

# PyroBus Series Operators Guide

---



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

Field of View	Model Number
2:1	PB21
15:1	PB151
30:1	PB301
ø5mm @ 100mm	PBCF

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

### MECHANICAL

<b>Construction</b>	Stainless Steel
<b>Dimensions</b>	18 mm diameter x 103 mm long
<b>Thread Mounting</b>	M16 x 1 mm pitch
<b>Cable Length</b>	1 m
<b>Weight with Cable</b>	95 g

### ENVIRONMENTAL

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

\* Other configurations available upon request

### PM240 SPECIFICATIONS

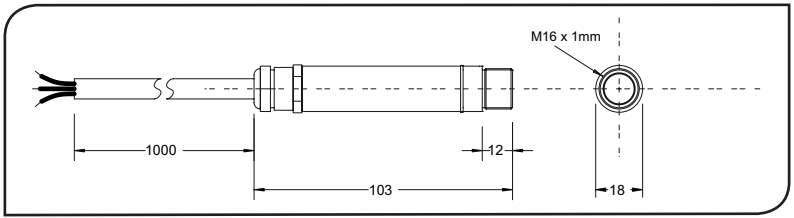
<b>Display Format</b>	LCD type TFT 320 x 240, 3.5" touch screen, Resistive
<b>Supply Voltage</b>	12 to 24 V DC
<b>Power Consumption</b>	8 W
<b>Serial port EXP1</b>	RS485 Modbus RTU interface for PyroBus sensors
<b>Serial port COM2</b>	RS485 / RS232 interface for second display (read only)
<b>Outputs (PM240E only)</b>	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

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

### ENVIRONMENTAL

<b>Environmental Rating</b>	IP54 (front), IP30 (housing)
<b>Ambient Temperature Range</b>	0°C to 45°C
<b>Relative Humidity</b>	35% to 95%, non-condensing



**ACCESSORIES**

A range of accessories to suit different applications and industrial environments is available. These may be ordered at any time and added on-site. The accessories consist of the following parts .

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

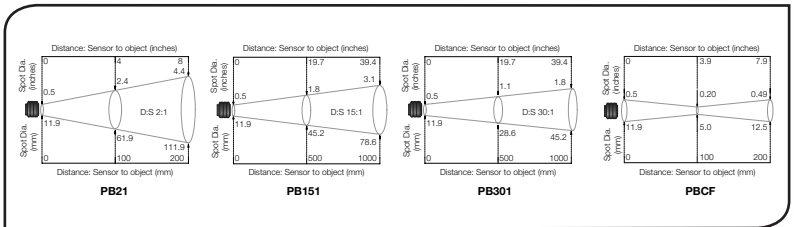
**OPTIONS**

The following options are available. Options are factory installed and must be ordered with the PyroBus.

- Air/water cooled housing                      Certificate of calibration                      Longer cable

**OPTICAL CHART**

The optical chart below indicates the nominal target spot diameter at any given distance from the sensing head and assumes 90% energy.



**INSTALLATION**

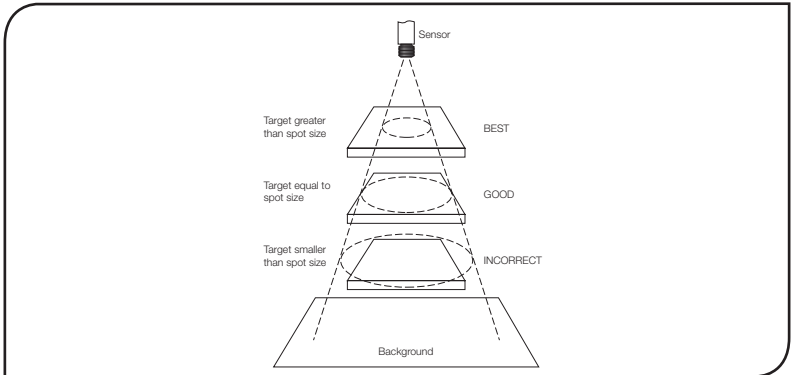
The installation process consists of the following stages:

- 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

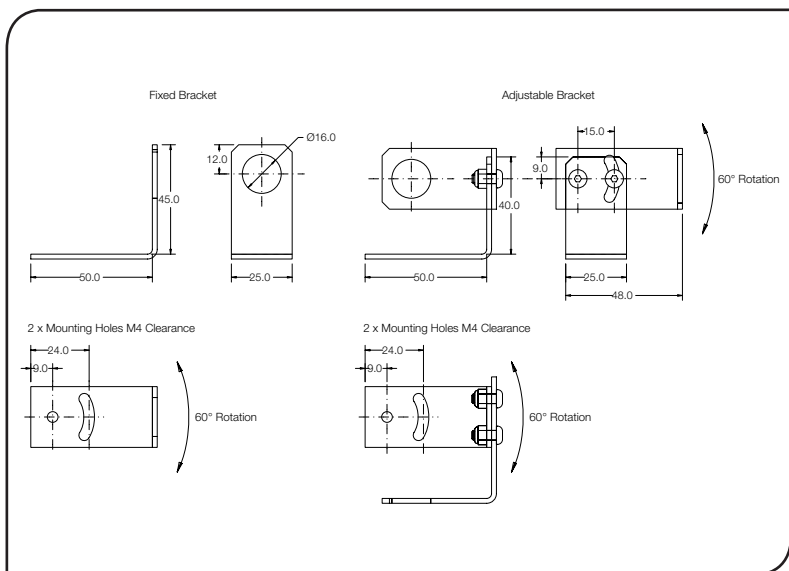
Check the distance between the sensor and the Modbus Master. If necessary, the PyroBus sensor can be ordered with a longer cable attached.

## POWER SUPPLY

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

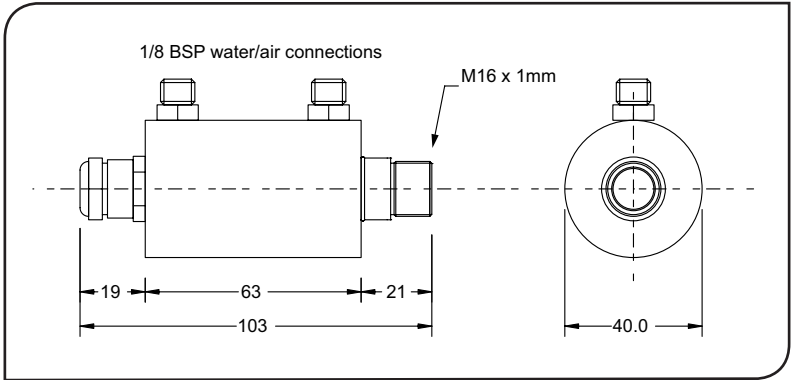
## MECHANICAL INSTALLATION

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**

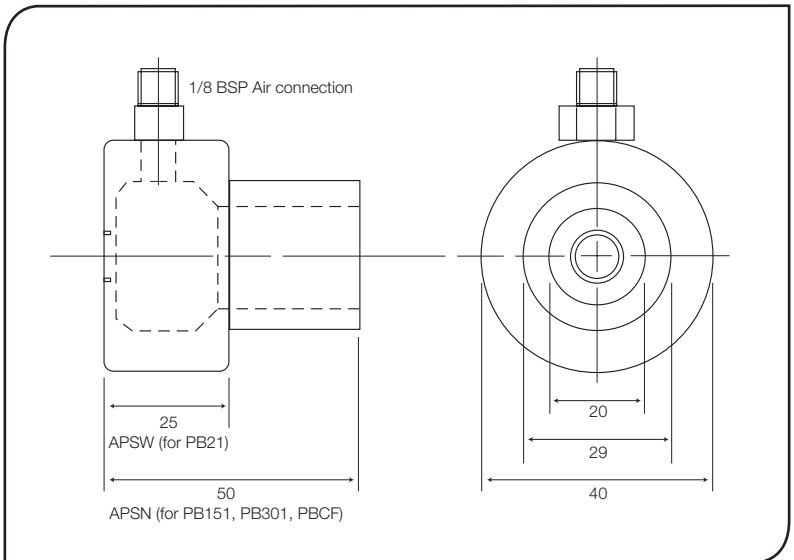
The air/water cooled housing shown below allows the sensor to withstand high ambient temperatures. It is equipped with two 1/8" BSP fittings. Water temperature should be 10°C to 27°C for efficient cooling. Chilled water below 10°C is not recommended. To avoid condensation, the air purge collar should be used with the water-cooled housing. Water flow rate should not be more than 0.5 to 1.5 litres/min.



