



ELM Earth Leakage Relay

Designed for the Metalliferous Market

1. Description

The Ampcontrol ELM Earth Leakage Relay is electronic in design and is based on microprocessor technology. The 'Healthy' LED flashes to indicate correct operation of the microprocessor. The Relay uses a toroid to measure earth fault current. A definite time operating characteristic is provided with adjustable trip sensitivity and time delay. When a fault occurs and the trip level and time delay is exceeded the relay's trip function is activated, operating the trip contacts connected in the system control circuit. The 'Trip' LED is 'On' when a trip occurs. The trip condition is latched in non-volatile memory and requires operation of the reset input to clear the trip condition. An internal reset is also provided on the facia of the relay. The 'Relay' LED is 'On' to indicate the relay is energised.

A ten-segment LED bar graph indicates the % of leakage level being detected. This reading can be remotely monitored/displayed using the 4-20mA Output of the Relay. When the relay measures currents with frequencies much greater than 50Hz the bar graph LED fast flashes (5Hz) instead of being steady. Should the high frequency current persist until the time delay is exceeded the relay will trip. The 'Har.Trip' LED (Harmonic Trip) is 'On' when a trip occurs.

The ELM Earth Leakage Relay is housed in a stainless steel case and can be either 'DIN Rail' mounted or 'Panel Mounted' through a 68 x 38mm cut out. When panel mounted the front of the ELM Relay is designed to provide IP-56 ingress protection. There is provision to prevent unauthorised adjustment of the trip settings by sealing the post (in front of the knurled nut) with a lead seal, thus preventing the removal of the front facia cover.

An internal switch mode power supply allows the ELM to operate from 24VAC to 132VAC or 20VDC to 185VDC.

2. Features

- Microprocessor based for high stability and accuracy.
- Adjustable trip level and time delay settings.
- Fail safe or non-fail safe on loss of supply.
- Bar graph to monitor leakage level. 4-20mA Output for remote indication.
- Maximum leakage since last power up/reset stored in memory.
- Continual monitoring of the toroid.
- AC or DC Supply operation.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.

3. Application

The ELM Relay has been designed and approved for use on earth fault-limited systems. To ensure maximum protection the earth leakage system should be used in conjunction with the other protection systems. The collective systems are designed to limit touch and step potentials.



The relay is also suitable for industry where equipment or system earth leakage protection is required.

The relay is not suitable for personal protection, i.e. users of portable drills, grinders etc, which require trip levels of 20-30mA, with instantaneous operation. (Refer AS3190).

The Relay continually monitors the toroid and if the connection is lost the relay will trip and flash the 'CT Fault' LED.

3.1 Methods of Earth Leakage Protection

There are two methods of protection used. They are the Core Balance and Series Neutral earth leakage protection systems. (See ELM user Manual E09802 for full details).

Core Balance:

With this method the three phases are passed symmetrically through the toroid. If there is no earth fault, the vector sum of the currents in a three-phase supply is zero. If current from any phase flows to earth the system becomes unbalanced. The toroid produces an output, which trips the relay.

Series Neutral:

With this method the neutral connection of the supply transformer is passed through the toroid. An earth fault on any of the phase conductors causes an earth current which returns, through the toroid, to the star point of the transformer and trips the relay.

A test current is injected through the window of the toroid to test the operation of the relay (See typical connection diagram, page 2). To reset the relay press the button located on the facia of the relay or provide an external normally open contact (it is recommended that a twisted pair be used between the N/O contact and the reset input). The reset button is also used to access the memory of the processor to view the maximum level of leakage since the previous trip. A section of the bar graph will slow flash (2Hz) indicating the peak level while, the reset button is held closed and will continue to flash for 1 second after the reset button is released.

3.2 Toroids

The ELM Relay is designed for use with Ampcontrol EL500 series Toroids. They are available with window sizes 20, 60, 85mm. These allow trip settings from 100mA to 2.5A.

3.3 Mode of Operation

The relay can be operated in fail-safe or non-fail safe modes of operation.

Fail Safe Mode:

This mode is the default and preferred method, where the relay drops out on fault or loss of power. Power to the relay is from the line side of the isolating device or from an independent supply.

Non Fail Safe Mode:

In this mode of operation the relay picks up on fault. This method should only be used when the supply to the relay is only available from the load side of the isolating device. To select this mode link the 'NFS' input terminals ('NFS' LED is 'On' when this mode is selected).

Note1: To restore power following a trip condition the reset needs to be held while re-closing the circuit breaker.

Relay Contacts:

1 N/O, 1 C/O. Rated at 5A 250V, 100VA maximum.

Trip and Time Delay Settings:

Two separate rotary, 16 position switches, set the trip and time delay parameters of the relay.

Switch Position	Trip Level mA	Time Delay mS
0	100	50
1	150	100
2	200	150
3	250	200
4	300	250
5	350	300
6	400	350
7	450	400
8	500	450
9	750	500
A	1000	750
B	1250	1000
C	1500	1500
D	1750	2000
E	2000	2500
F	2500	3000

4. Specifications

Relay Supply Volts: 24 –132VAC, 20-185VDC

Dimensions: 47 H x 77 W x 116 D mm

4-20mA Output:

The 'Loop Powered' current output represents the leakage current as a percentage of the trip level.

4mA => 0% leakage, 20mA =>120% leakage

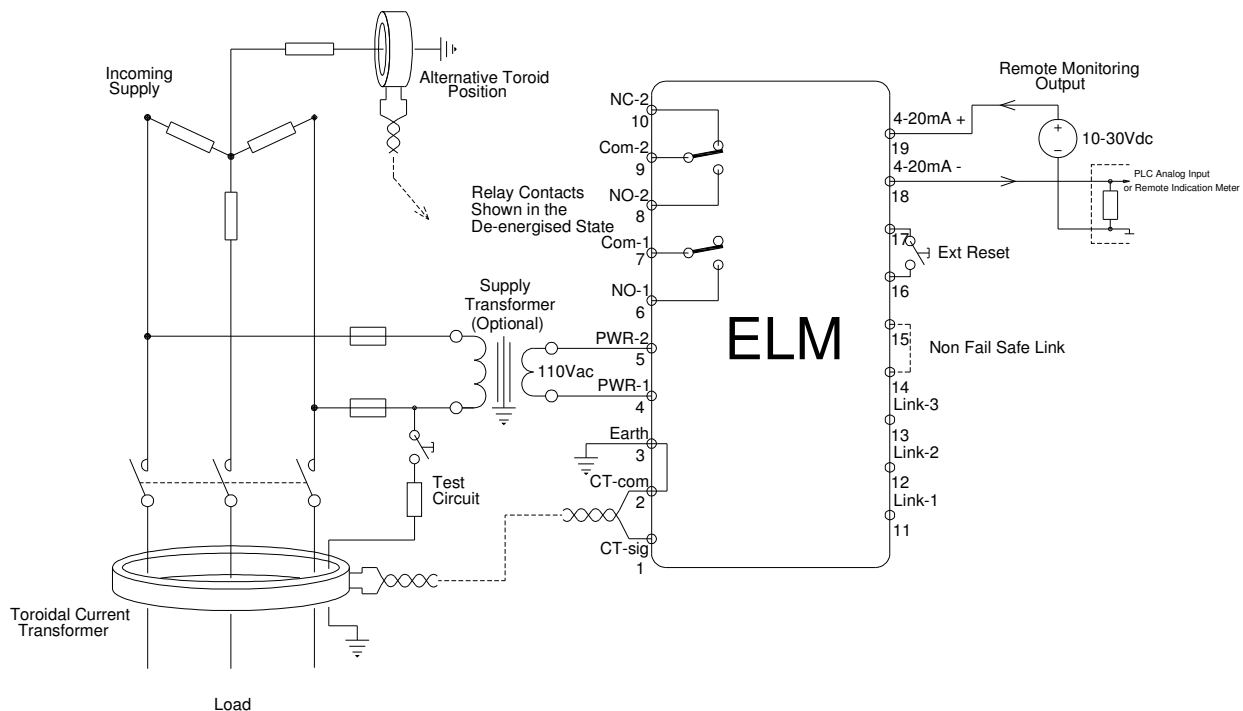
(100% = 17.33mA)

Maximum Loop Resistance = $[V_s - 10] \times 50$, where V_s must be greater than 10VDC and less than 30VDC.

5. Equipment List

E09792	ELM Earth Leakage Relay
E08406	ELD DIN Rail Mounting Kit
E08554	ELD-ELC Adapter Kit
E08554	ELD-ELC/F Adapter Kit
C18058	Toroid - 60mm ID
C18059	Toroid - 85mm ID
C18057	Toroid - 112mm ID

Typical Connection Diagram



ELD Earth Leakage Relay

Designed & Approved to AS2081.3.1988

1. Description

The Ampcontrol ELD Earth Leakage Relay is electronic in design and is based on microprocessor technology. The Relay uses a toroid to measure earth fault current. A definite time operating characteristic is provided with adjustable trip sensitivity and time delay. When a fault occurs and the trip level and time delay is exceeded the relay's trip function is activated, operating the trip contacts connected in the system control circuit. In Fail-Safe Mode the trip is latched in non-volatile memory and requires operation of the reset input to clear the trip condition. An internal reset is also provided on the facia of the relay.

A ten-segment LED bar graph indicates the % of leakage level being detected. This reading can be remotely monitored/displayed using the 4-20mA Output of the Relay. When the relay measures currents with frequencies much greater than 50Hz the bar graph LED fast flashes (5Hz) instead of being steady. Should the high frequency current persist until the time delay is exceeded the relay will trip and the 'Har.Trip' LED (Harmonic Trip) will be illuminated.

The ELD Earth Leakage Relay is housed in a stainless steel case and can be either 'DIN Rail' mounted or 'Panel Mounted' through a 68 x 38mm cut out. When panel mounted the front of the ELD Relay is designed to provide IP-56 ingress protection. It also provides provision to prevent unauthorised adjustment of the trip settings.

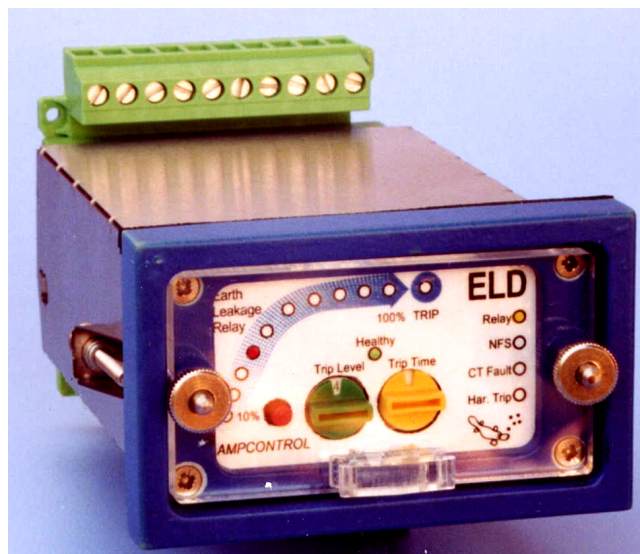
An internal switch mode power supply allows the ELD to operate from 24VAC to 132VAC or 20VDC to 185VDC.

2. Features

- Microprocessor based for high stability and accuracy.
- Adjustable trip level and time delay settings.
- Fail safe or non-fail safe on loss of supply.
- Bar graph to monitor leakage level. 4-20mA Output for remote indication.
- Maximum leakage since last power up/reset stored in memory.
- Continual monitoring of the toroid.
- AC or DC Supply operation.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.
- Designed and tested to AS2081.3.1988 for use in mining.

3. Application

To ensure maximum protection the earth leakage system should be used in conjunction with the other protection systems covered by AS2081. The collective systems are designed to limit touch and step potentials.



The relay is also suitable for industry where equipment or system earth leakage protection is required. The relay is not suitable for personal protection, i.e. users of portable drills, grinders etc, which require trip levels of 20-30mA, with instantaneous operation. (Refer AS3190).

The ELD Relay is designed for use on earth fault-limited systems.

The ELD Relay continually monitors the toroid and if the connection is lost the relay will trip and flash the 'CT Fault LED'.

3.1 Methods of Earth Leakage Protection

There are two methods of protection used. They are the Core Balance and Series Neutral earth leakage protection systems.

Core Balance:

With this method the three phases are passed symmetrically through the toroid. If there is no earth fault, the vector sum of the currents in a three-phase supply is zero. If current from any phase flows to earth the system becomes unbalanced. The toroid produces an output, which trips the relay.

Series Neutral:

With this method the neutral connection of the supply transformer is passed through the toroid. An earth fault on any of the phase conductors causes an earth current which returns, through the toroid, to the star point of the transformer and trips the relay.

A test current is injected through the window of the toroid to test the operation of the relay (See typical connection diagram, page 2). To reset the relay press the button located on the facia of the relay or provide an external normally open contact. The reset button is also used to access the memory of the processor to view the maximum level of leakage since the previous trip. A section of the bar graph will slow flash (2Hz) indicating the peak level while, the reset button is held closed and will continue to flash for 1 second after the reset button is released.

3.2 Toroids

The ELD Relay is designed and recommended for use with Ampcontrol EL500S series Toroids. They are available with window sizes 60, 85, 112mm. These allow trip settings from 100mA to 2.5A.

3.3 Mode of Operation

The relay can be operated in fail-safe or non-fail safe modes of operation.

Fail Safe Mode:

This mode is the default and preferred method, where the relay drops out on fault or loss of power. Power to the relay is from the line side of the isolating device or from an independent supply.

Non Fail Safe Mode:

In this mode of operation the relay picks up on fault. This method should only be used when the supply to the relay is only available from the load side of the isolating device. To select this mode link the 'NFS' input terminals.

Note:

This mode of operation should only be used when there is not a requirement to comply with AS2081.3.1988.

4. Specifications

Relay Supply Volts:

24 –132VAC, 20-185VDC

4-20mA Output:

The 'Loop Powered' current output represents the leakage current as a percentage of the trip level.

4mA => 0% leakage, 20mA =>120% leakage
(100% = 17.33mA)

Maximum Loop Resistance = $[V_s - 10] \times 50$, where V_s must be greater than 10VDC and less than 30VDC.

Relay Contacts:

1 N/O, 1 C/O. Rated at 5A 250V, 100VA maximum.

Trip and Time Delay Settings:

Two separate rotary, 16 position switches, set the trip and time delay parameters of the relay

Switch Position	Trip Level mA	Time Delay mS
0	100	50
1	150	100
2	200	150
3	250	200
4	300	250
5	350	300
6	400	350
7	450	400
8	500	450
9	750	500
A	1000	750*
B	1250	1000*
C	1500	1500*
D	1750	2000*
E	2000	2500*
F	2500	3000*

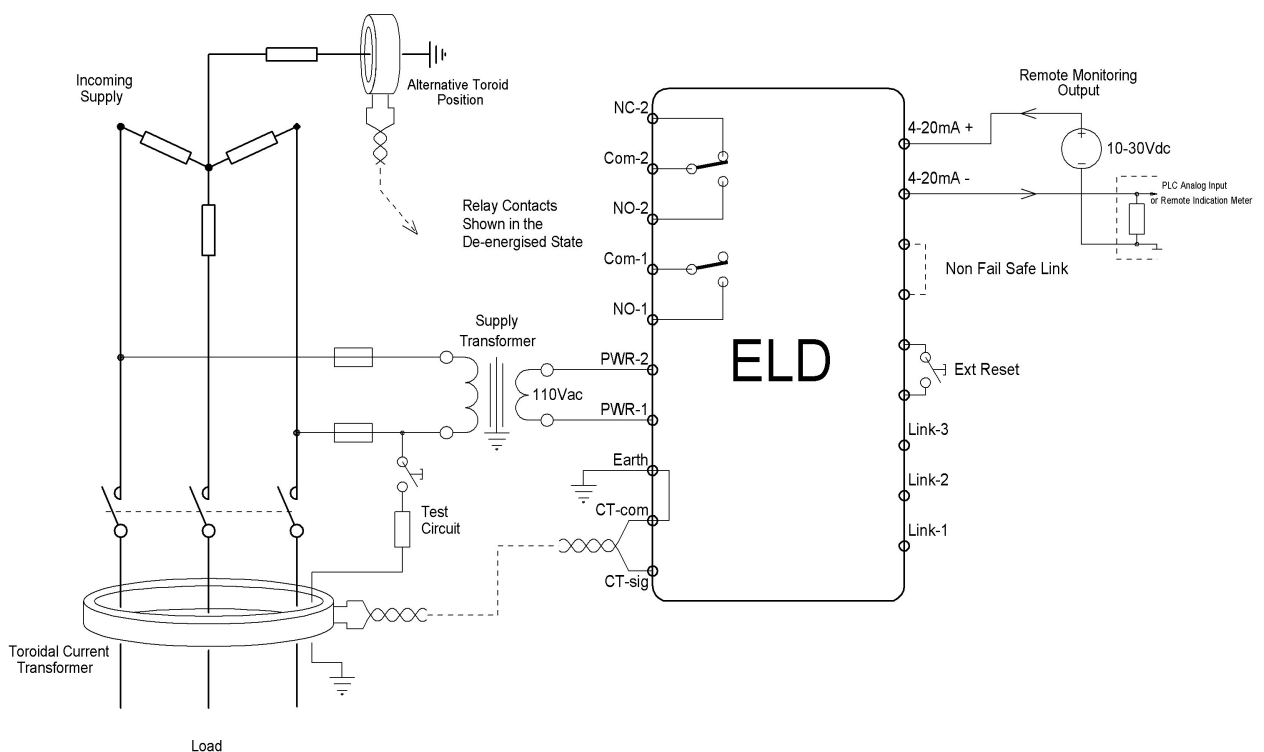
Values marked with an asterisk (*) should not be selected when there is a requirement to comply with AS2081.3-1988

Dimensions: 47 H x 77 W x 116 D mm

5. Equipment List

E08405 ELD Earth Leakage Relay
E08406 ELD DIN Rail Mounting Kit
E08554 ELD-ELC Adapter Kit
E08554 ELD-ELC/F Adapter Kit
C18058 Toroid - 60mm ID
C18059 Toroid - 85mm ID
C18057 Toroid – 112mm ID

Typical Connection Diagram



ELD V2 Earth Leakage Relay

Designed & Approved to AS/NZS 2081.3:2002

1. Description

The Ampcontrol ELD V2 Earth Leakage Relay is electronic in design and is based on microprocessor technology. The 'Healthy' LED flashes to indicate correct operation of the microprocessor. The Relay uses a toroid to measure earth fault current. A definite time operating characteristic is provided with adjustable trip sensitivity and time delay. When a fault occurs and the trip level and time delay is exceeded the relay's trip function is activated, operating the trip contacts connected in the system control circuit. The 'Trip' LED is 'On' when a trip occurs. The trip condition is latched in non-volatile memory and requires operation of the reset input to clear the trip condition. An internal reset is also provided on the facia of the relay. The 'Relay' LED is 'On' to indicate the relay is energised.

A ten-segment LED bar graph indicates the % of leakage level being detected. This reading can be remotely monitored/displayed using the 4-20mA Output of the Relay. When the relay measures currents with frequencies much greater than 50Hz the bar graph LED fast flashes (5Hz) instead of being steady. Should the high frequency current persist until the time delay is exceeded the relay will trip. The 'Har.Trip' LED (Harmonic Trip) is 'On' when a trip occurs.

The ELD V2 Earth Leakage Relay is housed in a stainless steel case and can be either 'DIN Rail' mounted or 'Panel Mounted' through a 68 x 38mm cut out. When panel mounted the front of the ELD V2 Relay is designed to provide IP-56 ingress protection. There is provision to prevent unauthorised adjustment of the trip settings by sealing the post (in front of the knurled nut) with a lead seal, thus preventing the removal of the front facia cover.

An internal switch mode power supply allows the ELD to operate from 25.6VAC to 132VAC or 20VDC to 185VDC.

2. Features

- Microprocessor based for high stability and accuracy.
- Adjustable trip level and time delay settings.
- Fail safe operation.
- Bar graph to monitor leakage level. 4-20mA Output for remote indication.
- Maximum leakage since last power up/reset stored in memory.
- Continual monitoring of the toroid.
- AC or DC Supply operation.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.
- Designed and tested to AS/NZS 2081.3:2002 for use in mining.

3. Application

The ELD Relay has been designed and approved for use on earth fault-limited systems. To ensure maximum protection the earth leakage system should be used in conjunction with the other protection systems covered by AS2081. The collective systems are designed to limit touch and step potentials.



The relay is also suitable for industry where equipment or system earth leakage protection is required.

The relay is not suitable for personal protection, i.e. users of portable drills, grinders etc, which require trip levels of 20-30mA, with instantaneous operation. (Refer AS3190).

The Relay continually monitors the toroid and if the connection is lost the relay will trip and flash the 'CT Fault' LED.

3.1 Methods of Earth Leakage Protection

There are two methods of protection used. They are the Core Balance and Series Neutral earth leakage protection systems. (See ELD user Manual E09982 for full details).

Core Balance:

With this method the three phases are passed symmetrically through the toroid. If there is no earth fault, the vector sum of the currents in a three-phase supply is zero. If current from any phase flows to earth the system becomes unbalanced. The toroid produces an output, which trips the relay.

