



Screen shown with red background to indicate alarm condition



DATA LOGGING SPECIFICATIONS

Data Logging Interval	1 to 86,400 seconds (1 day)
MicroSD Card	Max. capacity: 2 GB (not included)
Internal Clock Battery	1 x BR 1225 3V (not included)
Variables Logged	Target temperature, sensing head temperature, electronics module temperature, max, min, average, emissivity setting, reflected energy compensation temperature, alarm events
File format	.csv
Configurable Parameters	Sample period, number of samples, scheduled start date and time

DATA LOGGING (-CRT AND -BRT MODELS)

The PyroMini can be used as a standalone data logger.

PyroMini models -CRT and -BRT include a MicroSD card slot for data logging, which can be configured via the touch screen interface. The user can select the sample rate and the number of samples to be taken and schedule the data logging to start at a certain time.

With a 2 GB card, the user can store 28.4 million readings, which provides almost 1 year's worth of data at the fastest possible sample rate of 1 per second.

Data is stored on the MicroSD card in .csv format and can be viewed and edited easily using spreadsheet software. Alarm events can also be logged to the MicroSD Card.

A MicroSD card with SD card adapter is available as an optional accessory.

The MicroSD card slot and battery holder are located on the touch screen circuit board in the lid of the PyroMini. Readings are time and date stamped using the sensor's internal clock. The clock is reset when the power is disconnected, or it will continue if the optional battery is fitted.

MODEL NUMBERS

Series	Field of View	Measurement Temperature Range	Output and Interface
PM2.2	151	PT	CB
	251	MT	CRT
	751	HT	BB
	CF	HT	BRT

SERIES PM2.2



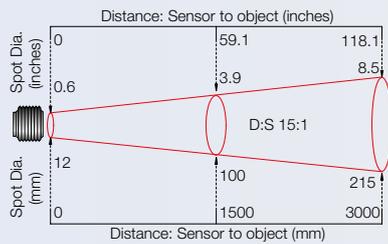
PyroMini 2.2 series infrared temperature sensor with miniature sensing head and separate electronics module

Model shown does not include screen

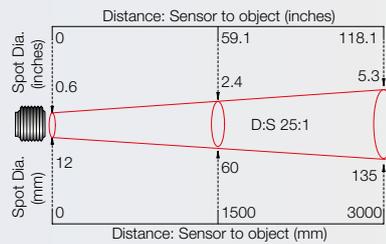
OUTPUT AND INTERFACE

- CB** 4 to 20 mA output, no screen
- CRT** 4 to 20 mA output and two alarm relay outputs, with touch screen
- BB** RS485 Modbus output, no screen
- BRT** RS485 Modbus output and two alarm relay outputs, with touch screen

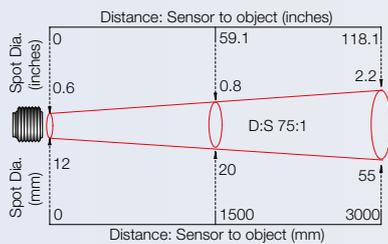
FIELD OF VIEW



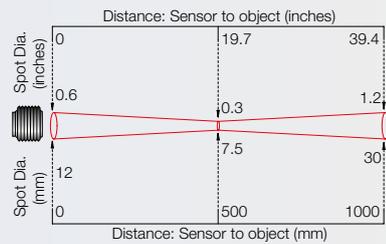
PU151-2.2



PU251-2.2



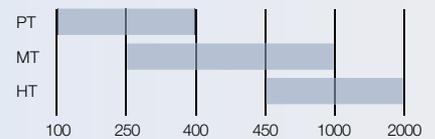
PU751-2.2



PUCF-2.2

Diameter of target spot measured versus distance from sensing head - 90% energy

MEASUREMENT TEMPERATURE RANGE (°C)



-CB models: Fixed 4 to 20 mA output scale (e.g. -MT: 250°C @ 4 mA, 1000°C @ 20 mA)

-CRT models: 4 to 20 mA output is configurable within this range

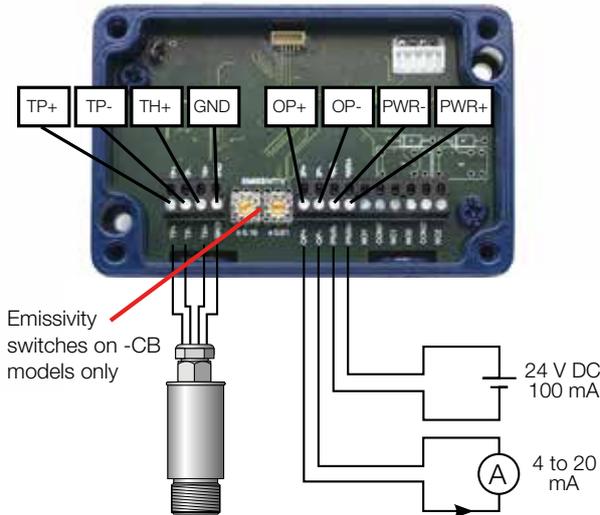
-BB and -BRT models: Digital output, full temperature range

EXAMPLE: PM2.2-251-MT-BRT

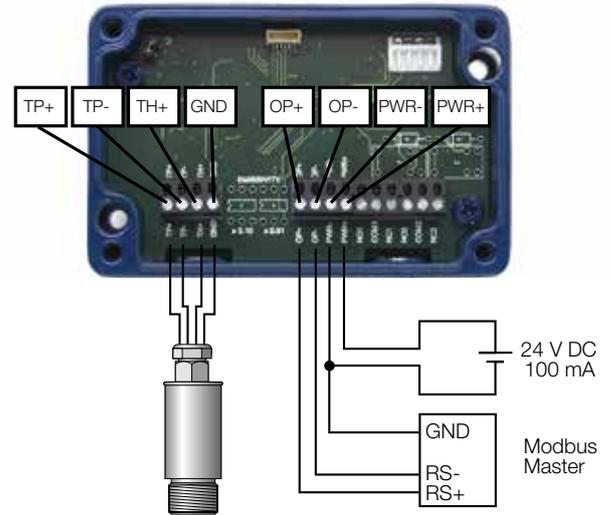
Series	Field of View	Measurement Temperature Range	Output and Interface
PM2.2 PyroMini 2.2	251 25:1 divergent optics	MT 250°C to 1000°C	BRT RS485 Modbus output and two alarm relay outputs, with touch screen

