TECHNICAL DATASHEET

AIM

Analogue Input Module

Summary

The iMAC AIM is an Intrinsically Safe (Ex ia) Analogue Input Module that interfaces directly to the iMAC Fieldbus.

The AIM Module is available in two models, a 4-20mA input module and a 0-10V input module. The Module requires a local 9-24VDC power supply, which is also monitored as an analogue input.

The analogue sample rate is fixed at 1ms and averaged over a configurable block size. Both the analogue input function and the power supply monitoring function have configurable set points with optional hysteresis. When the monitored value reaches this set point, an exception scan is triggered on that address. The exception scan function allows the iMAC Controller to respond quickly during an alarm situation.

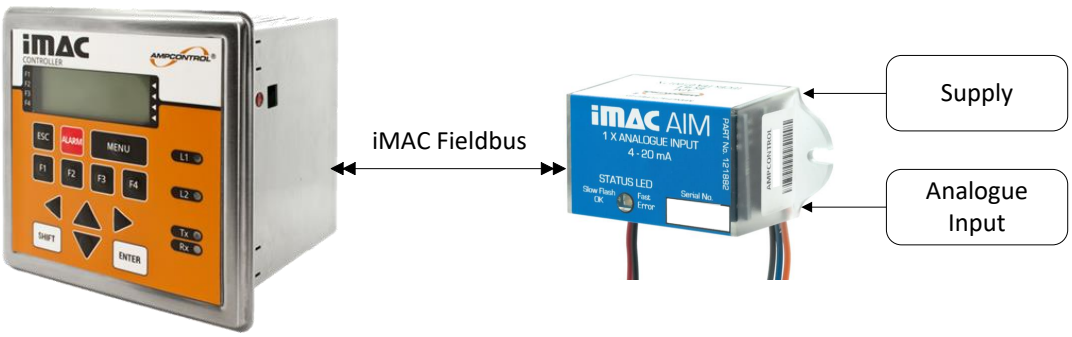
Data Register(s)

3 (Digital Flags, Analogue Input, Power Supply)

Features

- Intrinsically Safe Ex ia Group I Ma
- 4-20mA or 0-10V analogue input (model dependent)
- Power supply monitoring with wide operating range
- Analogue input is electrically isolated from the iMAC Fieldbus
- 5 programmable status flags with 3 set points, to monitor analogue input level (channel AI)
- 2 programmable status flags with 2 set points, to monitor the power supply (channel PS)
- Compact, encapsulated design
- Multifunction diagnostic status LED
- Remotely configured via the iMAC Controller
- Optional DIN rail mounting kit available

Minimum System



CAUTION!

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).

Shorting the analogue input channel (blue wire) with the power supply (+V orange wire) (while powered) will blow the internal I.S. protection fuse and will permanently damage the module.

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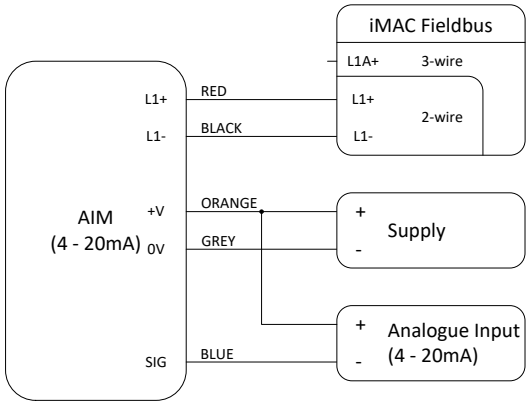
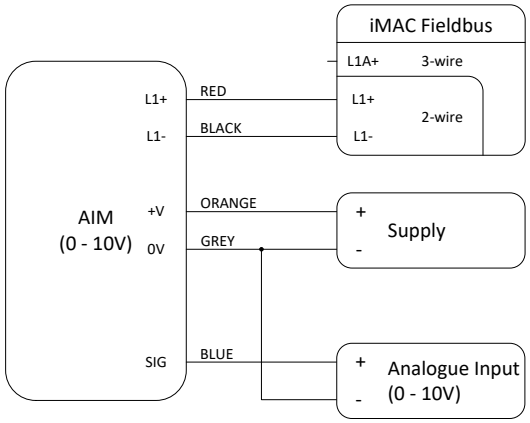
Electrical Connections

4 - 20mA



0 - 10V



Note: refer to iMACB094 - iMAC Installation Requirements

Label	Wire colour	Type	Description	
L1+	Red	L1 Comms	iMAC Fieldbus	
L1-	Black			
+V	Orange	Power supply input	DC	Also positive for the 4 - 20mA measurement
0V	Grey			Also negative for the 0 - 10V measurement
SIG	Blue	Analogue input	Positive input for the 0 - 10V model, Negative input for the 4 - 20mA model	

