

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

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

MECHANICAL

Construction	Stainless Steel
Dimensions	18 mm diameter x 103 mm long
Thread Mounting	M16 x 1 mm pitch
Cable Length	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

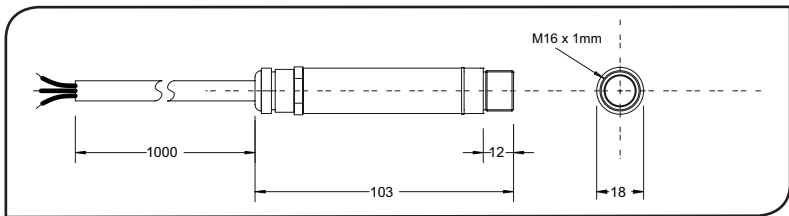
Display Format	LCD type TFT 320 x 240, 3.5" touch screen, Resistive
Supply Voltage	12 to 24 V DC
Power Consumption	8 W
Serial port EXP1	RS485 Modbus RTU interface for PyroBus sensors
Serial port COM2	RS485 / RS232 interface for second display (read only)
Outputs (PM240E only)	4 analogue outputs, 0 to 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



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

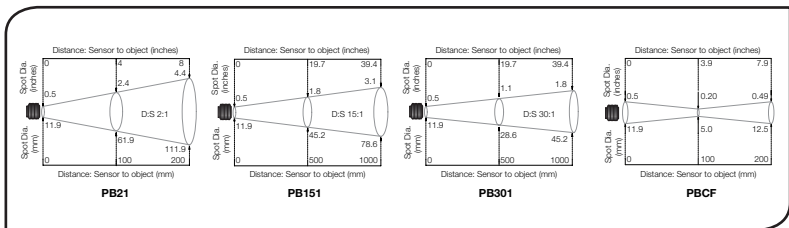
OPTIONS

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

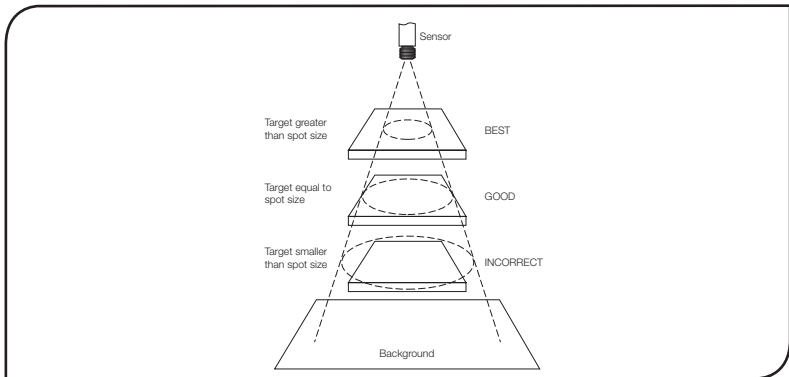
The installation process consists of the following stages:

- 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

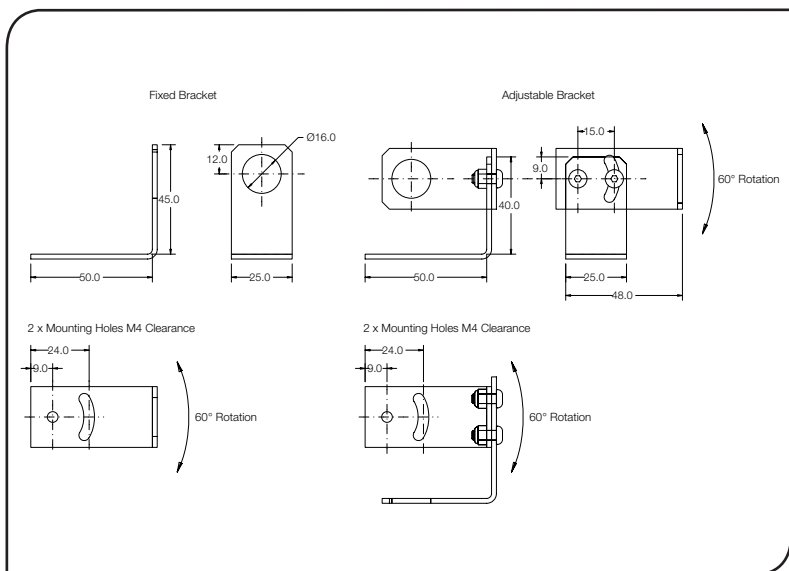
Check the distance between the sensor and the Modbus Master. If necessary, the PyroBus sensor can be ordered with a longer cable attached.

POWER SUPPLY

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

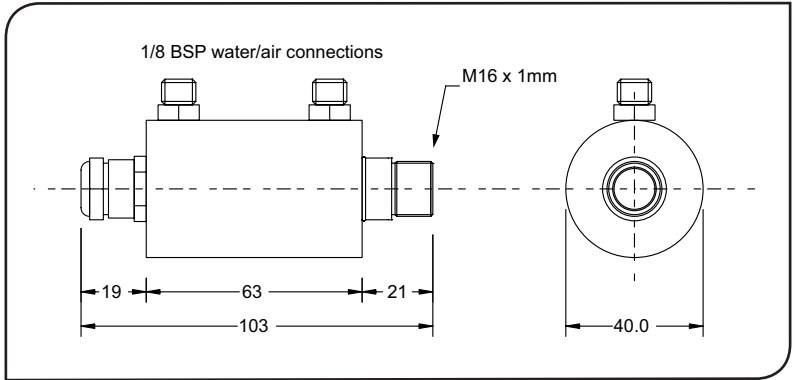
MECHANICAL INSTALLATION

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 PyroBus sensor housing must be connected to earth.