CONNECTIONS

-CB and -CRT models

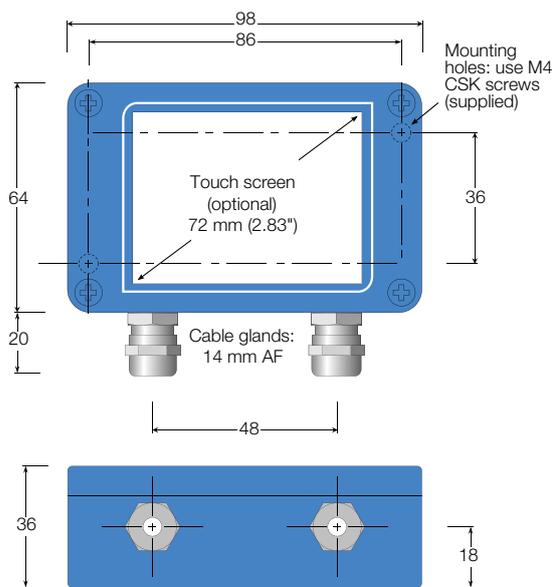


-BB and -BRT models

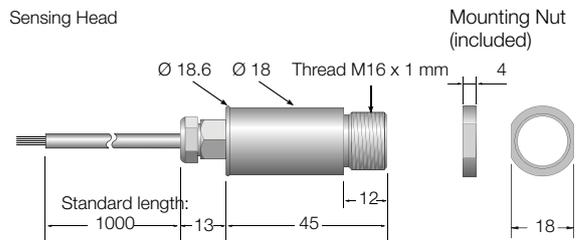


DIMENSIONS AND ACCESSORIES

Electronics Module

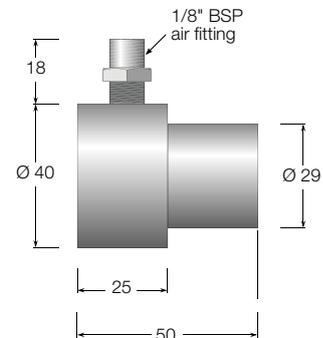


Sensing Head



Mounting Nut (included)

Air Purge Collar



All dimensions in mm

ACCESSORIES ALSO AVAILABLE

- MSD** MicroSD Card with SD Card adapter: stores logged data (-CRT and -BRT models)
- PM2.2CE** Extended cable between sensing head and electronics module (up to 30 m length)
- CALCERTA** Calibration certificate
- LSTS** Laser sighting tool
- ABS** Adjustable mounting bracket
- FBS** Fixed mounting bracket
- DLSB** Dual Laser Sighting Bracket
- APSN** Air purge collar
- PM180** 6-channel Modbus temperature indicator with touch screen interface and data logging



PyroMini 0.9

Miniature Infrared Temperature Sensor for Semiconductors & Metals, with Optional Touch Screen



- Very short measurement wavelength for low-emissivity targets such as silicon and many metal surfaces
- Miniature sensing head and configurable electronics module
- Touch screen (optional) for temperature indication and configuration. Screen turns bright red in alarm condition for maximum visibility
- Temperature ranges from 350°C to 2000°C
- Adjustable emissivity setting on all models
- Data logging to MicroSD Card (optional) on touch screen models
- 4 to 20 mA or RS485 Modbus outputs
- Alarm relay outputs rated 24 V DC (optional) - no need for separate trip amplifier
- Resistant to interference from movement of sensing head cable - ideal for mounting on robot arms
- Maximum, minimum, average and instantaneous readings, peak or valley hold, reflected energy compensation
- Optional mounting brackets, air purge collar and laser sighting tool
- Sensing head sealed to IP65

GENERAL SPECIFICATIONS

Temperature Range

PT models: 350°C to 800°C

MT models: 550°C to 1200°C

HT models: 800°C to 2000°C

Maximum Temperature Span (-CRT models)

Full temperature range (up to 1200°C)

Minimum Temperature Span (-CRT models)

100°C

Output

4 to 20 mA or RS485 Modbus (up to 247 sensors may be installed on a single Modbus network)

Field of View

See table of Model Numbers

Accuracy

± 1% of reading

Repeatability

± 0.5% of reading

Emissivity Setting Range

0.10 to 1.00

Emissivity Setting Method

-CB models: via two rotary switches in electronics box

-BB and -BRT models: via RS485

-CRT and -BRT models: via touch screen

Response Time, t_{90}

≥240 ms (90% response)

Spectral Response

0.9 μ m

Supply Voltage

24 V DC ± 5%

Maximum Current Draw

100 mA

Maximum Loop Impedance

-CB and -CRT models: 900 Ω (4 to 20 mA output)

Alarm Relays (-CRT and -BRT models)

2 x Single Pole Changeover alarm relays rated 24 V DC, 1 A, isolated 500 V DC

MECHANICAL

	Sensing head	Electronics Module
Construction	Stainless Steel 316	Cast aluminium
Dimensions	Ø 18 x 45 mm (see diagram)	98(w) x 64(h) x 36(d) mm
Mounting	M16 x 1 mm thread	Two M4 screw holes for wall mounting (see diagram)

Cable Length (sensing head to electronics module)