Series Neutral:

With this method the neutral connection of the supply transformer is passed through the toroid. An earth fault on any of the phase conductors causes an earth current which returns, through the toroid, to the star point of the transformer and trips the relay.

A test current is injected through the window of the toroid to test the operation of the relay (See typical connection diagram, page 2). To reset the relay press the button located on the facia of the relay or provide an external normally open contact (it is recommended that a twisted pair be used between the N/O contact and the reset input). The reset button is also used to access the memory of the processor to view the maximum level of leakage since the previous trip. A section of the bar graph will slow flash (2Hz) indicating the peak level while, the reset button is held closed and will continue to flash for 1 second after the reset button is released.

3.2 Toroids

The ELD Relay is designed for use with Ampcontrol EL500S series Toroids. They are available with window sizes 25, 60, 112mm. These allow trip settings from 100mA to 500mA.

3.3 Mode of Operation

The relay can only be operated in the fail-safe mode of operation.

This is the default mode, where the relay drops out on fault or loss of power. Power to the relay is from the line side of the isolating device or from an independent supply.

4. Specifications

Relay Supply Volts: 25.6 –132VAC, 20-185VDC

4-20mA Output:

The 'Loop Powered' current output represents the leakage current as a percentage of the trip level.

4mA => 0% leakage, 20mA =>120% leakage

(100% = 17.33mA)

Maximum Loop Resistance = $[V_s - 10] \times 50$, where V_s must be greater than 10VDC and less than 30VDC.

Relay Contacts:

1 N/O, 1 C/O. Rated at 5A 250V.

Dimensions: 47 H x 77 W x 116 D mm

Trip and Time Delay Settings:

Two separate rotary, 16 position switches, set the trip and time delay parameters of the relay.

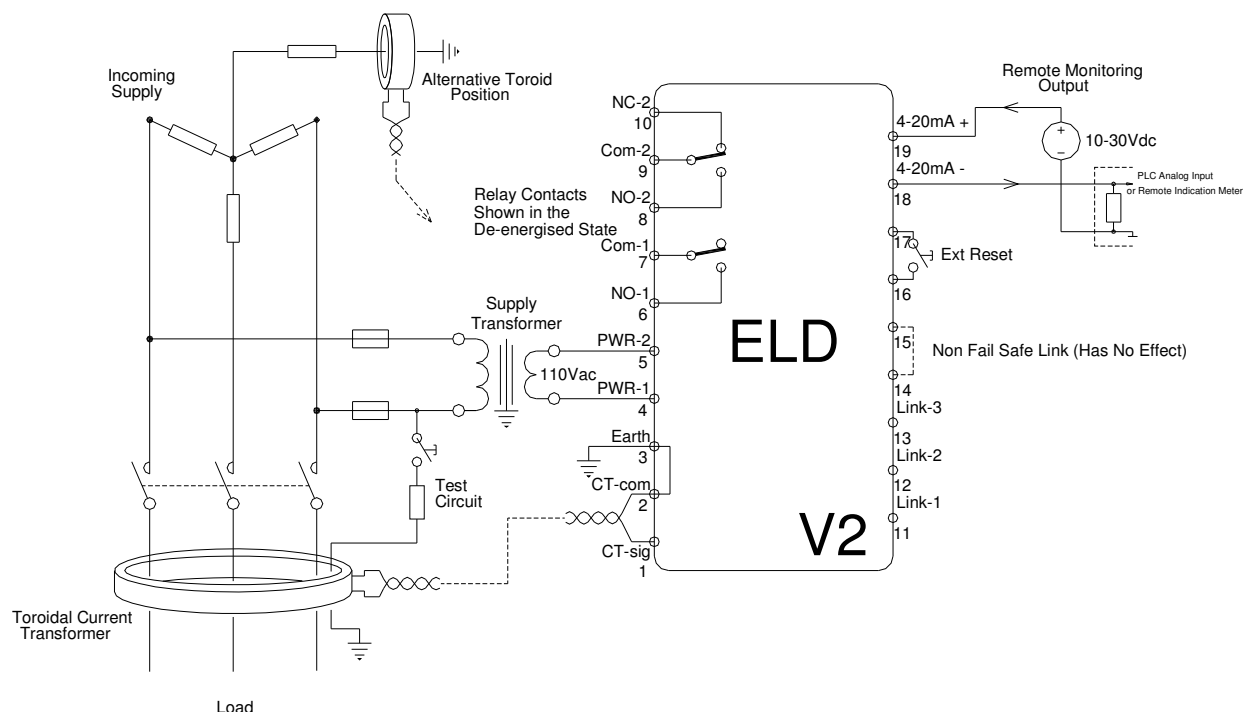
Switch Position	Trip Level mA	Time Delay mS
0	100	50
1	150	100
2	200	150
3	250	200
4	300	250
5	350	300
6	400	350
7	450	400
8	500	450
9	750	500
A	1000	500
B	1250	500
C	1500	500
D	1750	500
E	2000	500
F	2500	500

Important Note: The above table refers to Version 2 of the ELD Relay, designed and tested to AS/NZS 2081.3:2002. Switch positions 9-F have been modified from the Version 1 relay to comply with the 2002 version of the standard. Verify you have the correct version of the relay by checking that 'V2' is printed on the fascia, as shown on the image in this document, before selecting positions 9-F of this table

5. Equipment List

E09911	ELD V2 Earth Leakage Relay
E08406	ELD DIN Rail Mounting Kit
E08554	ELD-ELC Adapter Kit
E08554	ELD-ELC/F Adapter Kit
C18068	Toroid - 25mm ID
C18058	Toroid - 60mm ID
C18057	Toroid - 112mm ID

Typical Connection Diagram



ELV - WIDEBAND EARTH LEAKAGE RELAY

Compliant with AS/NZS 2081:2011, Section 6

Applications

The Ampcontrol ELV is the next generation of earth leakage relays and provides earth leakage protection (earth fault protection) as per AS/NZS 2081:2011. It has been designed for use on earth fault-limited systems, and particularly coal mining applications. The relay is also suitable for other applications where equipment or system-wide earth leakage protection is required.

Features

- AS/NZS 2081:2011 (Section 6) compliant
- Wide operating bandwidth (5Hz to 10kHz)
- Wide current range (down to 30mA)
- Fail safe operation
- Continual monitoring of the toroid
- Adjustable trip level and time delay settings
- Uses patented technology (AU2011264414) to characterise earth leakage currents giving superior fault discrimination, particularly in applications involving switching power electronics and variable speed drives



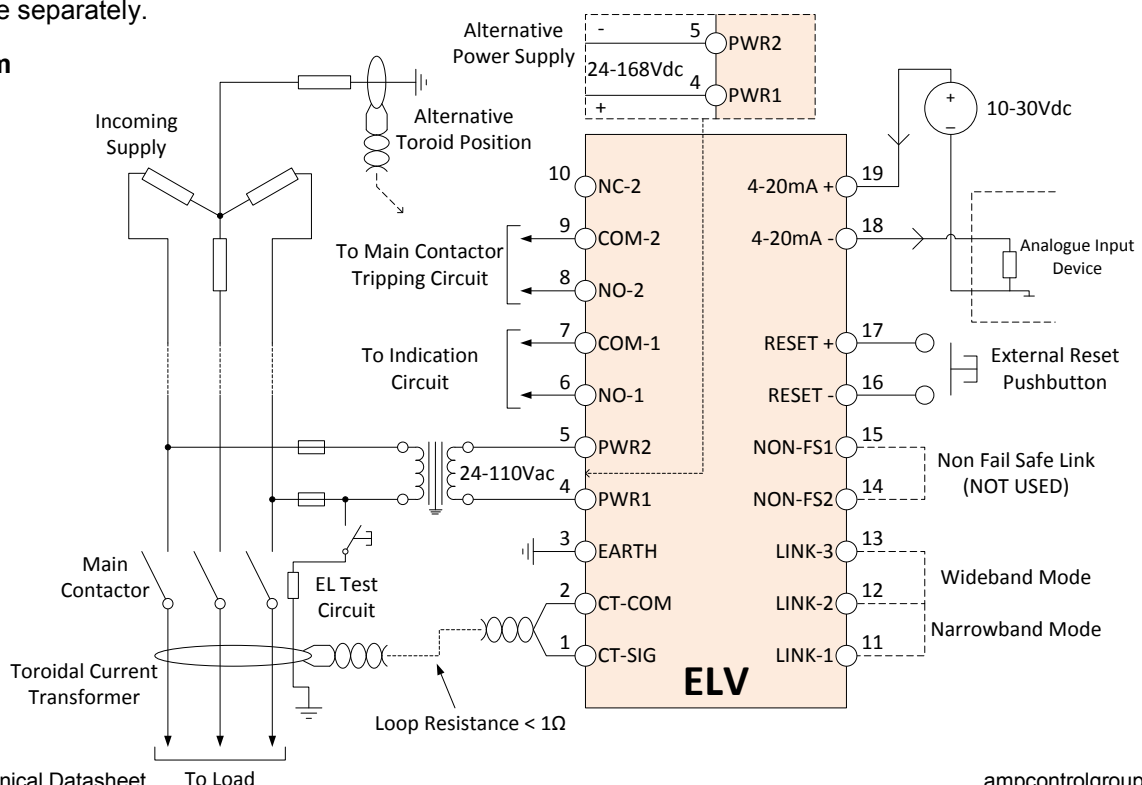
Product description

The ELV relay provides a definite time operating characteristic with adjustable trip sensitivity and time delay. The relay latches when tripped and provides normally open and change-over relay contacts. The relay supports an external reset switch, and a 4-20mA interface allows external monitoring.

The user has the ability to switch the relay between wideband (up to 10kHz), narrowband (power frequency) and weighted frequency mode (up to 10kHz, high frequency compensated).

The ELV Earth Leakage Relay is housed in a stainless steel case and can be either 'DIN Rail' or 'Panel' mounted through a 69 x 39mm cut out. When panel mounted the front of the ELV relay is designed to provide IP56 ingress protection. An attachment to prevent unauthorised adjustment of the trip settings is available separately.

Diagram



SPECIFICATIONS

Supply Voltage

Voltage	24-110VAC +/- 20%, 50Hz 24-168VDC +/- 10%
Power Consumption	< 3W
Operating Temperature	0 to 60°C
Humidity	Between 10% relative humidity and the dew point, non-condensing

Operating Frequency

	Narrow Bandwidth	Weighted/Wide Bandwidth
Frequency	50Hz	5Hz – 10kHz
Accuracy	5% @ 50Hz	5% @ 50Hz

Operating Modes

	Narrow Bandwidth	Wide Bandwidth	Weighted Bandwidth
Links (Bridged)	1-2	2-3	1-3 or no links bridged

Relay Contacts

Contacts	1 x NO / 1 x CO
Ratings	250V, 1.6A, 400VA
Relay to Toroid	< 1Ω

4-20mA Output

4-20mA Output	The 'Loop Powered' current represents the leakage current as a % of the trip level. 4mA => 0% leakage, 20mA => 120% leakage (100% = 17.33mA)
Loop Supply Voltage	10 – 30VDC
Max. Loop Resistance	700Ω at 24V loop supply
Accuracy	+/- 2% of full scale

Mechanical

Dimensions	77w x 47h x 116d (mm)
Cut-Out Dimensions	69w x 39h (mm)
Weight	500g
IP Rating	IP56 (when panel mounted)

Trip and Time Delay Settings

Switch Position	Trip Level (mA) ±5%	Time Delay (ms) +0ms, -20ms
0	30	50
1	60	100
2	100	150
3	150	200
4	200	250
5	250	300
6	300	350
7	350	400
8	400	450
9	450	500
A	500	500
B	750	500
C	1000	500
D	1500	500
E	2000	500
F	2500	500

Item Numbers

170447	ELV Wideband Earth Leakage Relay
101399	DIN Rail Mounting Kit (suit ELD, ELV & ELM)
164672	Lockable Front Cover (suit ELD, ELV & ELM)
115437	Toroid – 25 mm ID (DIN Rail Mounted)
101658	Toroid – 60 mm ID
101656	Toroid – 112 mm ID

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

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

ELV-PRO ANALYSER

Electrical Protection Relays

Description

Ampcontrol's ELV-PRO is a high performance, microprocessor based, wide bandwidth earth leakage protection relay that is capable of measuring and analysing power and switching frequency currents flowing in IT power systems. The ELV-PRO uses patented technology (US20130258537) to characterise earth leakage currents giving superior fault discrimination.

The ELV-PRO relay is designed for use in systems that may exhibit circulative earth currents and complex earth leakage currents typically associated with variable speed drives in mining environments.

Features

- Compliance to AS/NZS 4871 and AS/NZS 2081
- Patented earth leakage analysis method*
- Fail safe operation
- Wide range Earth Leakage Current Measurement (20 Hz to 8 kHz)
- Wideband, Narrowband and Weighted Frequency Response Modes
- Adjustable trip level and trip times
- On board memory logs last 1000 data logs and 50 events
- CIP over EtherNet/IP for control and monitoring
- Modbus TCP
- Continuous Toroid Connection Monitoring
- DIN rail mounted



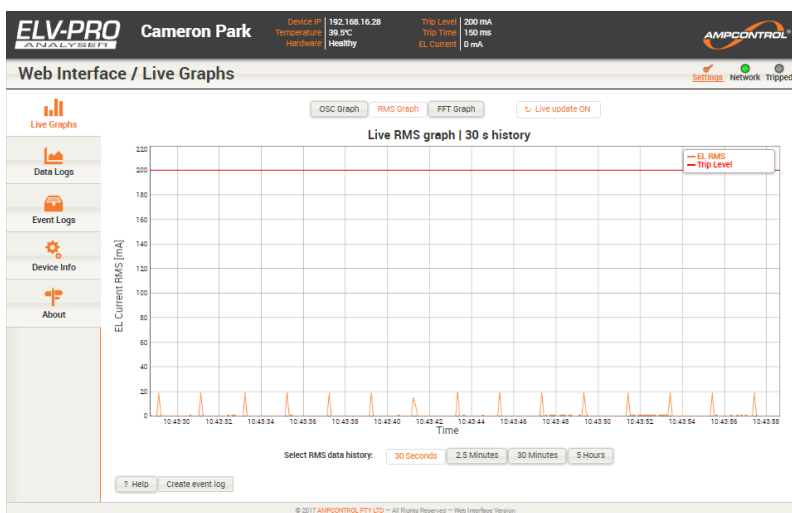
* International patent application number PCT/AU2011/000705

Application

The ELV-PRO is intended for use at transformer NER connection points as a BUEL Protection relay. The relay is not limited to be used in this configuration only, and can be utilised on any individual outlet if desired. This would allow greater earth leakage current data to be captured relating to a specific outlet, rather than the entire system connected to the transformers secondary that the NER is protecting.

The ELV-PRO provides data logging to assist in fault finding. On each event trigger, the relay stores system data 2 seconds before and 2 seconds after the event including system time, earth leakage current, phase current and zero crossing of the phase current.

Ethernet connection to the ELV-PRO relay provides the ability to monitor the device parameters and real time measured current from an internet browser. All data logs stored on the unit can also be viewed.



Specifications	
Supply	
<i>Regulated Voltage</i>	24V DC $\pm 25\%$
<i>Power Supply Requirement</i>	12W
Dimensions	
<i>OTS (W x H x L) (mm)</i>	135 x 135 x 107
Operating Conditions	
<i>Ambient operating temperature</i>	0-60°C
<i>IP Rating</i>	IP20
Earth Leakage Protection	
<i>Trip Current Level</i>	50mA – 5A (50mA – 1A in 50mA increments, 1A – 5A in 100mA increments)
<i>Trip Operation Time</i>	Instantaneous – 500ms in 50ms increments.
Output Contacts	
<i>Relay 1 – Fail Safe</i>	1xCO (Mechanical) 6A / 250VAC, 50VDC, 300VA ($\cos\phi=1$)
<i>Relay 2 – Fail Safe</i>	1xNO (Solid State) 2.9A / 110VAC/DC, 100VA ($\cos\phi=1$)
ELV-PRO Inputs	
<i>Inputs 1-5</i>	Programmable Trip/Log functions
<i>Input 6 – Trip Reset</i>	Manual trip reset by external pushbutton.
<i>Earth Leakage Toroid (CT)</i>	Toroid 100/1A (Ampcontrol EL500S series recommended).
<i>Phase Monitoring Toroid (CT)</i>	Optional; 5A secondary toroid, for monitoring a selected phase current
<i>Zero Crossing (110VAC)</i>	Optional; Phase current zero crossing detection
Communication Interface	
<i>Ethernet Socket</i>	Relay 10BASE-TX or 100BASE-TX accessible via http (using a standard web browser).
<i>EtherNet IP</i>	Standard Protocol, See above for details
<i>Modbus IP</i>	Standard Protocol, See above for details
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	

Equipment List	
Part Number	Description
162129	ELV-PRO - Wideband earth leakage relay
179345	ELV-PRO Settings Dongle
115437	Toroid EL500S - 25mm ID
101658	Toroid EL500S - 60mm ID
101656	Toroid EL500S - 112mmID

DISCLAIMER

While every effort has been made to ensure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

ECD EARTH CONTINUITY RELAY – TYPE D

Electrical Protection

Applications

Substation or DCB Earth continuity protection

[Ex ia] I IECEx TSA 13.0004X (Intrinsically safe)

AS2081: 2011 – Section 5 (Earth Continuity)

Features

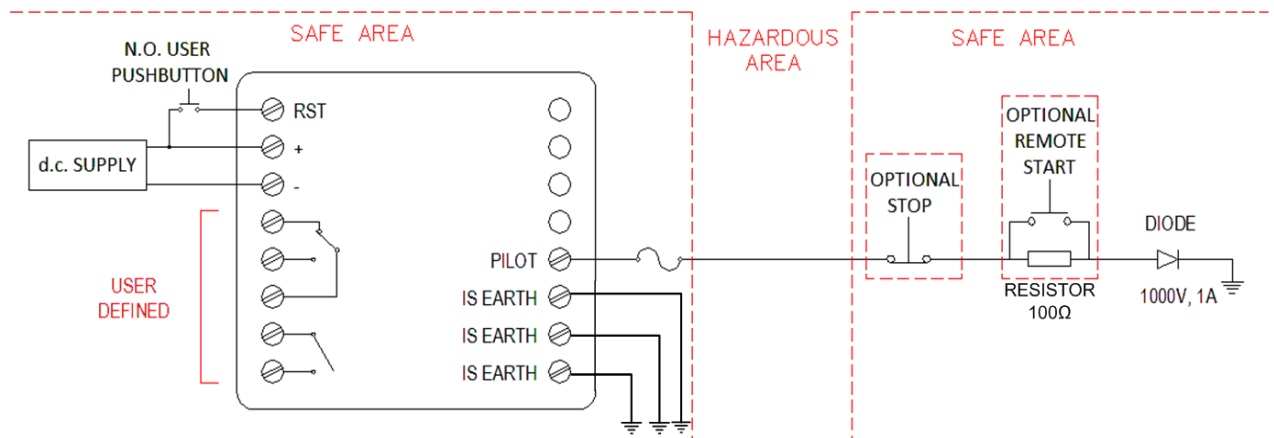
- AS/NZS 2081: 2011 Compliant
- SIL2 Capable
- 24VDC or 48VDC Supply (model dependent)
- 5 x diagnostic LEDs
- Trip time settings – 50ms, 100ms, 200ms, 300ms, 400ms, 500ms
- Trip resistance settings - 10Ω, 15Ω, 20Ω, 25Ω, 35Ω, 45Ω
- Selectable remote start
- Selectable trip latching
- Diode termination


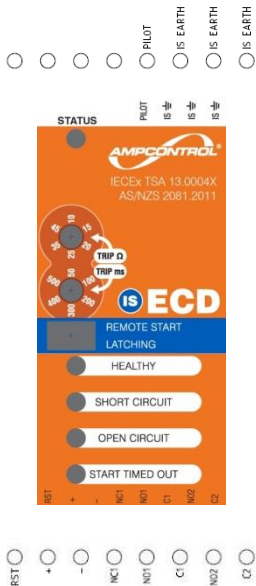


Product description

The ECD is an electrical protection relay designed for operation in underground coal mining applications. It provides earth continuity protection functions that ensure the electrical distribution system in the mine operates safely. It continually monitors the earth continuity of a mining trailing or reeling cable.

Diagram



Specifications		
Certification / approvals		
Type	[Ex ia] I - for use in non-hazardous area only	
Certificate Number	IECEX TSA 13.0004X	
I/O Parameters	Um = 132Vrms Im = 5.25A for 1s Uo = 28V Io = 184mA Po = 1.28W Co = 2.0uF Lo = 10.0mH	
Ambient Temperature	-20°C to +65°C	
Models		
Variant	ECD 24VDC IS	ECD 48VDC IS
Power Supply Inputs		
Voltage	18 – 28.8Vd.c.	36 – 57.6Vd.c.
Current	<250mA	<125mA
Outputs		
Relay Contacts	2 x NO / 1 x NC / 2 x COM	
Limits	1A @ 110Va.c. - 1A @ 30Vd.c (Resistive)	
Mechanical		
Weight	503gms	
IP rating	IP20	
Dimensions		Front panel
		

Ordering	
Part Number	Description
163554	ECD 24VDC IS
163555	ECD 48VDC IS
Accessories	
141479	P/SUPPLY 24V 1A DIN MOUNT
115119	MODULE PTB PILOT TERMINATION FOR ECB/D/M
169732	RES 100R 5W 1%
NA	Normally Open Reset Button - Contact Ampcontrol

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

MEC-1 EARTH CONTINUITY RELAY

Product overview

The MEC-1 is an electrical protection relay designed for operation in metalliferous mining applications. It provides earth continuity protection functions that ensure the electrical distribution system in the mine operates safely in accordance with AS/NZS 2081:2011.

