innovative infrared temperature sensors
low-noise industrial power supplies
WELCOME TO CALEX

Since 1973, Calex Electronics Ltd has been providing high quality, cost effective temperature measurement and power conversion solutions for industries worldwide. Our in-house design and manufacturing is focused on non-contact infrared temperature sensors and AC/DC power supplies.

We also offer a wide range of complementary products including thermocouples, resistance thermometers, indicators, controllers, SCADA systems, calibrators and DC/DC converters.

Calex Electronics Ltd is ISO 9001 and ISO 14001 certified.
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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 reflective metals, may require a specialised 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.
PyroNFC
Smartphone Configurable Infrared Temperature Sensor

- Non-contact industrial temperature sensor
- Fully configurable via smartphone app
- Voltage output (linear with temperature) and open collector alarm output. Both can be used simultaneously
- Measures from 0°C to 1000°C, accurately and consistently
- Extremely small, with side-entry cable: ideal for mounting in tight spaces
- Fast response time: 125 ms
- Low cost, high performance
- Operates in ambient temperatures up to 80°C without cooling
- Form factor optimised for brake testing applications, plus many others

APP FEATURES
- Continuously read temperature from PyroNFC sensors
- Instantly configure PyroNFC sensors without powering them
- Simply touch the sensor with the device to communicate
- Compatible with NFC-equipped Android devices
- Get the app free from Google Play Store (search for “PyroNFC”)

GENERAL SPECIFICATIONS
- Temperature Range
  0 to 1000°C
- Outputs
  2 outputs, configurable via NFC: 0-5 V DC or 0-10 V DC output, linear with measured temperature, rescalable, and:
  - Open collector alarm output with temperature threshold and hysteresis
- Field of View
  15:1 (see OPTICS)
- Accuracy
  ± 1.5% of reading or ± 1.5°C, whichever is greater
- Repeatability
  ± 0.5% of reading or ± 0.5°C, whichever is greater
- Response Time, t90
  125 ms
- Configuration
  Via Android app using NFC-equipped device (e.g. smartphone or tablet)
- Emissivity
  Adjustable via app
- Emissivity Setting Range
  0.2 to 1.0
- Max Temperature Span (Linear Output)
  1000°C
- Min Temperature Span (Linear Output)
  100°C
- Spectral Range
  8-14 µm
- Max. Supply Voltage
  28 V DC
- Min. Supply Voltage (at Sensor)
  12 V DC (for 10 V output)
  6 V DC (for 5 V output)
- Max Current Draw
  7 mA

ENVIRONMENTAL
- Environmental Rating
  IP65
- Ambient Temperature Range
  0°C to 80°C
- Relative Humidity
  95% max. non-condensing

CONFORMITY
- Electromagnetic Compatibility (EMC)
  EN61326-1, EN61326-2-3 (Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Industrial)
- RoHS Compliant
  Yes

APP
- Configurable Parameters
  Temperature range
  Linear voltage output type and scale
  Alarm output threshold and hysteresis
  Emissivity setting
  Reflected temperature
- Temperature Units
  °C / °F
- Signal Processing
  Averaging Period (0.125 to 60 seconds)
  Peak / Valley Hold
  Hold Period (0.125 to 1200 seconds)
- Real Time Temperature Reading
  Hold NFC device against sensor for continuous in-app temperature updates
### OPTICS
Diameter of target spot measured versus distance from sensing head (90% energy)

<table>
<thead>
<tr>
<th>Spot Dia. (inches)</th>
<th>Distance: Sensor to object (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.4</td>
<td>1.7</td>
</tr>
<tr>
<td>0.8</td>
<td>19.7</td>
</tr>
<tr>
<td>1</td>
<td>39.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spot Dia. (mm)</th>
<th>Distance: Sensor to object (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>0.4</td>
<td>76</td>
</tr>
<tr>
<td>0.8</td>
<td>43</td>
</tr>
<tr>
<td>1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

**D:S 15:1**

### MECHANICAL SPECIFICATIONS

**Construction**
- Black anodised aluminium and ABS

**Cable Length**
- 1 metre standard (longer lengths available to order)

**Weight with 1 Metre Cable**
- 65 g

- Touch NFC smartphone here

- Open collector output for alarm
  - 0 to 28 V DC, 50 mA

- Power supply
  - 6 to 28 V DC

- Output 0 to 5 V DC or 0 to 10 V DC for display or controller

- 2 x mounting holes
  - M3 x 0.5 mm
  - Depth 7 mm

- Ø 3.2 nominal

### MODEL NUMBERS

**PN 151**

**Optics**
- 151 = 15:1 divergent optics

**Series**
- PN = PyroNFC infrared temperature sensor with 0-5 / 0-10 V DC output, open collector alarm output, NFC wireless communications and 1 metre cable

### ACCESSORIES

- Fixed mounting bracket **FBN**
- Adjustable mounting bracket **ABN**
- Air purge collar **APN**
- 3-point UKAS traceable calibration certificate **CALCERTA**
- Extended cable (30 m max) **PNCE**

**Specifications subject to change without notice**
PyroCouple, PyroEpsilon, PyroBus
Compact Non-Contact Temperature Sensors

The PyroCouple is a simple infrared temperature sensor with a choice of analogue outputs. No complicated setup is required - just connect a temperature indicator and power supply, and instantly start taking measurements.

- Suitable for non-contact temperature measurement on most non-reflective non-metal surfaces, such as paper, thick plastics, asphalt, painted surfaces, food, rubber and organic materials, among many others.
- Choice of analogue outputs for measured temperature:
  - Two-wire 4-20 mA
  - Four-wire 0-50 mV
  - Four-wire Type K, J or T thermocouple
- Additional 4-20 mA sensor body temperature output on the power supply loop of four-wire models: indicates the air temperature around the sensor and helps prevent overheating or overcooling

The PyroEpsilon is a simple sensor with an adjustable emissivity setting. It is ideal if the target is partially reflective.

- Two-wire 4-20 mA output
- Emissivity adjustment via a separate two-wire 4-20 mA input
- Adjust the emissivity continuously during the process using a variable 4-20 mA source
- Set the emissivity manually with the PyroTune emissivity adjuster
- If you are not sure the emissivity of the target is high, choose the PyroEpsilon instead of the PyroCouple.

The PyroBus is a networkable, fully configurable sensor with RS485 Modbus RTU communications.

- Up to 247 sensors may be connected to a single network.
- Adjustable emissivity setting for use on a wide range of materials
- Averaging function to smooth the temperature output
- Peak and valley hold processing for measuring individual objects on a conveyor
- Reflected energy compensation for accurately measuring the temperature of objects in ovens or chillers, from outside
- Maximum, minimum and instantaneous temperature readings
- Optional 6-channel touch screen terminal for local display, configuration and data logging
- Connect sensors and 6-channel terminals directly to an existing RS485 Modbus system

The Calex Compact Series is a range of high quality, low cost non-contact sensors that 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. All models conform to industrial EMC standards.
### GENERAL SPECIFICATIONS - SENSORS

#### Output (PyroCouple)

<table>
<thead>
<tr>
<th>PyroCouple Output Option (see Model Numbers)</th>
<th>Target Temperature Output</th>
<th>Sensor Temperature Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0</td>
<td>4-20 mA</td>
<td>Not available</td>
</tr>
<tr>
<td>-1</td>
<td>0-50 mV</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>-2</td>
<td>Type T thermocouple</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>-3</td>
<td>Type J thermocouple</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>-4</td>
<td>Type K thermocouple</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>-5</td>
<td>0-50 mV (very low current draw: 3.2 mA)</td>
<td>Not available</td>
</tr>
</tbody>
</table>

#### Output

<table>
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<th>PyroEpsilon</th>
<th>PyroBus</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Above</td>
<td>Two-wire 4-20 mA</td>
<td>-20 to 500°C</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>LT = -20 to +100 ºC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MT = 0 to 250 ºC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HT = 0 to 500 ºC</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1% of reading or ±1ºC whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.5% of reading or ±0.5ºC whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Emissivity Setting</td>
<td>Fixed at 0.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variable 0.2 to 1.0 via continuous 4-20 mA input</td>
<td></td>
</tr>
<tr>
<td>Response Time, t90</td>
<td>240 ms (90% response)</td>
<td></td>
</tr>
<tr>
<td>Spectral Range</td>
<td>8 to 14 μm</td>
<td></td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>24 V DC (28 V DC max.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 V DC (13 V DC max.)</td>
<td></td>
</tr>
<tr>
<td>Min. Sensor Voltage</td>
<td>6 V DC</td>
<td></td>
</tr>
<tr>
<td>Max. Loop Impedance</td>
<td>900 Ω (4-20 mA output)</td>
<td></td>
</tr>
<tr>
<td>Output Impedance</td>
<td>56 Ω (voltage/thermocouple output)</td>
<td></td>
</tr>
<tr>
<td>Input Impedance</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Current Draw</td>
<td>20 mA max. (PyroCouple -5 models: 3.2 mA @ 24 V DC)</td>
<td></td>
</tr>
<tr>
<td>Baud Rate</td>
<td>9600 baud*</td>
<td></td>
</tr>
<tr>
<td>Format</td>
<td>8 data bits, no parity, 1 stop bit *</td>
<td></td>
</tr>
</tbody>
</table>

* Other configurations available upon request

### MECHANICAL

**Construction**
- Stainless Steel

**Dimensions**
- 18 mm diameter x 103 mm long
- M16 x 1 mm pitch
- 1m (longer lengths available to order)
- 95 g

### ENVIRONMENTAL

**Environmental Rating**
- IP65

**Ambient Temperature Range**
- 0ºC to 70ºC

**Relative Humidity**
- 95% max. non-condensing

### GENERAL SPECIFICATIONS - PYROTUNE

**Output**
- 4-20 mA for emissivity adjustment of PyroEpsilon sensor

**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**
- 0ºC to 70ºC

**Relative Humidity**
- 95% max. non-condensing
CONNECTIONS

**PYROCOUPLE**

- **Two-wire (option 0)**
- **Four-wire (options 1 to 5)**

**PYROEPSILON**

- **PyroTune or PLC**

**PYROBUS**

- **Modbus Master**
**OPTICS**

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

**ACCESSORIES**

Fixed mounting bracket **FBS**

Adjustable mounting bracket **ABS**

Air purge collar for 2:1 optics **APSW** or for all other optics (shown above) **APSN**

Laser sighting tool **LSTS**

Air or water cooled jacket with air purge collar **WJ** (see Model Numbers)

Dual laser sighting bracket, adjustable **DLSBAS** or fixed **DLSBFS**

PyroTune emissivity adjuster **PT** (for PyroEpsilon only)

6-channel touch screen interface for temperature display, configuration and data logging (PyroBus only) **PM180**

Protective plastic window with stainless steel holder **PWS** (PyroEpsilon and PyroBus only)

**MODEL NUMBERS**

<table>
<thead>
<tr>
<th>PC</th>
<th>151</th>
<th>MT</th>
<th>0</th>
<th>WJ</th>
</tr>
</thead>
</table>

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

**Output option (PyroCouple only)**

- **0** = 2 wire, 4-20mA
- **1** = 4-wire, 0-50mV (target temp.), 4-20mA (sensor temp.)
- **2** = 4-wire, J Thermocouple (target temp.), 4-20mA (sensor temp.)
- **3** = 4-wire, K Thermocouple (target temp.), 4-20mA (sensor temp.)
- **4** = 4-wire, 0-50mV (target temp.), very low current draw

Example: Model PC151HT-4 has a type K thermocouple output representing target temperatures of 0ºC to 500ºC plus a 4-20mA output proportional to internal sensor temperature. For simplicity, the sensor temperature range is always set the same as the target temperature range.

**Temperature range (PyroCouple and PyroEpsilon only)**

- **LT** = -20 to +100 ºC
- **MT** = 0 to 250 ºC
- **HT** = 0 to 500 ºC (not normally available on PC21 models)

**Field of view**

- **21** = 2:1 divergent optics
- **151** = 15:1 divergent optics
- **301** = 30:1 divergent optics

**Example Model Numbers:** PC151MT-0, PE151MT, PB151

**Series**

- **PC** = PyroCouple: fixed emissivity, choice of analogue outputs
- **PE** = PyroEpsilon: adjustable emissivity, 4-20mA output
- **PB** = PyroBus: fully configurable, RS485 Modbus communications

**Specifications subject to change without notice**
PyroMini
Miniature Infrared Temperature Sensors with Optional Touch Screen Interface

**FEATURES (ALL MODELS)**
- 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
- 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
- Maximum, minimum, average and instantaneous readings, peak or valley hold, reflected energy compensation

**PYROMINI GENERAL PURPOSE**
- High-ambient sensing heads (optional) withstand up to 120°C or 180°C without cooling
- Suitable for a wide range of target materials such as paper, plastics, food, painted surfaces, coated metal and many more
- Resistant to interference from movement of sensing head cable (-JA, -HA models) - ideal for mounting on robot arms
- Temperature ranges from -20°C to 1000°C

**PYROMINI 2.2 HIGH TEMPERATURE**
- Short-wavelength measurement for improved accuracy on reflective targets such as steel rollers and many other metal surfaces
- Temperature ranges from 100°C to 2000°C
- Choice of optics, including narrow options for long-distance measurements of very hot objects

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th></th>
<th>PyroMini General Purpose</th>
<th>PyroMini 2.2 High Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature Range</strong></td>
<td>Choice of ranges from -20°C to 2000°C (see Model Numbers on page 3)</td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>4 to 20 mA or RS485 Modbus (up to 247 sensors may be installed on each Modbus network)</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm Relays (-CRT and -BRT models)</strong></td>
<td>2 x Single Pole Changeover alarm relays rated 24 V DC, 1 A, isolated 500 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 1°C or 1% of reading, whichever is greater</td>
<td>± 2°C or 1% of reading, whichever is greater</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>± 0.5°C or 0.5%, whichever is greater</td>
<td></td>
</tr>
<tr>
<td><strong>Field of View</strong></td>
<td>Choice of optics (see Model Numbers on page 3)</td>
<td></td>
</tr>
<tr>
<td><strong>Emissivity Setting Range</strong></td>
<td>0.20 to 1.00</td>
<td>0.10 to 1.00</td>
</tr>
<tr>
<td><strong>Emissivity Setting Method</strong></td>
<td>-CRT and -BRT models: via touch screen -BB and -BRT models: via RS485 -CB models: via two rotary switches in electronics box</td>
<td></td>
</tr>
<tr>
<td><strong>Response Time, t90</strong></td>
<td>≥240 ms (90% response)</td>
<td></td>
</tr>
<tr>
<td><strong>Spectral Range</strong></td>
<td>8 to 14 μm</td>
<td>2.0 to 2.6 μm</td>
</tr>
<tr>
<td><strong>Supply Voltage</strong></td>
<td>24 V DC ± 5%</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Current Draw</strong></td>
<td>100 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Loop Impedance</strong></td>
<td>CB and -CRT models: 900 Ω (4 to 20 mA output)</td>
<td></td>
</tr>
<tr>
<td><strong>Max Temp Span (-CRT models)</strong></td>
<td>Full temperature range</td>
<td></td>
</tr>
<tr>
<td><strong>Min Temp Span (-CRT models)</strong></td>
<td>100°C</td>
<td></td>
</tr>
</tbody>
</table>

**MECHANICAL**

<table>
<thead>
<tr>
<th>Sensing Head</th>
<th>Electronics Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Stainless Steel 316</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Ø 18 x 45 mm (see diagram)</td>
</tr>
<tr>
<td>Mounting</td>
<td>M16 x 1 mm thread</td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Sensing Head</th>
<th>Electronics Module (without touch screen)</th>
<th>Electronics Module (with touch screen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Rating</td>
<td>IP65 (NEMA 4)</td>
<td>IP65 (NEMA 4)</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td>See below</td>
<td>0°C to 60°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>Maximum 95% non-condensing</td>
<td>Maximum 95% non-condensing</td>
</tr>
<tr>
<td>RoHS Compliant</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Ambient Temperature Range (Sensing Head)
PyroMini: Ranges from 0°C to 180°C, depending on model (see Model Numbers on page 3)
PyroMini 2.2: 0°C to 70°C

**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.

DATA LOGGING SPECIFICATIONS

- **Data 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, 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.
### Fixed Infrared Temperature Sensors

**Sensing Head Operating Temperature Range** (General Purpose models only)

- **MA**
  - Operates between 0°C to 60°C
- **JA**
  - Operates between 0°C to 120°C
- **HA**
  - Operates between 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.

