

# PIM

## Pressure Input Module (1x Pressure Transducer Input)

### Summary

The iMAC PIM is an intrinsically safe (Ex ia I Ma) pressure input module for the iMAC system. The value of the pressure input is quantised and transmitted to the iMAC Controller via the iMAC intrinsically safe fieldbus allowing remote monitoring and control. The iMAC PIM module is powered directly from the iMAC fieldbus allowing large distributed systems to be quickly deployed without the need for additional remote power supplies.

The iMAC PIM module is supplied paired with a transducer calibrated to the appropriate range.

The iMAC PIM transmits a single 16-bit register to the iMAC Controller combining status flags and the pressure value.

The alarm and trip status flag conditions are configurable remotely from the iMAC controller and are stored securely in the non-volatile memory of the PIM module.

The PIM module is housed in a compact enclosure that is panel mounted using two screws. A separately purchased mounting accessory allows the PIM module to be DIN Rail mounted.

The PIM module has a status LED that indicates the health of the module, with the flash pattern corresponding to the module status.



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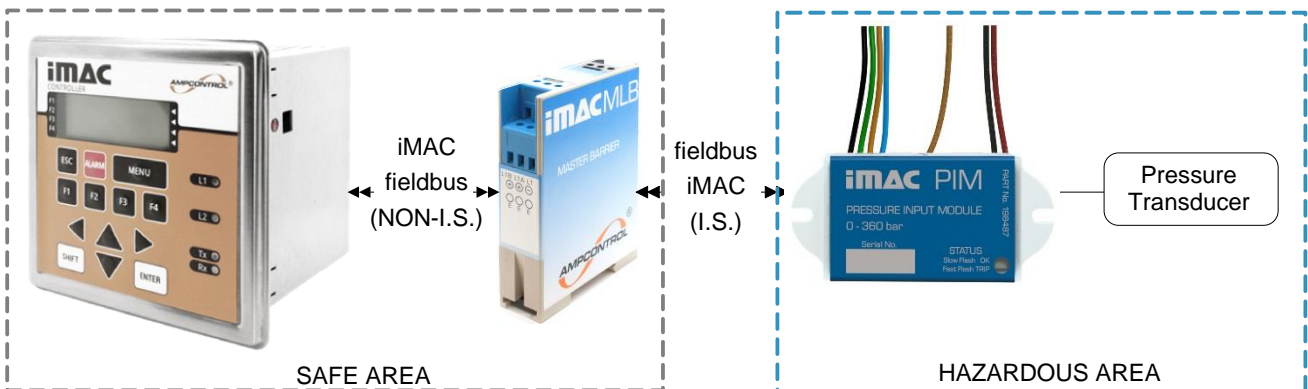
### Data Register(s)

1 (Combined Flags and Pressure)

### Features

- 1x Pressure Transducer input
- Programmable status flags and set points
- Remotely monitored and configured from the iMAC Controller
- Down-line powered from the iMAC L1 fieldbus
- Intrinsically safe Ex ia Group I Ma
- Multi-function diagnostic status LED

### System Overview



**CAUTION!**



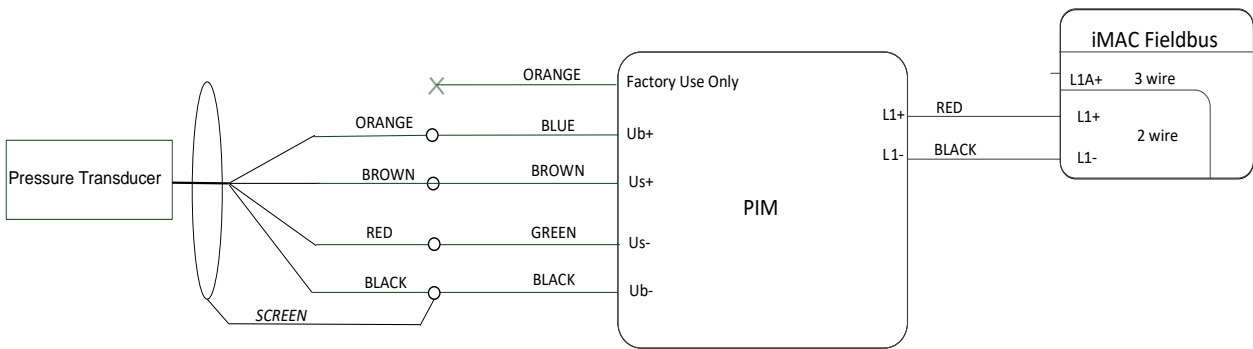
PIM modules used in non-I.S. systems shall not be re-used in I.S. systems as the integrity of internal components upon which intrinsic safety depends may have been compromised.