Typically the MEC-1 relay will be connected to the pilot conductor of a trailing or reeling cable. With the pilot conductor terminated to earth through a diode, the relay measures the resistance of the pilot-earth loop (series resistance), to ensure the integrity of the earth conductors, and the pilot to earth resistance (shunt resistance), to ensure the integrity of the pilot-earth loop. If either the series resistance exceeds, or the shunt resistance falls below, the configured settings, a trip will remove power.

The MEC-1 relay is based on microprocessor digital logic, and features a user friendly LED and switch interface. It is installed within a compact, DIN rail mounted unit with pluggable connectors for easy change out if required.

The MEC-1 supersedes previous Ampcontrol metalliferous relays including the ECM and ECM-R.

Features

- AS/NZS 2081: 2011 Compliant
- 24VAC/DC operation
- 5 x diagnostic LEDs
- Trip time settings – 50ms, 100ms, 200ms, 300ms, 400ms, 500ms
- Trip resistance settings - 10Ω, 15Ω, 20Ω, 25Ω, 35Ω, 45Ω
- Selectable remote start
- Selectable trip latching
- Diode termination

Applications

The MEC-1 is designed for use in metalliferous mines. The relay continually monitors the integrity of the earth connection in a mining trailing or reeling cable, and is normally installed in a substation or distribution box.

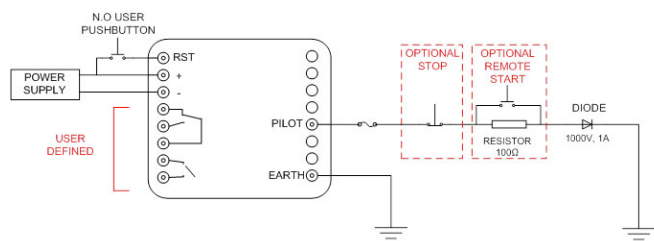


Developed for



This product has been developed to meet the needs of operating environments in the countries listed. For more information on tailoring a specific solution for use in your country, please contact us today on +61 2 4961 9000 or via email on info@ampcontrolgroup.com.

Block diagram



Specifications

Power Supply Inputs	
Voltage	24VAC/DC \pm 20%, 5W
Ambient temperature	-20°C to +65°C

Earth continuity protection: AS/NZS 2081:2011	
Series Resistance Trip Settings (\pm 3)	10, 15, 20, 25, 35, 45
Shunt Resistance	1.25k
Trip Time Settings	50ms, 100ms, 200ms, 300ms, 400ms, 500ms
Optional Start Button	100, 1%, 5W

Mechanical

Weight	503gms
IP Rating	IP20

Dimensions



Front Panel



ECM3 EARTH CONTINUITY RELAY

Electrical Protection for Hard Rock Mines

Application

The ECM3 has been designed to provide earth continuity protection for cables containing pilot cores. In practical applications, environmental factors often prevent an earth continuity protection system from complying with both requirements of AS/NZS 2081 and AS/NZS 4871. Affecting factors can include coupled noise onto the pilot of the cable, variation in the resistance of the pilot cable due to temperature, and the overall length of the cable. The introduction of the dynamic trip response characteristic allows an electrical protection system incorporating an ECM3 to maintain a much lower touch voltage under earth fault conditions without any degradation of reliability or the introduction of nuisance tripping.

Ampcontrol has developed the ECM3 - EC protection relay, which is designed with AS/NZS 2081 (2011) and AS/NZS 4871.1 (2012) in mind, to achieve superior touch potential compliance and noise immunity of an EC protected system than any current generation EC relay.



Features

- Earth continuity protection
- Resistive termination unit for greater noise tolerance
- Resistance dependent trip characteristic
- Robust pilot noise rejection
- Selectable trip resistance from 15Ω to 90Ω in 5Ω steps
- DIN rail mounted
- External reset
- AC or DC supply operation
- LED status indicators

Description

Earth continuity protection is provided using pilot earth loop or earth continuity monitoring. The ECM3 relay monitors a low voltage DC signal applied between the pilot and earth of the cable and, by measuring this signal, determines the resistance of the Pilot-Earth loop.

Unlike its predecessor, the ECM2, the ECM3's earth continuity trip point can be reduced, restricting the earth resistance and maintaining touch potential compliance. The pilot resistance trip point is adjustable in steps of 5Ω from 15Ω to 90Ω. Setting the trip threshold closer to the pilot resistance ensures that the maximum touch voltage is kept within an acceptable range. The maximum loop resistance setting is 90Ω.

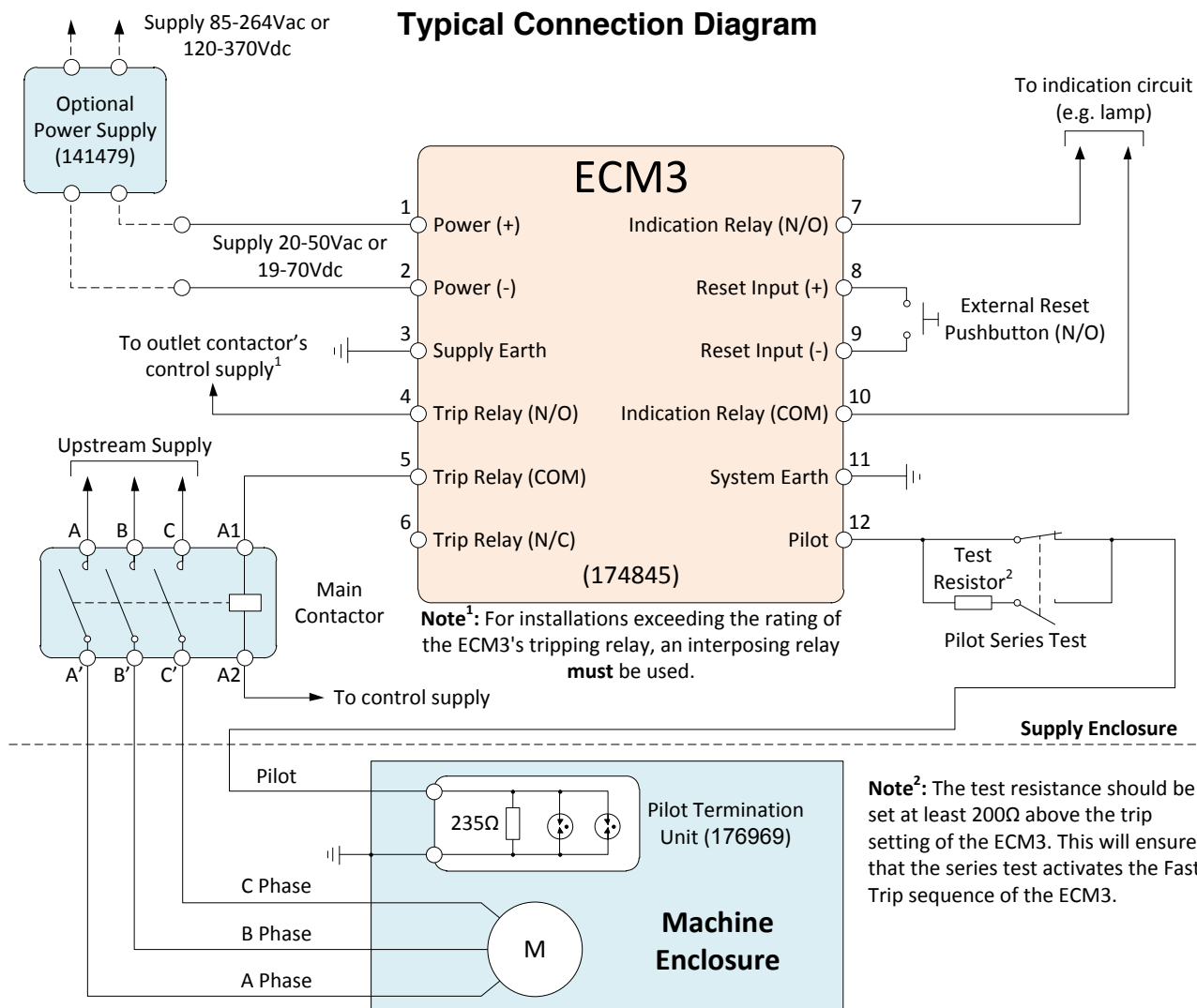
The ECM3 implements earth continuity protection using a resistance dependent trip characteristic, whereby the speed of trip actuation is related to the magnitude of the fault. In this manner, a very high impedance fault in the earth return path (e.g. cable open circuit) will result in a very fast trip, and a fault where the earth return path gradually increases over the trip setting will result in a slower trip actuation. The substantial advantage of this method is that sources of pilot noise, such as cable slip rings and non-symmetrical cables, have a significantly reduced impact on the ECM3. This dynamic trip time response distinguishes the ECM3 from other current generation EC relays by providing far superior noise immunity.

The relay is housed in a DIN rail mount enclosure. The user interface consists of three indication lamps (R/Y/G LED's) and a selector switch for the setting of the series pilot resistance.

The ECM3 relay performs the following functions:

1. Ensures earth return path exist and is below the resistance set point selected to maintain touch potential limitations.
2. Provides an interlock relay to interface in the start sequence of the cables control circuit ensuring pilot circuit healthy prior to start.
3. Provides one set of voltage free contacts for indication.

Typical Connection Diagram



Connection Explanation

Reference	Terminal Name	Connection Information
Terminals 1 & 2	Power	The ECM3 requires a regulated supply of 20-50Vac or 19-70Vdc. For power consumption see specifications. An optional external power supply is available to extend the incoming voltage range to 85-264Vac or 120-370Vdc.
Terminal 3	Supply Earth	Optional earth connection for the ECM's power supply.
Terminals 4, 5 & 6	Trip Relay	The ECM3's tripping relay is a changeover relay with both a normally open and normally closed contact available.
Terminals 7 & 10	Indication Relay	The Indication Relay is intended to be wired into an indication circuit, such as a lamp or PLC input.
Terminals 8 & 9	Reset Input	To reset an earth continuity trip on the ECM3, terminals 8 and 9 must be shorted together. This is generally implemented using an external normally open pushbutton.
Terminal 11	System Earth	Earth connection for the ECM3's loop measurement circuit.
Terminal 12	Pilot	Pilot connection.
Pilot Series Test	N/A	The pilot series test connects a test resistance in series with the pilot line, testing that the ECM3 trips the contactor.
Pilot Termination Unit	N/A	The Pilot Termination Unit contains the ECM3's 235Ω terminating resistor, as well as two 90V gas arrestors.

Advantages of the Variable Trip Threshold & Dynamic Trip Time Response

The ECM3 allows the user to adjust the trip point between 15Ω - 90Ω with 5Ω increments. The trip threshold should ideally be set as per the earth protection study recommendations such that touch potentials under fault conditions remain within the limits. Typically this can be calculated to be 5Ω to 10Ω above the healthy earth return path's impedance. The ability to reduce the earth continuity trip point means that the maximum possible touch voltage is significantly reduced.

In conventional earth continuity protection relays, setting the trip threshold this close to the healthy value would result in excessive nuisance trips due to electrical noise coupling with the pilot conductor. As a result conventional systems increase the trip level, which can result in higher touch potentials during fault conditions.

The ECM3's dynamic trip time response overcomes this issue by utilising a fast trip response of 300msec, for high impedance faults such as an open circuit. The converse is also true for lower impedance faults by increasing the trip response between 300msec to 3sec depending on fault impedance.

Use on cables with asymmetrically located pilot

A cable is termed asymmetric if a single pilot core is not located in the centre of the three power cores. Asymmetry causes mains frequency voltage to be induced into the pilot core. The amount of induced voltage depends on cable length, cable parameters and load current. Practical tests have demonstrated that when the pilot core connected to an ECM3 is coupled with up to 150VAC of 50Hz noise, it is capable of monitoring the pilot resistance with an accuracy of 5%. The ECM3 relay is capable of monitoring earth continuity continuously and indefinitely when exposed to voltages up to 45VAC on the pilot core, with internal heating having no effect. If however the pilot is coupled with higher voltages, the relay's thermal overload trip begins to function. The thermal overload maintains an inverse time relationship with induced pilot noise magnitude. Such a trip will be indicated with all three indicating lamps (LED) flashing. The ECM3 requires time until the internal resistor has cooled sufficiently before the relay can be reset.

Persistent high AC voltages on the pilot circuit not only stress the relay thermally, but more importantly it is indicative of potentially hazardous step and touch voltages on the installation. When in operation, if the ECM3 repeatedly trips on thermal overload, it is important that steps are taken to reduce the AC voltage coupled into the pilot by either, shortening the cable, replacing the cable with a symmetric alternative or reducing the load.

Setting the trip threshold

Altering the trip threshold can be made with the ECM3 energised or not. Adjustment is achieved via the 16 position selector behind the clear front cover. To access the selector switch, carefully remove the clear plastic cover by levering it on the short side with a small blade screw driver.

To set the trip threshold:

1. Begin with the ECM3 set to 90Ω. See setting table on ECM3 label for switch positions.
2. Install relay as per installation requirements. Power it up and confirm it shows the EC as healthy.
3. Using the 16 position selector, slowly lower the trip threshold until the ECM3's Red LED begins to flash whilst the Green LED remains on (the ECM3 is now indicating that the Pilot/Earth-Loop is above the resistance setting)
4. Before the Green LED turns off (EC trip), increase the trip threshold from this point by 10Ω (two (2) setting points).
5. The trip threshold is now set to 10Ω above the healthy pilot-earth impedance.
6. Carefully replace the clear cover by inserting it at an angle on one short side, then push on the other side until it locks in.

Output Relay and LED Operation

LED	State	Indication	Lamp Relay	Output Relay
Green	Flashing	Initial state the relay enters when the ECM3 is powered up (other LEDs are OFF).	De-Energised	De-Energised
	Steady On	With the external circuit showing the correct conditions and after a reset, the relay enters its normal operating mode with the green LED in a steady ON state.	Energised	Energised
	Off	ECM3 is in a tripped state.	De-Energised	De-Energised
Yellow	Flashing	Fault condition where the ECM3 has detected a SC between the pilot and earth.	De-Energised	De-Energised
Red	Fast Flashing	Fault condition where the ECM3 has detected that the series resistance of the pilot-earth loop has exceeded the "Fast Trip" threshold. The green LED will be off, indicating a tripped state.	De-Energised	De-Energised
Red	Slow Flashing	Slow flashing indicates that the pilot-earth loop series resistance has exceeded the "Slow Trip" threshold of the ECM3 and will initiate an EC trip within 3 seconds. Once a trip occurs, the green LED will turn off, indicating a tripped state.	De-Energised	De-Energised
All	Flashing	Thermal Overload. Investigate the cause and cycle power to the ECM3 relay to restore operation.	De-Energised	De-Energised
Red and Yellow	Flashing	Relay is faulty and needs to be returned to Ampcontrol for repair	De-Energised	De-Energised

The relay does not retain the trip state and indication when the power is removed. However, if a fault exists at power-up, the relay will indicate the fault and won't be able to be reset until the fault is removed.

Switching Inductive Loads

If the control voltage is AC and an inductive load is to be switched, such as a relay or contactor coil, an RC suppressor (e.g. PMR209 series from KEMET, 100nF 100Ω 250V) should be installed in parallel with the load. If a DC control voltage is used then the inductive switched load should have a diode in parallel. RC suppressors and diodes reduce contact arcing, extending the life of the ECM3's relay contacts as well as reducing the chance for interference with the relays function.

Optional earth connection for power supply

This connection may be used with a power supply that has significant common mode voltage transients (voltage transients between active and earth). The earth connection provides a path to shunt those energies to earth through an internal transient absorber (MOV) if they exceed a certain level. A regulated power supply should be used; excessive common mode transients may damage the ECM3.

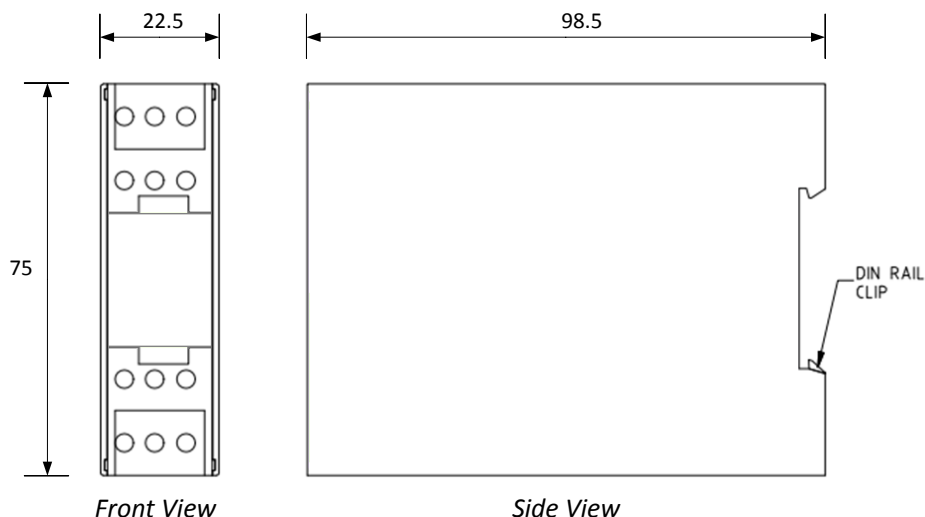
Power supply input protection

The power supply input is protected with a non-user replaceable thermal fuse that activates if excessive current flows into the relay. Excessive current could be caused by an internal fault or if the supply voltage exceeds the specified limits. The thermal fuse recovers after removal of the fault. If the fault persists internal damage has occurred and the relay requires to be returned to Ampcontrol for repair.

Changing the Operation of the Indication Relay Output

The ECM3's Indication Relay output is factory supplied as a normally open relay. If desired, this can be changed to a normally closed relay to suit the user's requirements. To change the function of the indication relay, remove the internals of the relay from the enclosure and switch the S2 switch (located between the on-board relay and the terminal header).

ECM3 Dimensional Diagram



Specifications

General	
Regulated Supply Voltage	20-50VAC 50/60Hz, 19-70VDC 110/240VAC requires an additional external power supply – see ordering information
Power Consumption	2W
Tripping Relay Contacts (Terminals 4, 5, 6)	1 C/O 240VAC $\cos\phi = 1$ or 30VDC, 2A max, 100VA max.
Indication Relay Contacts (Terminals 7, 10)	1 N/O or 1 N/C 240VAC $\cos\phi = 1$ or 30VDC, 1A max, 100VA max.
Tolerable Pilot AC Voltage	up to 40Vrms continuous, 300Vrms maximum transient voltage
Ambient Temperature	-20°C to 45°C
IP Rating	IP20
Earth Continuity Protection	
Key Trip Times (Slow Trip and Fast Trip)	Trip Setting ($15\Omega \dots 90\Omega$) < $R_{\text{SERIES}} < 150\Omega$ = 300ms...3s $R_{\text{SERIES}} > 150\Omega$ = 300ms
Pilot (Series) Resistance Trip Threshold	15Ω - 90Ω selectable in 5Ω increments (excludes external 235Ω terminating resistor)
Shunt Leakage Trip Value	1000Ω or lower, Trip reset threshold 1500Ω or greater (excludes external 235Ω terminating resistor)
Dimensions	
ECM3	75 x 22.5 x 100mm
External Power Supply	90 x 22.5 x 100mm
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	

Ordering Information

Part Number	Description
174845	ECM3 Earth Continuity Relay 20-50VAC 19-70VDC
141479	85-264VAC or 120-370VDC to 24VDC 1A External Power Supply
176969	ECM Termination Module with Suppression

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

EFL-IS – I.S. EFLO & FC PROTECTION RELAY

IECEX TRA 15.0011X

Application

The Ampcontrol EFL-IS relay is IECEX Ex ia certified and is compliant to AS/NZS 2081:2011 sections 7 & 9. It has been designed for installation on mining outlets supplying hazardous area equipment that require earth fault lockout and frozen contact protection. The EFL-IS is capable of being installed on a wide range of system voltages from 110V up to 1.1kV. In addition to EFLO and FC protection, the EFL-IS also offers a selectable undervoltage protection function.