1 m (standard), up to 30 m (optional)

Weight with 1 m Cable

390 g (approx)

Cable Connections

Removable screw terminal blocks (see Connections)

Conductor size: 28 AWG to 18 AWG

Suitable for cable diameters 3.0 to 6.5 mm

Output Cable Gland

ENVIRONMENTAL

	Sensing head	Electronics Module (without touch screen)	Electronics Module (with touch screen)
Environmental Rating	IP65 (NEMA 4)	IP65 (NEMA 4)	
Ambient Temperature Range	0°C to 70°C	0°C to 60°C	0°C to 60°C
Relative Humidity	Maximum 95% non-condensing	Maximum 95% non-condensing	Maximum 95% non-condensing
CE Marked	Yes	Yes	Yes
RoHS Compliant	Yes	Yes	Yes

ELECTROMAGNETIC COMPATIBILITY STANDARDS:

Conforms to EMC Directive EN61326-1:2006 (Electrical equipment for measurement, control and laboratory use – Industrial) as well as industrial standards for electromagnetic immunity and emissions.

TOUCH SCREEN (-CRT AND -BRT MODELS)

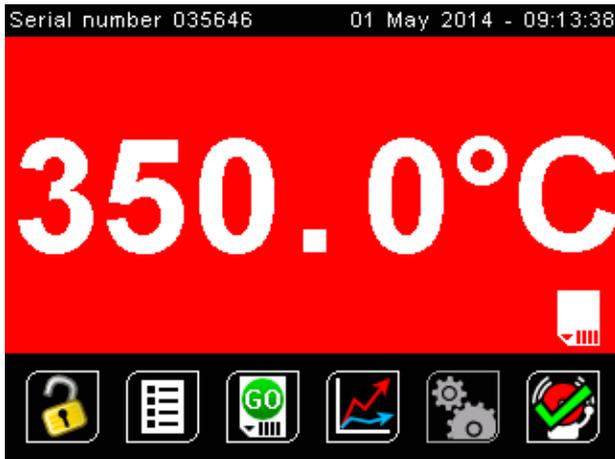
The optional backlit touch screen interface mounted in the lid of the electronics module provides a large, bright display of the measured temperature, as well as controls allowing full configuration of the sensor. The graph view shows the history of the measured temperature.

In alarm conditions, the display changes colour to provide an immediate and obvious alarm indication. Alarm modes and levels can be configured via the touch screen.

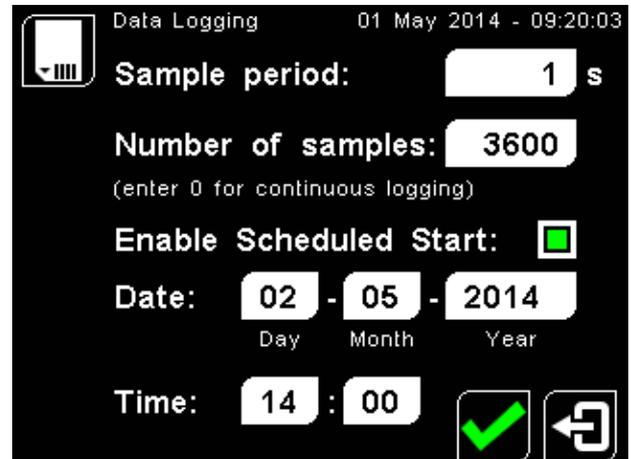
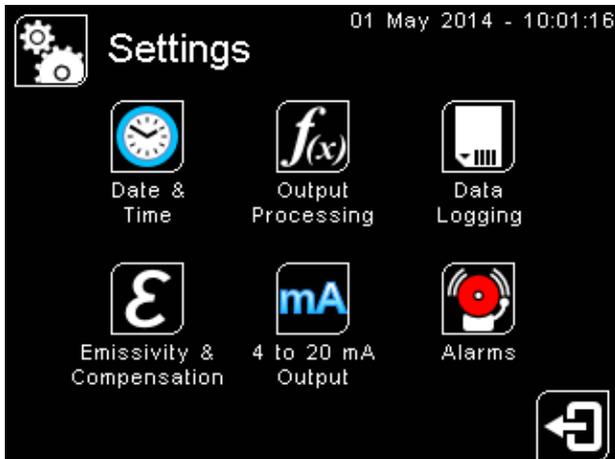
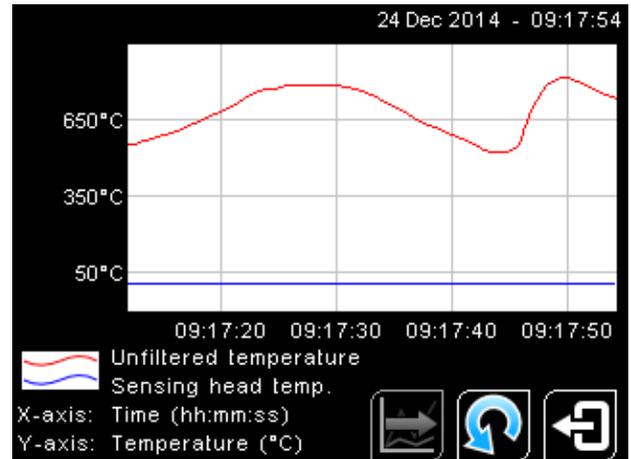
TOUCH SCREEN SPECIFICATIONS

Touch Screen Display Format	2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit
Configurable Parameters	Temperature range, temperature units, emissivity setting, reflected energy compensation, alarms, signal processing, Modbus address (-BRT models), date and time, data logging
Temperature Units	°C or °F configurable
Temperature Resolution	0.1°
Alarm Configuration	Two alarms with adjustable level, individually configurable as HI or LO. Alarm 2 can be set to target temperature or sensing head internal temperature
Signal Processing	Average, peak hold, valley hold, minimum, maximum

EXAMPLE SCREENSHOTS



Screen shown with red background to indicate alarm condition



DATA LOGGING SPECIFICATIONS

Data Logging Interval	1 to 86,400 seconds (1 day)
MicroSD Card	Max. capacity: 4 GB (not included)
Internal Clock Battery	1 x BR 1225 3V (not included)
Variables Logged	Target temperature, sensing head temperature, electronics module temperature, max, min, average, emissivity setting, reflected energy compensation temperature, alarm events
File format	.csv
Configurable Parameters	Sample period, number of samples, scheduled start date and time

DATA LOGGING (-CRT AND -BRT MODELS)

The PyroMini can be used as a standalone data logger.