AIR/WATER COOLED HOUSING

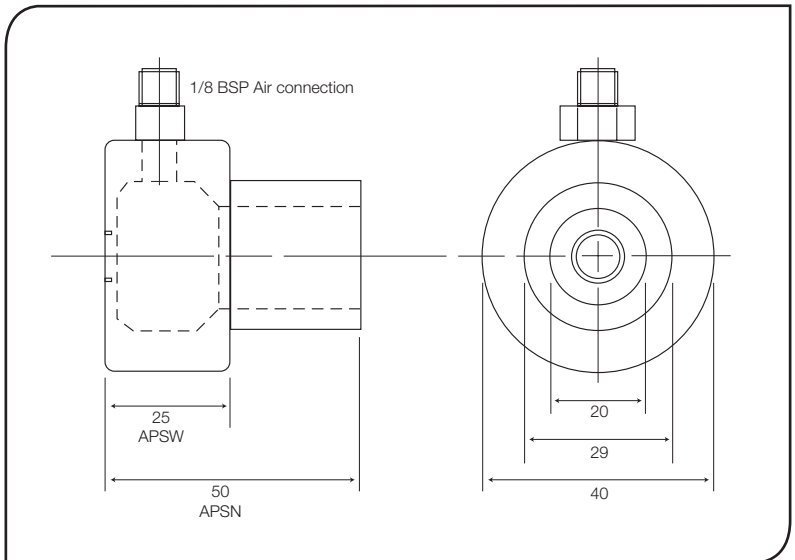
The air/water cooled housing shown below allows the sensor to withstand high ambient temperatures. It is equipped with two 1/8" BSP fittings. Water temperature should be 10°C to 27°C for efficient cooling. Chilled water below 10°C is not recommended. To avoid condensation, the air purge collar should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

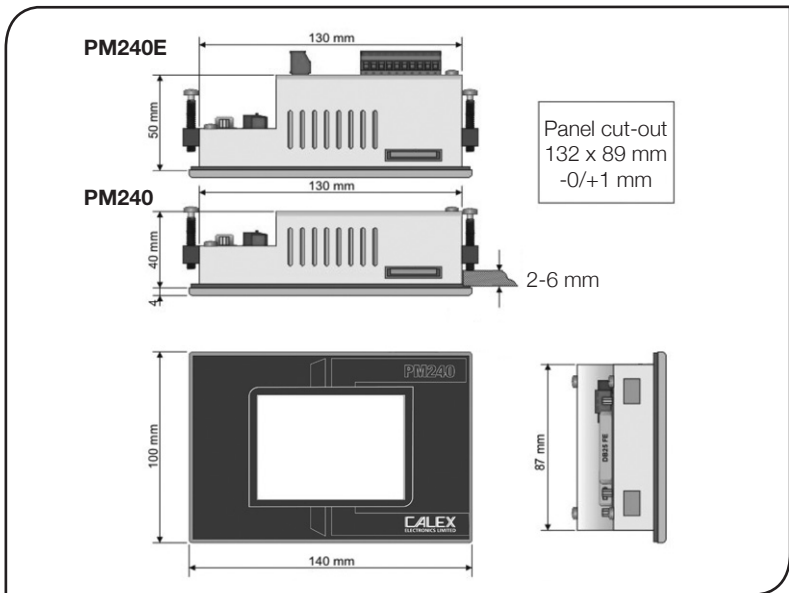


AIR PURGE COLLAR

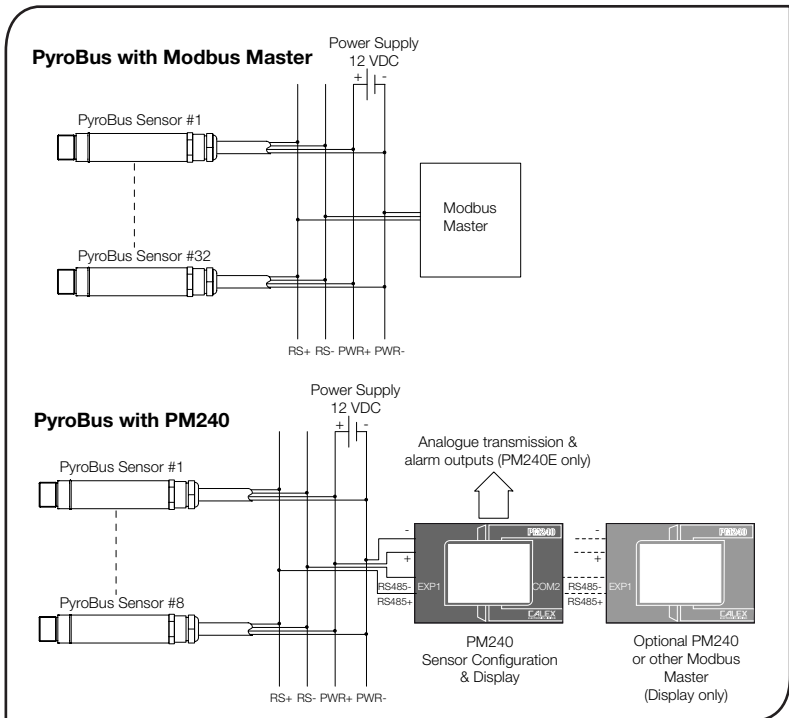
The air purge collar below is used to keep dust, fumes, moisture, and other contaminants away from the lens. It must be screwed in fully. Air flows into the 1/8" BSP fitting and out of the front aperture. Air flow should be no more than 0.5 to 1.5 litres/min.

Clean or 'instrument' air is recommended.





ELECTRICAL INSTALLATION



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

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.

Troubleshooting		
Symptom	Probable Cause	Solution
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 one year from the date of purchase. This guarantee extends only to the original buyer according to Calex terms and conditions of Sale.

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