Features

- AS/NZS 2081:2011* compliant
- IECEX [Ex ia], ia certification
- Earth Fault Lock-out (EFLO) protection
- Frozen Contact (FC) protection
- Selectable Undervoltage (UV) protection
- Compatible with a wide range of system voltages



Description

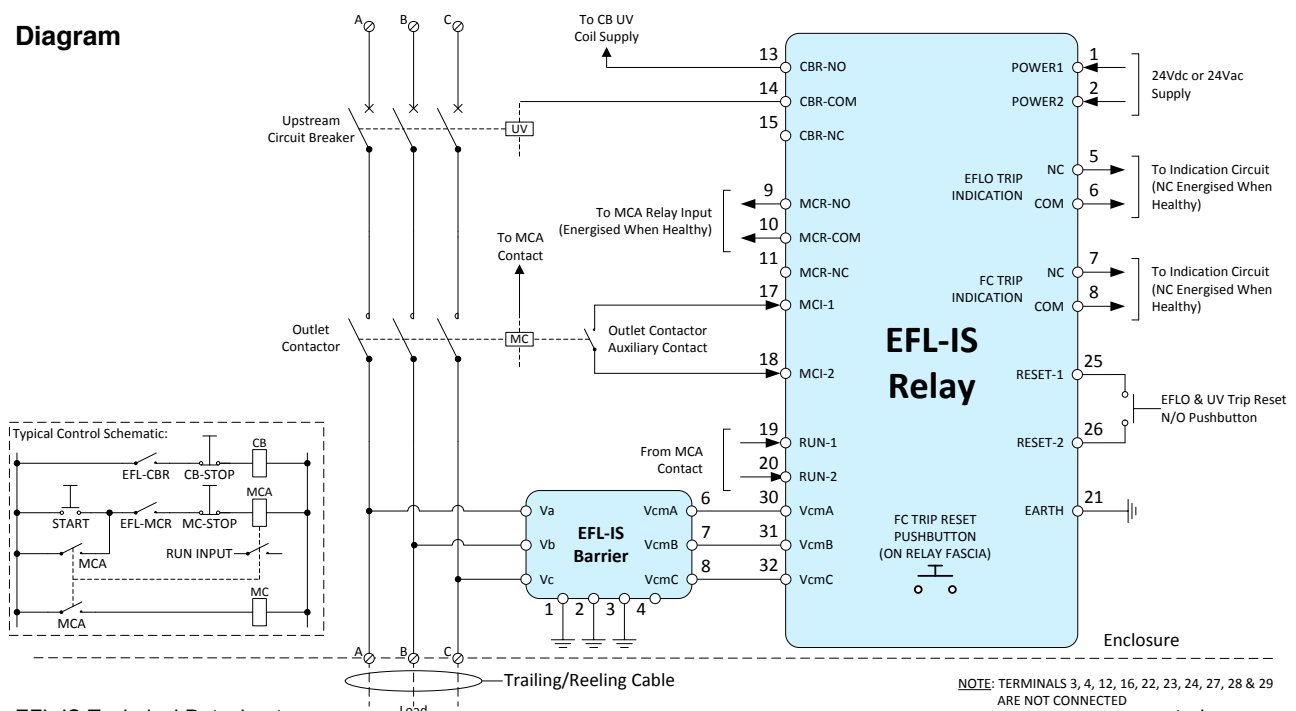
While the outlet's main contactor is open, the EFL-IS relay will use an intrinsically safe signal to continually monitor the resistance of the outlet's phase conductors to earth. If this resistance falls below an acceptable level the EFL-IS relay will initiate an EFLO trip, preventing the outlet from being started.

The EFL-IS relay will also monitor the state of the outlet's main contactor. If voltage appears on the line when the contactor is open, a Frozen Contact electrical trip will occur. This FC output relay is intended to be used to open the upstream circuit breaker. If the main contactor is either open when it should be closed or closed when it should be open a Frozen Contact logical trip will occur, initiating an upstream circuit breaker trip. A back EMF timer is also provided to inhibit the frozen contact electrical trip function for a short period after the main contactor is open.

The EFL-IS relay also has an undervoltage protection function which, if activated, will open the main contactor if the outlet voltage falls below 50% of the selected system voltage.

The EFL-IS relay monitors the line voltage via the externally connected EFL-IS barrier. The external barrier is supplied with high voltage flying lead connections to allow the high voltage terminations to be made.

Diagram



Specifications			
Supply Voltage			
Voltage	24Vdc ± 20% or, 24Vac ± 20%, 50Hz		
Power Consumption	< 5W		
System Voltage			
1.1kV Barrier (174623)	110V to 1.1kV		
Certification			
IECEX	IECEX TRA 15.0011X		
EFL-IS Relay Marking	[Ex ia], ia I Ma		
EFL-IS Barrier Marking	[Ex ia] I Ma		
Relay Contacts			
Group	Type	Rating	
MCR Trip Contacts	1 x CO (NO-COM-NC)	250Vac, 6A, 300VA (AC1), 60VA (AC15) 30Vdc, 1.2A (DC1)	
CBR Trip Contacts	1 x CO (NO-COM-NC)	250Vac., 6A, 300VA (AC1), 60VA (AC15) 30Vdc, 1.2A (DC1)	
EFLO Indication Contacts	1 x NC	250Vac, 6A, 300VA (AC1), 60VA (AC15) 30Vdc, 1.2A (DC1)	
FC Indication Contacts	1 x NC	250Vac, 6A, 300VA (AC1), 60VA (AC15) 30Vdc, 1.2A (DC1)	
Mechanical & Environment			
Dimensions (HxWxD)	111 x 45 x 114mm (EFL-IS Relay) 111 x 22 x 114mm (EFL-IS Barrier)		
Terminal Max. Wire Gauge	2.5mm ²		
IP Rating	IP20		
Operating Temperature	-20°C to 60°C		
Humidity	Between 10% relative humidity and the dew point, non-condensing		
Air Flow	The EFL-IS Relay and Barrier are to be mounted in a position that allows unrestricted air flow through the upper and lower air vents.		
LED Indication			
LED	ON	OFF	FLASHING
Status	Internal Fault	-	OK
Trip (FC)	-	FC Healthy	FC Trip
Logical (FC)	Logical FC Trip	-	-
Elec (FC)	Electrical FC Trip	-	-
Undervoltage	UV Trip	System Healthy or UV Not Activated	-
EFLO Status	EFLO Trip	EFLO Healthy	EFLO Test Underway
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			

Ordering	
Part Number	Description
174624	RELAY EFL IS
174623	BARRIER EFL EXT 1.1KV IS

DISCLAIMER

While every effort has been made to ensure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

EFL – EARTH FAULT LOCKOUT AND FROZEN CONTACTOR PROTECTION RELAY

Compliant with AS/NZS 2081:2011, Sections 7 & 9

Application

Ampcontrol's EFL Relay is compliant to AS/NZS 2081:2011 and has been designed for installation on mining outlets that require earth fault lockout and frozen contactor protection. The EFL is capable of being installed on a wide range of system voltages from 110V up to 3.3kV (barrier dependent). In addition to EFLO and FC protection, the EFL also offers a selectable undervoltage protection function.

The EFL is for use in non-hazardous areas only, for intrinsically safe applications, use the Ampcontrol OMA Relay. The EFL-IS Relay is expected to be available in 2016.

Description

While the outlet's main contactor is open the EFL will continually monitor the resistance of the phase conductors to earth on the load side of the contactor. If this resistance falls below an acceptable level, then the EFL will initiate an EFLO trip, preventing the outlet from being started.

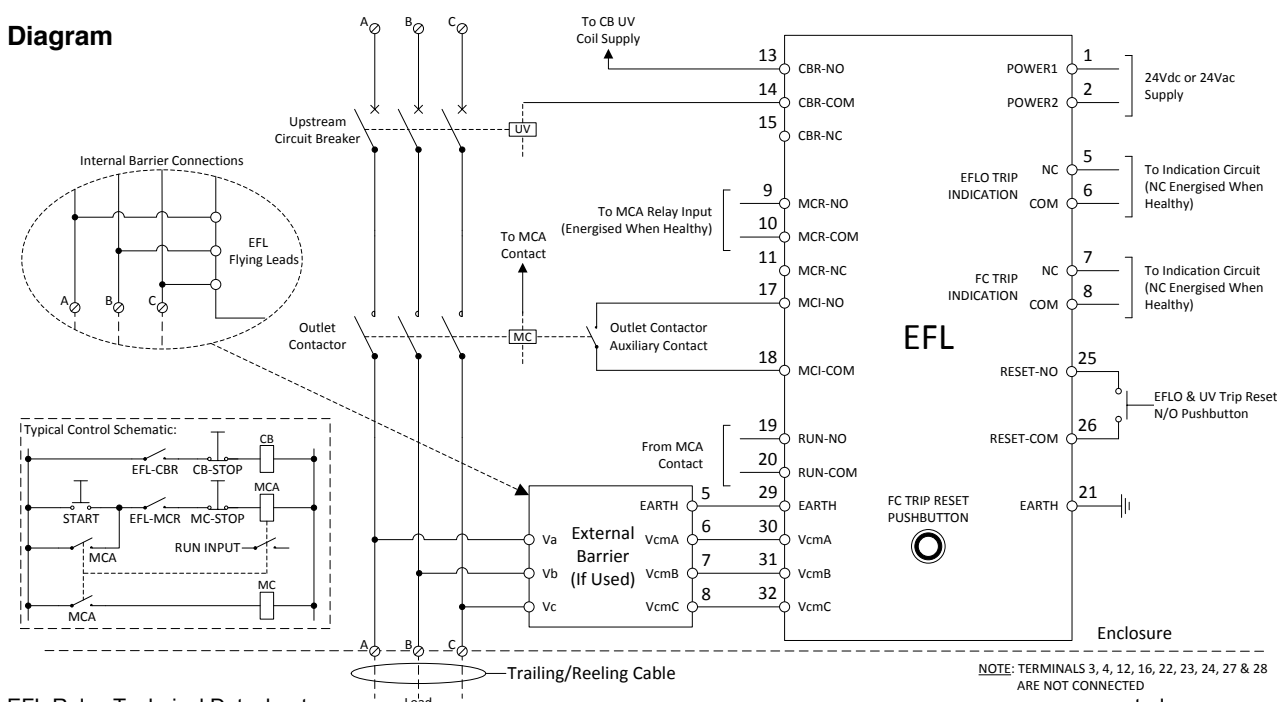
The EFL will also monitor the state of the outlet's main contactor and compare it with that of the auxiliary contactor. If a discrepancy occurs, then the EFL will initiate a Logical FC trip and open the upstream circuit breaker via the CBR contact. The EFL is able to monitor the voltage level on the secondary side of the contactor. If voltage is present after the back emf timer has expired, then the EFL will trip the CBR contact on an Electrical FC trip.

Additionally, the EFL has an undervoltage protection function which, if activated, will open the main contactor if the voltage on the load side of the contactor falls below 50% of the selected system voltage.

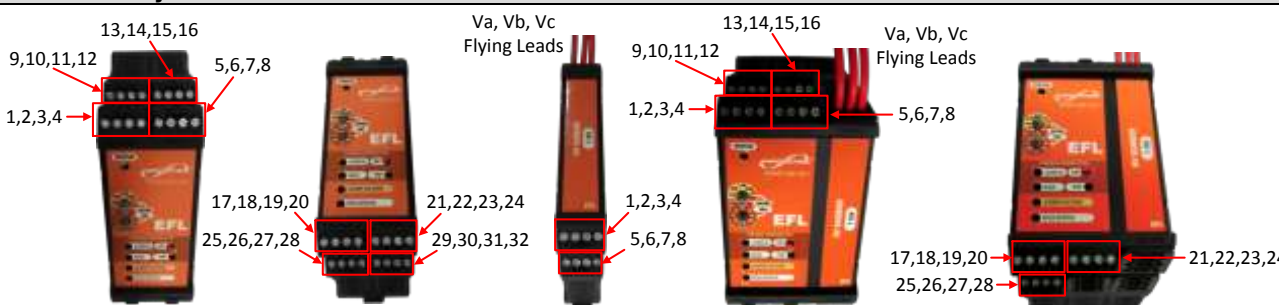
Features

- AS/NZS 2081:2011 compliant
- Earth Fault Lock-out (EFLO) protection
- Frozen Contactor (FC) protection
- Selectable Undervoltage (UV) protection
- Compatible with a wide range of system voltages
- Internal or external barriers available

Diagram



SPECIFICATIONS

Supply Voltage			
Voltage	24Vd.c ± 20% or, 24Va.c ± 20%, 50Hz		
Power Consumption	< 5W		
Relay Contacts			
Group	Type	Rating	
MCR Trip Contacts	1 x CO (NO-COM-NC)	250V a.c., 6A, 300VA (AC1), 60VA (AC15) 30V d.c., 1.2A (DC1)	
CBR Trip Contacts	1 x CO (NO-COM-NC)	250V a.c., 6A, 300VA (AC1), 60VA (AC15) 30V d.c., 1.2A (DC1)	
EFLO Indication Contacts	1 x NC	250V a.c., 6A, 300VA (AC1), 60VA (AC15) 30V d.c., 1.2A (DC1)	
FC Indication Contacts	1 x NC	250V a.c., 6A, 300VA (AC1), 60VA (AC15) 30V d.c., 1.2A (DC1)	
Mechanical & Environment			
Dimensions (HxWxD)	111 x 45 x 114mm (EFL) 111 x 22 x 114mm (Barrier) 111 x 75 x 114mm (EFL with Internal Barrier)		
IP Rating	IP20		
Operating Temperature	-20°C to 65°C		
Humidity	Between 10% relative humidity and the dew point, non-condensing		
Air Flow	The EFL is to be mounted in a position that allows unrestricted air flow through the upper and lower air vents.		
Terminal Layouts			
			
Stand Alone EFL	Barrier	EFL with Internal Barrier	
LED Indication			
LED	ON	OFF	FLASHING
Status	Internal Fault	-	OK
Trip (FC)	-	FC Healthy	FC Trip
Logical (FC)	Logical FC Trip	-	-
Elec (FC)	Electrical FC Trip	-	-
Undervoltage	UV Trip	System Healthy or UV Not Activated	-
EFLO Status	EFLO Trip	EFLO Healthy	EFLO Test Underway
Part Numbers			
173151	EFL Protection Relay		
173175	EFL Protection Relay with Internal 415V-1100V Barrier		
173176	External 415V-1100V Barrier to suit EFL Protection Relay		
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: ampcontrolgroup.com			

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

INTEGRATED PROTECTION RELAY

IPM Version 2

Applications

The IPM Integrated Protection Relay provides all the necessary protection functions to control the various types of mining machinery. The default Status Screen allows unskilled personnel to determine what is required to apply power to the machine. (See IPM User Manual 121549 for full details).

Alarms

Alarms can be programmed to warn of a pending trip condition.

Earth Leakage

The earth leakage protection function uses a 1000:1 core balance toroid to measure the earth fault current. A Residual Current Device (RCD) operating characteristic is provided with adjustable trip sensitivity and time delay. When the earth leakage reaches 100% of the selected trip level, a trip occurs. The higher the fault current measured, the faster the trip time and vice versa. (See IPM User manual 121549 for full details).

Earth Continuity

The earth continuity function tests for the continuity of the earthing between the outlet and the machine, via the pilot core in the trailing cable. The pilot core is also used to transfer data when a Remote Termination Module is used to achieve Machine Data Transfer.

Short Circuit

The short circuit function has a definite time characteristic. If the current exceeds the selected level for the pre-set time then a trip occurs. The short circuit function trips the CBR relay, which in turn can trip the main circuit breaker.

Main Contactor Fail

The Main Contactor Fail (MCF) protection operates if the Main Contactor (MC) fails to function by either:

1. Failing to open when required.
2. Failing to maintain insulation across the contacts when the contactor is open.

Residual Current

The three phase current signals are summed electronically in the IPM Relay to produce a residual current signal that can be used to detect earth fault currents. (See User Manual 121549 for full details).

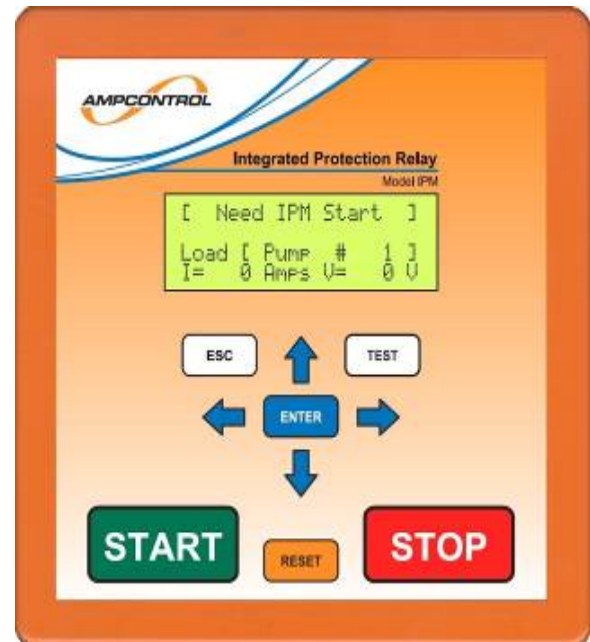
Remote Start

This functionality is similar to that of the IPB/C/D. The remote start can be set in two modes. In one mode it is always active and in the other mode it is active only when the auxiliary digital input is closed.

Overload Protection

Optional CT's can extend the relays current range.

- 1:100 0.5A – 64A
- 1: 1000 5.125A – 640A



Features

- Automatic and Manual High Voltage Insulation Test
- Machine Recognition
- RS485 communication port interfaces to SCADA system via Modbus protocol
- 4-20mA Analogue output
- Thermal modelling
- User friendly. Relay and Remote Termination Module are programmed from the IPM Display
- Microprocessor based
- Status messages to indicate what is required to energise the outlet
- Diode or Remote Termination Module operation
- 50 Event Log with real time clock
- Relay & Digital Input Status to aid fault finding
- Local or remote operation
- Plug-in for quick change out
- Burp Function for controlled fan starting
- Snore Function for controlling pumps
- Remote Start Capability

Product description

The Ampcontrol IPM Integrated Protection Relay (Version IPM V2.0) is an intelligent protection relay based on microprocessor technology. All of the tripping logic and outlet control is performed by the microprocessor, so that virtually no external control is required.

The IPM Integrated Relay provides the necessary functions required for protecting electrical outlets supplying underground mining machinery, powered by reeling or trailing cables, in the metalliferous industry. The relay can also be used to provide optimum overload protection of motors used on conveyors, pumps, fans and compressors. All of the protection functions are combined into a compact, plug-in unit, which can be easily changed out to minimise down time in the event of a problem with the relay.

The IPM Integrated Protection Relay can provide Machine Data Transfer through the use of a Remote Termination Module (RTM) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the RTM the relay parameters are automatically up loaded from a remote machine when a cable is inserted into a power outlet. The IPM's remote start capability can also be access by use of the Ampcontrol's Remote Termination Module.

A RS485 Modbus communication port is available that can be connected to Motor Starter PLC's or a central monitoring system for continuous monitoring and fault-finding.

The IPM Relay provides an isolated 4-20mA analogue output to continuously monitor Average Current, Overload, Earth Leakage and the Insulation level of the relay.

An automatic Insulation Test can be initiated once all starting conditions are met. A high voltage DC "Insulation Test" to earth of the cable is carried out. If the result of the Insulation Test is above the preset resistance level, the IPM's MCR relay energises, which in turn closes the main contactor. A manual "Insulation Test" is provided as a maintenance/fault finding tool.

A Burp Function allows for the progressive inflation of ventilation bags (tubes) by pulsing the motor contactor controlling a ventilation fan, several times at start up.

A Snore Function is available for controlling pumps; the Snore function automatically stops the output on detection of low current and restarts the outlet after a fixed or automatically-adjustable time delay.

The standard current transformers supplied with the IPM Integrated Protection Relay enables protection of motors with full load currents ranging from 0.5A to 640A. The selected full load current can be set to one of 224 values across the range. The IPM Relay can be set to automatically reset or require a manual reset, by pressing the keypad 'RESET' button or activating the 'RESET' digital input, following an overload trip condition once the thermal accumulator falls below the set value.

The IPM Relay's 50 event log and adjustable settings are battery backed.

A four-line 20 character backlit LCD display combining with a keypad provides an easy to operate user interface. The display provides easy access to all available information. A simple procedure allows adjustment of the relay's settings.