#### Example: PM-MA-301-CT-BRT

**Series**

- **PM** (PyroMini - General Purpose)
- **PM2.2** (PyroMini 2.2 - High Temperature)

**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**

- **PT**
  - 151
  - 251
  - 751
  - CF
- **CT**
  - MT
  - HT

**PyroMini** (General Purpose)

- **-LT**
  - Operates between 0°C to 1000°C
- **-MT**
  - Operates between 0°C to 2000°C
- **-HT**
  - Operates between 0°C to 3000°C
- **-CT**
  - Operates between 0°C to 5000°C

**PyroMini 2.2 (High Temperature)**

- **-PT**
  - Operates between 0°C to 1000°C
- **-MT**
  - Operates between 0°C to 2000°C
- **-HT**
  - Operates between 0°C to 3000°C

**Measurement Temperature Range**

- **-LT**
  - Operates between 20°C to 60°C
- **-MT**
  - Operates between 20°C to 150°C
- **-HT**
  - Operates between 20°C to 300°C
- **-CT**
  - Operates between 20°C to 600°C

**Optics**

- **-301**
  - Divergent
- **-CT**
  - Digital output, -20 to 1000 °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
**CONNECTIONS**

- **-CB and -CRT models**
  - TP+: TP-: TH+: GND: OP+: OP-: PWR+: PWR-:

- **-BB and -BRT models**
  - TP+: TP-: TH+: GND: OP+: OP-: PWR+: PWR-: Modbus Master

24 V DC
100 mA

**4 to 20 mA**

Emissivity switches on -CB models only

**DIMENSIONS AND ACCESSORIES**

**Electronics Module**

- Touch screen (optional)
- Thread M16 x 1 mm
- Standard length: 150 mm
- Cable glands: 14 mm AF

**Sensing Head**

- ø 18.6
- ø 18
- Thread M16 x 1 mm
- Removable spigot fitted to type APSN for use with all models except -21.

**Air Purge Collar**

- ø 40
- ø 20
- 1/8” BSP air fitting

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 (PyroMini -MA models) **PMCE**, (PyroMini -HA and -JA models) **PMCEHT**, (PyroMini 2.2 models) **PM2.2CE**
- Calibration certificate **CALCERTA**
- Laser sighting tool **LSTS**
- Mounting bracket, Adjustable **ABS**, Fixed **FBS**
- Dual Laser Sighting Bracket, Adjustable **DLSBAS**, Fixed **DLSBFS**
- 6-channel Modbus temperature indicator with data logging **PM180**
PyroUSB

USB Configurable Infrared Temperature Sensors with mA Output

- Fast, accurate non-contact temperature measurement
- General purpose models suitable for most non-metals
- Short wavelength models suitable for reflective targets such as steel rollers and other metal surfaces, even at low temperatures
- Configurable temperature range, emissivity setting etc. via USB using the included cable and software
- Features max, min, average and instantaneous readings; peak or valley hold; reflected energy compensation
- OPC Server capabilities
- Temperature ranges from -40 to 2000°C
- Stainless steel housing, sealed to IP65
- Choice of optics
- 4 to 20 mA output
- Quick and easy installation
- Wide range of accessories

The PyroUSB Series measures temperatures from -40°C to 2000°C accurately and consistently, with an outstanding response time as low as 240 ms. The selectable 0 to 20 mA or 4 to 20 mA output is compatible with almost any indicator, controller, recorder or data logger, without the need for special interfacing or signal conditioning.

A choice of measurement wavelengths is available to suit a range of applications.

PyroUSB (general purpose) models can measure from -40°C to 1000°C. They are suitable for measuring high-emissivity materials such as paper, thick plastics, food, pharmaceuticals, rubber, asphalt and painted surfaces.

PyroUSB 2.2 (high temperature) models can measure from 45°C to 2000°C. They provide a more accurate reading than general-purpose sensors when measuring reflective surfaces including many metals. They are also capable of measuring temperatures through glass.

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 temperature range and emissivity, 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.

PYROUSB (GENERAL PURPOSE) MODELS:

PYROUSB 2.2 (HIGH TEMPERATURE) MODELS:

ALL MODELS:

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

<table>
<thead>
<tr>
<th></th>
<th>PyroUSB General Purpose</th>
<th>PyroUSB 2.2 High Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature Range</strong></td>
<td>Choice of ranges from -40°C to 1000°C</td>
<td>Choice of ranges from 45°C to 2000°C (see Minimum Measurable Temperature and Model Numbers)</td>
</tr>
<tr>
<td><strong>Field-of-View</strong></td>
<td>Choice of optics (see Optics and Model Numbers)</td>
<td>Selectable 4 to 20 mA or 0 to 20 mA (linear with temperature)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>4 to 20 mA (linear with temperature)</td>
<td>Selectable 4 to 20 mA or 0 to 20 mA (linear with temperature)</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>Via PC port conforming to USB 2.0</td>
<td>Via PC port conforming to USB 2.0</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>±1°C or ±1% of reading, whichever is greater</td>
<td>±2°C or ±1% of reading, whichever is greater</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>±0.5% of reading or ±0.5°C, whichever is greater</td>
<td>±0.5% of reading or ±0.5°C, whichever is greater</td>
</tr>
<tr>
<td><strong>Emissivity Setting</strong></td>
<td>0.1 to 1.0</td>
<td>0.1 to 1.0</td>
</tr>
<tr>
<td><strong>Response Time, t90</strong></td>
<td>≥240 ms (90% response)</td>
<td>≥240 ms (90% response)</td>
</tr>
<tr>
<td><strong>Spectral Range</strong></td>
<td>8 to 14 μm</td>
<td>2.0 to 2.5 μm</td>
</tr>
<tr>
<td><strong>Supply Voltage</strong></td>
<td>24 V DC (26 V DC max)</td>
<td>24 V DC (26 V DC max)</td>
</tr>
<tr>
<td><strong>Sensor Voltage</strong></td>
<td>6 V DC min</td>
<td>11 V DC min</td>
</tr>
<tr>
<td><strong>Max Loop Impedance</strong></td>
<td>900 Ω @ 24 V DC</td>
<td>900 Ω @ 24 V DC</td>
</tr>
<tr>
<td><strong>Maximum Span</strong></td>
<td>Full temperature range</td>
<td>Full temperature range</td>
</tr>
<tr>
<td><strong>Minimum Span</strong></td>
<td>100°C</td>
<td>100°C</td>
</tr>
</tbody>
</table>

* Object temperature > Tmin (see graph of Minimum Measurable Temperature)

### Mechanical

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

### Environmental

- **Environmental Rating**: IP65
- **Ambient Temperature**: 0°C to 70°C (cooling available for higher temperatures)
- **Relative Humidity**: 95% max. non-condensing

### Optics

- **Spot Dia.**: 0.6 1.2 1.9 (inches)
- **Spot Dia.**: 15 30 50 (mm)

### Environmental Rating

- **IP65**: 0°C to 70°C (cooling available for higher temperatures)
- **Relative Humidity**: 95% max. non-condensing

### Model Numbers - General Purpose

<table>
<thead>
<tr>
<th>Puxxxx xx</th>
<th>Cooling (blank)</th>
<th>Field of view</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>-15:1 divergent optics</td>
<td>151 = 15:1 divergent optics</td>
</tr>
<tr>
<td>301</td>
<td>-30:1 divergent optics</td>
<td>301 = 30:1 divergent optics</td>
</tr>
<tr>
<td>CF</td>
<td>Close-focus optics (focal spot size 5 mm at 100 mm distance)</td>
<td>CF - Close-focus optics (focal spot size 7.5 mm at 500 mm distance)</td>
</tr>
</tbody>
</table>

### Model Numbers - High Temperature

<table>
<thead>
<tr>
<th>Puxxxx xx 2.2 xx</th>
<th>Cooling (blank)</th>
<th>Field of view</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>-15:1 divergent optics</td>
<td>151 = 15:1 divergent optics (model PU151LT2.2 only)</td>
</tr>
<tr>
<td>PT</td>
<td>-30:1 divergent optics</td>
<td>PT - 30:1 divergent optics (model PU151PT2.2 only)</td>
</tr>
<tr>
<td>CF</td>
<td>Close-focus optics (focal spot size 7.5 mm at 500 mm distance)</td>
<td>CF - Close-focus optics (focal spot size 7.5 mm at 500 mm distance) (model PUCFMT or HT)</td>
</tr>
</tbody>
</table>

### Accessories

- **Accessories Also Available**
- **Fixed mounting bracket FBL**
- **Extended analogue output cable (30 m max):** for PyroUSB (general purpose) models without cooling **PUCE**
- **Deep fast cooling models:** for PyroUSB (general purpose) models **PUCEHT**
- **For PyroUSB 2.2 (High Temperature) models PU2.2CE**

### Model Numbers

- **PU151**: Close-focus optics (focal spot size 5 mm at 100 mm distance)
- **PU301**: 30:1 divergent optics (model PU301MT or HT)
- **PU751**: 75:1 divergent optics (model PU751MT or HT)
- **PU251**: 25:1 divergent optics (model PU251MT or HT)
- **PUCF**: Close-focus optics (focal spot size 7.5 mm at 500 mm distance) (model PUCFMT or HT)

### Model Numbers

- **PU151-2.2**: Close-focus optics (focal spot size 7.5 mm at 30 mm distance)
- **PU301-2.2**: 30:1 divergent optics (model PU301MT or HT)
- **PU751-2.2**: 75:1 divergent optics (model PU751MT or HT)
- **PU751-2.2** (model PUCFMT or HT)

### Minimum Measurable Temperature

Graph showing the minimum measurable object temperature, determined by surface emissivity (ε) and sensor temperature (T_s).
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature Range</strong></td>
<td>-20°C to 1000°C</td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>USB</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>±1% of reading or ±1°C whichever is greater</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>± 0.5% of reading or ±0.5°C whichever is greater</td>
</tr>
<tr>
<td><strong>Emissivity Setting</strong></td>
<td>0.2 to 1.0</td>
</tr>
<tr>
<td><strong>Response Time, t90</strong></td>
<td>125 ms (90% response)</td>
</tr>
<tr>
<td><strong>Spectral Range</strong></td>
<td>8 to 14 µm</td>
</tr>
<tr>
<td><strong>Supply Voltage</strong></td>
<td>5 V DC (provided by USB)</td>
</tr>
<tr>
<td><strong>Supply Current</strong></td>
<td>50 mA max.</td>
</tr>
</tbody>
</table>

### VIRTUAL COM PORT
- **Baud Rate**: 9600 baud *
- **Format**: 8 data bits, no parity, 1 stop bit *
- **Protocol**: Modbus over Serial Line *
* Other configurations available upon request

### CONFIGURATION
- **Configuration Method**: Via USB using included CalexConfig software or Modbus
- **Configurable Parameters**: Emissivity Setting, Averaging, Reflected Energy Compensation

### MECHANICAL
- **Construction**: Stainless Steel
- **Dimensions**: 18 mm diameter x 45 mm long
- **Thread Mounting**: M16 x 1 mm pitch
- **Cable Length**: 1.5 m
- **Weight with Cable**: 85 g

### ENVIRONMENTAL
- **Environmental Rating**: IP65
- **Ambient Temperature**: 0°C to 75°C
- **Relative Humidity**: 95% max. non-condensing

### CONFORMITY
- **RoHS Compliant**: Yes
- **Electromagnetic Compatibility**: EN61326-1, EN61326-2-3 (Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Industrial)

The PyroMiniUSB is a miniature infrared sensor that measures the surface temperature of a solid or liquid without contact. It can measure non-metal surfaces between -20°C and 1000°C, with a response time of just 125 ms.

Materials including paper, thick plastics, rubber, food and organic materials, as well as painted metals and most dirty, rusty or oily surfaces, are measured accurately, safely and cleanly.

A choice of optics is available to measure small or large targets at distances ranging from a few millimetres up to tens of metres.

It has a rugged stainless steel housing, sealed to IP65, and is built to withstand ambient temperatures of up to 75°C.

### COMPACT
The sensor is just 45 mm long (plus cable gland), so it can fit into very small spaces. The USB interface is built into the sensor, so there is no need for additional bulky interface modules.

### BENCHTOP AND LABORATORY
With the precision and robustness of our industrial pyrometers, and the plug-and-play convenience of USB, the PyroMiniUSB is the ideal benchtop temperature sensor for testing and experimentation.