PyroMini models -CRT and -BRT include a MicroSD card slot for data logging, which can be configured via the touch screen interface. The user can select the sample rate and the number of samples to be taken and schedule the data logging to start at a certain time.

With a 2 GB card, the user can store 28.4 million readings, which provides almost 1 year's worth of data at the fastest possible sample rate of 1 per second.

Data is stored on the MicroSD card in .csv format and can be viewed and edited easily using spreadsheet software. Alarm events can also be logged to the MicroSD Card.

A MicroSD card with SD card adapter is available as an optional accessory.

The MicroSD card slot and battery holder are located on the touch screen circuit board in the lid of the PyroMini. Readings are time and date stamped using the sensor's internal clock. The clock is reset when the power is disconnected, or it will continue if the optional battery is fitted.

MODEL NUMBERS

Series	Field of View	Measurement Temperature Range	Output and Interface
PM0.9	121	PT	CB
	251	MT	CRT
	751	HT	BB
	CF	HT	BRT

SERIES PM0.9



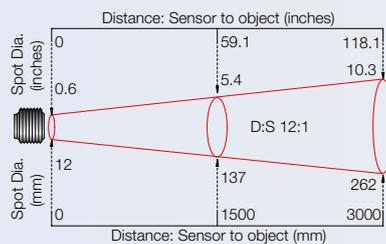
PyroMini 0.9 series infrared temperature sensor with miniature sensing head and separate electronics module

Model shown does not include screen

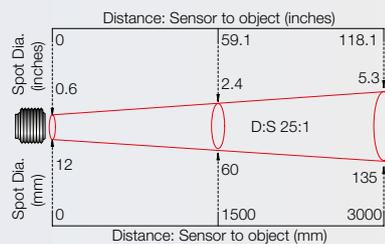
OUTPUT AND INTERFACE

- CB** 4 to 20 mA output, no screen
- CRT** 4 to 20 mA output and two alarm relay outputs, with touch screen
- BB** RS485 Modbus output, no screen
- BRT** RS485 Modbus output and two alarm relay outputs, with touch screen

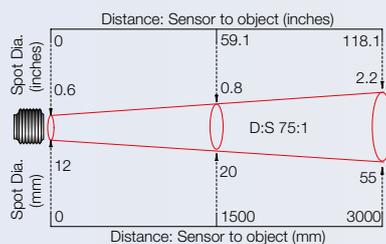
FIELD OF VIEW



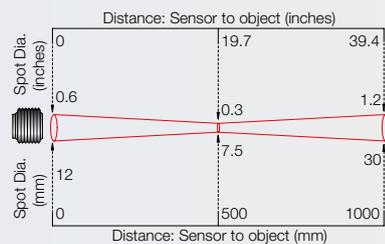
-121



-251



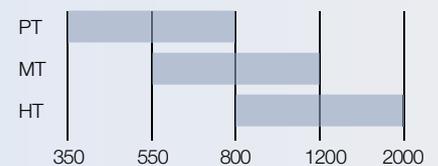
-751



-CF

Diameter of target spot measured versus distance from sensing head - 90% energy

MEASUREMENT TEMPERATURE RANGE (°C)



-CB models: Fixed 4 to 20 mA output scale (e.g. -MT: 550°C @ 4 mA, 1200°C @ 20 mA)

-CRT models: 4 to 20 mA output is configurable within this range

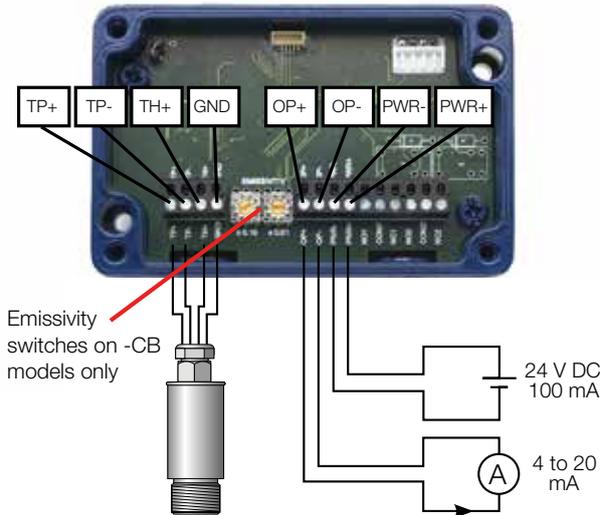
-BB and -BRT models: Digital output, full temperature range