**CAUTION!**



PIM modules and Transducers are factory calibrated together. A PIM module shall only be connected to its corresponding Transducer (matched by serial number). Failure to adhere to this will result in pressure values that are incorrect.

**Electrical Connections**



Note: refer to iMACB094 – iMAC Installation Requirements

Label	iMAC Wire Colour	Transducer Wire Colour	Description
L1+	Red		iMAC fieldbus L1 connections (2-wire)
L1-	Black		
Factory Use Only	Orange	Do not connect	Pressure Sensor
Ub+	Blue	Orange	
Us+	Brown	Brown	
Us-	Green	Red	
Ub-	Black	Black + Screen	

## Data Register

Flags and Pressure Register			
Bit	Description	Bit Value	R / W
15	Trip	1 = Trip	r
14	Warning	1 = Warning	r
13	Sign Bit	1 = Negative ( <i>While a negative value can be displayed, this is for diagnostic purposes only and the module is not capable of measuring a pressure below 0</i> )	r
12 - 0	13-bit unsigned pressure value.	0 to 8192 See Functional Logic table below	r

## Configuration Parameters

(Refer to document IMACB005 - iMAC module parameters programming procedure).

Data Register Parameters (roll-call name: PIM Module)				
No	Description	Range	Default	R/W
1	Data register address	1 - 255	255	r / w
2	Warning Setpoint	0 to 3600 (0.0 to 360.0 bar)	3200 (320 bar)	r / w
3	Trip Setpoint	0 to 3600 (0.0 to 360.0 bar)	3100 (310 bar)	r / w
4	Future Use	-	-	-

## Functional Logic

### Flags

The trip and warning flags have a hysteresis of 3 bar.

Warning Flag: If set to 1 indicates the pressure value is lower than the warning set point.

Trip Flag: If set to 1 indicates the pressure value is lower than the trip set point *OR*

If set to 1 indicates the PIM is in a fault state. At runtime, the module performs various checks for faults which can impact the correct operation of the module. If such a fault is detected, it is indicated as described in the table below in conjunction with particular Pressure Value. The table is arranged in order of priority (first row highest).

Type	Pressure Value	Register Flags	Data Register Value (Incl Flags)	Reason for Fault
Return to Ampcontrol *	8032	Trip = 1, Warning = 0	40800	Internal module fault
Field Recoverable *	8042	Trip = 1, Warning = 0	40810	Wiring fault/sensor loose connection
Over/Under Pressure Fault	8052	Trip = 1, Warning = 0	40820	Pressure is below or above the fault levels.

\* These fault states are cleared by the following mechanisms:

1. Runtime hard faults (e.g. sensor connection).
  - a) Automatically every 5 seconds.
  - b) By writing the module parameters (block 0), without changing any values.
2. Start-up hard faults (e.g. parameter checksum errors).
  - a) Can only be resolved by first writing the parameter block, and then cycling module power (only checked at start-up).

### Pressure Value

A 13-bit unsigned representation of the pressure.

Module Type	Nominal Pressure Range	Nominal Display Range #	Scaling	Display Resolution	Overpressure Fault Level	Under pressure Fault Level
360 bar	0 to 360 bar (0 to 36,000kPa)	-30 to 3600	Register is x10	0.1	>= 365 bar	-3 bar


The pressure value has a fixed exception scan margin of 3 bar.

# While a negative value can be displayed, this is for diagnostic purposes only and the module is not capable of measuring a pressure below 0.

LED Indicators			
Status LED (RED)			
Flash Sequence		Module - iMAC Comms Status	Module - Function Status
Off		Unknown (check connections)	Unknown (check connections)
Slow Flash		Healthy	All status register warn and fault bits = 0
2 Flashes		Healthy (has been roll-called)	-
3 Flashes		Error (address clash)	-
Fast Flash		Warn (general)	Trip or Warning Flag set

### Pressure Transducer

Before installation, commissioning and operation, ensure that the appropriate pressure transmitter has been selected in terms of measuring range, design and specific measuring conditions:

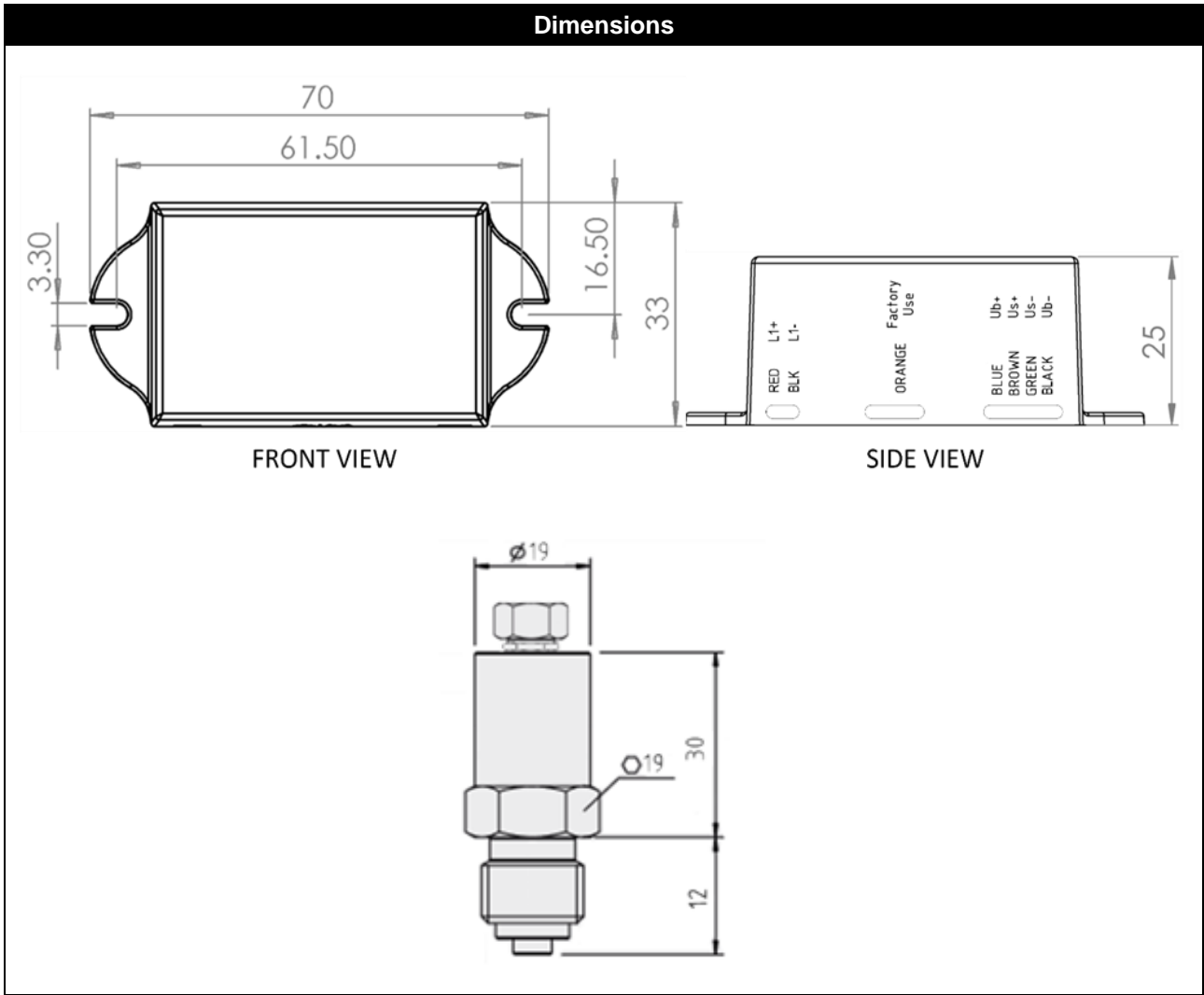
<p><b>WARNING!</b></p> 	<p>The PIM and its Pressure Transducer interface with systems that may contain stored energy in the form high pressure air or water.</p> <ul style="list-style-type: none"> <li>• Open the process connections only after the system has been verified as isolated and depressurised.</li> <li>• The mounting, dismounting, installation, and maintenance of the pressure transmitter shall be performed by suitably qualified personnel.</li> <li>• The PIM shall not be used to prove proof of isolation.</li> <li>• Refer to the iMAC System Documentation for additional safety information.</li> </ul>
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- Prior to installation, the pressure transmitter and the point of mounting must be subjected to a visual inspection. Sealing faces shall be clean and undamaged.
- For sealing process connections with tapered threads, the sealing must be made in the threads using additional sealing material, e.g. PTFE tape.
- When screwing the instrument in, the force required to do this must not be applied through the case or the electrical gland, only through the spanner flats provided for this purpose and using a suitable tool.
- Apply the correct torque depending on the dimensions of the process connection and the gasket used (form/material). When screwing in, do not cross the threads.
- Repairs must only be carried out by the manufacturer.
- Do not use any pointed or hard objects for cleaning, as they may damage the diaphragm of the process connection.