### EDUCATION
The PyroMiniUSB is ideal for teaching science concepts such as emissivity, reflectivity, thermal conductivity, energy transfer, insulation and internal energy.
**SOFTWARE: CALEXCONFIG**

- Temperature display
- Graph of measured temperature and sensor temperature
- Sensor configuration
- Data logging to an Excel-compatible file
- Connect multiple sensors to the same software
- Simple, touch-friendly interface
- Software included with every sensor
- Free to download from the Calex website
- Or use the provided Modbus details to connect the sensor to your own software

**OPTICS**

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

**MAJOR DIMENSIONS**

- Sensor
- Air Purge Collar (optional)
- Mounting Nut (included)
- Removable spigot fitted to type APSN for use with -201 models. Not fitted to type APSW for -21 models.

**MODEL NUMBERS**

- Field of view
  - 21 = 2:1 divergent optics
  - 201 = 20:1 divergent optics

**SERIES**

- PMU = PyroMiniUSB sensor

**ACCESSORIES**

- Laser sighting tool
- Adjustable mounting bracket
- Air purge collar
- Fixed mounting bracket

**MODEL NUMBERS**

**SERIES**

- PMU = PyroMiniUSB sensor

**OPTICS**

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

**MAJOR DIMENSIONS**

- Sensor
- Air Purge Collar (optional)
- Mounting Nut (included)
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**MODEL NUMBERS**

- Field of view
  - 21 = 2:1 divergent optics
  - 201 = 20:1 divergent optics

**SERIES**

- PMU = PyroMiniUSB sensor

**ACCESSORIES**

- Laser sighting tool
- Adjustable mounting bracket
- Air purge collar
- Fixed mounting bracket
PyroCube

IR Temperature Sensor with Fast Response Time, Small Measured Spot and Continuous LED Sighting

• Response time 0.001 seconds (-F models) - the fastest in the world
• Measures from 0°C to 500°C
• Ideal for small targets - measurement area as small as 1.6 mm diameter
• Continuous LED sighting on all models - shows the position and size of the measurement spot while readings are being taken
• Multilingual touch screen interface (optional) for temperature display, data logging, sensor configuration and alarms
• Measures surface temperature of paper, thick plastics, food, rubber, electronic components, cable, ceramics, textiles, painted surfaces and some metals, as well as many other materials

PyroCube sensor with optional touch screen interface

PYROCUBE SENSOR SPECIFICATIONS

MEASUREMENT

Temperature range
0°C to 500°C
Response time (95% of step change)
-S models: 10 ms to 5 s
-F models: 1 ms to 5 s
Adjustable via averaging function
Target sighting
Red LED built-in as standard on all models. Indicates the measured spot size. Switchable on/off*
Measurement accuracy†
-S models: ± 3°C or 1%, whichever is greater
-F models: ± 3.5°C or 1%, whichever is greater
Repeatability†
-S models: ± 0.5°C
-F models: ± 1°C
Resolution †
-S models: < 0.5°C
-F models: < 1.5°C (0 to 50°C); < 0.7°C (above 50°C)
Emissivity setting
Adjustable 0.3 to 1.0 via RS232C or optional touch screen interface
Field of view
See OPTICS on page 2

ELECTRICAL

Outputs
1 analogue output and 1 alarm output
Analogue output
4-20 mA (set by default), 0-20 mA, mV/°C or voltage‡, selectable via RS232C or optional touch screen interface.
Alarm output
1 open drain alarm output, rated 27 V DC, 0.2 A *
Supply voltage
5 to 27 V DC, 100 mA max
Digital communications
RS232C Modbus RTU, non isolated

MECHANICAL

Weight (without cable)
85 g

ENVIRONMENTAL

Environmental rating
IP67
Operating ambient temperature
0°C to 50°C
Storage temperature
-15°C to 70°C
Operating ambient humidity
30% to 85% RH non condensing

DISPLAY

Optional PM030 touch screen terminal for indication, configuration, data logging and alarm outputs

* LED SIGHTING AND ALARMS

Sensor Only
These functions are selectable via RS232C and share a common connection, which is configurable either as an input to switch the LED sighting on/off, or an open drain alarm output, but not both at once.

Sensor with PM030
These functions may be configured via the PM030 interface. Two alarm relay outputs are provided in place of the open drain output.

† Ambient temperature 23 ± 5°C, emissivity 1.0, averaging time 50 ms
‡Voltage can be 0-1, 0-5, or 0-10 V DC, depending on model (see Model Numbers).
PM030 TOUCH SCREEN INTERFACE

- **Optional wall-mounted display, data logging, configuration and alarm unit for PyroCube sensor**

- **Read the temperature**
  The large, bright backlit temperature display is visible from a distance and turns red in an alarm condition.

- **Record the temperature history**
  See a graph of the measured temperature, and log more than a year of data to a single MicroSD Card. The data is stored in a simple text format that can be imported easily into Excel.

- **Configure the sensor**
  All the sensor’s configuration settings can be adjusted via the intuitive touch screen interface.

- **Trigger temperature alarms**
  Two alarms are individually configurable as high, low, band or error. The screen turns bright red to signal an alarm condition, and the built-in 24 V, 1 A relay outputs can be connected directly to alarm sounders and beacons.

- **Accurate measurements, even with reflections of hot objects**
  Place the sensor outside an oven or furnace and accurately measure the temperature of objects inside by using the Reflected Energy Compensation feature.

Outputs (from touch screen module)
Retransmitted analogue output from sensor, plus 2 relays, rated 24 V DC, 1 A

<table>
<thead>
<tr>
<th>Output Type</th>
<th>Effective Minimum Output</th>
<th>Output Accuracy (additional to Measurement Accuracy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1 V DC</td>
<td>30 mV</td>
<td>±1.5 mV</td>
</tr>
<tr>
<td>mV/°C</td>
<td>30 mV</td>
<td>±1.5 mV</td>
</tr>
<tr>
<td>0 to 20 mA</td>
<td>0.2 mA</td>
<td>±0.02 mA</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>4.0 mA</td>
<td>±0.02 mA</td>
</tr>
</tbody>
</table>

PM030 SPECIFICATIONS

**Display Format**
2.83” (72 mm) resistive touch TFT, 320x240 pixels, backlit

**Configurable Parameters**
Language (English, Chinese, Japanese)
Temperature units °C/°F
Displayed temperature
LED sighting on/off
Password
Date & time (for data logging time stamps)
Peak hold period, decay level
Averaging period
Correction (gain/offset)
Emissivity setting (with teach function)
Reflected energy compensation (with teach function)
Output type
Output temperature range
Polarity on error
Alarm mode, levels, hysteresis

---

Accuracy specifications are valid up to the maximum distances shown
PM030 DATA LOGGING SPECIFICATIONS

Storage
MicroSD Card (optional), max. 32 GB, equal to 16 years of data at the fastest sample rate of 1 per second

Sample Interval
1 second to 1 day (configurable)

Internal Clock Battery
1 x BR 1225, 3 V (not included)

Variables Logged
Instantaneous measured temperature, hold temperature, alarm events

Configurable Parameters
Data logging:
- Sample period
- Number of samples
Alarm logging:
- Scheduled start
- Alarm times when triggered, acknowledged, reset
- Log data while triggered

DIMENSIONS

All dimensions in mm

PYROCUBE CONNECTIONS - SENSOR ONLY

<table>
<thead>
<tr>
<th>Analogue output</th>
<th>Minimum supply voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1 V</td>
<td>5 V</td>
</tr>
<tr>
<td>0 to 5 V</td>
<td>8 V</td>
</tr>
<tr>
<td>0 to 10 V</td>
<td>12 V</td>
</tr>
<tr>
<td>mV/°C</td>
<td>5 V</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>2 V x (0.02 A x loop impedance [Ω])</td>
</tr>
<tr>
<td>0 to 20 mA</td>
<td></td>
</tr>
</tbody>
</table>

* See LED SIGHTING AND ALARMS on page 1 (Specifications)
PM030 CONNECTIONS

Alarm Relays:
24 V DC, 1 A

Power Supply:
5 to 27 V DC

Temperature Output:
0-20 mA
4-20 mA
mV/°C
0-1 V DC
0-5 V DC
0-10 V DC

PM030 CONNECTIONS

ACCESSORIES

FBC Mounting bracket
PWC Protective lens cover
APC Air purge collar
ADP Airless dust protector
RAM Right angled mirror
WCJ Water Cooling Jacket
PCMCE5 5 m extension cable with connectors

MODEL NUMBERS

PCU - S1.6 - 2M - 1V

Voltage output option
1V = 0 to 1 V DC
5V = 0 to 5 V DC
10V = 0 to 10 V DC
Note: All models also have 0-20 mA,
4-20 mA, and mV/°C outputs as standard.

Response time and optics
S1.6 = 10 ms response, 1.6 mm spot at 35 mm distance
S3.0 = 10 ms response, 3.0 mm spot at 70 mm distance
S5.5 = 10 ms response, 5.5 mm spot at 120 mm distance
F3.5 = 1 ms response, 3.5 mm spot at 100 mm distance
F7.0 = 1 ms response, 7.0 mm spot at 200 mm distance

Series
PCU = PyroCube sensor

PM030 Touch screen interface module for PyroCube sensor

Issue C - July 15
Specifications subject to change without notice
FibreMini
Fibre Optic Infrared Temperature Sensor for Harsh Applications

- Temperature ranges from 250°C to 2000°C
- Miniature sensing head withstands 200°C ambient temperature
- Short measurement wavelength for improved accuracy on metals
- No electronics in the sensing head - ideal for use near induction heaters and strong electromagnetic fields
- Touch screen display with configuration and data logging
- Choice of analogue or digital output
- Alarm relays on all models
- Advanced signal processing functions
- Built-in laser sighting, simultaneous with measurement

**MECHANICAL**

<table>
<thead>
<tr>
<th>Sensing head</th>
<th>Electronics Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Stainless Steel 316, Cast aluminium</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Ø 12 x 48 mm (see diagram), 98(w) x 64(h) x 36(d) mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>M12 x 1.5 mm thread, Two M4 screw holes for wall mounting (see diagram)</td>
</tr>
</tbody>
</table>

**Fibre Optic Cable Length**
- 3 m, 5 m or 10 m

**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

**ENVIRONMENTAL**

<table>
<thead>
<tr>
<th>Sensing head (without touch screen)</th>
<th>Electronics Module (with touch screen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Rating</td>
<td>IP65 (NEMA 4)</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td>0°C to 200°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>Maximum 95% non-condensing</td>
</tr>
<tr>
<td>CE Marked</td>
<td>Yes</td>
</tr>
<tr>
<td>RoHS Compliant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**ELECTROMAGNETIC COMPATIBILITY STANDARDS:**
EN61326-1, EN61326-2-3 (Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Industrial)
TOUCH SCREEN

The 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 turns bright red to provide an immediate and obvious alarm indication. Alarm modes and levels can be configured via the touch screen.

TOUCH SCREEN SPECIFICATIONS

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

DATA LOGGING SPECIFICATIONS

<table>
<thead>
<tr>
<th>Data Logging Interval</th>
<th>1 to 86,400 seconds (1 day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MicroSD Card</td>
<td>Max. capacity: 32 GB (not included)</td>
</tr>
<tr>
<td>Internal Clock Battery</td>
<td>1 x BR 1225 3V (not included)</td>
</tr>
<tr>
<td>Variables Logged</td>
<td>Target temperature, electronics module temperature, max, min, average, emissivity setting, reflected energy compensation temperature, alarm events</td>
</tr>
<tr>
<td>File format</td>
<td>.csv</td>
</tr>
<tr>
<td>Configurable Parameters</td>
<td>Sample period, number of samples, scheduled start date and time</td>
</tr>
</tbody>
</table>

DATA LOGGING (-CRT AND -BRT MODELS)

The FibreMini can be used as a standalone data logger.

All models 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 MicroSD card larger than 2 GB, years of data can be stored, even at the fastest possible sample rate of 1 per second.

Data is stored 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 inside the electronics module. 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.
fixed infrared temperature sensors

- CRT models:
  - Temperature Output: 4-20 mA
  - Alarm Relays: 24 V DC, 1 A
  - Power Supply: 24 V DC +/- 5%

- BRT models:
  - RS485 Modbus Communications
  - Modbus Master

- Fibre Optic Cable: 4.6

- Sensing Head:
  - Ambient Temp. 200°C Max.

- Mounting Holes (use M4 CSK screws)

- Electronics Module:
  - Depth: 36

- Cable Gland:
  - 17 AF
  - Height: 19-24

- Dimensions:
  - 2 x Mounting Holes (use M4 CSK screws)
  - 2 x Mounting Holes (use M4 CSK screws)

- Connections and Dimensions:
  - OP+  OP-  PWR+  PWR-
  - NO1  COM1  NC1  NO2  COM2  NC2
  - GND
  - RS-  RS+
  - Modbus Master
  - RS485 Modbus Communications

- Fibre Optic Cable:
  - 4.6

- M12 x 1.5

- 2 x Nut 14 AF
**FIELD OF VIEW**

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

**MEASUREMENT TEMPERATURE RANGE (°C)**

- CRT models: 4 to 20 mA output is configurable within this range.
- BRT models: Digital output, full temperature range.