EXAMPLE: PM2.2-251-MT-BRT

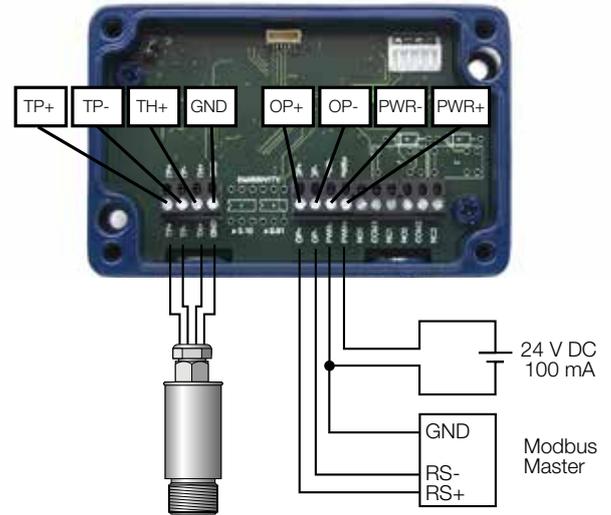
Series	Field of View	Measurement Temperature Range	Output and Interface
PM0.9 PyroMini 0.9	121 12:1 divergent optics	PT 350°C to 800°C	CRT 4-20 mA output and two alarm relay outputs, with touch screen

CONNECTIONS

-CB and -CRT models

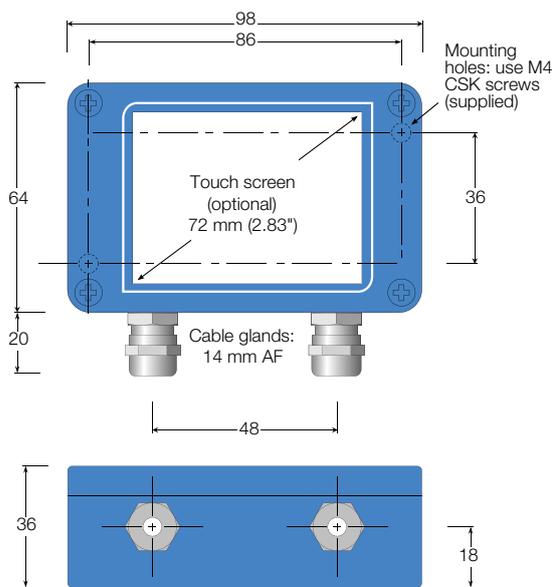


-BB and -BRT models

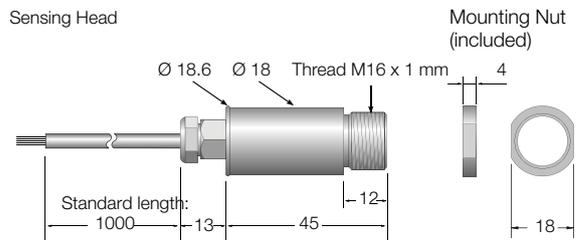


DIMENSIONS AND ACCESSORIES

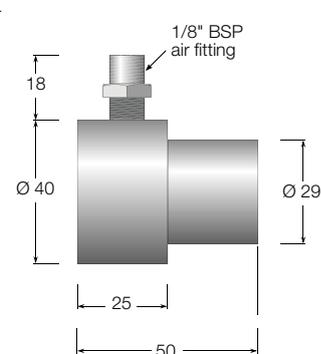
Electronics Module



Sensing Head



Air Purge Collar



All dimensions in mm

ACCESSORIES ALSO AVAILABLE

- MSD** MicroSD Card with SD Card adapter: stores logged data (-CRT and -BRT models)
- PM0.9CE** Extended cable between sensing head and electronics module (up to 30 m length)
- CALCERTA** Calibration certificate
- LSTS** Laser sighting tool
- ABS** Adjustable mounting bracket
- FBS** Fixed mounting bracket
- DLSBAS** Dual Laser Sighting Bracket, Adjustable
- DLSBFS** Dual Laser Sighting Bracket, Fixed
- APSN** Air purge collar
- PM180** 6-channel Modbus temperature indicator with touch screen interface and data logging



PM180 Series

6-channel Modbus Pyrometer Hub with Data Logging



- Compatible with PyroBus and PyroMini infrared temperature sensors with RS485 Modbus interface
- Operates as Modbus master and isolated Modbus slave
- Configure, display and log data and alarms from up to 6 sensors per PM180 unit, simultaneously or individually
- MicroSD Card stores up to 1 year of data (with 2 GB card)
- Touch screen with backlight
- Scheduled and manual logging start/stop
- Relay alarms with ICP DAS M-7061 (not included)
- Analogue outputs with ICP DAS M-7024 (not included)
- Temperature chart displays data from 2 channels simultaneously
- CE marked and RoHS compliant

GENERAL SPECIFICATIONS

Display

2.83" (72 mm) resistive touch TFT, 320 x 240 pixels, backlit

Supply Voltage

10 to 30 V DC

Maximum Current Draw

100 mA

Ambient Temperature Range

0°C to 60°C

Relative Humidity

Maximum 95%, non-condensing

Configurable Parameters (global)

Temperature units, date and time, data logging, graph channels, alarm logging

Configurable Parameters (per channel)

Signal processing, emissivity setting, reflected energy compensation, alarms, Modbus address

Alarm Configuration

12 alarms (2 per sensor) with adjustable level, individually configurable as HI or LO.

Temperature Units

°C or °F selectable

Temperature Resolution

0.1°

Signal Processing

Average, peak hold, valley hold, minimum, maximum

Display Sample Period

120 ms per sensor (720 ms in total for 6 sensors)

Compatible Sensor Types

PyroBus (all models), PyroMini (-BB and -BRT models)

DATA LOGGING

Logging Interval

1 to 86,400 seconds (1 day)

MicroSD Card

Max. capacity: 32 GB (not included)

Internal Clock Battery

1 x BR 1225 3V (not included)

Variables Logged

Target temperature, sensing head temperature, alarm events

File Format

.csv (can be imported to Excel)