Data Register(s)

Flags Register

Bit	Description	Bit Value	R / W	Channel
15	-	0	r	-
14	-	0	r	-
13	-	0	r	-
12	-	0	r	-
11	-	0	r	-
10	-	0	r	-
9	Reserved (factory use)	0	r	-
8	Reserved (factory use)	0	r	-
7	Reserved (factory use)	0	r	-
6	Power supply < Set point B (trip)	1 = Alarm	r	PS
5	Power supply < Set point A (warn)	1 = Alarm	r	PS
4	Set point 2 ≤ Analogue input < Set point 3	1 = Alarm	r	AI
3	Set point 1 ≤ Analogue input < Set point 2	1 = Alarm	r	AI
2	Analogue input ≥ Set point 3	1 = Alarm	r	AI
1	Analogue input ≥ Set point 2	1 = Alarm	r	AI
0	Analogue input < Set point 1	1 = Alarm	r	AI

Analogue Input Register (channel AI)

4 - 20mA model		0 - 10V model	
Analogue input (mA)	Register value (read only)	*Analogue input (V)*	Register value (read only)
0	0	0	0
4.000	4000 (0FA0h)	5.000	5000 (1388h)
20.000	20000 (4E20h)	10.000	10000 (2710h)
22.000	22000 (55F0h)	12.000	12000 (2EE0h)

Power Supply Register (channel PS)	
Supply Voltage (V)	**Register Value (read only)**
0	0
10.00	1000 (03E8h)
28.00	2800 (0AF0h)

Configuration Parameters

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

Flags Register Parameters (roll-call name: AIM Flags)						
No	**Description**	**Range (0 - 20mA / 0 - 10V)**	**Default (0 - 20mA / 0 - 10V)**	**Ch**	**Units**	**R / W**
1	Flags register address	1 - 255	220	-	-	r / w
2	Exception scan trigger margin	100 - 10000	1000	AI	µA / mV	r / w
3	20% engineering value (factory use)	0FA0h / 07D0h	4000 / 2000	AI	µA / mV	r
4	100% engineering value (factory use)	4E20h / 2710h	20000 / 10000	AI	µA / mV	r

Analogue Input Register Parameters (roll-call name: AIM Analog)						
No	**Description**	**Range (0 - 20mA / 0 - 10V)**	**Default (0 - 20mA / 0 - 10V)**	**Ch**	**Units**	**R / W**
1	Input register address	1 - 255	221	AI	-	r / w
2	Set point 1	0 - 20000 / 0 - 10000	4000 / 2000	AI	µA / mV	r / w
3	Set point 2	0 - 20000 / 0 - 10000	12000 / 6000	AI	µA / mV	r / w
4	Set point 3	0 - 20000 / 0 - 10000	16000 / 8000	AI	µA / mV	r / w

Power Supply Register Parameters (roll-call name: AIM PwrSupply)						
No	**Description**	**Range (0 - 20mA / 0 - 10V)**	**Default (0 - 20mA / 0 - 10V)**	**Ch**	**Units**	**R / W**
1	Power supply register address	1 - 255	222	PS	-	r / w
2	Set point A (warn)	1000 - 2400	1000	PS	10mV	r / w
3	Set point B (alarm)	800 - 2400	800	PS	10mV	r / w
4	Hysteresis and Sample average (block) size (see below)	0064h - F1F4h	01F4h	AI,PS	samples	r / w

Parameter Details…

Parameter 4 – Hysteresis and Sample Average (block) Size: The upper four bits of Parameter 4 of the Power Supply Register allow for configuration of the hysteresis level while the lower bits allow for setting of the sample block size.

Parameter 4 - Hysteresis and Sample average (block) size	
Hysteresis	**Sample average (block) size**
Nibble 3 (4 bits)	**Nibble 2,1,0 (12 bits)**
Range: 0 - 16 (see table below) Default: 0	Range: 100 - 500 Default: 500

Sampling

The number of averaged samples per channel is determined by the “sample average (block) size” parameter. Each channel is sampled as a complete block before moving on to the other channel. The analogue sample rate is fixed at 1ms, therefore, the total sample cycle for both channels in milliseconds is 2 * sample average size. Should the sample block size be set to a value outside the valid range, the value stored in the register will automatically update to nearest limit. E.g. a setting of < 100 will be stored as 100, a setting > 500 will be stored as 500.