**MODEL NUMBERS**

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Field of View</th>
<th>Series</th>
<th>Model</th>
<th>Field of View</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM2.2</td>
<td>301</td>
<td>30:1</td>
<td>HT</td>
<td>CRT</td>
<td>75:1</td>
</tr>
<tr>
<td>5M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Temperature Range**
  
  MT = 250°C to 1000°C
  
  HT = 450°C to 2000°C

- **Fibre Optic Cable Length**
  
  3M = 3 metres
  
  5M = 5 metres
  
  10M = 10 metres

- **Output and Interface**
  
  CRT = 4-20 mA output, two alarm relay outputs, with touch screen
  
  BRT = RS485 Modbus output, two alarm relay outputs, with touch screen

- **Series**
  
  FM2.2 = FibreMini with 2.2 µm spectral response

**ACCESSORIES ALSO AVAILABLE**

- **MSD**: MicroSD Card with SD Card adapter; stores logged data
- **CALCERTA**: Calibration certificate
- **ABF**: Adjustable mounting bracket
- **FBF**: Fixed mounting bracket
- **APF**: Air purge collar
- **PM180**: 6-channel Modbus temperature indicator with touch screen interface and data logging

**FIELD OF VIEW MEASUREMENT TEMPERATURE RANGE (°C)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Distance: Sensor to object (inches)</th>
<th>Distance: Sensor to object (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT - CRT models:</td>
<td>3</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>76.2</td>
</tr>
<tr>
<td>HT - BRT models:</td>
<td>3</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>76.2</td>
</tr>
</tbody>
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**Distance: Sensor to object (inches)**

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<th>Model</th>
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<tr>
<td></td>
<td>100</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>76.2</td>
</tr>
<tr>
<td>HT - BRT models:</td>
<td>3</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>3000</td>
<td>76.2</td>
</tr>
</tbody>
</table>

**Distance: Sensor to object (mm)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Diameter of target spot measured versus distance from sensing head - 90% energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT - CRT models:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>3000</td>
</tr>
<tr>
<td>HT - BRT models:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>3000</td>
</tr>
</tbody>
</table>
ExTemp
Intrinsically Safe Infrared Temperature Sensor

- 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
- Recalibrable 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, t90**: 240 ms (90% response)
- **Spectral Range**: 8 to 14 μm
- **Supply Voltage**: 12 to 24 V DC ±5%
- **Maximum Current Draw**: 25 mA
- **Maximum Loop Impedance**: See Application Guide (available separately)

**MECHANICAL**

- **Construction**: Stainless Steel 316
- **Major Dimensions**: Ø 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**

The ExTemp is ATEX, IECEx and TIIIS certified.

- **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 ≤ Ta ≤ 70°C
- **Maximum DC Input Voltage**: U_i = 28 V
- **Maximum Input Current**: I_i = 93 mA
- **Maximum Input Power**: P_i = 650 mW
- **Maximum Internal Capacitance**: C_i = 8 nF
- **Maximum Internal Inductance**: L_i = 0 mH
- **ATEX Certificate Number**: CML 14ATEX2079
- **IECEx Certificate Number**: IECEx CML 14.0032
- **TIIIS Certificate Number**: TC21097

**MODEL NUMBERS**

- **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 Ø 5 mm at distance 100 mm)
DIAMETER OF TARGET SPOT MEASURED VERSUS DISTANCE FROM SENSING HEAD

CONNECTIONS

Hazardous Area
(All Zones IIC and IIIIC)

Safe Area
(Non-Hazardous)

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

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

DIMENSIONS (mm)

Two mounting nuts (included)

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

Power supply
Measurement instrumentation
ExTemp USB Adapter
PC with software
Optional

Ground the sensor at one point only

FBL
Fixed infrared temperature sensors
Calex provides IR-transmissive windows in a choice of sizes. Windows are commonly circular, however other shapes are available, and we can provide windows manufactured to suit your requirements.

The material should be chosen to suit the type of sensor and the conditions in the process, such as the pressure and temperature. Short-wavelength sensors, such as the PyroUSB 2.2, PyroMini 2.2 and FibreMini, can view through glass, quartz and calcium fluoride. Other materials, such as zinc selenide and germanium, are required for use with long-wavelength (8 to 14 µm) sensors.

The sensor must have an adjustable emissivity setting to compensate for the small percentage of infrared energy lost to reflection and absorption by the window. Use this formula to ensure maximum accuracy.

\[
\text{Emissivity setting} = \text{actual emissivity of target} \times \text{transmission of window}
\]

The protective plastic window models PWS and PWL are designed to help protect the germanium lens of Calex infrared temperature sensors from mechanical damage, and to help retain fragments of the lens if it is damaged.

To use the window, simply screw the stainless steel window holder onto the front of the sensor, tighten with a spanner, adjust the emissivity setting using the formula below, and begin taking measurements.

\[
\text{Emissivity setting} = \text{actual emissivity of target} \times 0.768
\]

### MATERIALS

<table>
<thead>
<tr>
<th>Window Material</th>
<th>Transmission Range</th>
<th>Transmission (approx.)</th>
<th>Maximum Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc selenide (ZnSe)</td>
<td>4 to 14 µm</td>
<td>72%</td>
<td>250°C</td>
</tr>
<tr>
<td>Germanium (Ge)</td>
<td>2 to 14 µm</td>
<td>46% uncoated (around 90% if anti-reflective coated)</td>
<td>70°C</td>
</tr>
<tr>
<td>Calcium fluoride (CaF2)</td>
<td>0.2 to 7 µm</td>
<td>94%</td>
<td>1200°C</td>
</tr>
<tr>
<td>Sapphire (Al2O3)</td>
<td>0.2 to 4.5 µm</td>
<td>85%</td>
<td>2000°C</td>
</tr>
<tr>
<td>Quartz Crystal (SiO2)</td>
<td>0.4 to 3 µm</td>
<td>92%</td>
<td>490°C</td>
</tr>
</tbody>
</table>

### ORDERING

These windows are inexpensive compared with the cost of replacing the lens of an infrared temperature sensor. Contact Calex for a quotation, or for assistance on choosing a suitable window.

---

**Accessories for fixed infrared temperature sensors**

---

**Protective Plastic Window**
- ideal for the food and pharmaceutical industries

---

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model</th>
<th>PWS</th>
<th>PWL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>M16 x 1 mm</td>
<td>M20 x 1 mm</td>
</tr>
<tr>
<td>Compatible With</td>
<td>PyroEpsilon, PyroBus, PyroMini*, PyroMiniBus, PyroMiniUSB</td>
<td>PyroUSB*</td>
</tr>
<tr>
<td>Transmission (8 to 14 µm)</td>
<td>76.8%</td>
<td>76.8%</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td>0°C to 100°C**</td>
<td>0°C to 100°C**</td>
</tr>
<tr>
<td>Window material</td>
<td>IR-transmissive plastic</td>
<td>IR-transmissive plastic</td>
</tr>
<tr>
<td>Holder material</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
</tr>
</tbody>
</table>

*Not compatible with PyroUSB 2.2 or PyroMini 2.3 models

** Do not exceed the ambient temperature limits of the sensor.
DLSB
Dual Laser Sighting Bracket

- Mounting bracket for Calex 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

**OPTIONS**

- Extended cable for all models (30 m max)

---

**DIMENSIONS (mm)**

**ORDERING INFORMATION**

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

**Description**

- Mounting bracket for Calex 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

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- **Operating temperature range**: -10°C to +60°C

**OPTIONS**

- Extended cable for all models (30 m max)
PyroMiniBus

Multi-Channel Infrared Temperature Monitoring System

- Miniature non-contact temperature sensors with RS485 Modbus communications
- Touch screen terminal for configuration, display, alarms and data logging
- Low-cost standalone 6-channel system
- Build larger systems using the PM180’s isolated Modbus Master and Slave interfaces
- Analogue and alarm relay outputs via optional modules
- Conforms to industrial EMC standards

The PyroMiniBus is an industrial infrared temperature monitoring system, with miniature sensing heads and optional display modules.

PyroMiniBus sensors are designed to measure the surface temperature of non-reflective materials in industrial applications, from -20°C to 1000°C. They are sealed to IP65, built from 316 stainless steel, and fully tested to industrial EMC standards.

They can measure food, paper, thick plastics, asphalt, paint, bulk materials and organic materials, as well as most dirty, rusty or oily surfaces.

**ROBUST**

PyroMiniBus sensors have an operating temperature rating of up to 120°C with no need for cooling.

**COMPACT**

The sensors measure just 45 mm long (plus cable gland), so they can fit into the smallest of spaces.

**CONFIGURABLE**

Up to 6 sensors can be connected to the optional PM180 interface module, which provides temperature display, configuration, and high-capacity data logging to a MicroSD Card. Analogue and relay outputs are available via separate DIN rail mounted modules.

**LOW COST**

With up to 6 sensors connected to one PM180, the PyroMiniBus is an ideal low-cost non-contact temperature measurement system.

**NETWORKABLE**

To measure more than 6 locations, PyroMiniBus sensors and PM180 sub-networks may be connected to an RS485 Modbus SCADA system or PLC. It is possible to measure the temperature of hundreds or thousands of locations on the same network.
**PM180 6-CHANNEL TOUCH SCREEN TERMINAL**

- Configure, display and log data and alarms from up to 6 sensors per terminal unit, simultaneously or individually
- Operates as Modbus master and Modbus slave
- High capacity data logging to MicroSD Card
- Bright touch screen with backlight
- Analogue and relay outputs via optional ICP DAS modules
- 2-channel scrolling temperature chart

---

**Intuitive touch screen interface**

Display 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**

Schedule a start time, or start and stop logging at the touch of an icon. Temperature data and alarm events may be logged to a MicroSD Card (not supplied).
PYROMINIBUS SENSOR SPECIFICATION

Temperature Range
-20°C to 1000°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 Setting
0.2 to 1.0

Response Time, t90
125 ms (90% response)

Spectral Range
8 to 14 μm

Supply Voltage
6 to 28 V DC

Supply Current
50 mA max.

Baud Rate
9600 baud *

Format
8 data bits, no parity, 1 stop bit *

* Other configurations available upon request

CONFIGURATION

Configuration Method
Via PM180 touch screen, or directly via RS485 Modbus

Configurable Parameters
Emissivity Setting, Averaging, Reflected Energy Compensation

MECHANICAL

Construction
Stainless Steel

Dimensions
18 mm diameter x 45 mm long

Thread Mounting
M16 x 1 mm pitch

Cable Length
1m (longer lengths available to order)

Weight with Cable
85 g

ENVIRONMENTAL

Environmental Rating
IP65

Ambient Temperature
0°C to 120°C

Relative Humidity
95% max. non-condensing

CONFORMITY

See PM180 Specification (right)

OPTICS

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

PM821

PMB201

PM180 SPECIFICATION

Compatible Sensor Types
PyroMiniBus (all models), PyroBus (all models), PyroMini (-BB and -BRT models)

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

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
Averaging with configurable period

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

DATA LOGGING

Logging Interval
1 to 86,400 seconds (1 day)

MicroSD Card
Max. capacity: 32 GB (not included - stores years of logged data)

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

Construction
Die Cast Aluminium

Electrical Connections
Removable screw terminals, 28 AWG to 18 AWG

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

Weight
280 g

ENVIRONMENTAL

Environmental Rating
IP65

Ambient Temperature Range
0°C to 60°C

Relative Humidity
Maximum 95%, non-condensing

CONFORMITY

RoHS Compliant
Yes

Electromagnetic Compatibility
EN61326-1, EN61326-2-3 (Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Industrial)
### PMBHUB SPECIFICATIONS

**Construction**
Die Cast Aluminium

**Electrical Connections**
Removable screw terminals, 28 AWG to 18 AWG

**Weight**
250 g

**Environmental Rating**
IP65

**Enclosure Dimensions**
Same as PM180

## PM180 ACCESSORIES

- **International AC mains power supply for PM180** PM180MA
- **MicroSD Card for PM180 data logging** MSD
- **12-channel Modbus relay output module** M-7061
- **4-channel Modbus voltage or current analogue output module** M-7024

## SENSOR ACCESSORIES

- **IP65 junction box for 6 sensors** PMBHUB
- **Adjustable mounting bracket** ABS
- **Fixed mounting bracket** FBS
- **Extended cable** PMBCE
- **Calibration certificate** CALCERTA
- **Laser sighting tool** LSTS

Fixed or Adjustable mounting bracket with continuous laser sighting DLSBFS / DLSBAS

---

**Issue C - Sept 15**

Specifications subject to change without notice
PyroNet Z
Wireless Non-Contact Temperature Measurement System

- Battery-powered wireless transmitter for PyroCouple infrared temperature sensor
- Choice of 1-channel or 125-channel wireless receivers
- Analogue outputs, alarm relays, and digital communications
- Replace expensive cable runs, and install temperature sensors where cabling is impossible

**Temperature Sensor**
The temperature of a surface is measured using a PyroCouple non-contact infrared sensor with a 0-50 mV output. Materials including paper, thick plastics, painted surfaces, food, asphalt and organic materials are measured easily and instantaneously.

**Wireless Transmitter**
The battery-powered PZ-TX1 transmitter periodically takes a measured temperature reading from the PyroCouple temperature sensor and sends it wirelessly to a PyroNet-Z receiver. It is supplied in a compact wall-mounted enclosure.

**Wireless Receivers**
A choice of single-channel or multi-channel receivers is available.
- **Single Channel**
The wall-mounted PZ-RX1 receives the wireless signal from one PZ-TX1 transmitter. It provides one analogue output and two relay outputs.
- **Multi Channel**
The PZ-RX125 is a DIN rail mounted unit with digital communications via RS485 or Ethernet. Its 125 channels may be individually assigned to wireless transmitters or outputs. Optional analogue and relay output modules may be added using the included clip-on bus connector.
- **Multi-Channel Output Modules**
These optional DIN rail mounted units clip onto the PZ-RX125 via the included bus connector and provide 4 analogue or relay outputs.
For sensor specifications, see PyroCouple data sheet.

### GENERAL

<table>
<thead>
<tr>
<th>Model</th>
<th>Transmitter</th>
<th>Receivers</th>
<th>Output Modules for PZ-RX125</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ-TX1</td>
<td>PZ-RX1</td>
<td>PZ-RX125</td>
<td>PZ-OP4A</td>
</tr>
<tr>
<td>1 channel</td>
<td>1 channel</td>
<td>125 channel</td>
<td>Analogue outputs (4 channels)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Relay outputs (4 channels)</td>
</tr>
</tbody>
</table>

Models shown include optional 5 dBi antenna

#### Inputs
- 1 x PyroCouple with output option 5 (0 to 50 mV).
- Wireless signal from 1 x PZ-TX1.
- Wireless signal from up to 125 x PZ-TX1.
- Digital communications with PZ-RX125 via clip-on DIN rail bus connector.

#### Outputs and Communications
- Wireless transmission only.
- 1 analogue output (selectable 4-20 mA or 0-10 V DC), and 2 relay outputs rated 3 A @ 240 V AC.
- Choice of RS485 Modbus RTU, Ethernet TCP/IP or Ethernet Modbus TCP; Optional 1-channel 4-20 mA (built-in); Optional output modules (see right).
- 4 outputs, selectable 4-20 mA, 0-10 V DC, or mA sink via switches.
- 4 SPDT relay outputs, rated 3 A @ 240 V AC.