The IPM Relay is housed in an enclosure suitable for flush mounting in a 135mm square cut out and has robust plug in connectors on the rear of the relay. **Note: Torque setting for mounting screws on Main Mounting Bracket – 0.8Nm**

Protection Functions

The Ampcontrol IPM Integrated Protection Relay provides protection functions for:

- Earth Leakage
- Earth Continuity
- Phase Current Balance
- Overload
- Short Circuit
- Under Voltage / Under Current
- Contactor Fail
- Residual Current

Specifications	
General	
Auxiliary Supply Volts	24VAC / DC \pm 20%
Power Consumption	<10W
Protection Settings	
Earth Leakage Protection	Trip setting 25-500mA and off
	Time Delay – Instantaneous (<80ms), 50ms - 150ms
Earth Continuity Protection	Reset if resistance is <45 ohms
	Trip if resistance is > 45 ohms
	Trip Time Delay: 80, 120, 160, 200, 300, 400, 500ms
	Shunt Leakage Trip if <1500 ohms
Overload Protection	Current Range: 0.5 to 640 (224 steps) – See Overload Protection Section above.
	Trip time @ 6x FLC: 3, 4, 5, 6, 7, 8, 10, 12, 14, 16, 20, 24, 28, 32, 40s
	Overload Reset Level: 30%, 40%, 50%, 60%, 70%, 80%, 90%, A-30%, A-40%, A-50%, A-60%, A-70%, A-80%, A-90%
	Cooling Multiplier 1, 1.5, 2, 2.5, 3, 4, 5
Short Circuit Protection	Trip Setting: 3 to 10 times in 0.5 increments (times full load)
	Trip Time: 20, 40, 60, 80, 100, 120, 160ms
Under Voltage Protection	Selectable from 20% to 80% in 10% increments
	Trip Delay 800ms
Under Current Protection	Selectable from 32% to 96% in 8% increments and none
	Trip Delay 800ms
Insulation Test	Lockout resistance is selectable at 1, 2, 5, 10, 20 Meg Ohm and none
Current balance	Trip Settings: 5%, 10%, 20%, 50% and off
	Trip Delay: 2s
Residual Current	Trip Setting: 10% to 250% and off
	Trip Time: 100ms to 5s
Back EMF Timer	Trip Delay Settings: 2, 5, 10, 15 and 20s
Machine Numbers	Can be allocated from 1 to 40
Burp Function	No Pulses Setting: 1 to 6 any none
	Time On/Time Off Setting: 0.6, 0.8, 1.0, 1.2, 1.5, 2.0, 2.5 and 3.0s
Snore Function	None, 5, 10, 15, 20, 8F, 15F, 20F, 30F, 60F
	Time in Minutes F= Fixed delay
Outputs	
Communications	RS485 Slave MODBUS
	Baud Rate: 1200 to 19200
Monitoring	4-20mA Analogue Output – Iave, O/L, E/L, M Ω
Relay Contacts	MCR (1 NO, 1 C/O), CBR and ALM (1 C/O)
	5A/190VAC 100VA max

Ordering Information	
Part Number	Description
121503	IPM Integrated Protection Relay 24V
121504	ITM-415 Insulation Test Module
121505	ITM-1000V Insulation Test Module
121506	RTM Remote Termination Module
101703	88mm Earth leakage Toroid
141548	Current Transformer 100:1 [500:5]
101272	Current Transformer 1000:1
121549	IPM User Manual

PF1 - PUMP, FAN, EARTH LEAKAGE AND EARTH CONTINUITY RELAY



What is the PF1?

The PF1 provides selectable control functionality for fan and pump installations while also providing earth leakage and earth continuity protection.

The selectable pump protection mode (anti-snore) detects low load events automatically managing the pump duty cycle and preventing potential damage to the pump.

The selectable fan protection mode (burp) prevents damage to the material of the ventilation tube during the initial stages of inflation.

The PF1 also features best practice earth continuity and earth leakage protection ensuring you operate the safest most effective electrical system.

What makes the PF1 your best choice?

Multi-functional protection in a single unit

Combining earth leakage and earth continuity protection with pump and fan control into a single multi-functional unit saves space and provides a significant cost saving when compared with individual solutions for each function.

Advanced pump control functionality

Ampcontrol is committed to best practice, the pump control functionality of the PF1 is no exception. It has many advantages over other pump control products including:

- The ability to be configured in manual or automatic mode, providing the freedom to operate the relay in a way which best suits the application. This includes the ability to let

FEATURES



Pump and fan control with earth leakage and earth continuity protection



Easy to use, set up and control



Ease of documentation with settings downloaded and reviewed via computer



Logging of a wide range of events provides effective avenues for trouble shooting and timely resolution of faults

the relay fully control the pump operations, or by using external devices to determine pump on and off times (eg float switches).

- Adaptive pump time allowing the pump operation to be varied automatically depending on the conditions in which the pump is operating. This variation in pump on and off times reduces the stress and potential damage on the pump motor that fixed on/off times may cause if conditions change.
- Straight forward current set point means there is no guessing of the required settings.
- Standardisation of installations and parts as a result of a single wide ranging current transformer.



1300 267 373

ampcontrolgroup.com



PF1 - PUMP, FAN, EARTH LEAKAGE AND EARTH CONTINUITY RELAY

Event logging

For effective trouble shooting and timely resolution of faults the PF1 logs a wide range of events including changes to settings, tripping of protection functions and changes in relay status. The PF1 can be connected to a computer to view the event logs stored in the device.

Smart tools software

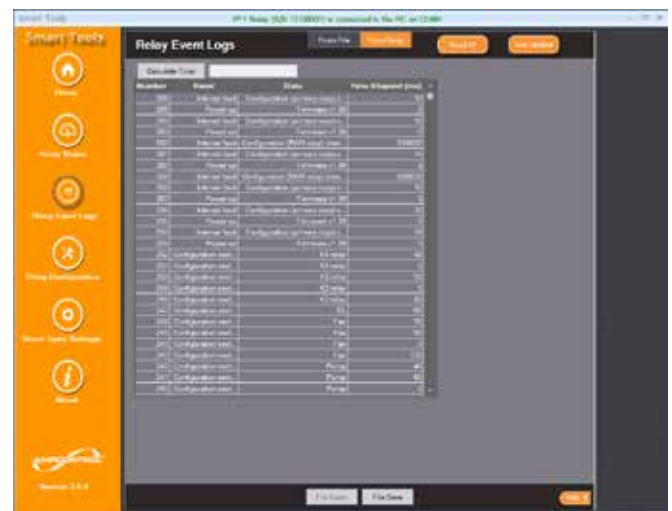
Improving user functionality and experience through software platforms.

Ease of use, set up and control

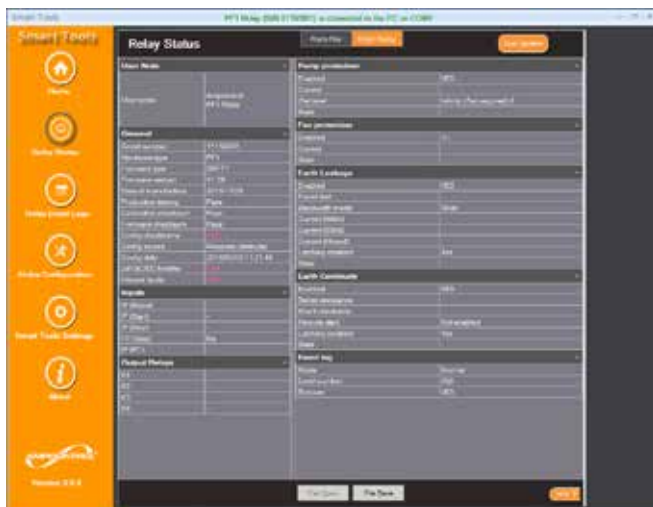
Included with the PF1 is a comprehensive interface which is intuitive and easy to use. It provides the user with access to the status of the relay and the ability to easily change settings and control the functionality of the device. A comprehensive help menu ensures that the user has all the tools required to easily operate the relay.



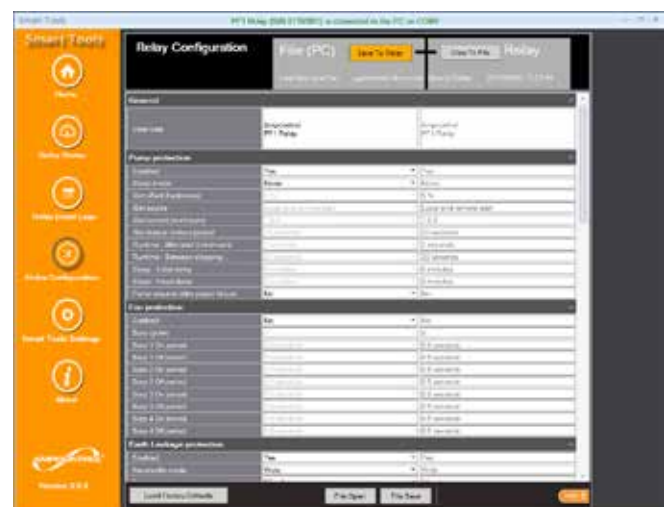
Smart tools software access



Event logs



Current and saved status



Relay configuration



IPD Integrated Protection Relay

IEC Ex ITA 07.0018X

1. Description

The Ampcontrol IPD Integrated Protection Relay (Version IPD1 V02) is an intelligent protection relay based on microprocessor technology.

The integrated relay provides the necessary functions required for protecting electrical outlets supplying mobile machines powered by reeling or trailing cables. All of the protection functions are combined into a compact, plug-in unit, which can be easily changed out to minimise down time in the event of a problem with the relay.

The IPD Relay can provide machine communication through the use of a Remote Termination Unit (RTU-D) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the RTU-D Remote Termination Unit the relay parameters are automatically up loaded from a remote machine when a cable is inserted into a power outlet.

The earth fault lockout function tests the resistance of the 3 phase lines to earth by applying an intrinsically safe signal prior to the closure of the main contactor in accordance with AS/NZS2081.4 2002. The test is initiated once all starting conditions are met. If the resistance is above the preset level then an automatic high voltage DC "Insulation Test" to earth of the cable can be carried out. If the result of the Insulation Test is above the preset resistance level, the IPD's MCR relay energises, which in turn closes the main contactor. A manual "Insulation Test" is provided as a maintenance/fault finding tool. (When this test is performed the MCR relay does not close at completion of a healthy test).

The IPD continuously monitors the Earth Leakage toroid, if the connection is lost the Relay will trip.

The Insulation Test allows cable insulation levels to be trended as an aid to preventative maintenance.

The IPD Relay has 5 Digital inputs, which feed into a microprocessor unit. The microprocessor has been programmed to control three output relays. Relay MCR for the main contactor and Relay CBR for the circuit breaker. Relay RL3 can be turned off or configured to follow the Fan Interlock Drive output of the IPD Relay. All of the tripping logic and outlet control is performed by the microprocessor, so that virtually no external control is required.

Extensive information display and monitoring features are included to facilitate fault finding and system trending. This information can be read locally on the IPD Remote Display



Opto Isolated Outputs are available for connection to PLC's or an optional Relay Output Modules (ROU).

See IPD User Manual 110773 for full details

2. Protection Functions

- Earth Leakage
- Earth Fault Lockout
- Earth Continuity
- Overcurrent/Overload
- Short Circuit
- Contactor Fail

3. Features

- Automatic and Manual High Voltage Insulation Test
- Machine Communications
- User friendly. Relay and Remote Termination Unit programmed from the Remote Display Module
- 28 Status messages to indicate what is required to energise the outlet.
- Microprocessor based
- Fail safe operation
- Diode or Remote Termination Unit operation
- IS Remote Display Module - Ex (ia)
- 120 Event Log
- Local or remote operation
- Sequencing and remote communication via PLC link
- Plug-in for quick change out
- Fan Interlocking provided on any outlet
- Thermal modelling
- Fully functional for a period of two (2) seconds during extreme control power dip or power loss.
- Relay & Digital Input Status to aid fault finding
- Continuous monitoring of the Earth Leakage toroid

AMPCONTROL

POWER THROUGH INNOVATION

ampcontrolgroup.com

4. Application

The IPD Integrated Protection Relay is Approved for use in mining operations. For the protection of mining equipment in hazardous areas the relay is installed in a flameproof enclosure with the Remote Display Module being installed outside the enclosure. This is possible because of its intrinsically safe design.

4.1 Sequence Control

Through machine communication, the identity of the machine can be transferred via serial communications to a PLC. This allows the PLC to arrange sequencing particularly in longwall installations.

4.2 Fan Interlocking

A fan interlocking facility can be selected to prevent outlets from being energised until a mine ventilation fan is operational. This facility eliminates the need for dedicated outlets.

4.3 Remote Data Communications

The IPD Integrated Protection Relay has the facility for connecting remote monitoring equipment. This can be in the form of peripheral equipment such as PLC's.

For PLC applications each integrated protection relay is connected to a Serial Interface Module (IPSI-D), which has its output multi-drop connected to a DNET-IP2 Protocol Converter. The Protocol Converter provides the communications link to a PLC (See User Manual 110773 for further details).

The Ampcontrol DNET-IP2 Serial Communication System transfers data and commands between the Host System and the modules using RS232, RS422 and RS485 protocols.

5. Specifications

Auxiliary Supply Volts:

110vac \pm 10% 10VA, 50Hz \pm 2Hz

Earth Leakage Protection:

Trip setting 100-500mA in 50mA increments

Time Delay - Instantaneous (<50mS), 100mS then 150mS - 470mS in 40mS increments

Earth Continuity Protection:

Reset if resistance is <45 ohms

Trip if resistance is > 45 ohms

Shunt Leakage Trip if <1500 ohms

Operating Times: 80, 120, 160, 200, 300, 400 and 500mS

Pilot Cable Parameters: C <0.3uF, L <10mH, L/R <600uH/ Ω .

Earth Fault Lockout Protection:

IS Test

Lockout if resistance is:

415V < 4.15k ohms
1000V < 10k ohms
3.3kV < 33k ohms

Insulation Test

Lockout resistance is selectable at 0.1, 0.2, 0.5, 1, 2, 5, 10, and 15 Meg Ohm

Over-current / Overload Protection:

Current Range: 7.5 to 464 Amps (60 to 116 A in 4A increments x multiplier)

Current Multiplier: 1/8, 1/4, 1/2, 1, 2, 4 times

Time Multiplier: 0.05, 0.075, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 times

Cooling Multiplier: 0.2, 0.3, 0.4, 0.5, 0.8, 1, 2, 5, 10, 20, 50 times

Current Balance:

Trip Settings: 5%, 10%, 20%, 50% and off

Short Circuit Protection:

Trip Setting: 3 to 10 times in 0.5 increments
(times full load)

Trip Time: 20, 40, 60, 80, 100, 120, 160mS

Back EMF Timer:

Trip Delay Settings: 2, 5, 10 and 20 Seconds

Machine Numbers: Can be allocated from 1 to 40

Fan Current

Threshold Level: 32% to 96% in 8% increments (% of full load current)

Under-voltage Protection:

Selectable from 20% to 80% in 10% increments

Trip Delay 800mS

Serial Communications:

For information on Protocol and hardware requirements see DNET-IP2 Serial Communication System User Manual.

Relay Contacts: MCR, CBR, RL3, RL4

1 N/O 5A/190VAC 100VA max

1 C/O 5A/190VAC 100VA max

6. Equipment List

162831	Integrated Protection Relay IPD1V03
121115	IPD Base Plate
110141	IPD Remote Display Module RDM-D
110145	IPD Remote Termination Unit RTU-D
101487	CCMA 110V Cable Connection Module
110146	CCMD 415V Cable Connection Module
110147	CCMD 1000V Cable Connection Module
110148	CCMD 3.3kV Cable Connection Module
101826	EFTM 415/1kV IPC Earth/Fault Test
121170	EFTM 3.3kV IPC Earth/Fault Test
110773	IPD1V03 User Manual
101296	Fuse Holder C/W 3A/660V Fuse
117139	Fuse 3A/660V (Spare Item)

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd - ABN 35 000 770 141

7 Billbrooke Close CAMERON PARK NSW 2285

Phone: (02) 4903 4800

Fax: (02) 4903 4888

E-mail: electronics@ampcontrol.com.au

Website: ampcontrolgroup.com



HPB Integrated Protection Relay

Description

The Ampcontrol HPB Integrated Protection Relay (6.6 kV, 11kV or 22 kV) is an intelligent protection relay based on microprocessor technology. The Relay has been specifically designed to operate with very high interference to the pilot conductor that occurs on cables in open cut mining operations. This is more prevalent on a non-symmetric position of the pilot and earth conductors.

The integrated relay provides the necessary functions required for protecting electrical outlets supplying draglines, shovels, drills etc. All of the protection functions are combined into a compact, plug-in unit, which can be easily changed out to minimise down time in the event of a problem with the relay.

The HPB Relay can provide machine communication through the use of an HPB Termination Unit (HTU-1) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the HTU-1 Termination Unit the relay parameters are automatically up loaded from a remote machine when a cable is inserted into a power outlet.

The relay can perform an automatic "H.V. Insulation" test on the cable prior to the closure of the main contactor. The results of the test are displayed on the HPB Display Module (HDM-1) and can be remotely monitored.

The HPB Relay has 5 digital inputs, which feed into a microprocessor unit. The microprocessor has been programmed to control three output relays. Relay MCR for the main contactor and Relay CBR for the circuit breaker. RL3 is used to control the supply to the Cable Connection Module enabling it to perform the Earth Fault Lockout test. All of the tripping logic and outlet control is performed by the microprocessor, so that only minimal external control is required.

Extensive information display and monitoring features are included to facilitate fault finding and system trending. This information can be read locally on the HPB Display Module (HDM-1) or remotely via a communication link.

Opto isolated outputs are available for connection to optional LED or Relay Modules to provide additional "run" and "trip" indications. The Ampcontrol Relay Output Module (ROU) enables these indications to be interfaced with a PLC. **See HPB User Manual 117829 for full details.**



HPB 6.6kV Version Shown

Protection Functions

- Earth leakage
- Earth Fault Lockout
- Earth Continuity
- Over-current/Overload
- Short Circuit
- Contactor Fail

Features

- Machine Communications
- Insulation Test on the cable prior to closure of the main contactor
- User friendly. Relay and Remote Termination Unit programmed from the Remote Display Module
- Microprocessor based
- Fail safe operation
- Resistor or Remote Termination Unit operation
- 120 Event Log
- Local or remote operation
- Remote communication via PLC link
- Plug-in for quick change out
- Nine Status messages to indicate what is required to energise the outlet.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.
- Relay & Digital Input Status to aid fault finding

Application

The HPB Integrated Protection Relay is normally installed in a mobile substation and provides protection for draglines, drills, shovels and other surface mining equipment connected to the sub station.

Before an outlet can be energised the following conditions must apply:

- a) No protection faults present
- b) Local stop input open, remote stop loop closed
- c) Local start input closed

Once these conditions are met a cable fault lock out test is performed automatically. The start button must remain closed during the test, which may take up to 25 seconds to complete due to the charging of the cable capacitance. If the result of this test is satisfactory the HPB Relay goes into the run mode and the MCR Relay picks up and closes the main contactor.

Specifications

Note: An 11kV system includes the HPB22kV relay.

Auxiliary Supply Volts:

HPB 6.6kV: 110 Vac \pm 20% >20 VA, 50 Hz \pm 2 Hz
HPB 22 kV: 48 Vdc \pm 20% >40W

Earth Leakage Protection:

HPB6.6kV: Trip setting 200 mA to 1000 mA in 100 mA increments
HPB 22 kV: Trip setting 500 mA to 2500 mA in 250 mA increments
Time Delay: Instantaneous, <80 ms, and 150 ms – 470 ms (in 40 ms increments).

Earth Continuity Protection:

Trip Setting: 50 Ω , 75 Ω , and 100 Ω
Shunt Leakage Trip if < 200 Ω (Resistor Mode)
Operating Time: 300 ms, 400 ms, 500 ms, 1.0 s, 1.2 s, 1.5 s and 2 s

Earth Fault Lockout Protection:

HPB 6.6kV: Selectable at 2, 5, 10, 20 and 50 Meg ohm and off
HPB 22 kV: Selectable at 15, 20, 30, 50 and 100 Meg ohm and off
Test time is selectable at 10, 15, 20 and 25 seconds

Over-current Protection:

Current Range: HPB6.6kV: 7.5 to 464 Amps (60 to 116 Amps in 4 Amp increments times multiplier)
HPB 22kV: 15 to 928 Amps (60 to 116 Amps in 4 Amp increments times multiplier)
Current Multiplier: HPB 6.6kV: 1/8, 1/4, 1/2, 1, 2, 4 times
HPB 22kV: 1/4, 1/2, 1, 2, 4, 8 times
Current Balance:
Trip Settings: 5%, 10%, 20%, 50% and off

Short Circuit Protection:

Trip Setting: 3.0 to 10.0 times in 0.5 increments (times full load current)
Trip Time (ms): 20, 40, 60, 80, 100, 120, 160

Back EMF Timer:

Trip Delay Settings: 2, 5, 10, 15, 20, 30, 35, and 40 Seconds

Machine Numbers:

Can be allocated from 1 to 40

Under voltage Protection:

Selectable from 30% to 80% (in 10% increments), or disabled.
Trip Delay 800 ms

Serial Communications:

For information on data format and hardware see DNET-IP2 Serial Communication System User Manual 118626.

Relay Contacts:

MCR, CBR	1 N/O 5 A/190 Vac 100 VA maximum
	1 C/O 5 A/190 Vac 100 VA maximum
RL3	1 N/O 5 A/190 Vac 100 VA maximum

Equipment List

144069 -	HPB 6.6kV Integrated Protection Relay
142842 -	HPB 22kV Integrated Protection Relay
118732 -	HTU-1 Termination Unit
142848 -	HPB Base
142845 -	HPB Base – 48 V
118542 -	HDM Remote Display Module Flush Mount
117648 -	6.6 kV Cable Connection Module
143369 -	22 kV Cable Connection Kit
144371 -	11 kV Cable Connection Kit
101503 -	IPA/IPB Relay/LED Output Module
117829 -	HPB User Manual
143911 -	Power Supply 48V 2.5A 120W DIN Mount

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285
Phone: (02) 4903 4800
Fax: (02) 4903 4888
E-mail: electronicsorders@ampcontrolgroup.com
Web site: www.ampcontrolgroup.com



Battery Chargers

ABCM Battery Charger

Modular design

Ethernet connection

Wide temperature compensation -10°C to 60°C^*

Australian designed and manufactured



AMPCONTROL[®]

ABCM Battery Charger

Ampcontrol's ABCM Battery Charger range offers the latest switched mode rectifier design, providing a highly stable output voltage and current limiting. The range includes a microprocessor controlled rectifier unit which offers improved efficiency over the single phase full wave thyristor controlled rectifier units, as well as modularity and redundancy.

