PyroBus, non-contact infrared sensors, measure temperatures from -20°C to 500°C and provide a RS485 Modbus RTU interface.

**PYROBUS SPECIFICATIONS**

**Temperature Range vs Field-of-View table**

<table>
<thead>
<tr>
<th>Field of View</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:1</td>
<td>PB21</td>
</tr>
<tr>
<td>15:1</td>
<td>PB151</td>
</tr>
<tr>
<td>30:1</td>
<td>PB301</td>
</tr>
<tr>
<td>ø5mm @ 100mm</td>
<td>PBCF</td>
</tr>
</tbody>
</table>

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

**MECHANICAL**

- **Construction**: Stainless Steel
- **Dimensions**: 18 mm diameter x 103 mm long
- **Thread Mounting**: M16 x 1 mm pitch
- **Cable Length**: 1 m
- **Weight with Cable**: 95 g

**ENVIRONMENTAL**

- **Environmental Rating**: IP65
- **Ambient Temperature**: 0°C to 70°C
- **Relative Humidity**: 95% max. non-condensing
* Other configurations available upon request

**PM240 SPECIFICATIONS**

- **Display Format**: LCD type TFT 320 x 240, 3.5" touch screen, Resistive
- **Supply Voltage**: 12 to 24 V DC
- **Power Consumption**: 8 W
- **Serial port EXP1**: RS485 Modbus RTU interface for PyroBus sensors
- **Serial port COM2**: RS485 / RS232 interface for second display (read only)
- **Outputs (PM240E only)**: 4 analogue outputs, 0 to 10 V DC, 16 programmable alarm outputs,12/24 V DC, 700 mA, (3 A max. per block of 8 outputs).

**MECHANICAL**

- **Construction**: Polycarbonate with gasket, transparent lid (PC) and quick release screws
- **Mounting**: Surface
- **Dimensions**: 140mm wide x 100mm tall x 44mm deep (PM240)
  140mm wide x 100mm tall x 65mm deep (PM240E)

**ENVIRONMENTAL**

- **Environmental Rating**: IP54 (front), IP30 (housing)
- **Ambient Temperature Range**: 0°C to 45°C
- **Relative Humidity**: 35% to 95%, non-condensing
The installation process consists of the following stages:

**Preparation**  
Mechanical installation  
Electrical installation

Please read the following sections thoroughly before proceeding with the installation.

**PREPARATION**  
Ensure that the sensor is positioned so that it is focused on the target only.
DISTANCE AND SPOT SIZE
The size of the area (spot size) to be measured determines the distance between the sensor and the target. The spot size must not be larger than the target. The sensor should be mounted so that the measured spot size is smaller than the target.

AMBIENT TEMPERATURE
The sensor is designed to operate in ambient temperatures from 0°C to 70°C. For ambient temperatures above 70°C, an air/water-cooled housing will be required.

Avoid thermal shock. Allow 20 minutes for the unit to adjust to large changes in ambient temperature.

ATMOSPHERIC QUALITY
Smoke, fumes or dust can contaminate the lens and cause errors in temperature measurement. In these types of environment the air purge collar should be used to help keep the lens clean.

ELECTRICAL INTERFERENCE
To minimise electromagnetic interference or ‘noise’, the sensor should be mounted away from motors, generators and such like.

WIRING
Check the distance between the sensor and the Modbus Master. If necessary, the PyroBus sensor can be ordered with a longer cable attached.

POWER SUPPLY
Be sure to use a 12Vdc, (50mA max.) power supply.

MECHANICAL INSTALLATION
All sensors come with a 1m cable and a mounting nut. The sensor can be mounted on brackets or cut outs of your own design, or you can use the fixed and adjustable mounting bracket accessories which are shown below. Note: The sensor must be grounded at only one point, either the cable shield or the sensor housing.
AIR/WATER COOLED HOUSING
The air/water cooled housing shown below allows the sensor to withstand high ambient temperatures. It is equipped with two 1/8” BSP fittings. Water temperature should be 10°C to 27°C for efficient cooling. Chilled water below 10°C is not recommended. To avoid condensation, the air purge collar should be used with the water-cooled housing. Water flow rate should not be more than 0.5 to 1.5 litres/min.

AIR PURGE COLLAR
The air purge collar below is used to keep dust, fumes, moisture, and other contaminants away from the lens. It must be screwed in fully. Air flows into the 1/8” BSP fitting and out of the front aperture. Air flow should be no more than 5 to 15 litres/min.