### SPECIFICATIONS

#### Accuracy (total non-linearity)
Better than +/- 0.05%.

#### Sample rate
- Selectable 10 s, 30 s, 1 min, 1 hour, via switches. Custom sample rates available; contact Calex.
- -
- -
- -

#### Diagnostics
- Via display.
- -

#### Display
- -
- -

#### Configurable Parameters (via switches inside enclosure)
- Network code (A-H), channel number, sample period.
- Network code (A-H), no-signal alarm time, relay operation mode (no-signal alarm or setpoint), analogue output type (voltage/current).
- Display scaling, analogue output scaling and type (models with built-in analogue output), Modbus protocol RTU/TCP (Ethernet models), Modbus slave address, baud rate, port settings, timeout.
- Individually selectable current or voltage output, output scaling.
- Alarm temperature setpoint, hysteresis, high/low alarm function, error or timeout alarm function.
- See PZ-OP4R.
- -

#### Relay (alarm) set points
- Selectable 25% or 75% of input range as standard. Alternative setpoints may be factory-set.
- See PZ-OP4R.
- -

#### Mounting
- Wall mounted.
- DIN Rail TS35.
- DIN Rail TS35.

### ELECTRICAL

#### Power supply
- 3 x 3.6 V lithium batteries (1 for transmitter, 2 for sensor)
- 24 V DC
- 16 to 30 V DC
- 12 to 36 V DC. Powered via clip-on DIN rail mounted bus connector.

#### Battery life
- Typically > 1 year.
- -
- -

#### Max current draw
- 40 mA (during transmission)
- 180 mA
- 120 mA
- 90 mA continuous (260 mA on startup).

#### Input connection
- Screw terminals.
- Screw terminals.
- Clip-on DIN rail mounted bus connector.

#### Power connection
- Screw terminals.
- Screw terminals.
- Clip-on DIN rail mounted bus connector.

#### Output connection
- Screw terminals.
- Analogue output and RS485 interface: Screw terminals.
- Ethernet interface: RJ45 socket.
- Screw terminals.

#### Conductor size (for screw terminals)
- 0.5 to 4.0 mm.

#### Tested Surge Voltage
- 2.5 kV for 50 µs.

#### Tested Transient Voltage
- 10 kV/µs.

#### Isolation (power supply - output)
- 1 kV.
SPECIFICATIONS
For sensor specifications, see PyroCouple data sheet.

GENERAL

<table>
<thead>
<tr>
<th>Model</th>
<th>Transmitter</th>
<th>Receivers</th>
<th>Output Modules for PZ-RX125</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PZ-TX1</td>
<td>PZ-RX1</td>
<td>PZ-RX125</td>
</tr>
<tr>
<td></td>
<td>1 channel</td>
<td>1 channel</td>
<td>125 channel</td>
</tr>
</tbody>
</table>

Models shown include optional 5 dBi antenna.

ENVIRONMENTAL

<table>
<thead>
<tr>
<th>Environmental rating</th>
<th>IP67</th>
<th>IP67</th>
<th>Designed for mounting in a cabinet with suitable environmental protection. IP67 enclosure available - contact Calex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>160 (w) x 90 (h) x 50 (d) mm</td>
<td>120 (w) x 80 (h) x 55 (d) mm</td>
<td>114.5 (d) x 99 (h) x 22.5 (w) mm</td>
</tr>
<tr>
<td></td>
<td>114.5 (d) x 99 (h) x 17.5 (w) mm</td>
<td>114.5 (d) x 99 (h) x 17.5 (w) mm</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-20°C to 55°C</td>
<td>0°C to 55°C</td>
<td>0% to 90%</td>
</tr>
</tbody>
</table>

WIRELESS COMMUNICATIONS

<table>
<thead>
<tr>
<th>Output power</th>
<th>20 dBm</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>2 dBi antenna with SMA connector fitted as standard. Higher-gain antenna available (see Accessories). Antenna may be mounted remotely via extension cable.</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Approvals & Conformity

CE Marked; conforms to FCC part 15, IC Canada RSS 210e, ETSI EN 300-328, Japan ARIB STD-T66

CONNECTIONS

<table>
<thead>
<tr>
<th>Screw terminal number</th>
<th>Power supply +24 V DC</th>
<th>Power supply 0 V</th>
<th>Output 1: mA/V +</th>
<th>Relay 1 NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PWR- (PyroCouple model -5)</td>
<td>Power supply 0 V</td>
<td>Output 1: mA/V +</td>
<td>Relay 1 NO</td>
</tr>
<tr>
<td>2</td>
<td>Not connected</td>
<td>Power supply 0 V</td>
<td>Power supply 16-32 V DC</td>
<td>Output 1: mA/V - (mA sink +)</td>
</tr>
<tr>
<td>3</td>
<td>PWR+ (PyroCouple model -5)</td>
<td>mA sink +</td>
<td>Output 2: mA/V +</td>
<td>Relay 2 NO</td>
</tr>
<tr>
<td>4</td>
<td>OP+ (PyroCouple model -5)</td>
<td>mA sink -</td>
<td>Output 2: mA/V - (mA sink +)</td>
<td>Relay 2 NC</td>
</tr>
<tr>
<td>5</td>
<td>OP- (PyroCouple model -5)</td>
<td>Output mA/V +</td>
<td>Output 3: mA/V +</td>
<td>Relay 3 NO</td>
</tr>
<tr>
<td>6</td>
<td>Output mA/V -</td>
<td>Output 2: mA/V - (mA sink +)</td>
<td>Output 3: mA/V - (mA sink +)</td>
<td>Relay 3 NC</td>
</tr>
<tr>
<td>7</td>
<td>Relay 1 Common</td>
<td>RS485 Signal Ground (B models)</td>
<td>Output 4: mA/V +</td>
<td>Relay 4 NO</td>
</tr>
<tr>
<td>8</td>
<td>Relay 1 Normally Open</td>
<td>RS485 B - (B models)</td>
<td>Output 4: mA/V - (mA sink +)</td>
<td>Relay 4 NC</td>
</tr>
<tr>
<td>9</td>
<td>Relay 1 Normally Closed</td>
<td>RS485 A + (A models)</td>
<td>Output 1: mA sink -</td>
<td>Relay 1 COM</td>
</tr>
<tr>
<td>10</td>
<td>Relay 2 Common</td>
<td>mA/V Output - (A models)</td>
<td>Output 2: mA sink -</td>
<td>Relay 2 COM</td>
</tr>
<tr>
<td>11</td>
<td>Relay 2 Normally Open</td>
<td></td>
<td>Output 3: mA sink -</td>
<td>Relay 3 COM</td>
</tr>
<tr>
<td>12</td>
<td>Relay 2 Normally Closed</td>
<td>mA/V Output + (A models)</td>
<td>Output 4: mA sink -</td>
<td>Relay 4 COM</td>
</tr>
<tr>
<td>Other</td>
<td>RJ45 Socket (E models)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ORDERING

PZ-TX1  Wireless transmitter for 1 x PyroCouple infrared temperature sensor with output option 5, in IP67 wall mount enclosure, fitted with 2 dBi antenna

Sensor not included - see PyroCouple data sheet for ordering information

PZ-RX1  Single channel wireless receiver for 1 x PZ-TX1, with 1 x 4-20 mA output, in IP67 wall mount enclosure, fitted with 2 dBi antenna

Note: Up to PZ-RX1/transmitter pairs may be used on the same site. If more sensors or outputs are required, use the PZ-RX125.

PZ-RX125-B  125 channel receiver, DIN rail mounted, fitted with 2 dBi antenna:
- with RS485 Modbus RTU communications only
- with RS485 Modbus RTU communications and 1 x built-in analogue output
- with Ethernet communications only
- with Ethernet communications and 1 x built-in analogue output

OPTIONS AND ACCESSORIES

PZ-OP4A  DIN rail mounted output module for PZ-RX125, with 4 x individually selectable 4-20 mA or 0-10 V outputs

PZ-OP4R  DIN rail mounted output module for PZ-RX125, with 4 x relay outputs

PZ-ANT5  Optional high-gain indoor antenna with SMA connector for PyroNet Z wireless receivers and transmitters, 5 dBi

Outdoor antenna options are also available. Contact Calex for details.

PZ-ANTCE  Optional extension cable for antenna (e.g. for mounting the antenna on the outside of a metal cabinet)

PZ-BATT  Replacement battery for PZ-TX1 (3 batteries required per transmitter)
The PyroNet GSM telemetry module transmits readings from up to 4 devices with analogue output, such as the PyroCouple and PyroMini infrared temperature sensors.

Measurements are taken at regular intervals and transmitted to the internet via the GSM cellular phone network, using the PyroNet GSM’s built-in SIM card.

Our hosted web interface, PyroNet GSMView, allows you to access and analyse data anywhere in the world via the internet.

A choice of battery-powered, solar-powered or 6-24 V DC-powered versions is available for indoor or outdoor use - contact Calex for advice.

Optional relay outputs rated 30 V DC, 2 A are available for connection directly to alarm hardware.

PyroNet GSMView

- View and export data via a web browser
- Configure the PyroNet GSM unit remotely
- API included for third-party data export
- See configurable graphs
- Send alarms via email

PyroNet GSMView is a web-based interface for data acquisition and analysis. Your data is hosted securely on the PyroNet GSMView servers and access is included as standard in your monthly subscription.

You can export measurement data to be used in a spreadsheet, and configure the system to send email or SMS alarms, for temperature alerts or loss of communication (for example, due to power failure).
GENERAL SPECIFICATIONS

Inputs
4 x analogue inputs, selectable 0-20 mA, 4-20 mA, 0-5 V, 0-10 V or digital ON/OFF
Optional plug-in board with 5 x digital or pulse inputs - contact Calex.

Compatible with
PyroCouple, PyroMini, PyroUSB, or any other sensor with analogue voltage or current output

Input resolution
10 bit (1024 increments) over 10 volts

Accuracy
0.25%

Sample rate
Configurable depending on data subscription (typically 1 transmission per 10 minutes, or 1 transmission per hour)

Outputs
-R models: 2 relay outputs rated 30 V DC, 2 A

Display
40 x 40 mm, 128 x 128 pixel resolution, backlit

Programming interface
USB port for configuration and firmware updates

Firmware updates
Via USB or GSM network

Warranty
2 years

ELECTRICAL

Input connector
Removable screw terminals, pitch 3.81 mm. 4 x 3-pin connectors for sensors, 1 x 2-pin connector for power

Power supply
3.9 V battery (-B models) or 6-24 V DC, 0.5 A (-DC models)

Output power to sensors
3.9 V (unregulated), 5 V or 21.6 V

Output current to sensors
31.25 mA max.

ENVIRONMENTAL

Environmental rating
IP67

Dimensions
138 x 76 x 68 mm (excluding cable glands)

TELECOMMUNICATIONS

Approvals & Conformity
Conforms with R&TTE Directive; GE, GCF, FCC, PTCRB, IC, ANATEL approved

Modem type
Quad-band GSM & GPRS 850/900/1800/1900 Mhz

Output power
Class 4 (2 W) 850/900 MHz
Class 1 (1 W) 1800/1900 MHz

Antenna
Internal antenna built in as standard. Optional external antenna via SMA connector

GENERAL SPECIFICATIONS

Inputs
4 x analogue inputs, selectable 0-20 mA, 4-20 mA, 0-5 V, 0-10 V or digital ON/OFF
Optional plug-in board with 5 x digital or pulse inputs - contact Calex.

Compatible with
PyroCouple, PyroMini, PyroUSB, or any other sensor with analogue voltage or current output

Input resolution
10 bit (1024 increments) over 10 volts

Accuracy
0.25%

Sample rate
Configurable depending on data subscription (typically 1 transmission per 10 minutes, or 1 transmission per hour)

Outputs
-R models: 2 relay outputs rated 30 V DC, 2 A

Display
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Programming interface
USB port for configuration and firmware updates

Firmware updates
Via USB or GSM network

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Removable screw terminals, pitch 3.81 mm. 4 x 3-pin connectors for sensors, 1 x 2-pin connector for power

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3.9 V battery (-B models) or 6-24 V DC, 0.5 A (-DC models)

Output power to sensors
3.9 V (unregulated), 5 V or 21.6 V

Output current to sensors
31.25 mA max.

ENVIRONMENTAL

Environmental rating
IP67

Dimensions
138 x 76 x 68 mm (excluding cable glands)

TELECOMMUNICATIONS

Approvals & Conformity
Conforms with R&TTE Directive; GE, GCF, FCC, PTCRB, IC, ANATEL approved

Modem type
Quad-band GSM & GPRS 850/900/1800/1900 Mhz

Output power
Class 4 (2 W) 850/900 MHz
Class 1 (1 W) 1800/1900 MHz

Antenna
Internal antenna built in as standard. Optional external antenna via SMA connector

ORDERING

PyroNet GSM telemetry transmitter with 4 analogue inputs, IP67 weatherproof enclosure, built-in display, GSM modem for GPRS or SMS communications and internal antenna

OPTIONS AND ACCESSORIES

PGANT External antenna with connection kit

PGBAT Battery, 3.9 V, 16 Ah, non-rechargeable, with built-in secondary cell. For PGSM-B models.

Monthly Subscriptions
Subscriptions include a SIM card, access to PyroNet GSMView, and a daily allowance of 24 transmissions (1 per hour) or 144 transmissions (1 every 10 minutes) as standard. Other options are available.

Optionally, alarm events may be transmitted by SMS and email.

Contact Calex to discuss your requirements.
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**

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

| 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**

**Applications**

- **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.**

Specifications subject to change without notice.
The ST640 Series is a range of low cost, handheld infrared thermometers with laser sighting and large backlit LCD displays.

Each unit measures from -32°C to 535°C with 0.1°C resolution. They also offer a superior 12:1 field of view, which helps to minimise errors by producing a small diameter measurement area.

The emissivity setting on the ST640 is fixed at 0.95, making it ideal for most organic materials and non-shiny (painted, corroded or anodised) metals. The emissivity setting on the ST642 is adjustable from 0.1 to 1.0 and can be set automatically by using the thermocouple input and eSmart feature.

Both models provide adjustable audible and visual alarms in which the colour of the display changes when the target temperature exceeds the alarm set point.

Readings can be taken in °C or °F, and when the trigger is released the last measurement is held for approximately 7 seconds before the unit automatically turns off.

ST640 series thermometers will operate in ambient temperatures from 0°C to 50°C and are powered by a standard PP3, 9V battery.

Each unit is supplied complete with a soft carrying case.
The ST680 Series is a range of high quality, handheld infrared thermometers with laser sighting and large backlit LCD displays.