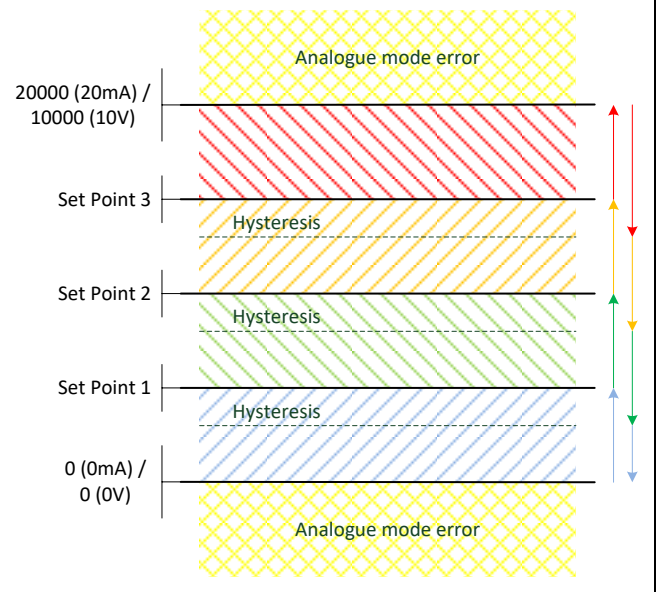
If consecutive analogue input results (averaged block) vary by the parameter – “exception scan trigger margin” or greater, the module will request an exception / priority scan.

Hysteresis (only applies to Module S/W Ver : 10 - since S/N 1807XXXXXX - June 2018)

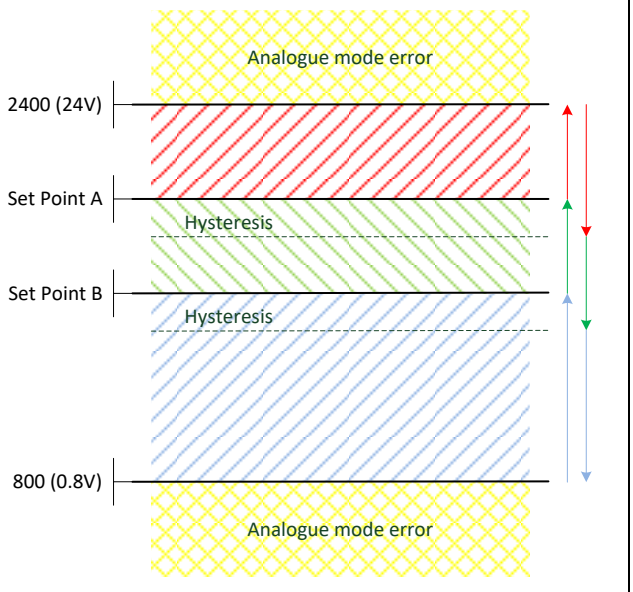
The hysteresis value applies to all three analogue input set points while a fixed value of 25 applies to the power supply set points. If the hysteresis is set to zero (default), zero hysteresis applies to both the analogue input and power supply.

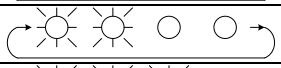
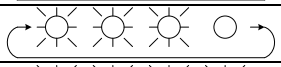
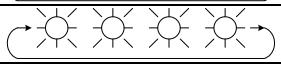
Hysteresis					
Setting			Setting as a % of Full Scale Analogue Value		
Setting	**Analogue Input**	**Power Supply**	**4 - 20mA** (%)	**0 - 10V** (%)	**Power Supply (0 - 24V)** (%)
0	0 (disabled)	0 (disabled)	-	-	-
1	25	25	0.125	0.25	1
2	50	25	0.250	0.50	1
3	75	25	0.375	0.75	1
4	100	25	0.500	1.00	1
5	150	25	0.750	1.50	1
6	200	25	1.000	2.00	1
7	250	25	1.250	2.50	1
8	300	25	1.500	3.00	1
9	350	25	1.750	3.50	1
A	400	25	2.000	4.00	1
B	450	25	2.250	4.50	1
C	500	25	2.500	5.00	1
D	600	25	3.000	6.00	1
E	700	25	3.500	7.00	1
F	800	25	4.000	8.00	1