Configurable Parameters

Sample period, number of samples, scheduled start date and time

MECHANICAL SPECIFICATIONS

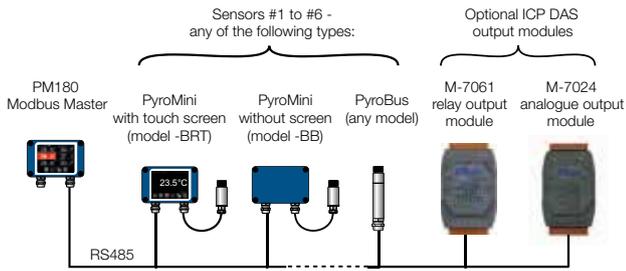
Dimensions

98(w) x 64(h) x 36(d) mm excluding cable glands

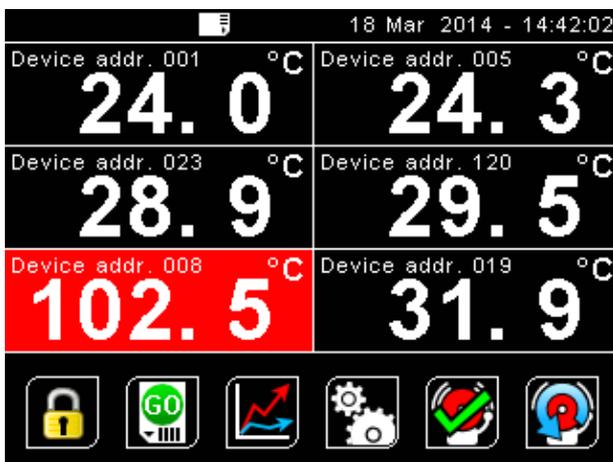
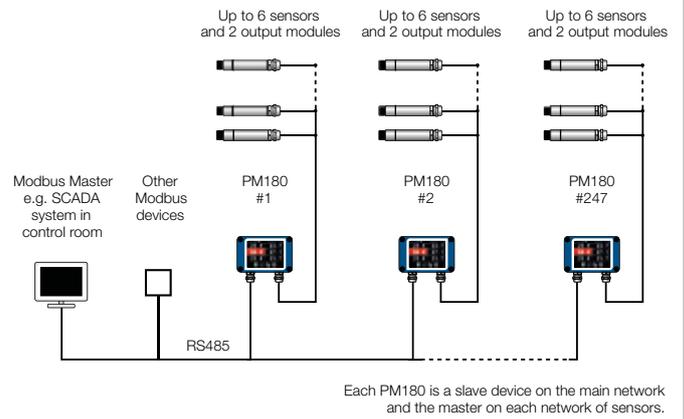
Weight

280 g

PM180 AS MODBUS MASTER

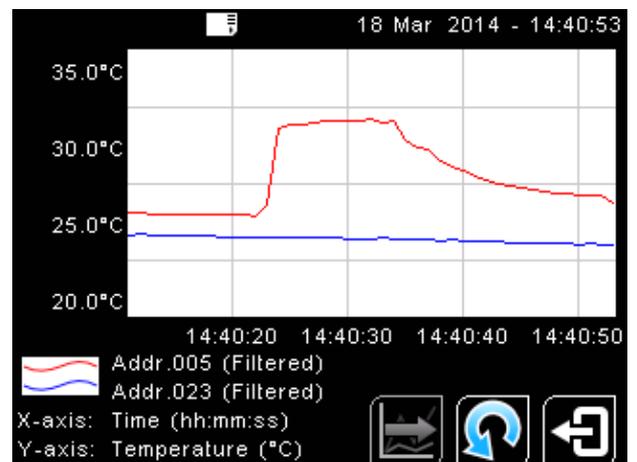


PM180 AS MODBUS SLAVE



Intuitive touch screen interface

Display, chart and configure all 6 channels individually or simultaneously. The display for each channel turns red in an alarm condition



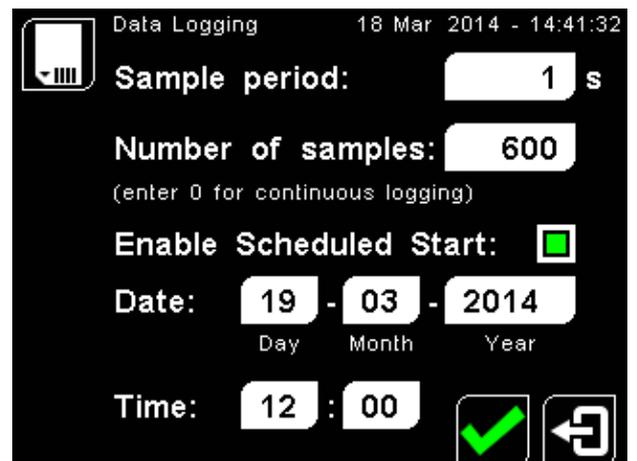
Temperature chart

Display temperature data from two channels in a scrolling graph



Password-protected settings

Configure options for each sensor and the PM180 itself via the touch screen interface



Data logging

Temperature data and alarm events may be logged to a MicroSD Card (not supplied)