Each unit measures from -50°C to 1000°C with 0.1°C resolution. They also offer a superior 50:1 field of view, which helps to minimise errors by producing a small diameter measurement area.

Model ST689 has a USB data output.

The emissivity setting is adjustable from 0.1 to 1.0 and both models provide adjustable audible alarms.

Readings can be taken in °C or °F, and when the trigger is released the last measurement is held for approximately 6 seconds before the unit automatically turns off.

ST680 series thermometers will operate in ambient temperatures from 0°C to 50°C and are powered by a standard PP3, 9V battery.

Each unit is supplied complete with a soft carrying case.
Thermocouples and RTDs

- Temperature probes manufactured to your requirements
- All thermocouple types including Type J, K, N, R, S, T and B
- Platinum resistance thermometers including Pt100 and Pt1000
- PTC and NTC thermistors
- Probe materials such as stainless steel, ceramic, Inconel and titanium
- Probes available with hardwired cable, or fitted with a sealed connection head
- Optional temperature transmitter and extension cable
- Curved or straight probes, diameters from 1 mm to 30 mm
- Choice of process connections
- Let us know your requirements and we will help you find a suitable probe
The PPT245 DIN-rail mounted controller provides a highly versatile alternative to panel-mounted instruments. It has one analogue input which is configurable for up to 18 different sensors/signals, two relay outputs, and a third output which can be configured either as a SSR logic signal or a 4 to 20mA / 0 to 10V analogue signal for control or re-scalable retransmission of the process variable or setpoint.

The analogue output can also be used to adjust the emissivity setting on a PyroEpsilon non-contact temperature sensor – the value is adjusted between 0.2 and 1.0 using the lower (red) LED display and associated push buttons.

The built-in switching power supply has an extended range of 24 to 230VAC/DC and does not require any jumper setting. The control modes are ON/OFF, PID + Autotuning and Heating/Cooling PID with a neutral zone.

Software features include launch tuning, setpoint selection via digital input, optional manual reset of the output via the front keypad, latch-on function for sensor calibration (including load cells) and a programmable cycle of 3 steps. RS485 serial communication (Modbus RTU) and load monitoring function (Loop Break RTU) with current transformer TA are also provided.

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>DIN 43880 for mounting on type EN 50022 rail or on a flat surface</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>24 to 230VAC/DC +/- 15% 50/60Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>3W</td>
</tr>
<tr>
<td>Display</td>
<td>4-digit dual LED, 8 red status LEDs</td>
</tr>
<tr>
<td>Operating Conditions</td>
<td>0-45°C, 35-95%RH</td>
</tr>
<tr>
<td>Inputs</td>
<td>1 configurable for J, K, R or S thermocouples; Pt100; Ni100; Pt1000; Pt500; PTC1k; NTC10k; 0 to 10V, 0/4 to 20mA; 0 to 40mV; potentiometer 6kΩ / 150kΩ; TA 50mA.</td>
</tr>
<tr>
<td>Outputs</td>
<td>2 relays 5A resistive + 1 logic SSR 12V-30mA / 4 to 20mA / 0 to10V for control or retransmission, galvanically isolated from input and power supply RS485 Modbus RTU (57600 baud max)</td>
</tr>
<tr>
<td>Digital Input</td>
<td>Input TA 50mA for Loop Break Alarm</td>
</tr>
<tr>
<td>Control Modes</td>
<td>ON/OFF, P, PI, PID, Autotuning</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.5%±1digit for TC/RTD; 0.2%±1digit for V/mA</td>
</tr>
<tr>
<td>Sampling Time</td>
<td>Selectable (15ms max)</td>
</tr>
<tr>
<td>Sealing</td>
<td>IP20</td>
</tr>
<tr>
<td>Configuration</td>
<td>Parameters protected by password; optional memory card with battery for repeat configurations; LabSoftView software for configuration via a PC</td>
</tr>
<tr>
<td>Optional Enclosure</td>
<td>Polycarbonate with transparent lid, IP65, 160H x 90W x 90D mm</td>
</tr>
</tbody>
</table>

The PPT245 DIN-rail mounted controller is suitable for:
- Metalworking furnaces
- Heating element control
- Footwear machinery
- Plastic extrusion
- Injection moulding
- Motorised valve control
- Woodworking machinery
- Pharmaceutical industry
- Current control
- Remote control via RS485
- Signal converter
There is an optional Memory Card to copy all of the configuration parameters from one controller to another without powering them up, whilst LabSoftView for Windows enables setting and monitoring of parameters on a PC.

The PPT245 is also available mounted in an IP65 enclosure with clear lid, which is ideal for mounting on a machine or close to the process where the operator can see the display.

If the PPT245 is ordered with a PyroEpsilon sensor, it is supplied pre-configured to display the 4 to 20mA signal from the sensor over the appropriate temperature range. It is also pre-configured to allow the emissivity setting on the sensor to be adjusted over the range 0.2 to 1.0. Since the PyroEpsilon derives its power from the PPT245 no other power source is required. The PPT245 can be supplied from a 24V to 230V source (+/-15%), AC or DC.

**Model Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>Inputs</th>
<th>Outputs</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPT245-21ABC-T</td>
<td>Selectable</td>
<td>2 Relays + SSR / 4..20mA / 0..10V + RS485</td>
<td>24...230V AC/DC +/- 15% 50/60Hz</td>
</tr>
</tbody>
</table>
ATR121
Controller with Dual Setpoint

The ATR121 is a dual-setpoint controller with a 3-digit red LED display. The input is configurable for thermocouples type J, K, S & R; Pt100; PTC1000; Ni100; NTC10k (typically used in the refrigeration industry); Pt500/Pt1000 (widely used in air-conditioning); 0 to 1V; 0 to 10V; 0 to 20mA and 4 to 20mA. Potentiometers with a full scale value of 6kΩ or 150kΩ may also be used and there is a "latch on" function for quick calibration and setting of minimum, maximum and zero via the front keys.

Two set-points are available, one for control and one for the alarm function. They can be configured to activate two relay outputs or an SSR output. The main relay for the control output is rated at 8A. The alarm relay is rated at 5A (alarm modes: threshold, band, deviation). Open/Close logic for motorised valves is also available.

Software features include ON/OFF control, PID + Autotuning and Heating-Cooling PID with a neutral zone. A single output (1 relay + SSR) version is also available.

Front of panel sealing to IP65 can be achieved using a gasket (optional). There is also an optional Memory Card to copy all of the configuration parameters from one controller to another without powering them up.

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>32H x 74W x 58D mm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>230VAC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>2W</td>
</tr>
<tr>
<td>Display</td>
<td>3-digit red LED plus decimal point; green status LEDs</td>
</tr>
<tr>
<td>Operating Ambient</td>
<td>0-40°C, 35-95%RH</td>
</tr>
<tr>
<td>Inputs</td>
<td>1 configurable for J, K, R or S thermocouples; Pt100; Ni100; Pt500; Pt1000; PTC; NTC; 0/4 to 20mA; 0 to 10VDC; potentiometers &lt;= 6kΩ or &lt;= 150kΩ</td>
</tr>
<tr>
<td>Outputs</td>
<td>Control relay 8A; Alarm relay 5A; SSR Control/Alarm; Open/Close logic (time-proportioned)</td>
</tr>
<tr>
<td>Control Action</td>
<td>ON/OFF; PID Autotuning; Heating/Cooling PID</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.5%±1digit for TC/RTD; 0.2%±1digit for mA/V</td>
</tr>
<tr>
<td>Sampling Time</td>
<td>66ms (selectable software filter on input and display)</td>
</tr>
<tr>
<td>Sealing</td>
<td>IP54 front panel (IP65 with gasket), IP30 housing, IP20 terminal blocks</td>
</tr>
<tr>
<td>Configuration</td>
<td>Parameters protected by password</td>
</tr>
</tbody>
</table>

- Food industry
- Ovens/furnaces
- Refrigeration
- Sterilizers
- Environmental chambers
- Safety units
- Injection moulding
- Driers
Model:

ATR121-B

Specifications subject to change without notice

<table>
<thead>
<tr>
<th>MODEL</th>
<th>INPUTS</th>
<th>OUTPUTS</th>
<th>POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATR121-B</td>
<td>Configurable / Selectable</td>
<td>2 Relays + SSR</td>
<td>230 Vac +/-10% 50/60 Hz</td>
</tr>
</tbody>
</table>
This triple-setpoint controller has a dual red/green LED display which shows the process variable and setpoint value at the same time. The built-in switching power supply has an extended range of 24 to 230VAC/DC and does not require any jumper setting. The analogue input is selectable for thermocouples J, K, R & S; Pt100; PTC1000; Ni100; NTC10k (refrigeration industry); Pt500/ Pt1000 (widely used in air-conditioning); 0 to 10V; 0 to 20mA and 4 to 20mA. Potentiometers with full scale up to 6kΩ and 150kΩ may also be used and there is a "latch on" function for quick calibration and setting of minimum, maximum and zero via the front keys.

Three setpoints are provided for control and/or alarm functions. They can be assigned to two relay outputs or an SSR output. The main control relay is rated at 8A. The alarm relay is rated at 5A (alarm modes: threshold, band, deviation). Open/Close logic for motorised valves is also available.

Software features include ON/OFF control, PID + Autotuning, Heating-Cooling PID with a neutral zone. A single output (1 relay + SSR) version is available with RS485 serial communication and Modbus-RTU/Slave protocol for supervisory systems.

Front of panel sealing to IP65 can be achieved using a gasket (optional). There is also an optional Memory Card to copy all of the configuration parameters from one controller to another without powering them up.

Software application LabSoftView for Windows enables setting and monitoring of parameters on a PC. A special software release which integrates both the basic control loop and the timer function is available upon request.
### Specifications

**Model:**
- **PIXSYS ATR142-ABC**
- **PIXSYS ATR142-ABC-T**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>INPUTS</th>
<th>OUTPUTS</th>
<th>POWER SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATR142-ABC</td>
<td>Selectable</td>
<td>2 Relays + SSR</td>
<td>24...230V AC/DC</td>
</tr>
<tr>
<td>ATR142-ABC-T</td>
<td>1 Relay + SSR + RS485</td>
<td></td>
<td>+/- 15% 50/60Hz</td>
</tr>
</tbody>
</table>

**Gasket for 32x74**
Code 1600.00.092 (optional)

**Memory Card (optional)**
Code MEMORY C121

**Memory Card (optional)**
with battery
Code MEMORY C243

**Front panel cut-out**
26.5 x 70.5 mm

**Suggested thickness**
2~8 mm

**Dimensions:**
- Width: 77 mm
- Height: 35 mm
- Depth: 7 mm
- Depth: 53 mm

**ATR142**

Specifications subject to change without notice
This multifunction controller offers 2 to 4 setpoints. It has one analogue input which is configurable for up to 18 different sensors/signals. The 2 to 4 outputs are configurable as relays (including Open/Close logic for motorised valve control), SSR, 4 to 20mA and 0 to 10V (either for control or re-scalable retransmission of the process variable/setpoint).

The built-in switching power supply has an extended range of 24 to 230VAC/DC and does not require any jumper setting. The control modes are ON/OFF, PID + Autotuning and Heating/Cooling PID with a neutral zone.

Software features include launch tuning, setpoint selection via digital input, optional manual reset of the output via the front keypad, latch-on function for sensor calibration (including load cells) and a programmable cycle of 3 steps. Optional features include RS485 serial communication (Modbus RTU) and load monitoring function (Loop Break Alarm) with current transformer TA.

Front of panel sealing to IP65 can be achieved using a gasket (optional). There is also an optional Memory Card to copy all of the configuration parameters from one controller to another without powering them up.

Software application LabSoftView for Windows enables setting and monitoring of parameters on a PC.
ATR243-20ABC
5  G2 SSR/VmA
4  5A 230V Resistive 1/8HP
3  TC2
2  TC1
1  VA

ATR243-20ABC-I
5  G2 SSR/VmA
4  5A 230V Resistive 1/8HP
3  TC2
2  TC1
1  VA

ATR243-21ABC-T
5  CAL/GND
4  INPUT
3  5A 230V Resistive 1/8HP
2  RS485
1  Q1

ATR243-31ABC
5  Q1 5A 230V Resistive 1/8HP
4  G2 SSR/VmA
3  5A 230V Resistive 1/8HP
2  TC2
1  TC1

ATR243-31ABC-I
5  Q1 5A 230V Resistive 1/8HP
4  G2 SSR/VmA
3  5A 230V Resistive 1/8HP
2  TC2
1  TC1

MODEL | INPUTS | OUTPUTS | POWER SUPPLY
--- | --- | --- | ---
ATR243-20ABC | 2 Relays + SSR / 4.20mA / 0..10V | Selectable | 24...230V AC/DC +/- 15% 50/60Hz
ATR243-20ABC-I | 2 Relays + SSR / 4.20mA / 0..10V + RS485 | Selectable | 24...230V AC/DC +/- 15% 50/60Hz
ATR243-21ABC-T | 2 Relays + SSR / 4.20mA / 0..10V + RS485 | Selectable | 24...230V AC/DC +/- 15% 50/60Hz
ATR243-31ABC | 3 Relays + SSR / 4.20mA / 0..10V | Selectable | 24...230V AC/DC +/- 15% 50/60Hz
ATR243-31ABC-I | 3 Relays + SSR / 4.20mA / 0..10V | Selectable | 24...230V AC/DC +/- 15% 50/60Hz

Specifications subject to change without notice
The FTK provides a quick and accurate way to check the calibration of infrared temperature sensors.

This rugged and portable unit is designed to provide fast calibration checks anywhere they are needed, from the factory to the workshop or laboratory.

Eighteen models are available; offering target temperatures from 35°C or 150°C, all providing outstanding stability with less than ±0.2°C deviation.

The FTK takes between 5 and 15 minutes to heat and stabilise at the desired temperature (depending on the model), and uses a clear LED to show when it has reached that temperature: green when the FTK is warming up, orange when the FTK is ready for operation and red when the FTK is above the calibration temperature.

The FTK can be used with any infrared temperature sensor that is able to measure between 35°C and 150°C and can focus on a target area less than Ø 50.8 mm.