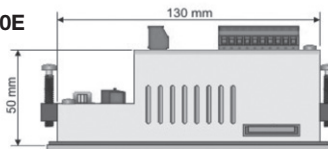
**AIR PURGE COLLAR**

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.

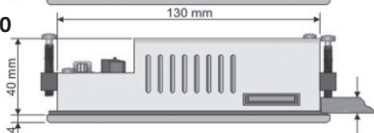


**PM240E**

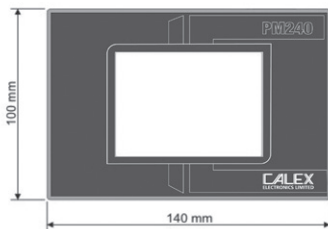


Panel cut-out  
132 x 89 mm  
-0/+1 mm

**PM240**

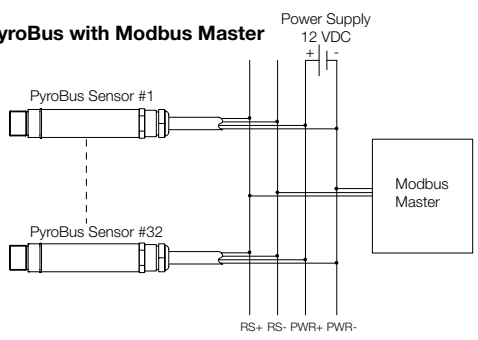


2-6 mm

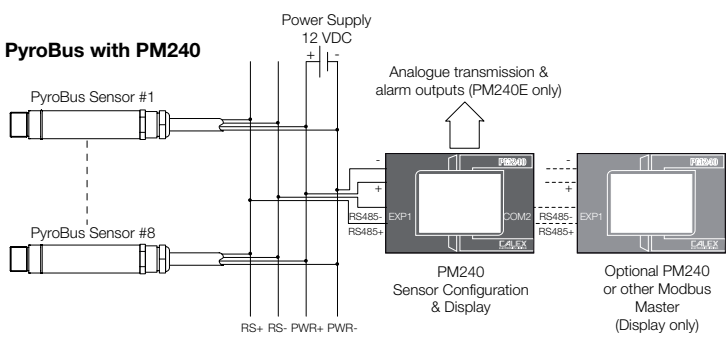


## ELECTRICAL INSTALLATION

### PyroBus with Modbus Master



### PyroBus with PM240



## MODBUS OVER SERIAL LINE

### INTERFACE

<b>Baud rate</b>	9600
<b>Format</b>	8 data bits, No parity, 1 stop bit
<b>Reply delay (ms)</b>	20

### SUPPORTED FUNCTIONS

<b>Read register</b>	0x03, 0x04
<b>Write single register</b>	0x06
<b>Write multiple register</b>	0x10
<b>Mask write register</b>	0x16

The list below includes all available addresses:

R = Read, W = Write, MW = Mask write

Address	Length (words)	Description	R/W/MW
0x00	1	MODBUS slave address (1 to 247)	R/W *
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.

<b>Troubleshooting</b>		
<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>
No output	No power to sensor	Check power supply
Erroneous temperature	Incorrect wire connection	Check wire colour codes
Erroneous temperature	Faulty sensor cable	Verify cable continuity
Erroneous temperature	Field of view obstruction	Remove obstruction

## 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.

Issue C - November 11

---

### **Calex Electronics Limited**

PO Box 2, Leighton Buzzard, Bedfordshire, England LU7 4AZ

Tel: +44 (0)1525 373178 Fax: +44 (0)1525 851319 Lo-call tel: 0845 3108053

Email: mail@calex.co.uk Online: <http://www.calex.co.uk>