MODEL NUMBERS

PM180

6-channel Modbus display/logger

ACCESSORIES

AC adapter **PM180MA**

2 GB MicroSD Card **MSD**

12-channel relay output module **M-7061**

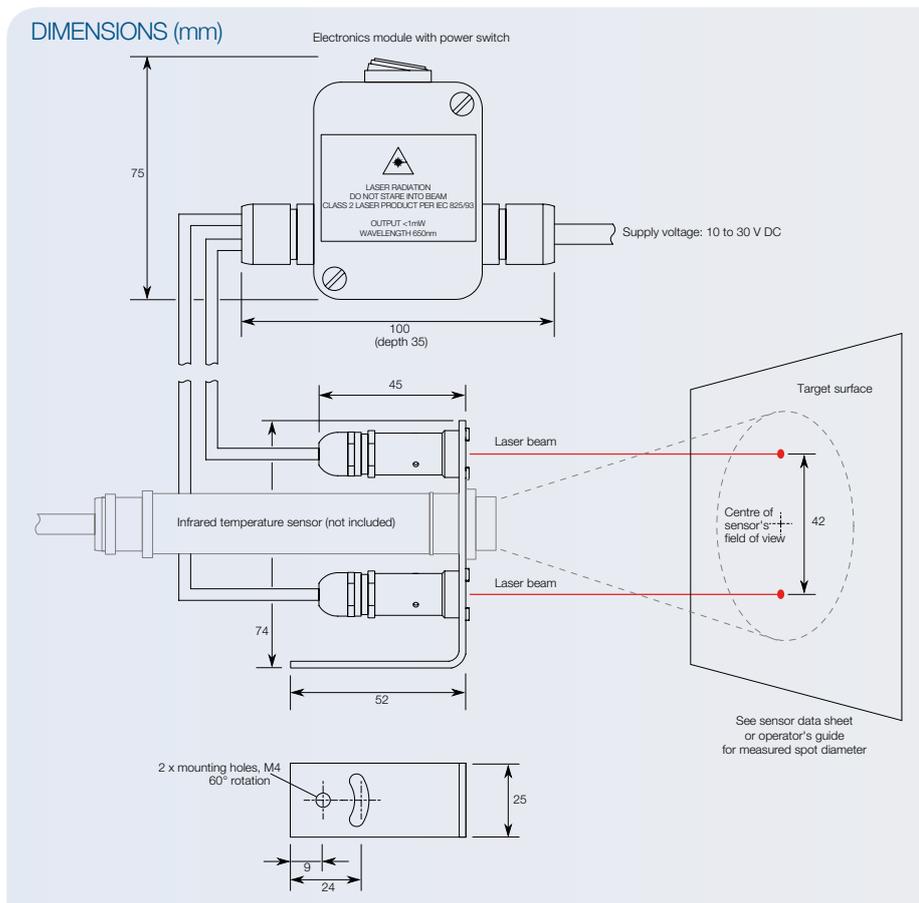
4-channel voltage or current analogue output module **M-7024**

DLSB

Dual Laser Sighting Bracket



- Mounting bracket for Calnex infrared temperature sensors
- Two parallel lasers indicate the centre of the measured spot
- Allows continuous targeting while taking measurements
- IP65 sealed
- Remote on/off switch



GENERAL SPECIFICATIONS

Supply voltage

10 to 30 V DC

Max current draw

100 mA

Electrical connection

Removable screw terminals

Power cable type

Use two-core cable with outer diameter 4.5 to 10 mm

Connection cable (lasers to electronics module)

Two cables, length 1 m as standard (longer cable available to order)

Construction

Bracket & laser housing: Stainless steel

Electronics module: Polycarbonate

Separation of laser dots

42 mm (calibrated at 1.5 m distance)

Dimensions (electronics module)

With glands & switch: 100 (w) x 75 (h) x 35 (d) mm

Box only: 50 (w) x 65 (h) x 35 (d) mm

Dimensions (bracket)

25 (w) x 74 (h) x 52 (d) mm

Weight (without sensor)

202 g

Environmental Rating

IP65

Relative humidity

95% max. non-condensing

Operating temperature range

-10°C to +60°C

ORDERING INFORMATION

Description	Compatibility	Type	Model number
Dual Laser Sighting Bracket	Sensors with 16 mm mounting thread (e.g. PyroCouple, PyroMini, PyroBus, PyroEpsilon)	Fixed (1-axis rotation)	DLSBFS
		Adjustable (2-axis rotation)	DLSBAS
	Sensors with 20 mm mounting thread (e.g. PyroUSB)	Fixed (1-axis rotation)	DLSBFL
		Adjustable (2-axis rotation)	DLSBAL

OPTIONS

- Extended cable for all models (30 m max)

PyroPen

Handheld Infrared Thermometer



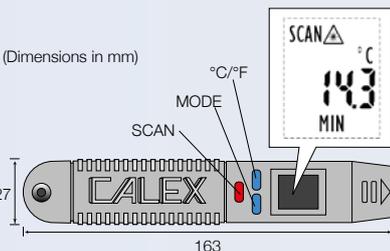
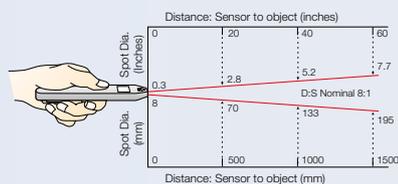
- Conveniently clips into your pocket just like a pen
- Unique ultra compact design
- Wide temperature range
- High accuracy and repeatability
- Fast response
- Displays maximum, minimum, average and current temperatures
- Narrow field of view
- Optional laser sighting
- Optional USB data logging & data acquisition

GENERAL SPECIFICATIONS

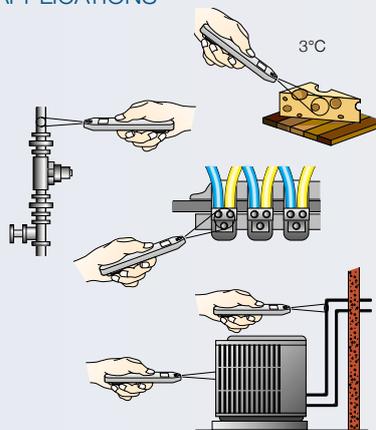
Temperature Range	-20°C to +500°C
Accuracy	+/-1% of reading or +/-1°C whichever is greater
Repeatability	+/-0.5% of reading or +/-0.5°C whichever is greater
Response Time, t_{90}	500 ms (90% response)
Spectral Range	8 to 14µm
Ambient Temp Range	0°C to +50°C
Housing	Pen style
Display	3.5 digit LCD
Power	2 x AAA batteries
Reading	°C or °F SCAN/HOLD/LOCK/MAX/MIN/AVG
Display Resolution	0.1°
Field-of-view	8:1
Relative Humidity	10 to 95% non-condensing
Dimensions	163 mm x 27 mm x 16 mm

	PyroPen E	PyroPen L	PyroPen U
Emissivity	Fixed at 0.95	Adjustable 0.3 to 1.0	Adjustable 0.3 to 1.0
Sighting	None	Laser	Laser
Data Logging	None	None	100 memory locations
Data Acquisition	None	None	Via USB cable and CalexSoft software supplied
Weight	50g	60g	60g

TARGET SIGHTING AND SPOT SIZES



APPLICATIONS



Designed to be simple, safe and convenient to use. The ultra compact PyroPen has been specifically designed to fit into your pocket, just like a pen, so that you can carry it with you anywhere you go.