Clean or ‘instrument’ air is recommended.
ELECTRICAL INSTALLATION

**PyroBus with Modbus Master**

Power Supply
12 VDC

PyroBus Sensor #1

PyroBus Sensor #32

RS+ RS- PWR+ PWR-

Modbus Master

**PyroBus with PM240**

Power Supply
12 VDC

PyroBus Sensor #1

PyroBus Sensor #8

RS+ RS- PWR+ PWR-

Analogue transmission & alarm outputs (PM240E only)

PM240 Sensor Configuration & Display

Optional PM240 or other Modbus Master (Display only)
MODBUS OVER SERIAL LINE

INTERFACE
Baud rate 9600
Format 8 data bits, No parity, 1 stop bit
Reply delay (ms) 20

SUPPORTED FUNCTIONS
Read register 0x03, 0x04
Write single register 0x06
Write multiple register 0x10
Mask write register 0x16

The list below includes all available addresses:
R = Read, W = Write, MW = Mask write

<table>
<thead>
<tr>
<th>Address</th>
<th>Length (words)</th>
<th>Description</th>
<th>R/W/MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>1</td>
<td>MODBUS slave address (1 to 247)</td>
<td>R/W *</td>
</tr>
</tbody>
</table>
| 0x02    | 2              | Sensor identification register
Bits 0..19 - Serial number
Bits 20..23 - Sensor type (8 = PyroBus)
Bits 24..26 - Sensor field-of-view (0 = 2:1, 1 = 15:1, 2 = 30:1)
Bits 27..32 - Reserved | R |
| 0x06    | 1              | Un-filtered object temperature | R |
| 0x08    | 1              | Sensor temperature | R |
| 0x0A    | 1              | Maximum temperature over hold period | R |
| 0x0C    | 1              | Minimum temperature over hold period | R |
| 0x0E    | 1              | Average temperature over hold period | R |
| 0x10    | 1              | Filtered object temperature | R |
| 0x12    | 1              | Reflected temperature | R/W |
| 0x14    | 1              | Sensor status register
Bits 0..1 - Reserved
Bit 2 - Hold processing on (1)/off (0)
Bit 3 - Hold peaks (1)/valleys (0)
Bits 4..6 - Reserved
Bit 7 - Reflected energy compensation on (1)/off (0)
Bits 8..15 - Reserved | R/W/MW |
| 0x16    | 1              | Average period (1 LSB = 0.05 seconds)
Minimum 0.05 seconds, Maximum 60.00 seconds | R/W |
| 0x18    | 1              | Hold period (1 LSB = 0.05 seconds)
Minimum 0.05 seconds, Maximum 1200.00 seconds | R/W |
| 0x1A    | 1              | Emissivity (1 LSB = 0.0001)
Minimum 0.2000, Maximum 1.0000 | R/W |

* Single register writes only. New address will not take effect until next power on.

Notes:
1. All temperatures are in tenths of degrees C
2. Writing to bits listed as reserved or unlisted registers could cause malfunction
3. All write and mask operations are saved to non-volatile memory
4. For further information please refer to http://www.modbus.org/specs.php
5. Use address 255 to communicate with any connected sensor. Use address 0 to broadcast to all connected sensors (no response expected)
**OPERATION**

Once the sensor is in position and the appropriate power, air, water, and cable connections are secure, the system is ready for continuous operation by completing the following simple steps:

1. Turn on the power supply
2. Turn on the Modbus Master
3. Read / monitor the temperature

**IMPORTANT**

Be aware of the following when using the sensor:

- If the sensor is exposed to significant changes in ambient temperature (hot to cold, or cold to hot), allow 20 minutes for the temperature to stabilise before taking or recording measurements.
- Do not operate the sensor near large electromagnetic fields (e.g. around arc welders or induction heaters).
  - Electromagnetic interference can cause measurement errors.
- Wire must be connected only to the appropriate terminals.

**MAINTENANCE**

Our customer service representatives are available for application assistance, calibration, repair, and solutions to specific problems. Contact our Service Department before returning any equipment. In many cases, problems can be solved over the telephone. If the sensor is not performing as it should, try to match the symptom below to the problem. If the table does not help, call Calex for further advice.

<table>
<thead>
<tr>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptom</strong></td>
</tr>
<tr>
<td>No output</td>
</tr>
<tr>
<td>Erroneous temperature</td>
</tr>
<tr>
<td>Erroneous temperature</td>
</tr>
<tr>
<td>Erroneous temperature</td>
</tr>
</tbody>
</table>

**LENS CLEANING**

Keep the lens clean at all times. Any foreign matter on the lens would affect measurement accuracy. Blow off loose particles (if not using the air purge accessory) with an air ‘puffer’.

**GUARANTEE**

Calex guarantees each instrument it manufactures to be free from defect in material and workmanship under normal use and service for the period of two years from the date of purchase. This guarantee extends only to the original buyer according to Calex terms and conditions of Sale.