**Certification / Approvals**

<i>Type</i>	Ex ia I MA (for use in zone 0, 1 or 2)	
<i>Certificate number</i>	IECEX ITA 07.0017X	
<i>Module type</i>	iMAC GM4 Module	
<i>IP rating</i>	The equipment shall be installed and terminated within an enclosure suitable for Group I providing a degree of protection not less than IP54 as per IEC60529.	
<i>Other</i>	<p>The equipment shall be properly mounted such that the encapsulation will not form an exposed external surface of the housing.</p> <p>Must be connected in accordance with iMAC system drawing IMACZ032.</p> <p>The GM4 conforms with the dielectric strength requirement of IEC60079-11:2011 Clause 6.3.13.</p>	
<i>I/O parameters</i>	iMac L1 fieldbus <sup>1</sup> L1+ (red), L1- (black)	$U_i = 21.5V$ with R source $\geq 44.65\Omega$ $P_i = 2.58W$ $C_i = \text{Negligible}$ $L_i = \text{Negligible}$
	Pressure Transducer Ub+ (Blue), Factory (Orange), Us+ (Brown), Us- (Green), Ub- (Black)	$U_o = 21.5V$ $I_o = 201mA$ $P_o = 1.1W$ $C_o = 10nF$ <sup>2</sup> $L_o = 30\mu H$ <sup>2</sup>
	<sup>1</sup> The L1+ and L1- terminals shall only be connected to a single MLB (Master Line Barrier). <sup>2</sup> The listed Co and Lo parameters include the inductance and capacitance of the flying leads.	
<i>Ambient temperature (Ta)</i>	-20°C to +40°C (refer to environmental specifications)	
<i>Pressure Transducer</i>	Only the Ampcontrol supplied Pressure Transducer shall be connected to the PIM. This has been assessed as simple apparatus.	
<i>Maintenance and decommissioning</i>	If the module is damaged, a replacement may be obtained from the manufacturer. See the Conditions of Safe Use for details. There are no user serviceable parts. For repairs or decommissioning, return to the manufacturer.	
<i>This table is provided for quick reference purposes only: refer to latest issue of the Certificate of Conformity for all system designs.</i>		

<b>Specifications</b>	
<b>Mechanical</b>	
<i>Dimensions (L x W x H)</i>	70 x 33 x 25mm (See diagram below)
<i>Weight</i>	PIM module 60g, transducer and cable 240g
<i>IP Rating</i>	PIM module is fully encapsulated
<i>Mounting</i>	Enclosure includes 2 mounting tabs, each with a 3mm slot (screws not supplied)
<i>Electrical Connections</i>	Individual 450mm flying leads (0.4mm <sup>2</sup> PVC insulated multi-strand flexible wire with an overall outside diameter of 1.5mm)
<i>Process Connections</i>	¼ NPT
<i>Transducer Material</i>	Stainless Steel
<b>Environmental</b>	
<i>Operating Temperature Range</i>	-20°C to +60°C
<i>Calibrated Temperature Range</i>	5°C to +60°C
<i>Storage</i>	<p>Store the module and transducer in an environment that is not exposed to the following:</p> <ul style="list-style-type: none"> <li>High temperatures, direct sunlight or proximity to hot objects</li> <li>Mechanical vibration, mechanical shock (putting it down hard)</li> <li>Soot, vapour, dust and corrosive gases</li> <li>Humid or wet environment</li> </ul>
<b>Inputs</b>	
<i>Nominal Range</i>	0-360 bar (0-36,000kPa)
<i>Transducer Overpressure Limit</i>	80,000kPa
<i>Display Resolution</i>	0.1 bar (10kPa)
<i>Initial Accuracy at Full Scale (@ 25°C)</i>	+/- 0.5% of F.S
<i>Drift with Temperature (with respect to 25°C)</i>	0.05 bar / °C
<i>Drift per year (max)</i>	0.1 bar
<i>Recalibration period</i>	Ampcontrol recommends the PIM and transducer be returned for factory re-calibration every 3 years depending on application.
<b>Communications (iMAC L1)</b>	
<i>Hardware interface</i>	2 wire (+/-18VDC I.S. via MLB barrier or +/-21VDC non-I.S. iMAC fieldbus)
<i>Line Speed</i>	300 - 1000 baud
<i>Bit protocol</i>	iMAC proprietary
<i>L1 Isolation</i>	None
<i>L1 Line Loading (baud)</i>	0.27mA (300) / 0.96mA (1000)
<b>Find Out More</b>	
<p>For more information on this product, contact Ampcontrol Customer Service on +61 1300 267 373 or <a href="mailto:customerservice@ampcontrolgroup.com">customerservice@ampcontrolgroup.com</a> or visit the Ampcontrol website: <a href="http://www.ampcontrolgroup.com">www.ampcontrolgroup.com</a></p>	



<b>Equipment List</b>	
<b>Part Number</b>	<b>Description</b>
198487	<i>IMAC PIM 0-360 BAR 1/4" NPT</i>
142323	<i>KIT IMAC DIN RAIL MOUNT</i>

**DISCLAIMER**

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