### SPECIFICATIONS

#### CALIBRATION SOURCE

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Temperature:</td>
<td>from 35 °C to 150 °C depending on model (see table overleaf)</td>
</tr>
<tr>
<td>Emissivity (ε):</td>
<td>0.98 ± 0.004 (for wavelength of 2 to 5.4 µm and 8 to 14 µm)</td>
</tr>
<tr>
<td>Aperture diameter:</td>
<td>50.8 mm</td>
</tr>
<tr>
<td>Warm-up time:</td>
<td>max. 5 minutes (FTK 35) to 15 minutes (FTK 150)</td>
</tr>
<tr>
<td>Temperature uncertainty:</td>
<td>0.4 °C for $T_{\text{temp}} = 10$ to $30$ °C (FTK 35 - 120)</td>
</tr>
<tr>
<td></td>
<td>0.6 °C for $T_{\text{temp}} = 0$ to $10$ °C (FTK 35 - 120)</td>
</tr>
<tr>
<td></td>
<td>0.5 °C for $T_{\text{temp}} = 10$ to $40$ °C (FTK 130 - 150)</td>
</tr>
<tr>
<td></td>
<td>0.7 °C for $T_{\text{temp}} = 0$ to $10$ °C (FTK 130 - 150)</td>
</tr>
<tr>
<td>Repeatability:</td>
<td>0.2 °C</td>
</tr>
<tr>
<td>Stability:</td>
<td>0.1 °C</td>
</tr>
<tr>
<td>Temperature uniformity:</td>
<td>0.2 °C (central area ø 45 mm)</td>
</tr>
<tr>
<td>Operating temperature: $T_{\text{op}}$:</td>
<td>0 to 30 °C, temporary (2 minutes) up to 70 °C</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>0 to 70 °C</td>
</tr>
<tr>
<td>Relative humidity:</td>
<td>10 to 85 %, non condensing</td>
</tr>
<tr>
<td>Status LED:</td>
<td>green: warm-up</td>
</tr>
<tr>
<td></td>
<td>orange: ready for operation</td>
</tr>
<tr>
<td></td>
<td>red: above calibration temperature</td>
</tr>
<tr>
<td>Power supply:</td>
<td>24 V DC, max. 1 A</td>
</tr>
<tr>
<td>Protection class:</td>
<td>IP50 (EN 60529)</td>
</tr>
<tr>
<td>Weight:</td>
<td>0.9 kg</td>
</tr>
<tr>
<td>Dimensions [mm]:</td>
<td>64.5 x 81.0 x 133.5 (ø x D x H)</td>
</tr>
<tr>
<td>CE marking:</td>
<td>according to EU regulations</td>
</tr>
</tbody>
</table>

#### POWER SUPPLY

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply:</td>
<td>100 to 240 V AC, 50 Hz</td>
</tr>
<tr>
<td>Output:</td>
<td>24 V DC, 1.3 A</td>
</tr>
<tr>
<td>Protection class:</td>
<td>EN 60950</td>
</tr>
<tr>
<td>Weight:</td>
<td>approx. 0.3 kg</td>
</tr>
<tr>
<td>CE marking:</td>
<td>according to EU directives regarding electromagnetic immunity</td>
</tr>
</tbody>
</table>
### MODELS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Target Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTK 35</td>
<td>Calibration source FTK 35</td>
<td>35 °C</td>
</tr>
<tr>
<td>FTK 45</td>
<td>Calibration source FTK 45</td>
<td>45 °C</td>
</tr>
<tr>
<td>FTK 50</td>
<td>Calibration source FTK 50</td>
<td>50 °C</td>
</tr>
<tr>
<td>FTK 55</td>
<td>Calibration source FTK 55</td>
<td>55 °C</td>
</tr>
<tr>
<td>FTK 60</td>
<td>Calibration source FTK 60</td>
<td>60 °C</td>
</tr>
<tr>
<td>FTK 65</td>
<td>Calibration source FTK 65</td>
<td>65 °C</td>
</tr>
<tr>
<td>FTK 70</td>
<td>Calibration source FTK 70</td>
<td>70 °C</td>
</tr>
<tr>
<td>FTK 75</td>
<td>Calibration source FTK 75</td>
<td>75 °C</td>
</tr>
<tr>
<td>FTK 80</td>
<td>Calibration source FTK 80</td>
<td>80 °C</td>
</tr>
<tr>
<td>FTK 85</td>
<td>Calibration source FTK 85</td>
<td>85 °C</td>
</tr>
<tr>
<td>FTK 90</td>
<td>Calibration source FTK 90</td>
<td>90 °C</td>
</tr>
<tr>
<td>FTK 95</td>
<td>Calibration source FTK 95</td>
<td>95 °C</td>
</tr>
<tr>
<td>FTK 100</td>
<td>Calibration source FTK 100</td>
<td>100 °C</td>
</tr>
<tr>
<td>FTK 110</td>
<td>Calibration source FTK 110</td>
<td>110 °C</td>
</tr>
<tr>
<td>FTK 120</td>
<td>Calibration source FTK 120</td>
<td>120 °C</td>
</tr>
<tr>
<td>FTK 130</td>
<td>Calibration source FTK 130</td>
<td>130 °C</td>
</tr>
<tr>
<td>FTK 140</td>
<td>Calibration source FTK 140</td>
<td>140 °C</td>
</tr>
<tr>
<td>FTK 150</td>
<td>Calibration source FTK 150</td>
<td>150 °C</td>
</tr>
</tbody>
</table>

### ACCESSORIES

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTKPSU</td>
<td>Power supply 100 to 240 V AC or 24 V DC</td>
</tr>
<tr>
<td>FTKPLUG-EU</td>
<td>Power plug EU</td>
</tr>
<tr>
<td>FTKPLUG-USA</td>
<td>Power plug US</td>
</tr>
<tr>
<td>FTKPLUG-UK</td>
<td>Power plug UK</td>
</tr>
<tr>
<td>FTKPLUG-AUS</td>
<td>Power plug AUS</td>
</tr>
<tr>
<td>FTKMOUNT</td>
<td>Adjustable ball and socket mounting block</td>
</tr>
</tbody>
</table>
# BB976
Blackbody Source

## General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range</td>
<td>30°C to 550°C</td>
</tr>
<tr>
<td>Emissivity</td>
<td>Greater than 0.995</td>
</tr>
<tr>
<td>Stability</td>
<td>±0.1°C</td>
</tr>
<tr>
<td>Display Resolution</td>
<td>0.01°C to 99.99; 0.1°C from 100 to 550</td>
</tr>
<tr>
<td>Heating Time</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Aperture Diameter</td>
<td>65 mm</td>
</tr>
<tr>
<td>Cavity Depth</td>
<td>160 mm</td>
</tr>
<tr>
<td>PC Interface</td>
<td>Included</td>
</tr>
<tr>
<td>Power</td>
<td>1000 W typical</td>
</tr>
<tr>
<td>Voltage</td>
<td>100-130 or 208-240 V AC, 50/60 Hz</td>
</tr>
<tr>
<td>Dimensions</td>
<td>H 310 mm, W 265 mm, D 200 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>10 kg</td>
</tr>
</tbody>
</table>

## Options
- Gallium Hockey Puck Cell: 431-03-00
- Indium Hockey Puck Cell: 976-05-00A
- Tin Hockey Puck Cell: 976-05-00B
- Zinc Hockey Puck Cell: 976-05-00C
- Orifice Plates 10, 20, 30, 40, 50 mm: 976-01-05
- (Restricts Cavity Aperture)
- Carrying Case: 931-22-64

The BB976 Portable Blackbody Calibration Source allows for calibration of non-contact infrared thermometers over the temperature range 30°C to 550°C. It is suitable for use as a primary radiation source for infrared thermometers. Laboratory performance and low uncertainty calibrations are ensured by the combination of high emissivity and excellent temperature uniformity. The digital temperature controller allows the block temperature to be set to any value from 30°C to 550°C. Traceability of the radiance temperature is established by a separate, built-in temperature indicator and included platinum resistance thermometer. A three point traceable calibration certificate is included. UKAS calibration of the resistance thermometer is available, as is radiometric calibration. Uniformity of the block is ensured by using distributed heating technology. For the smallest of uncertainties the BB976 may be used with ITS-90 Fixed Point Cells, Gallium 29.7646°C, Indium 156.5985°C, Tin 231.928°C and Zinc 419.527°C. The cells are provided with a certificate of metal purity.
BB982
Blackbody Source

The BB982 Portable Blackbody Calibration Source allows for calibration of non-contact infrared thermometers over the temperature range -10°C to 80°C.

It is suitable for use as a primary radiation source for infrared thermometers from sub zero to 80°C.

Laboratory performance and low uncertainty calibrations are ensured by the combination of high emissivity and excellent temperature uniformity.

The digital temperature controller allows the block temperature to be set to any value from -10°C to 80°C.

Traceability of the radiance temperature is established by a separate, built-in temperature indicator and included platinum resistance thermometer.

A three point traceable calibration certificate is included. UKAS calibration of the resistance thermometer is available, as is radiometric calibration.

Uniformity of the block is ensured by distributed thermoelectric heat pumps with the benefit of solid state vibration-free cooling.

**GENERAL SPECIFICATIONS**

- **Temperature Range**: -10°C to 80°C
- **Emissivity**: Greater than 0.995
- **Stability**: ±0.1°C
- **Display Resolution**: 0.01°C
- **Heating Time**: 45 minutes to 80°C
- **Cooling Time**: 45 minutes to -10°C
- **Aperture Diameter**: 50 mm
- **Cavity Depth**: 150 mm
- **PC Interface**: Included
- **Power**: 200 W typical
- **Voltage**: 100-130 or 208-240 V AC
- **Dimensions**: H 310 mm, W 265 mm, D 200 mm
- **Weight**: 10 kg

**OPTIONS**

- **Orifice Plates 10, 20, 30, 40, 50 mm**: 812-01-06
- **Carrying Case**: 931-22-64

**Issue A - Feb 10**
Specifications subject to change without notice
32000 Series
Open Frame AC/DC Regulated Linear Power Supplies

These high quality linear regulated power supplies provide outstanding value and are designed for ease of application and long trouble-free life. They will accommodate AC inputs from 100 V to 240 V and provide a wide range of DC outputs with very low ripple.

All 32000 series power supplies are built around industry-standard case sizes to simplify installation and a 3.75 kV isolation safety transformer. For additional safety the transformer primary is protected from thermal overloads by a thermal fuse. This fuse will blow if a transformer temperature of 130°C is exceeded. Every unit incorporates a safety earth tag.

All models are fitted with automatic foldback current limiting. An overvoltage protection (OVP) circuit protects sensitive loads against excessive voltage such as in TTL logic. OVP is a standard feature of all 5 V output units and an option on all other units.

The remote sensing feature, included in almost all 32000 series power supplies, may be used to compensate the voltage drop across the load lines. All dual-output power supplies feature a unique anti-latch circuit to minimise common mode latch up.
**SINGLE OUTPUT MODELS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current Amps</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>32005AR</td>
<td>5</td>
<td>3.0</td>
<td>A</td>
</tr>
<tr>
<td>32005BR</td>
<td>5</td>
<td>6.0</td>
<td>B</td>
</tr>
<tr>
<td>32005CR</td>
<td>5</td>
<td>9.0</td>
<td>C</td>
</tr>
<tr>
<td>32005DR</td>
<td>5</td>
<td>12.0</td>
<td>D</td>
</tr>
<tr>
<td>32012AR</td>
<td>12 to 15</td>
<td>1.7</td>
<td>A</td>
</tr>
<tr>
<td>32012BR</td>
<td>12 to 15</td>
<td>3.4</td>
<td>B</td>
</tr>
<tr>
<td>32012CR</td>
<td>12 to 15</td>
<td>5.1</td>
<td>C</td>
</tr>
<tr>
<td>32012DR</td>
<td>12 to 15</td>
<td>6.8</td>
<td>D</td>
</tr>
<tr>
<td>32012ER</td>
<td>12 to 15</td>
<td>10.2</td>
<td>E</td>
</tr>
<tr>
<td>32024AR</td>
<td>24 to 28</td>
<td>1.2</td>
<td>A</td>
</tr>
<tr>
<td>32024BR</td>
<td>24 to 28</td>
<td>2.4</td>
<td>B</td>
</tr>
<tr>
<td>32024CR</td>
<td>24 to 28</td>
<td>3.6</td>
<td>C</td>
</tr>
<tr>
<td>32024DR</td>
<td>24 to 28</td>
<td>4.8</td>
<td>D</td>
</tr>
<tr>
<td>32024ER</td>
<td>24 to 28</td>
<td>7.2</td>
<td>E</td>
</tr>
<tr>
<td>32024ER/10</td>
<td>24 to 28</td>
<td>10.0</td>
<td>E</td>
</tr>
<tr>
<td>32048AR*</td>
<td>48</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>32150AR</td>
<td>120 to 200</td>
<td>0.150**</td>
<td>A</td>
</tr>
</tbody>
</table>

* No remote sensing
** Output current from 180 to 200V falls linearly from 150mA to 125mA

**OVP SELECTION CHART**

<table>
<thead>
<tr>
<th>Case</th>
<th>OVP Model Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Output</td>
<td>A/B/C/D 32901AR, E 32901BR</td>
</tr>
<tr>
<td>Dual Output</td>
<td>AA/BB/CC 32901AR, protects both outputs, E 32901BR, protects both outputs</td>
</tr>
<tr>
<td>Triple Output</td>
<td>AA/AAA/D 32901AR, protects dual outputs, BBB/131 OVP built-in on 5 V outputs</td>
</tr>
</tbody>
</table>

**DUAL OUTPUT MODELS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Output 1 Voltage</th>
<th>Output 1 Current</th>
<th>Output 2 Voltage</th>
<th>Output 2 Current</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>32212AR</td>
<td>12 to 15</td>
<td>1.0</td>
<td>-12 to -15</td>
<td>1.0</td>
<td>AA</td>
</tr>
<tr>
<td>32212BR</td>
<td>12 to 15</td>
<td>1.7</td>
<td>-12 to -15</td>
<td>1.7</td>
<td>BB</td>
</tr>
<tr>
<td>32212CR</td>
<td>12 to 15</td>
<td>3.4</td>
<td>-12 to -15</td>
<td>3.4</td>
<td>CC</td>
</tr>
</tbody>
</table>

**TRIPLE OUTPUT MODELS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Output 1 Voltage</th>
<th>Output 1 Current</th>
<th>Output 2 Voltage</th>
<th>Output 2 Current</th>
<th>Output 3 Voltage</th>
<th>Output 3 Current</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>32305AR</td>
<td>5</td>
<td>2.0</td>
<td>9 to 15*</td>
<td>0.4</td>
<td>-9 to -15*</td>
<td>0.4</td>
<td>AA</td>
</tr>
<tr>
<td>32305BR</td>
<td>5</td>
<td>3.0</td>
<td>12 to 15</td>
<td>1.0</td>
<td>-12 to -15</td>
<td>1.0</td>
<td>AAA</td>
</tr>
<tr>
<td>32305DR</td>
<td>5</td>
<td>6.0</td>
<td>12 to 15</td>
<td>1.7</td>
<td>-12 to -15</td>
<td>1.7</td>
<td>BBB</td>
</tr>
<tr>
<td>32305ER</td>
<td>5</td>
<td>8.0</td>
<td>12 to 15</td>
<td>1.7</td>
<td>-12 to -15</td>
<td>1.7</td>
<td>BBB</td>
</tr>
<tr>
<td>32305FR</td>
<td>5</td>
<td>12.0</td>
<td>12 to 15</td>
<td>1.7</td>
<td>-12 to -15</td>
<td>1.7</td>
<td>BBB</td>
</tr>
</tbody>
</table>

**OPTIONS**

1. Tropicalisation – suffix code ‘T’
2. Low temperature operation -40°C to +50°C – suffix code ‘LT’
3. Overvoltage Protection Modules – These optional Overvoltage Protection Modules are available for use with any power supply NOT supplied with built-in OVP. Each is adjustable from 6.4V to 34V and should be used when maximum load protection is of prime importance. Response time is 1 ms. Mounting holes are provided on the chassis for these modules, which mount within the specified outline dimensions of each power supply.