All relevant parameters are digitally stored in non-volatile RAM to maintain the charger configuration even with loss of power. The DC output is fully regulated, short circuit protected and monitored against over and under voltage with current limit.

This cost effective system is easy to use and set up.

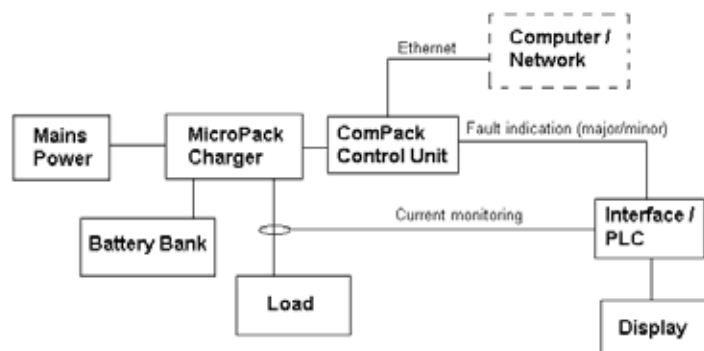
Features:

- Suitable for sealed lead acid batteries and can also be used for NiCad and Lithium batteries
- Ethernet connection for remote or local monitoring and control via web browser
- Modular design
- Wide temperature compensation -10°C to 60°C*
- Range - 12 to 120V DC, 5Amps to >100Amps output
- LCD comprehensive monitoring for metering, alarm messages and parameter settings
- Four relay outputs providing indication for normal and alarm status and can be customised if required
- Manual, automatic and timed boost charge modes are available
- Efficiency of the switched mode model is at least 20% better than transformer/choke units

Application:

Ideally suited for auto charging of stand-by battery supplies where a constant voltage, current limited charging characteristic is desired including:

- Emergency lighting
- Switchgear control
- DC supplies



The ABCM Battery Charger is available with a range of options that include battery voltage, battery capacity, face mounted displays and others.

* battery dependent

AMPCONTROL ELECTRONICS

Ampcontrol CSM ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285

Phone: +61 2 4903 4800

Fax: +61 2 4903 4888

electronics@ampcontrolgroup.com

ampcontrolgroup.com



Compact Intrinsically Safe Power Supply Series CPS-A

Features

- Switched Mode Power Supply
- DIN Rail Mounting
- LED Status Indication
- Certified Intrinsically Safe - Exia
- Tested to AS/NZS 60079.11:2000
- Designed For 110VAC Mains Voltage

Description

The CPS-A series of Compact Intrinsically Safe Power Supplies convert 110VAC mains power to intrinsically safe low voltage DC power.

The DIN rail mount enclosure is made of robust black polycarbonate and has a protection rating of IP20. Top and bottom enclosure walls feature ventilation slots for natural convection cooling. The side walls are solid and allow other components be stacked against it on the DIN rail. Top and bottom ventilation slots must be kept free for air circulation. Screw terminals are located on the front for connecting the AC mains cable and the output load circuits. The output has two terminals for each of the positive and negative DC supply.

The power supply has associated apparatus approval and must be mounted in an appropriate enclosure.

Some typical use of this power supply are for voice communication systems, gas detection systems and other electronic equipment requiring intrinsically safe Ex ia power in a group 1 environment.

Operation

The power supply exhibits very low output impedance. At full load the output voltage is reduced by only 0.3VDC. Precise smart current limiting provides maximum available current up to the I_o parameter. The power supply output acts as a current limited voltage source. The load impedance can vary down to short circuit while the maximum output current is maintained.

The red OVERLOAD LED on the fascia lights up when current limit is activated. The green OUTPUT LED is driven directly by the output voltage. The green OUTPUT SWITCH LED indicates that the internal control circuit is healthy and the output is ON. The LED turns off when mains power is removed as well as when a fault occurs.

Mechanical Specification

Dimensions	: 125 W x 102 H x 125 D mm
Weight	: 1kg
Operating Temperature	: 0-50°C for 12.6VDC / 2.4A : 0-60°C all other models
Ingress Protection	: IP-20



Electrical Specification

Supply Voltage : 110Vac \pm 20%, 50/60Hz

Intrinsically Safe Parameters :

U_o	I_o	C_o	L_o	L/R	U_m
12.6V	2.4A	10 μ F	74 μ H	30 μ H/ Ω	132VAC
		20 μ F	40 μ H	8 μ H/ Ω	
12.6V	2.0A	20 μ F	95 μ H	40 μ H/ Ω	
15.1V	1.5A	1 μ F	190 μ H	30 μ H/ Ω	
15.1V	0.469A	2 μ F	450 μ H	70 μ H/ Ω	
15.1V	0.51A	2 μ F	450 μ H	65 μ H/ Ω	

LED Status Indication

- AC Mains Supply ON – GREEN
- DC Output Power ON – GREEN
- DC Output Switch ON – GREEN
- DC Output Overload – RED

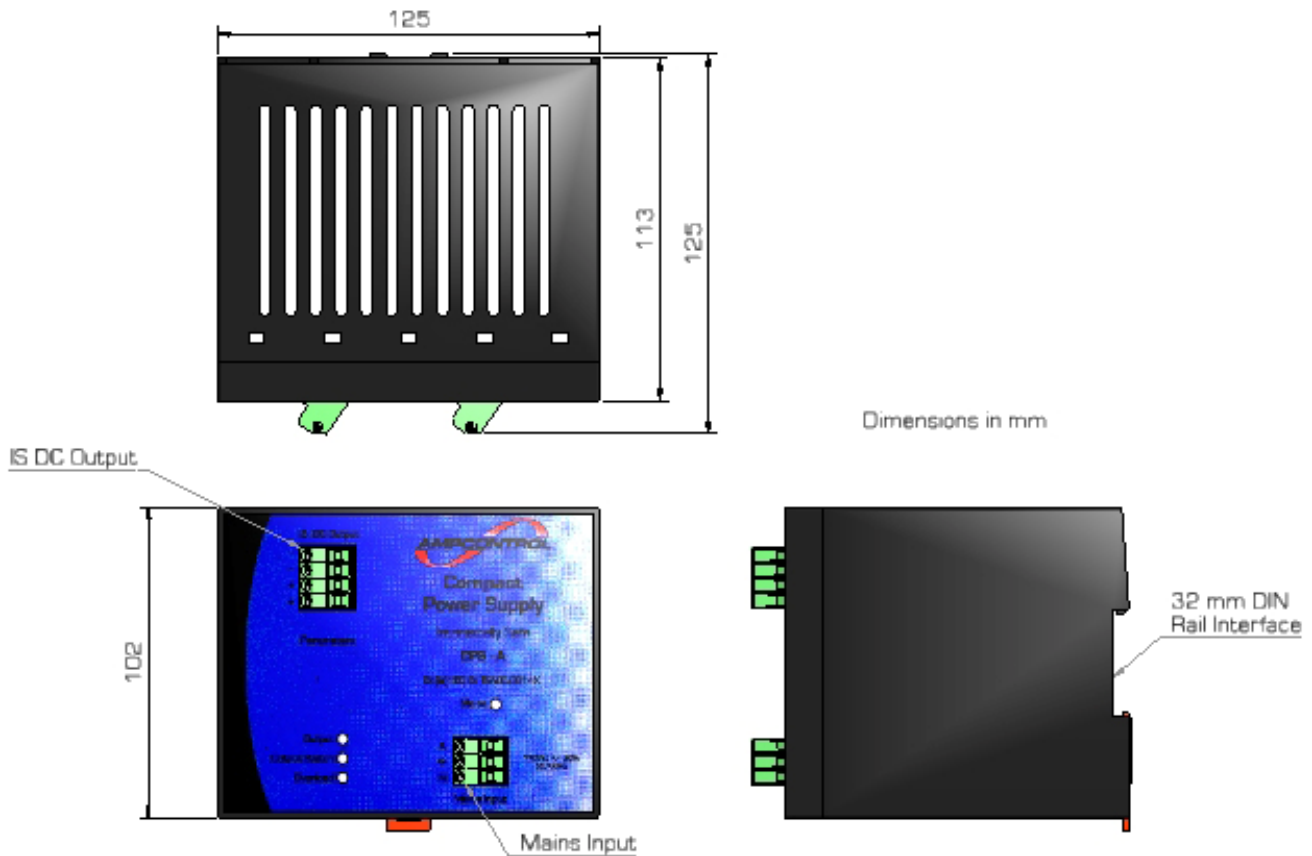
Approval & Certification

IECEX : IECEx TSA 06.0014X

Ordering Information

Part Number	Description
121307	CPS-A – 15.1VDC / 0.469A Output
121152	CPS-A – 15.1VDC / 1.50A Output
121155	CPS-A – 12.6VDC / 2.0A Output
121149	CPS-A – 12.6VDC / 2.4A Output

Dimensions



Electrical Connection

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285

Phone: (02) 4903 4800

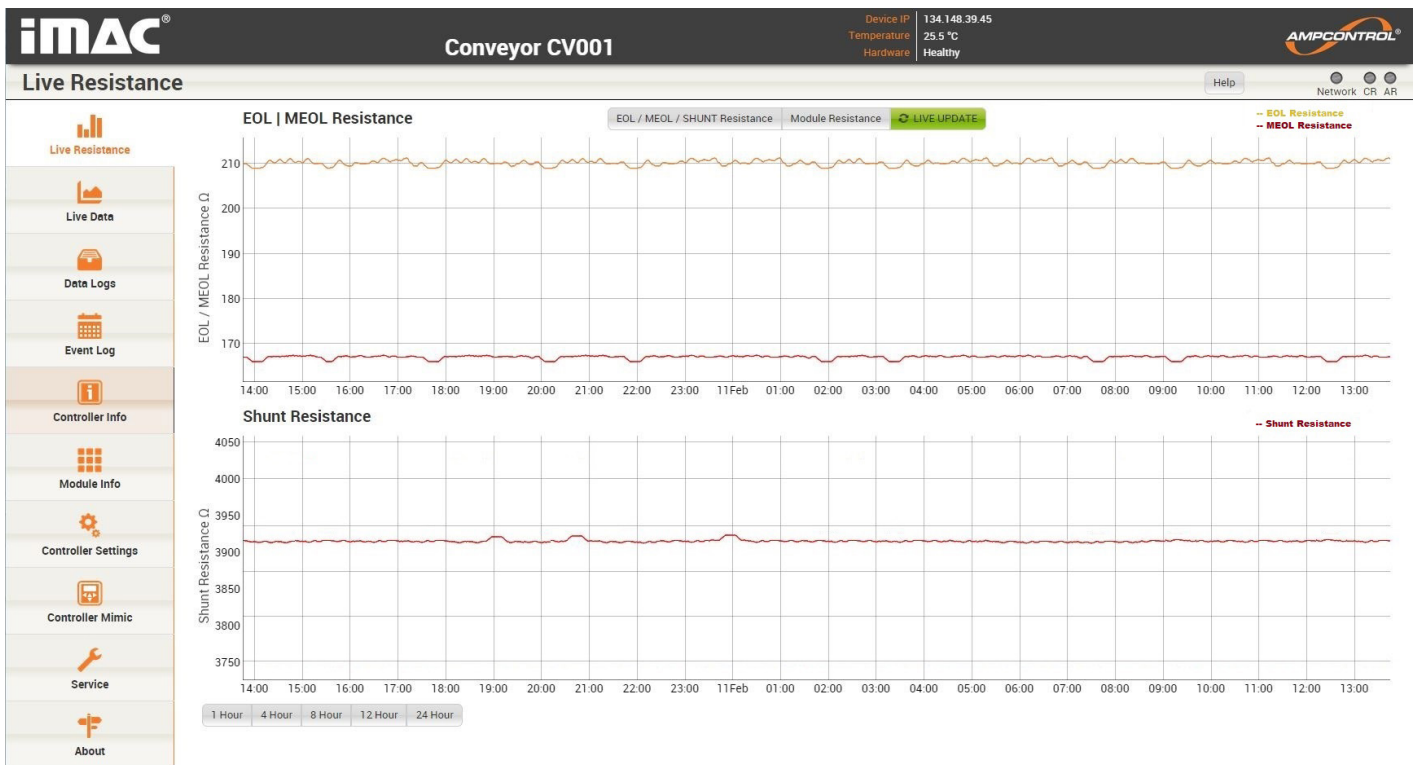
Fax: (02) 4903 4888

E-mail: electronics@ampcontrolgroup.com

Web site: www.ampcontrolgroup.com



IMAC2 — THE NEXT GENERATION CONTROLLER



Ampcontrol's iMAC2 Controller is the heart of our Integrated Monitoring and Control system, providing fully managed, distributed I/O over long distances within Group 1 hazardous environments.

Extending the capabilities of the standard iMAC system, the iMAC2 Controller provides real time and historical event logging, diagnostic tools and service information.

All available data can be viewed directly on the integrated HTTP web based interface and/or accessed by PLC or SCADA systems via the high speed Ethernet Modbus TCP/IP port.

Features

- Event and data logging
- HTTP web based interface
- Real time and historical data
- Ethernet communications port
- Modbus TCP/IP
- IP55



For more information on Ampcontrol's iMAC2
visit ampcontrolgroup.com/iMAC2

iMAC2 provides all the standard features of the existing controller with advanced communication, data logs and diagnostic tools.

FEATURES

iMAC Controller



iMAC2 Controller



STANDARD iMAC USER INTERFACE	✓	✓
EVENT AND DATA LOGGING	✗	✓
HTTP WEB BASED INTERFACE VIEW REAL TIME REGISTER DATA VIEW REAL TIME AND HISTORICAL RESISTANCE GRAPHS VIEW EVENT AND DATA LOGS VIEW REMOTE LCD DISPLAY VIEW AND MODIFY DEVICE SETTINGS VIEW AND CREATE SERVICE LOGS PASSWORD PROTECTION	✗	✓
BACKLIT LCD DISPLAY	✗ Except 24VDC Model	✓
LARGE LOG CAPACITY	✗	✓
REAL TIME CLOCK (TIME STAMPING)	✗	✓
SUPPORTS APPLICATION SOFTWARE (SLP)	✓	✓
CONFIGURABLE SERIAL COMMUNICATIONS PORT RS232/RS422/RS485	✓	✓
ETHERNET COMMUNICATIONS PORT RJ45 100BASE-TX	✗	✓
MODBUS TCP/IP	✗	✓
ETHERNET/IP (FUTURE ENHANCEMENT)	✗	✓
POWER SUPPLY (OPTIONS)	110VAC / 240VAC / 24VDC	24VDC
INGRESS PROTECTION (PANEL MOUNTED)	IP55	IP55
DIMENSIONS HxWxD (MM)	155x155x120	155x155x140
CUT OUT DIMENSIONS (MM)	135x135 +3mm mounting 'ears'	135x135 Mounting 'ears' not required
MOUNTING	Panel 2 x Retaining Clips	Panel 4 x Compact Retaining Clips
CONTROL RELAYS	2	2
DIGITAL INPUTS VOLTAGE FREE CONTACTS	3	3
SEPARATED CONNECTORS FOR POWER SUPPLY, RELAYS, INPUTS & SERIAL COMMUNICATIONS	✗	✓
TARGET APPLICATION	Designed specifically for long line distributed monitoring and control in harsh environments.	

For more information on Ampcontrol's iMAC2
visit ampcontrolgroup.com/iMAC2



PULLKEY SAFETY SWITCH

CONVEYOR SYSTEMS

Applications

The Ampcontrol designed and manufactured Pullkey Safety Switch provides a reliable means of conveyor emergency stop control for all types of material handling applications even under the most demanding conditions.

The Pullkey Safety Switch is constructed from powder coated stainless steel that provides a corrosion resistant and robust finish requiring little maintenance. The unit has an ingress protection rating of IP66 (dustproof and protection from strong jets of water).



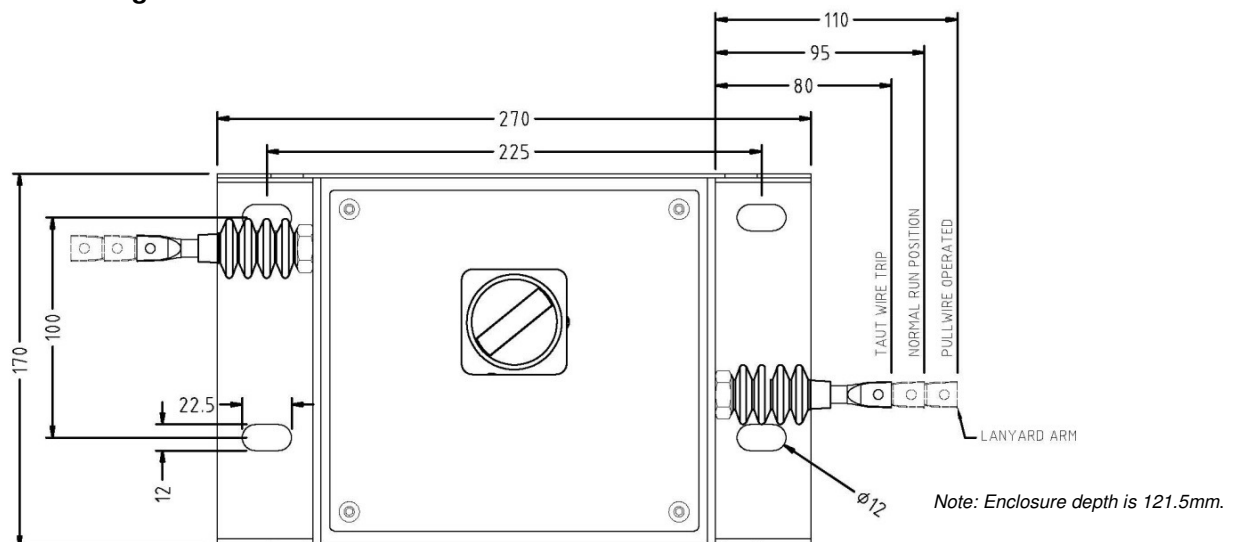
The pullkey emergency stop function can be operated manually by rotating the red STOP/RUN control switch or by operation of either pullwire/lanyard arm. The pullkey is available in either taut wire or slack wire configurations for use in tensioned or non-tensioned lanyard systems respectively.

Our standard range of pullkeys contain only switch contacts and are suitable for simple series connected emergency stop systems. Our recommended iMAC range of pullkeys incorporate Ampcontrol's proprietary iMAC (Integrated Monitoring and Control) system which provides sophisticated emergency stop monitoring, status/diagnostic LED indication and optional remote isolation functions.

Features

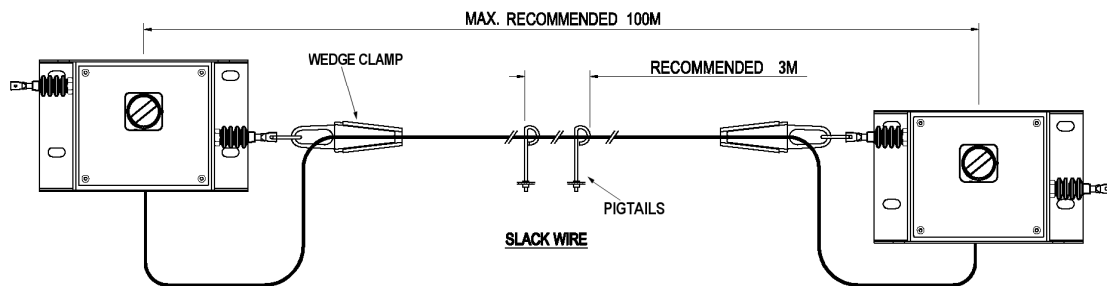
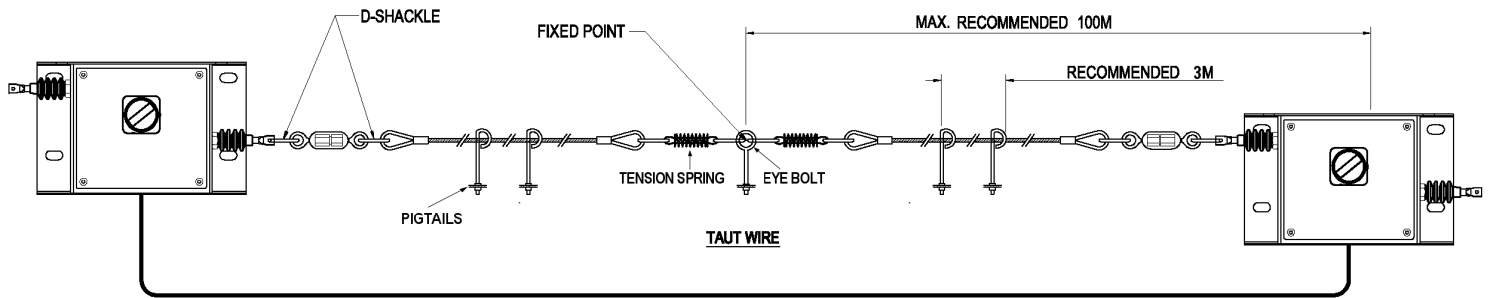
- Emergency stop and latching (manual reset) complies with conveyor code AS 1755.
- Robust stainless steel construction ideal for corrosive environments.
- Fully enclosed pullkey mechanism ensures function reliability, certified IP66.
- Suitable for either taut wire (tensioned) or slack wire (non-tensioned) lanyard systems
- iMAC integration for emergency stop monitoring, status/diagnostic LED indication and optional remote isolation functions.
- Functional tested to 40,000 operations (long service life).
- Gold plated switch contacts ensure superior switching reliability.
- Plug and socket or glanded cable entry options.
- Wide operating temperature range of -20°C to +50°C for harsh industrial environments.