AI Set-points / Hysteresis



PS Set-points / Hysteresis



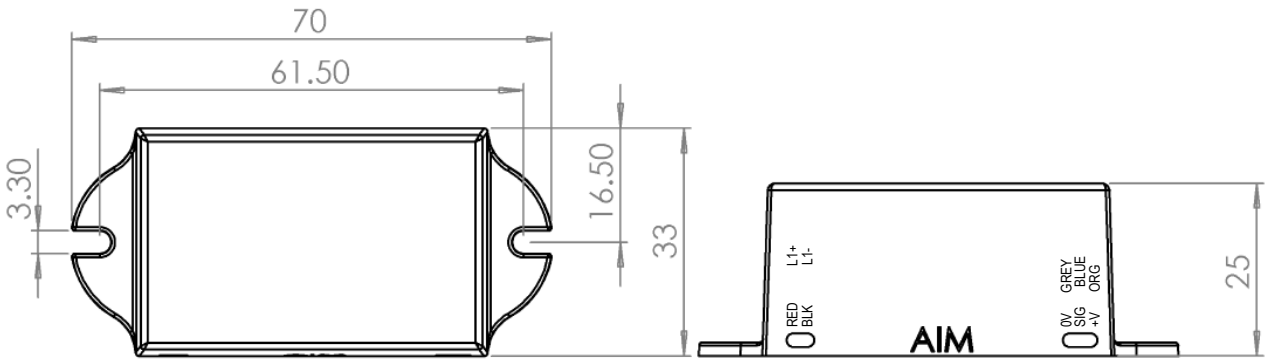
LED Indicators			
Status LED (RED)			
Flash Sequence		**Module - iMAC Comms Status**	**Module - Function Status**
Off		Unknown (check connections)	Unknown (check connections)
Slow Flash		Healthy	-
2 Flashes		Healthy (has been roll-called)	-
3 Flashes		Error (address clash)	-
Fast Flash		Unhealthy	-

Certification / Approvals		
Intrinsic Safety		
Type	Ex ia I – for use in zone 0, 1 or 2	
Certificate number	IECEx ITA 07.0017X or MASC M/10-132X (model dependant)	
Module type	AIM	
IP rating	Must be installed in an enclosure not less than IP20 (IP54 recommended)	
Other	Must be mounted in such a manner that the encapsulation is not exposed	
I/O parameters	L1+ (red), L1- (black)	Ui = 21.5V (44.65R source resistor) Ci = Negligible Li = Negligible
	+V (orange), 0V (grey), SIG (blue)	Ui = 16.5V Ii = 3A Ci = negligible Li = negligible Uo = 0V Io = 0A
Ambient temperature (Ta)	-20°C to +40°C (refer to operating environment specifications)	
This table is provided for quick reference purposes only: refer to latest issue of the Certificate of Conformity for all system designs.		
QPS		
File Number	LR1527	
Model	121882 MODULE IMAC AIM 4-20mA IECEx	
Environment	Indoor use (or must be installed in a suitable outdoor enclosure with minimum IP54 rating) Altitude up to 2000m Pollution Degree 2	
The specified values approved by these standards may differ from the general specifications detailed elsewhere in this datasheet.		

Specifications	
Mechanical	
Dimensions (H x W x D)	33mm x 70mm x 25mm (See diagram below)
Weight	60g
IP Rating	Module is fully encapsulated
Mounting	Enclosure includes 2 mounting tabs, each with a 3mm wide slot (screws not supplied)
Electrical Connections	Individual 450mm flying leads (0.4mm^2 PVC insulated multi-strand wire with an overall diameter of 1.5mm)
Environmental	
Operating Temperature	-10°C to +60°C
Relative Humidity	<95% RH

Power Supply (external)		
Analogue Interface	Additional power supply required	
Voltage	9 - 16.5VDC (I.S.) / 9 - 24VDC (Non-I.S.)	
Current	4 mA	
Analogue Inputs		
Sampling	All analogue channels are sampled at 1kHz, with a 100 - 500 (configurable) sample average (block) size	
Power supply	(external)	
Limits	Refer to “Power Supply” section	
Accuracy	± 3%	
Analogue Interface	0 - 20mA	0 - 10V
Input Impedance	62Ω	10kΩ
Limits	22mA	12VDC (max)
Accuracy	±1 % (4 - 20mA)	±1 % (2 - 10V)
Communications (iMAC L1)		
Hardware interface	2 wire (+/-18VDC I.S. or +/-21VDC non-I.S.)	
Line Speed	300 - 1000 baud	
Bit protocol	iMAC proprietary	
L1 Isolation	5.3kV RMS	
L1 Line Loading (baud)	1mA (300 - 1000 baud)	
Find Out More		
For more information on this product, contact Ampcontrol Customer Service on +61 1300 267 373 or *customerservice@ampcontrolgroup.com* or visit the Ampcontrol website: www.ampcontrolgroup.com		

Dimensions



FRONT VIEW SIDE VIEW

Equipment List

Part Number	**Description**
121882	MODULE IMAC AIM 4-20mA IECEx
121881	MODULE IMAC AIM 0-10V IECEx
141061	MODULE IMAC AIM 4-20mA IECEx South Africa
142323	KIT IMAC DIN RAIL MOUNT