**32000 SERIES - GENERAL DIMENSIONS**

All dimensions are in mm

<table>
<thead>
<tr>
<th>A Case</th>
<th>B Case</th>
<th>C Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight: 0.9kg</td>
<td>Weight: 1.8kg</td>
<td>Weight: 2.7kg</td>
</tr>
<tr>
<td>19.05, 9.65, 11.43, 12.70</td>
<td>123.70, 120.00, 104.70, 120.00, 104.70, 6.35, 11.75, 11.75, 19.05</td>
<td>19.05, 19.05, 19.05, 19.05, 11.43, 19.05</td>
</tr>
</tbody>
</table>

Mounting holes 4.77mm diameter
Fuse at: 0.5/0.25 Amps for 100-120/220-240 VAC

32000 SERIES AC/DC linear power supplies 59
AC/DC linear power supplies

AAA Case
Weight: 2.3kg
Mounting holes 4.77mm diameter
Fuse at: 1.0/0.5 Amps for 100-120/220-240 VAC

BB Case
Weight: 1.8kg
Mounting holes 4.77mm diameter
Fuse at: 2.0/1.0 Amps for 100-120/220-240 VAC

BBB Case
Weight: 3.6kg
Mounting holes 4.77mm diameter
Fuse at: 2.0/1.0 Amps for 100-120/220-240 VAC

CC Case
Weight: 3.2kg
Mounting holes 4.77mm diameter
Fuse at: 2.0/1.0 Amps for 100-120/220-240 VAC

DBB Case
Weight: 5.0kg
Mounting holes 4.77mm diameter
Fuse at: 3.0/1.5 Amps for 100-120/220-240 VAC

Overvoltage Protection Modules
OVP–12
32901A
OVP–24
32901B

Specifications subject to change without notice

Issue I - July 14
The 41000 Series range of power supplies are designed for quick and trouble-free installation onto 35mm profile DIN rails. With outputs ranging from 5V to 24V and maximum current capabilities from 100mA to 500mA, these units are ideal for most instrumentation and control systems.

Every model in the range is provided with output current foldback limiting and is fully short-circuit protected. Great attention has been taken to usability and safety. The double insulated housing protects users without the need for earthing. A green "supply on" LED is provided to clearly indicate the presence of power, and link selection allows the use of 110 or 230V supplies without derating.
42000B Series
DIN Rail Mounting Linear Power Supplies

The 42000 Series DIN rail mounting power supplies are supplied ready for connection. The unit has only to be snapped on to the 35mm profile rail (DIN 46277-3) and connected to the clearly marked terminal screws. A status LED indicates power is on.

For increased power two or more units may be connected in parallel. The output of these units is fully protected against short circuits and overload.

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>115/230 V AC 50/60 Hz</td>
</tr>
<tr>
<td>DC Output</td>
<td>See model chart</td>
</tr>
<tr>
<td>Ripple &amp; Noise</td>
<td>5 mV P-P max.</td>
</tr>
<tr>
<td>Output Voltage Tolerance</td>
<td>±0.5% max.</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>±0.05% for 50% load change</td>
</tr>
<tr>
<td>Line Regulation</td>
<td>±0.05% for 10% line change</td>
</tr>
<tr>
<td>Isolation: Input to output</td>
<td>3750 V AC min.</td>
</tr>
<tr>
<td>Temperature Rating</td>
<td>Standard Range: 0°C to +40°C full-rated, derated linearly to 40% at 70°C</td>
</tr>
<tr>
<td>Case Size</td>
<td>(l x w x h) 162 x 105 x 98 mm</td>
</tr>
<tr>
<td>Case Material</td>
<td>Steel housing with aluminium base</td>
</tr>
<tr>
<td>Weight</td>
<td>2.49 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>42024B/3</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>42024B</td>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.
52000 Series
Chassis Mounting AC/DC Single/Dual Output Linear Power Supplies

These high quality linear regulated power supplies provide outstanding value and are designed for ease of application and long trouble free life.

Different models are available with fixed or adjustable outputs. There is also a model with adjustable dual outputs.

The 52000 Series uses rugged screw terminal blocks for input and output connections. Those models with adjustable outputs can be set via an easily accessible potentiometer.

The metal case used on all models provides screening, and threaded inserts allow these supplies to be mounted on the insulated base or on the side.

Adjustable output models are short circuit protected. Fixed voltage models can have their outputs short circuited for a maximum of three minutes.

GENERAL SPECIFICATIONS

AC Input 216 to 264 V AC, 47 to 60 Hz
Temperature Rating 0 to +50ºC (fixed-voltage units)
-25 to +50ºC (adjustable-voltage units)
Overall Dimensions (l x w x h) 160 x 100 x 57 mm

SINGLE FIXED OUTPUT REGULATED MODELS

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Line Regulation</th>
<th>Load Regulation</th>
<th>Output Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>52012</td>
<td>12</td>
<td>1.0</td>
<td>120</td>
<td>120</td>
<td>30</td>
</tr>
<tr>
<td>52024</td>
<td>24</td>
<td>0.5</td>
<td>500</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>52048</td>
<td>48</td>
<td>0.25</td>
<td>500</td>
<td>500</td>
<td>30</td>
</tr>
</tbody>
</table>

SINGLE ADJUSTABLE OUTPUT REGULATED MODELS

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Line Regulation</th>
<th>Load Regulation</th>
<th>Output Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>52008A</td>
<td>4 to 12</td>
<td>1.0</td>
<td>120</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>52015A</td>
<td>10 to 20</td>
<td>0.5</td>
<td>20</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>52024A</td>
<td>18 to 30</td>
<td>0.25</td>
<td>25</td>
<td>30</td>
<td>15</td>
</tr>
</tbody>
</table>

DUAL ADJUSTABLE OUTPUT REGULATED MODEL

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Line Regulation</th>
<th>Load Regulation</th>
<th>Output Ripple</th>
</tr>
</thead>
<tbody>
<tr>
<td>52212A</td>
<td>± 10 to 15</td>
<td>0.5</td>
<td>10</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

* For RoHS compliant version, add suffix ‘R’ to model number
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 and FibreMini
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 and PyroMiniUSB
Via USB using the included cable and software.

PyroBus and PyroMiniBus
Via the Modbus Master.

ExTemp
Via the optional USB adapter and software.

PyroPen L & U
Via push-buttons on the unit.

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

PyroNFC
Via NFC using the smartphone app

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.

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.

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.

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

Otherwise, try a short-wavelength sensor such as the PyroUSB 2.2 or PyroMini2.2.

Some metals, most commonly aluminium and copper, are very difficult to measure. Contact Calex 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 Calex 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.
To ensure an accurate temperature measurement, the emissivity setting of the sensor must match the emissivity of the target surface. Emissivity can depend on temperature, material and surface finish. The values in this emissivity table should be used as a guide and a starting point only, and you may find that further emissivity adjustment is required.

If accuracy is critical, we recommend reading the guide "Understanding and Using the Infrared Thermometer". Contact us to obtain a copy.

### FERROUS AND NON FERROUS METALS

<table>
<thead>
<tr>
<th>Material</th>
<th>Temp (°C)</th>
<th>Temp (°F)</th>
<th>Emissivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alloys</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-Ni, 24-Cr, 55-FE, Oxidized</td>
<td>200</td>
<td>392</td>
<td>0.90</td>
</tr>
<tr>
<td>20-Ni, 24-Cr, 55-FE, Oxidized</td>
<td>500</td>
<td>932</td>
<td>0.97</td>
</tr>
<tr>
<td>60-Ni, 12-Cr, 28-FE, Oxidized</td>
<td>270</td>
<td>518</td>
<td>0.89</td>
</tr>
<tr>
<td>60-Ni, 12-Cr, 28-FE, Oxidized</td>
<td>560</td>
<td>1040</td>
<td>0.82</td>
</tr>
<tr>
<td>80-Ni, 20-CR, Oxidized</td>
<td>100</td>
<td>212</td>
<td>0.87</td>
</tr>
<tr>
<td>80-Ni, 20-CR, Oxidized</td>
<td>600</td>
<td>1112</td>
<td>0.87</td>
</tr>
<tr>
<td>80-Ni, 20-CR, Oxidized</td>
<td>1300</td>
<td>2372</td>
<td>0.89</td>
</tr>
<tr>
<td>Haynes Alloy C, Oxidized</td>
<td>316-1093</td>
<td>600-2000</td>
<td>0.90-0.96</td>
</tr>
<tr>
<td>Haynes Alloy 25, Oxidized</td>
<td>316-1093</td>
<td>600-2000</td>
<td>0.86-0.89</td>
</tr>
<tr>
<td>Haynes Alloy X, Oxidized</td>
<td>316-1093</td>
<td>600-2000</td>
<td>0.85-0.86</td>
</tr>
<tr>
<td>Inconel Sheet</td>
<td>538</td>
<td>1000</td>
<td>0.28</td>
</tr>
<tr>
<td>Inconel Sheet</td>
<td>849</td>
<td>1200</td>
<td>0.42</td>
</tr>
<tr>
<td>Inconel Sheet</td>
<td>760</td>
<td>1400</td>
<td>0.58</td>
</tr>
<tr>
<td>Inconel X, Polished</td>
<td>24</td>
<td>75</td>
<td>0.19</td>
</tr>
<tr>
<td>Inconel B, Polished</td>
<td>24</td>
<td>75</td>
<td>0.21</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidized</td>
<td>100</td>
<td>212</td>
<td>0.74</td>
</tr>
<tr>
<td>Oxidized</td>
<td>499</td>
<td>930</td>
<td>0.84</td>
</tr>
<tr>
<td>Oxidized</td>
<td>1199</td>
<td>2190</td>
<td>0.89</td>
</tr>
<tr>
<td>Unoxidized</td>
<td>100</td>
<td>212</td>
<td>0.05</td>
</tr>
<tr>
<td>Red Rust</td>
<td>25</td>
<td>77</td>
<td>0.70</td>
</tr>
<tr>
<td>Rusted</td>
<td>25</td>
<td>77</td>
<td>0.65</td>
</tr>
<tr>
<td>Liquid</td>
<td>1516-1771</td>
<td>2760-3220</td>
<td>0.42-0.45</td>
</tr>
<tr>
<td>Cast Iron</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidized</td>
<td>199</td>
<td>390</td>
<td>0.64</td>
</tr>
<tr>
<td>Oxidized</td>
<td>599</td>
<td>1110</td>
<td>0.78</td>
</tr>
<tr>
<td>Unoxidized</td>
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<td>212</td>
<td>0.21</td>
</tr>
<tr>
<td>Strong Oxidation</td>
<td>40</td>
<td>104</td>
<td>0.95</td>
</tr>
<tr>
<td>Strong Oxidation</td>
<td>250</td>
<td>482</td>
<td>0.95</td>
</tr>
<tr>
<td>Liquid</td>
<td>1535</td>
<td>2795</td>
<td>0.29</td>
</tr>
<tr>
<td>Wrought Iron</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dull</td>
<td>25</td>
<td>77</td>
<td>0.94</td>
</tr>
<tr>
<td>Dull</td>
<td>849</td>
<td>1600</td>
<td>0.94</td>
</tr>
<tr>
<td>Smooth</td>
<td>38</td>
<td>100</td>
<td>0.35</td>
</tr>
<tr>
<td>Polished</td>
<td>38</td>
<td>100</td>
<td>0.28</td>
</tr>
<tr>
<td>Lead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polished</td>
<td>38-260</td>
<td>100-500</td>
<td>0.06-0.08</td>
</tr>
<tr>
<td>Rough</td>
<td>38</td>
<td>100</td>
<td>0.43</td>
</tr>
<tr>
<td>Oxidized</td>
<td>38</td>
<td>100</td>
<td>0.43</td>
</tr>
<tr>
<td>Oxidized at 593°C</td>
<td>38</td>
<td>100</td>
<td>0.63</td>
</tr>
<tr>
<td>Gray Oxidized</td>
<td>38</td>
<td>100</td>
<td>0.28</td>
</tr>
</tbody>
</table>

### OTHER MATERIALS

<table>
<thead>
<tr>
<th>Material</th>
<th>Temp (°C)</th>
<th>Temp (°F)</th>
<th>Emissivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Rolled</td>
<td>93</td>
<td>200</td>
<td>0.75-0.85</td>
</tr>
<tr>
<td>Ground Sheet</td>
<td>93-1093</td>
<td>1720-2010</td>
<td>0.55-0.61</td>
</tr>
<tr>
<td>Polished Sheet</td>
<td>38</td>
<td>100</td>
<td>0.07</td>
</tr>
<tr>
<td>Polished Sheet</td>
<td>260</td>
<td>500</td>
<td>0.10</td>
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| Asphalt, tar paper | 20 | 68 | 0.93 |
| Basalt | 20 | 68 | 0.72 |</p>
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