General Arrangement



	Version No: 4	Doc No: / Name:	PKB001 Technical Datasheet Pullkey Safety Switch		
Status: Approved	30.05.2014	Author / SME Prepared by:	Tech. Doc. Officer	Approval by Process Owner:	2.2.7 Process Owner
Refer to Ampcontrol Intranet for latest version					Page 1 of 3

Typical System Configurations



Ordering Information

Pullkeys

Standard Pullkeys

Part Number	Description
101540	PK TW STD OPT2 GLND LBRB#
111123	PK TW STD OPT1 GLND LBRB#
115571	PK TW STD OPT1 GLND LBRB#
115578	PK SW STD OPT2 GLND LBRB#




Standard Pullkey (P/N 101540 shown)

iMAC Pullkeys

Part Number	Description
106016	PK SW 2W+DI4 OPT2 GLND LBRB# IECEX
115572	PK TW 3W+IIM V2 OPT2 GLND LBRB# IECEX
115579	PK SW 3W+IIM V2 OPT2 GLND LBRB# IECEX
115637	PK SW 3W+IIM V2 OPT4 AMPH RBLB IECEX
115638	PK SW 3W+IIM V2 OPT4 AMPH RBLB IECEX
115673	PK SW 3W+IIM+LPU V2 OPT2 GLND LBRB#
115709	PK SW 3W+DI4 OPT4 AMPH M/F LBRB IECEX
141214	PK SW 3W+2xDI4 OPT7 AMPH LBRB IECEX
157486	PK SW 3W+IIM V2 OPT6 BULG RBLB IECEX
157823	PK SW 3W+DI4 OPT7 AMPH LBRB IECEX
161070	PK SW 3W+IIM V2 OPT4 AMPH M/F LBRB IECEX
161457	PK SW 3W+IIM V2 STATUS OPT7 GLND LBRB# IECEX
161521	PK SW 3W+IIM V2 STATUS OPT2 GLND LBRB# IECEX
161966	PK TW 3W+DI4+LPU OPT7 GLND LBRB#
163962	PK TW 3W+IIM V2 STATUS OPT8 GLND LBRB# IECEX



iMAC Pullkey (P/N 115572 shown)

iMAC Remote Isolation Pullkeys		
Part Number	Description	 <p>iMAC Remote Isolation Pullkey (P/N 115573 shown)</p>
115573	PK TW 3W+IIM V2 RIS OPT2 GLND LBRB IECEx	
115574	PK TW 3W+IIM+LPU V2 RIS OPT7 GLND LBRB	
115581	PK SW 3W+IIM V2 RIS OPT2 GLND LBRB IECEx	
115631	PK SW 3W+IIM V2 RIS OPT4 AMPH RBLB IECEx	
115632	PK SW 3W+IIM V2 RIS OPT4 AMPH RBLB IECEx	
115633	PK SW 3W+IIM V2 RIS OPT4 AMPH LBRB IECEx	
115695	PK SW 3W+IIM V2 RIS OPT4 AMPH LBRB IECEx	
115708	PK SW 3W+IIM V2 RIS OPT6 BULG LBRB IECEx	
115712	PK SW 3W+IIM V2 RIS OPT6 BULG LBRB IECEx	
159242	PK SW 3W+IIM V2 RIS OPT4 AMPH LBRB IECEx	
Accessories		
Taut Wire Systems		
Part Number	Description	
168159	CABLE PULLWIRE VECTRAN	
168133	SHACKLE D M5 S/S 316	
168128	TURNBUCKLE EYE/EYE M6 S/S 316	
168130	THIMBLE M5 S/S 304	
168131	GRIP WIRE ROPE M5 S/S 316	
159614	SUPPORT P/CABLE LANYARD PIGTAIL	
168132	SPRING LANYARD TENSION TYPE A	
168129	BOLT EYE M10X120MM S/S 304	
Slack Wire Systems		
Part Number	Description	
144957	CABLE PULLWIRE 3x1.5MM2 CU SCR N LS0H RED SHEATH	
120841	CABLE PULLWIRE 4x1.5MM2 RED SHEATH	
159596	CLAMP PULLWIRE WEDGECLAMP	
159614	SUPPORT P/CABLE LANYARD PIGTAIL	

IIM

Input and Indication Module

IECEX ITA 07.0017x

Description

The iMAC IIM Module is an intrinsically safe contact input and LED output module. The IIM monitors 5 voltage free contacts, provides 4 user LED outputs in addition to 3 status LEDs and monitors the status of the L1A+ communication line in 3-wire remote isolation systems.

Typical applications include remote isolation control and display, status and control of conveyor signal lines, remote indication and secure monitoring in a hazardous location.

Features

- One 16 bit input data word (Addressable 1..255)
- The Low Byte of the data word contains the 5 x Voltage Free input bits and the Line-A Monitor status.
- One 16 bit output data word (Fixed at Address 100)
- The bottom 4 bits of Address 100 control 4 of the 6 LED outputs.
- Down Line powered - over communication pair.
- High whetting current - contact sensing, typically 15 volts and 5 milliampere.
- Encapsulated, robust, reliable electronics.
- Compact design fits anywhere.
- The Module has been approved to IECEX Intrinsically Safe Standards for use Zone 0 hazardous locations.

LED Status Indication

- **LED1 to LED4** – are controlled from Address 100 data.
Slow Flash when data is 1.
No flash when data is a 0.
- **LED5** – is Address 100 status.
Slow Flash when address 100 data is received.
- **LED6** - A-Line Monitor input status.
Slow Flash when A-Line monitor input detects a valid LA+ connection.
- **LED7** – External OK LED mimics IIM status LED.
Slow flash if the module is communicating to the Controller over the L1 line and there are no trip conditions on this module.
Two flashes when module is being roll called.
Three flashes if there is an Address Clash
Fast flash if any of the complimentary pairs are not in the healthy condition.
Intermittent flash indicates a checksum error or an intermittent short or open circuit.

Data Mapping

The input data word is addressable from 1..255 except 100. The high byte is not used. The low byte bits are defined as follows:



Bit								Bit							
15							8	7	6	5	4	3	2	1	0
X	X	X	X	X	X	X	X	S	X	M	I5	I4	I3	I2	I1

IIM 16-Bit Input Data Word (A1..255, excluding 100)

- Bits 0 to 4 - 5 Voltage free inputs (I1 - I5). For N/C switch inputs, data will be 0 for a closed input and 1 for an open input. For N/O switch inputs, data will be 1 for a closed input and 0 for an open input. See programmable settings for configuring inputs as N/C or N/O.
- Bit 5 - A-Line Monitor input (M). When a valid LA+ line connection is detected this bit will be a 0 otherwise it will be 1.
- Bit 7 - Random data bit (S). The random data bit was introduced in the IIM data word to ensure a high Clash indication when two IIM modules are connected to an iMAC system with the same addresses. iMAC does not generate clash indication for two modules programmed with the same address that are transmitting the same data. The random bit improves clash detection as two modules with the same address will eventually have a data miss-match due to a difference in random bit state even though they may be transmitting identical input data. This allows addressing mistakes to be quickly identified.
- Bits 6 and 8 to 15 – Not used (X).

The output data word is fixed at address 100. The high byte is not used. The low byte bits are defined as follows:

Bit								Bit							
15							8	7	6	5	4	3	2	1	0
X	X	X	X	X	X	X	X	X	X	X	X	L4	L3	L2	L1

IIM 16-Bit Output Data Word (A100)

- Bits 0 to 3 - LED1 to LED4 (L1 – L4). The IIM reads Address 100 data from the communication line. The LEDs Slow Flash (1 flash/sec) when data is 1, no flash if data is 0.
- Bits 4 to 15 – Not used (X).

Programming Procedures

The IIM is programmed from the Controller using the following procedure.

Select the Rollcall and Program page from the Controller menu.

- Press <F2> to rollcall each module. The modules are rollcalled in address order. Keep pressing <F2> until the correct module with the correct serial number is displayed.

```
MAIN ROLLCALL PAGE
IIM Module    next>
Serial number: 1111
Address: 101,  read>
```

The rollcall page displays the type of module, the module's serial number and the module's address.

- Pressing <F4> will cause the Controller to read the programming parameters from the module and display the parameters on the "Programming Page"

Parameter	Meaning	Range
Parameter 1	iMAC IIM Input Address	1..255d
Parameter 2	Input Invert Bits	0..1Fh
Parameter 3	LED Output Address	64h
Parameter 4	Not Used	

Parameter 1: IIM Input Address. Selecting 0 will put IIM offline. Since address 100 is used for the LED output data the IIM address should not be programmed to 100.

Parameter 2: Invert bits for selecting N/O or N/C inputs. Bits 0 to 4 correspond to Inputs 1 to 5 respectively, set bits to 0 for N/C and 1 for N/O.

Parameter 3: IIM Output Address. Fixed at address 100.

Parameter 4: Not used

- Edit the parameters by pressing the function key corresponding to parameter for editing. Use the arrow keys to edit the value. Save edits by re-pressing the corresponding function key. To cancel edits press the <ESC> key.
- Write the edited parameters to the module by pressing the function key corresponding to the "Write Parameters?" message. Note the down arrow may have to be used to locate this message. This writes the parameter values into the module non-volatile memory.

Specifications

Power Supply:

Powered from iMAC Communication Line.

Inputs:

5 x Voltage free contact inputs sharing single common.
Nominal Sensing Current: 5mA.

Nominal Sensing Voltage: 15V.

Note: maximum length of lead between switch inputs and voltage free contacts should not exceed 10 metres.

Outputs:

7 x LED outputs sharing single common.

Communication:

iMAC 2/3 Wire Line.

500 to 1000 baud

Operating Environment:

0 to 50°C.

Overall Dimensions:

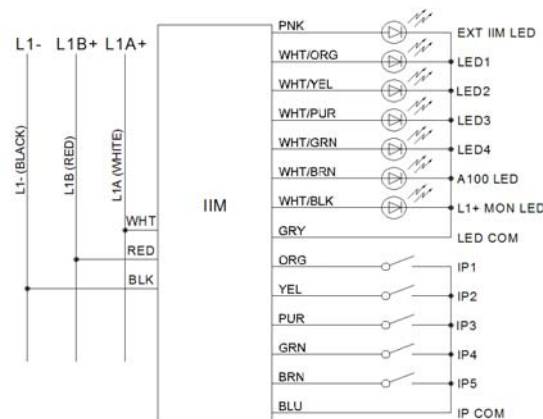
70L x 31W x 24H mm

Equipment List

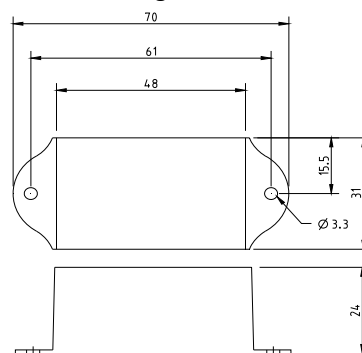
121891 iMAC IIM I.S.

142323 Kit iMAC Din Rail Mount

Connection Diagram



General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

DI4

Digital Input Module

IECEX ITA 07.0017X

Description

The Ampcontrol Non Volatile Memory DI4 Digital Input Module is IS (Intrinsically Safe). The Module has four normally closed digital inputs. The sensing voltage is 5V minimum and the sensing current is 1mA. The electronics are encapsulated in a plastic enclosure that is small enough to fit into a lanyard type switch to indicate the switch's operation.

The module can be used to read any contact input, similar in use to a PLC digital input card. DIN Rail mounting kits are available to suit the above applications.

The Module is powered from the iMAC L1 communication line and requires no external power supply.

Features

- 16 Bit data Word
- On line configuration from iMAC Controller
- Single unique 16 bit address
- Voltage free contact inputs (Programmable to N/O or N/C).
- Down line powered
- Encapsulated electronics
- Optional DIN rail mount
- Compact design

LED Status Indication

A red high intensity LED is mounted on the front of the module. The variable flash rate indicates the module's status.

No Flash if there is an incorrect iMAC L1 connection, open or short circuit.

Slow flash if the module is communicating to the controller over the L1 line and there are no trips.

Two flashes when module is being roll called.

Three flashes if there is an address clash.

Fast flash if the module is communicating a trip

If the module is mounted inside an enclosure then this LED will be hidden from view. For this reason an external LED with 200mm leads is available as an optional extra so that it can be mounted in a hole drilled through the enclosure for external viewing.



Data Mapping

The iMAC-DI4 Input Module writes one 16 bit data word to the iMAC two wire communication line and can be programmed from 0 to 255. Address 0 will put the module OFFLINE. The data word format is:

Bit								Bit			
15								7	6	5	4
X	X	X	X	X	X	X	X	X	X	X	X
								SW4	SW3	SW2	SW1

Where: SW1 to SW4 are the Switch Data Inputs.

The iMAC-DI4 Module initiates an 'exception scan' when there is a change in the input data. This facilitates a fast response to data changes. Only one exception scan is allowed per 'round robin' scan. This guarantees a background scanning rate.

Programming Procedures

DI4 address: XXX - iMAC Address (1-255 decimal)

Parameter 2: XXXX - 'Invert Status'
(0000..000F hexadecimal
Eg 0002 inverts the 2nd input.)

Parameter 3 & 4: XXXX - not used

Parameter Description:

DI4 address is in decimal and can have a value from 1 to 255.

Parameter 2 is the 'Invert Status' of the inputs. Inputs can be programmed to be normally open or normally closed contact inputs. Bits 0, 1, 2 and 3 are used to invert SW1 – SW4 data respectively before it is written to the iMAC communication line. 1 = normally open input, 0 = normally closed input. In either case a "trip" whether it be a N/C switch that is opened or a N/O switch that is closed will cause a 1 to be written into the corresponding bit of the data word.

Parameter 3 and 4 are not used

Specifications

Power Supply:

Powered from iMAC L1 Communication Line
Consumes 1mA at 1000 baud

Communication:

500 to 1000 baud between controller and field module
Field modules automatically adjust to controller baud rate

Inputs:

4 Contact Inputs
Sensing Current up to 5mA
Sensing Voltage up to 15 V
All inputs are common to blue lead

Maximum length of leads between the Switch Inputs and the voltage free contacts:

DI4 - leads are not to exceed 10 metres.

DI4 I.S. Long - leads are not to exceed 30 metres.

Dimensions:

DI4 Module – 70L x 31W x 24H mm

DIN Rail Mount with DI4 I.S. Long Module

70L x 45W x 37D mm

DIN Rail Mount C/w Terminals and DI4 I.S. Long Module

70L x 80W x 44D mm

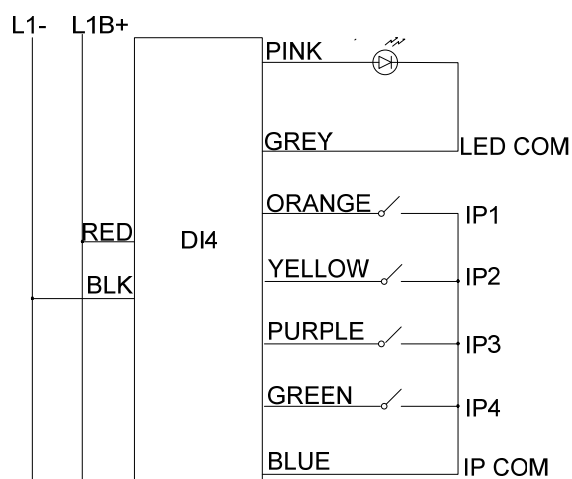
Operating Environment:

0 to 50°C

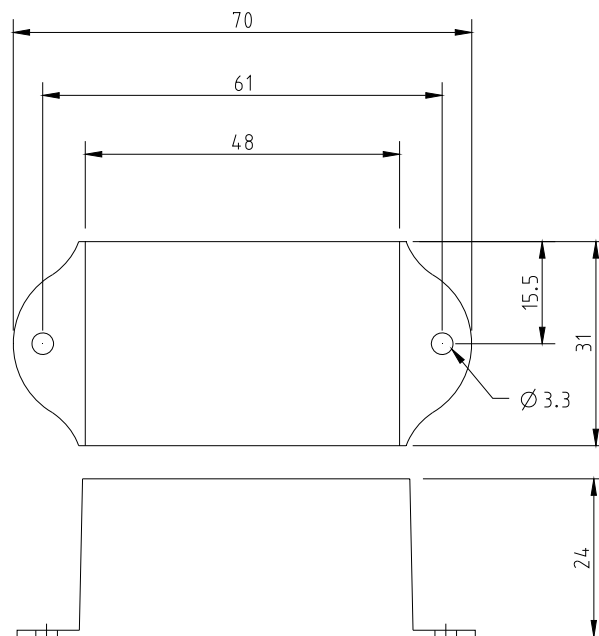
Equipment List

121892	iMAC - DI4 I.S. IECEX
121893	iMAC - DI4L I.S. Long IECEX
121894	iMAC - DI4 I.S. No Led IECEX
141059	iMAC - DI4 I.S. IECEX SA
142323	Kit iMAC Din Rail Mount

Connection Diagram



General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285

Phone: (02) 4903 4800

Fax: (02) 4903 4888

E-mail: electronics@ampcontrolgroup.com

Web site: www.ampcontrolgroup.com



EOL & MEOL

End of Line Modules

IECEX ITA 07.0017X

Description

The core function of the iMAC System is the End of Line Monitoring and the conditioning of the Control Relay (CR) with 'Signal Line Healthy'. This is the **key safety feature** of this relay that is located in the iMAC Controller. 'Signal Line Healthy' is generated if and only if the End of Line Module has successfully communicated with the Controller over eight (8) scans. The scan time is approximately 300mS. The End of Line Module has a unique serial number that the Controller continually checks.

The End of Line Module EOL forms part of the two wire monitoring, two/three wire emergency stop and three wire remote isolation systems.

The iMAC-MEOL Module is used when the application calls for remote isolation or continuous monitoring using a three-wire system. The module has a unique 16-bit serial number similar to the iMAC-EOL Module. The iMAC-MEOL connects to the B line in 3-wire systems.

The iMAC-MEOL Modules are approved to Intrinsically Safe Standards and are powered from the iMAC L1 communication line. No external power supply is required.

There should only be one EOL Module per communication line. If two modules are inadvertently connected the Controller will report an end of line error and the signal line is then treated as an open circuit line condition. If two MEOL Modules are inadvertently connected the Controller will report an address clash.

The End of Line (EOL) and (MEOL) Modules must be connected at the extreme end of the communication line. If this is not observed any control switches not observed between the iMAC-EOL Module and the Controller will be inoperative.



Features

- Compact Design
- Encapsulated, robust, reliable electronics
- Din Rail mounted
- The end of line data is located in a separate part of the communication protocol to the 'user data' so that it cannot be corrupted by erroneous input addresses. The 'Signal Line Healthy' message is applied to the Control Relay unconditionally and cannot be corrupted or overridden by the user programmable sections.

LED Status Indication

A red high intensity LED mounted on the front of the modules indicates the module's status.

Slow flash healthy

Two flash when module is roll called.

Fast flash checksum error (for 5 seconds)

Data Mapping

The iMAC EOL Module is assigned an address of 0 that cannot be altered.

The iMAC MEOL Module is assigned an address of 96 that cannot be altered.