You simply aim, press the SCAN button and read the temperature immediately. No fuss. No need to focus and no special training.

The non-contact nature of the measurement means that you can take the temperature of moving, rotating, inaccessible or hazardous objects. This makes the PyroPen particularly useful for test, inspection and maintenance applications in industries such as food & beverage, automotive, plastics & rubber, textiles, paper & packaging, chemicals & pharmaceuticals, HVAC, electrical, asphaltting, plus many others.

The PyroPen L has all the features of the PyroPen E, plus laser sighting for small or distant targets and adjustable emissivity.

The PyroPen U has all the features of the PyroPen L, plus a built-in memory for logging up to 100 temperatures and the ability to perform PC based data acquisition via USB. It is supplied complete with USB interface cable and CalexSoft software disk.

High performance, low cost. The Calex design team have taken advantage of the latest technology, not only to provide an ultra slim design but to incorporate reliability with high accuracy.

Advanced manufacturing techniques are used to ensure that the PyroPen meets the highest quality standards at low cost.

Each PyroPen comes with additional functions such as maximum, minimum and average temperature measurements. The PyroPen can be LOCKED into the ON position if continuous measurements are required. The last measured value can also be held for those situations where it is not easy to see the display whilst measuring.

Emissivity

What it is and why it matters

What is emissivity?

All surfaces emit infrared radiation. The amount of energy they emit depends on their temperature and emissivity.

To accurately measure the temperature of a surface, the infrared sensor needs to know how much of the energy it is “seeing” has been emitted from the surface as a result of the object’s temperature, and not reflected from the surface, or transmitted through it.

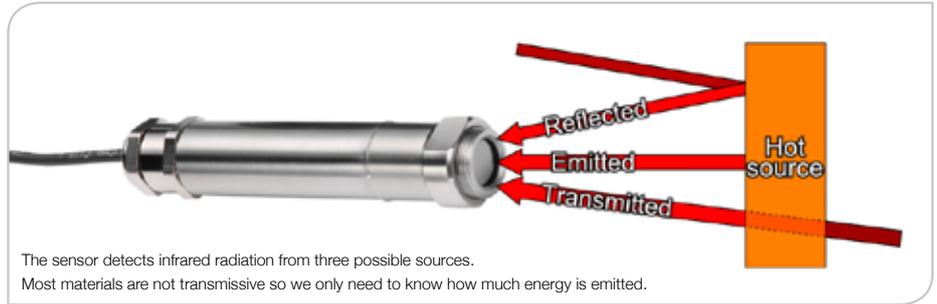
The emissivity of a surface is a measure of how effectively a surface emits infrared radiation.

The sensor’s emissivity setting should be set to match the emissivity of the target surface for maximum accuracy.

Transmissive materials

Most materials do not transmit any infrared radiation, so we can assume all the energy the sensor detects has been either emitted or reflected.

Transmissive materials are a special case. See below for more information.



How to adjust the emissivity setting

The emissivity setting can be adjusted in a different way for each type of sensor:

PyroMini

Via the touch screen, Modbus, or two rotary switches in the electronics module, depending on the model.

PyroEpsilon

Via the 4-20 mA input.

PyroUSB

Via USB using the included cable and software.

PyroBus

Via the Modbus Master.

ExTemp

Via the optional USB adapter and software.

PyroSight E

Via two rotary switches at the back of the sensor.

PyroPen L & U

Via push-buttons on the unit.

PyroCouple

The emissivity setting is fixed at 0.95 and cannot be adjusted.

High emissivity materials

e.g. painted or very dirty surfaces, food, rubber, thick plastics, paper, glue, asphalt

A surface with a high emissivity is easy to measure with a low-cost, general-purpose sensor. In this case, reflections are minimal.

Note: The colour of a surface does not usually affect the emissivity much.



Up to 1000°C: Low-cost 8 to 14 μm sensors such as the PyroCouple and PyroMini give good results.

It is also possible to use a 2.2 μm sensor such as the PyroUSB 2.2 above 45°C.

Low emissivity materials

e.g. clean, bare, reflective metal surfaces including iron and steel

Reflective surfaces have a low emissivity and are more difficult to measure accurately.

If the emissivity is known, it is possible to achieve a good reading from a bare metal surface using a short-wavelength sensor.



If it is possible to paint the surface, you can use a low-cost 8 to 14 μm sensor such as the PyroCouple or PyroMini.

Otherwise, try a short-wavelength sensor such as the PyroUSB 2.2 or PyroMini 2.2.

Some metals, most commonly aluminium and copper, are very difficult to measure. Contact Caalex for advice.

Transmissive materials

e.g. thin film plastics, silicon

A small number of materials, such as thin film plastics and silicon, transmit most wavelengths of infrared energy. If the plastic film is thinner than about 1-2 mm, general-purpose IR sensors could “see” through it.



Transmissive materials are difficult to measure. A specialised sensor may be required to achieve a good reading.

Contact Caalex for advice.

For more advice on emissivity, including how to measure the emissivity of a surface, see the Guide to Infrared Thermometry on our website, or contact us for help and guidance about a specific application.

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