Programming Procedures

Programming not necessary

Specifications

Power Supply:

Down line powered

Communication:

500 to 1000 baud

Dimensions:

75 H x 23 W x 98 D mm

Operating Environment:

0 to 50°C

Equipment List

121905	iMAC EOL I.S.
121908	iMAC MEOL I.S. MONITORING EOL

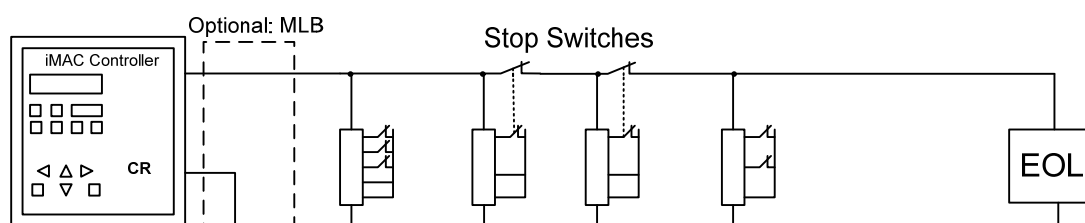
Connection Diagram

Figure 1: Two Wire Configuration

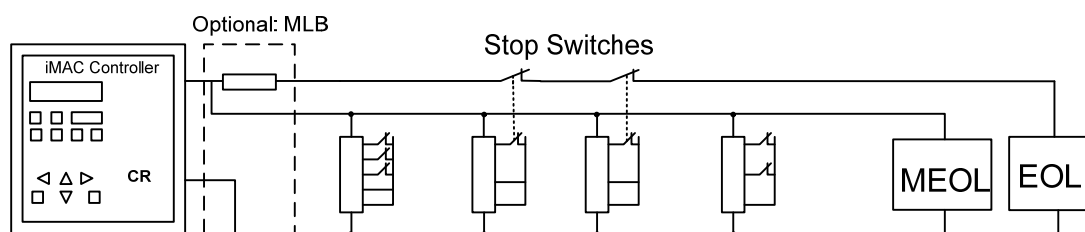


Figure 2: Three Wire Configuration

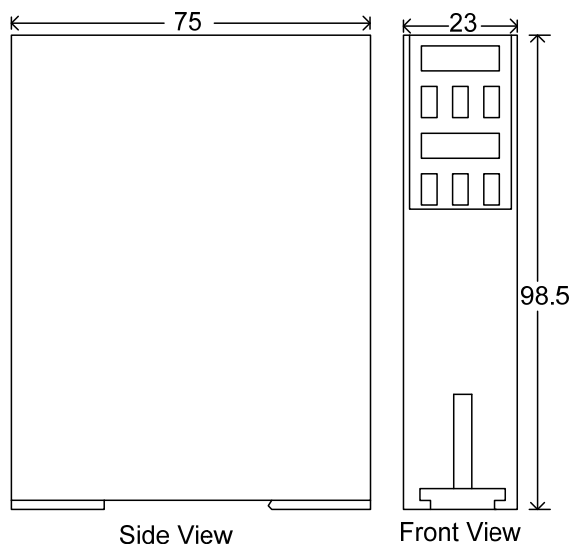
General Arrangement

Figure 3: EOL and MEOL General Arrangement

Technical Support

imacuser@ampcontrolgroup.com

LED-4

LED Display Module

IECEX ITA 07.0017x

Description

The iMAC-LED-4 Module is an intrinsically safe LED display module. It powers 4 LEDs for output indication and a fifth LED for system healthy indication. The output LEDs are used to indicate the status of equipment being monitored. Typical applications are to indicate remote isolation, status of conveyor signal lines, remote indication into a hazardous location etc.

When enabled the output LEDs flash at a 1.2 sec rate. The intensity of the flash is sufficient to be seen in bright ambient conditions. The Modules are powered from the iMAC L1 communication line and requires no external power supply.

The LED4 module is an output device and as such can be set to the same address as an input device such as a DI4 to indicate input status.

The Module has been approved to Exia Intrinsically Safe Standards for use in hazardous locations. It is a Zone 0 device.

Features

- 16 Bit data Word is written by controller
- On line configuration from iMAC Controller
- Single unique 16 bit address
- Down Line powered
- Four LED outputs
- LED indication to aid fault finding
- Encapsulated Electronics

LED Indication

There is provision for a single LED to be connected to the module to indicate communication status.

Slow flash if the module is communicating to the Controller over the L1 line.

Two flashes when module is being roll called.

Three flashes if there is an address clash or the LED-4 Module has been programmed to an address which has no owner. (ie. No data at that address).

Fast flash if there is a continuous communication error on the communication line.

Intermittent flash indicates a checksum error or an intermittent short or open circuit.



Data Mapping

The iMAC-LED-4 Module reads one 16 bit iMAC address from the communication line and outputs the data to the LEDs.

LED Data:

Bit												Bit			
15												0			
X	X	X	X	X	X	X	X	X	X	X	X	D	D	D	D

Only the lower 4 bits are used for LED data.
The high 12 bits of data are ignored.

Programming Procedure

Programming the iMAC-LED-4 Module is done through the Controller. The procedure below is for programming from a Controller.

Select the Rollcall and Program page from the Controller menu.

- Press <F2> to rollcall each module. The modules are rollcalled in address order. Continue pressing <F2> until the correct module with the correct serial number is displayed.
- Press <F4> to read address parameters. Pressing <F4> will cause the Controller to read the programming parameters from the module and display them on the "Programming Page"
- Edit the parameters.
- Write the parameters back to the module

The Rollcall Page displays the module's rollcall data.

```
MAIN ROLLCALL PAGE
LED4 Module      next>
Serial number: 1111
Address: 101, read>
```

The Rollcall Page displays the type of module, the module's serial number and address.

Output Register Parameters

Parameter 1	Module's Address	User
Parameter 2	Invert Control	0h
Parameter 3	Not used	0h
Parameter 4	Not used	0h

Parameter 1: Is the iMAC Address for LED data. Selecting 0 will put the LED-4 Module offline.

Parameter 2: Is the invert control. The bottom four bits, if set to 1, will invert the corresponding LEDs, driven from those bits.

Parameter 3: not used.

Parameter 4: not used

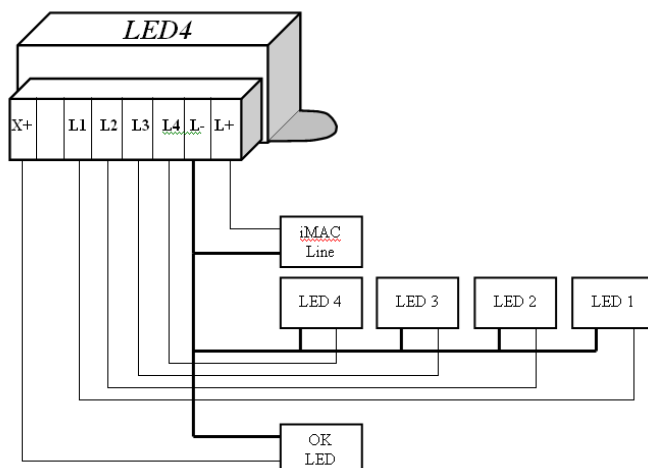
After editing the parameters, arrow down to the "WRITE PARAMETERS?" menu option. Asserting this function will write the parameters back to the module where they will be stored in non-volatile memory.

Press "ESC" to exit without altering the stored parameters.

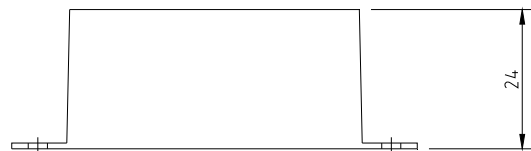
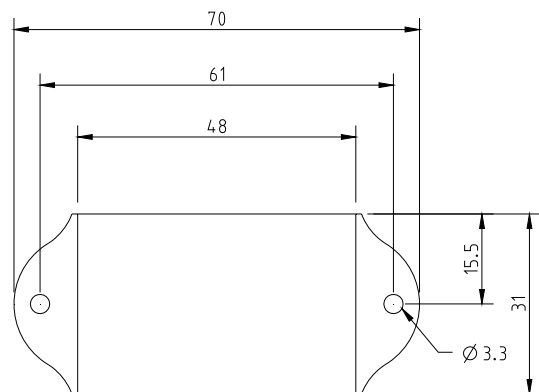
Equipment List

140213 iMAC-LED-4 LED Display Module

Connection Diagram



General Information



Technical Support

imacuser@ampcontrolgroup.com

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285

Phone: (02) 4903 4800

Fax: (02) 4903 4888

E-mail: electronics@ampcontrolgroup.com

Web site: www.ampcontrolgroup.com



SSW

Speed Switch Module

IECEX ITA 07.0017x

Description

The iMAC-SSW Speed Switch Module provides belt slip protection, speed indication and sequence control for conveyor belts using the iMAC Integrated Monitoring and Control System.

The iMAC-SSW Speed Switch Module powers two proximity heads, which monitor the conveyor drive roller and a free running idler roller. The module measures the belt slip by comparing the ratios of the pulses from the two pick-up heads.

Non-volatile memory is used to store the operating parameters of the conveyor belt such as the pulse rate at full speed for both heads. The operating parameters are used to calculate the slip and speed values. Setpoints stored in non-volatile memory in the iMAC-SSW Module are compared against the slip and speed values to determine trip conditions such as Slip Trip, Over Speed Trip or Under Speed Trip.

The iMAC-SSW Module sends the slip percentage, speed percentage, absolute speed, status bits and trip bits to the iMAC Controller for display, dissemination and belt control. The Controller sends control bits to the iMAC-SSW Module for setup control, resetting of trip conditions and testing the operation of the module.

The iMAC-SSW Module and its dual proximity detectors are down line powered from the communication line. No local power is required. The Module has been approved to Exia Intrinsically Safe Standards for use in hazardous locations provided the proximity detectors comply with the approval specifications (see over for details). It is a Zone 0 device.

Features

- Single or dual proximity detector operation
- Adjustable under and over speed protection
- Adjustable true slip protection at all speeds
- Adjustable inhibit timers for slip and speed protection
- Down line powered module and proximity detectors
- OK LED indication for basic fault finding
- Data output for % slip, % Speed and absolute speed
- Data display at iMAC Controller
- On line configuration from iMAC Controller

LED Status Indication

There is provision for a single external LED to be connected to the module to indicate communication status.

Slow flash if the module is communicating to the Controller over the L1 line.

Two flashes when module is being roll called.

Three flashes if there is an address clash.



Data Mapping

The iMAC-SSW Module publishes up to five (5) addresses onto the iMAC System.

1. Status Data	16 bits of Status
2. Control Data	8 bits control, 8 bits status
3. SLIP% Data	16 bit word
4. SPEED% Data	16 bit word
5. Absolute Speed Data	16 bit word

Programming Procedures

The iMAC-SSW Module can be setup using the iMac Controller. The description details for programming from the Controller are documented in the **iMAC-SSW User Manual 118754**.

Specification

Power Supply:

Modules and Proximity Detectors are down line powered from the iMAC communication line.

Speed Range:

60 pulses per minute to 5000 pulses per minute at normal operating conveyor speed

Communication:

iMAC 2 wire Line
500 to 1000 baud

Proximity Detectors:

NAMUR or other approved two wire sensors with the following maximum input parameters:

$V_i = 15.5\text{VDC}$
 $I_i = 52\text{mA}$
 $P_i = 169\text{mW}$
 $C_i = 22.8\mu\text{F}$
 $L_i = 1.23\text{mH}$

Cable Parameters:

The maximum permitted cable parameters between the Module and the proximity detectors:
22.8 μF

Module Dimensions:

188mmH or 2730 $\mu\text{H}/\text{ohm}$
31 H x 70 W x 24 D mm

The iMAC-SSW Speed Switch Module is a compact Intrinsically Safe approved module for use in mining operations for the detection of belt slip.

When two proximity detectors are used, accurate measurement of actual % belt slip is detected at any speed. The slip inhibit timer should be set to time out after the conveyor is moving and several pulses have been received from both proximity detectors. The inhibit timer for Under/Over speed protection should be set to time out after the conveyor has reached maximum speed.

In single head mode only the idler head is used (head 2) and the drive head (head 1) is ignored. SLIP protection and Under/Over Speed protection.

Both have inhibit timers and both have percentage maximums which should not be exceeded once the inhibit timers have expired. Both inhibit timers should be set so that the belt is up to speed before the timer expires.

Trip Conditions

The Trip Bit in the Status Data word (bit 0) indicates that a trip condition has occurred. A trip condition can be caused from:

1. Slip exceeding its trip setting after the Slip Inhibit Timer has expired.
2. Under/Over speed exceeding its trip setting after the Under/Over Inhibit Timer has expired.
3. Non-volatile memory corruption on power up.
4. No pulses from a proximity head after the Slip Inhibit Timer has expired.
5. A proximity head is not connected.
6. Test function is asserted

A TRIP condition can only be cleared using the Reset Function in the Controller SSW Page. A TEST function is also available which will cause the iMAC-SSW Module to Trip.

Brake Release Control

The Brake Release bit in the Status Data word (bit 1) is asserted as soon as the MC Control is asserted. The Brake bit will remain asserted through the ramp up and ramp down of the conveyor belt until the speed is less than the Brake Setpoint (usually 15%) at which point the Brake Release bit is cleared. In the case where the conveyor does not reach 15% speed before a slowing down, the Brake Release bit is cleared when the conveyor Stopped bit is asserted.

The Brake Setpoint is a number between 0 and 1000 representing a setpoint between 0 and 100%. For 15% the value for the setpoint should equal 150 (Decimal), 96 (Hexadecimal).

Sequence Control

The Sequence bit in the Status Data word (bit 2) is asserted when the speed exceeds the Sequence Setpoint (usually 65%). The Sequence bit is cleared when the speed is less than the Sequence Setpoint.

The Sequence Setpoint is a number between 0 and 1000 representing a setpoint between 0 and 100%. For 65% the

value for the setpoint should be 650 (Decimal), 28A (Hexadecimal).

Speed and Absolute Speed

The iMAC-SSW Module calculates the percentage speed and absolute speed, which can be read by the iMAC Controller as 16 bit words. The speed variables are calculated from the idler head pulses (Head 2) and operating parameters stored during the setup procedure.

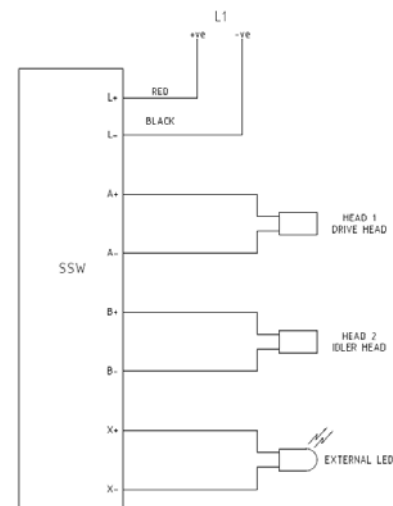
The percentage speed variable is used to determine Brake and Sequence control bits. The brake and sequence setpoints must be setup by the user.

The absolute speed is generated for display purposes only. To calculate absolute speed the iMAC-SSW Modules needs to be setup with parameters that specify the diameter of the reference roller and the number of targets on the roller.

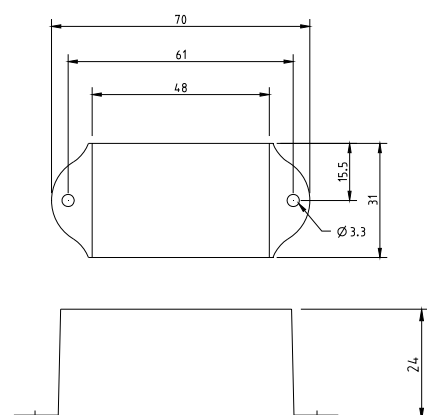
Equipment List

121910 iMAC SSW I.S. Speed Switch Module

Connection Diagram



General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

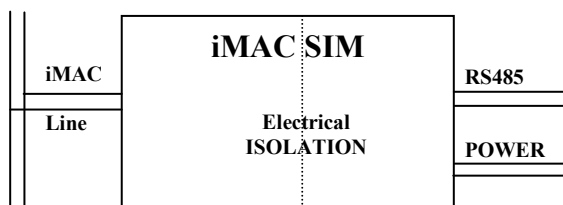
SIM

Serial Interface Module

IECEX ITA 07.0017x

Description

The iMAC SIM modules come in three variances: SIM G, SIM G2 and SIM T. The SIM G communicates to one Gasguard controller. The SIM G2 communicates with two Gasguard controllers. The SIM T is a serial interface module for RS485 communication to the Trolex 9042 Controller. The SIM module uses the Modbus communication protocol to transfer data from the Trolex 'host' system to the iMAC system. The SIM is the Master and the host system is the Slave.



The processor in the iMAC SIM is powered from the iMAC communication line. This arrangement assures the SIM can send back status information about the serial link even if there is no power to the host system. The iMAC system measures resistance out to the SIM module and maintains a count of communication errors.

The SIM processor and iMAC line are electrically isolated from the RS485 interface and the host system communication line. The RS485 driver side of the SIM module requires power to effect communications. The electrical isolation eliminates the problem of ground loops between the host system and the iMAC system.

The SIM is a ZONE 0 intrinsically safe module. The RS485 side of the SIM should be powered from an intrinsically safe power supply with an output of 9 to 16VDC. The RS485 interface is also intrinsically safe.

The iMAC SIM is programmed to interface to specific host systems such as Trolex or Gasguard gas monitoring systems.

Features

- RS485 serial communication port
- Modbus RTU Protocol
- On line configuration from iMAC Controller
- Low cost installation
- DIN rail or foot mount
- LED indication to aid fault finding



LED Status Indication

There are two LEDs visible from the front of the module to indicate iMAC communication status and RS485 communication status. Both LEDs are powered from the iMAC communication line.

RS485 LED

RS485 LED flashes every time the SIM module reads data from the 9042 Controller.

iMAC LED

Slow flash The module is communicating with the iMAC Controller, no alarms are active and the RS485 port is working correctly.

Two flashes The module is being roll called by the iMAC Controller.

Three flashes Address clash – the module has the same address as another module connected to the signal line.

Fast flash RS485 communication port is not functioning correctly.

Data Mapping

The iMAC SIM Module publishes four words of digital data and 12 words of analogue data onto the iMAC communication line. The iMAC SIM also retrieves 20 words of setpoint and setup data from the Trolex system. Please refer to the iMAC SIM Data Table Technical Information Sheet iMACB027 for a detailed data table layout.

Words 1 to 4 – digital data

The first four digital words contain the trip/alarm data from the eight 9042 channels and communication status from the SIM module.

Words 5 to 16 – analogue data

Words 5 to 12 are the eight input channel analogue values from the 9042 Controller.

Words 13 to 16 provide SIM firmware version, an RS485 communication error count and the SIM serial number.

Programming Procedures

For programming information see the iMAC User Manual or Technical Information Sheet iMACB005.

SIM Rollcall

The roll call displays the following information.

```
MAIN ROLLCALL PAGE
SIM Module next>
Serial number: 1111
Address: 100, read>
```

SIM Programming Parameters

Parameter	Description	Range
Parameter 1	iMAC Address	1..255d
Parameter 2	Trolex 9042 Modbus Address	1..1Fh
Parameter 3	Not Used	
Parameter 4	Not Used	

Parameter 1: Is the iMAC Address of the SIM. Setting this to 0 will put the SIM offline. This is the base address for the first word of data. The other data words follow consecutively.

Parameter 2: Is the Modbus address of the Slave device, i.e. the Trolex 9042 Controller. This setting should match the Modbus address set in the 9042 Controller's communication settings. A SIM can only be connected to **one** 9042 Controller and therefore the factory default address of 1 is usually left unchanged.

Parameters 3 and 4: Not used

Specifications

Power Supply:

9-16 VDC IS power to RS485 side

Current Consumption: 9VDC = 9mA, 12VDC = 18mA and 16VDC = 29mA

RS485 Communication Port:

Baud Rate = 2400 bps

Data Bits = 8

Parity = None

Maximum serial cable length = 300m

iMAC Communication Port:

iMAC 2 wire Multi-drop Line

500 to 1000 baud

Maximum distance between SIM and iMAC Controller = 5000m depending on cable used and the number of iMAC modules connected.

Module Dimensions:

75 H x 22.5 W x 98 D

Equipment List

121915	iMAC SIM G
121916	iMAC SIM G2
121917	iMAC SIM Trolex

Connection Diagram

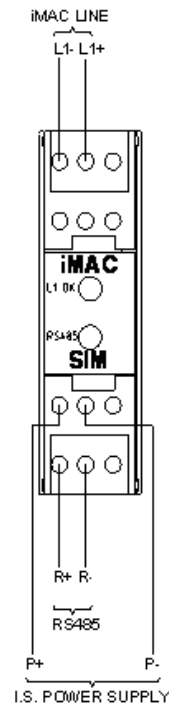


Figure 1: Connection Diagram of all SIM Modules.

General Arrangement

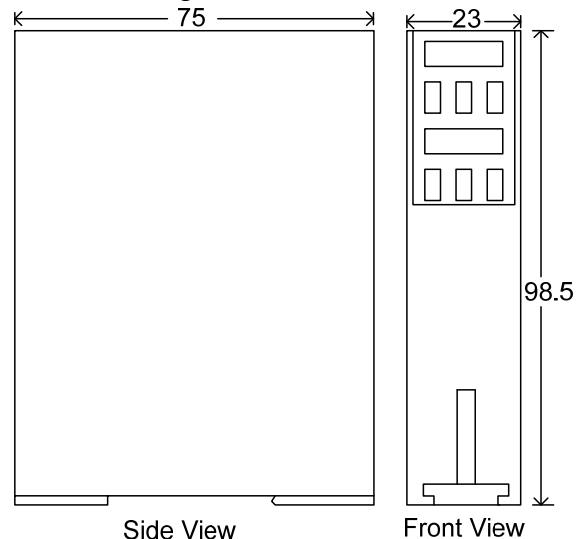


Figure 2: General arrangement of all SIM modules.

Technical Support

imacuser@ampcontrolgroup.com

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285

Phone: (02) 4903 4800

Fax: (02) 4903 4888

E-mail: electronics@ampcontrolgroup.com

Web site: www.ampcontrolgroup.com



MLB/SLB

Master / Slave Line Barrier

IECEX ITA 07.0017x

Description

The iMAC System has been approved as intrinsically safe for use with Group I and II gases, using the appropriate Master Line Barrier and Slave Line Barrier. This allows the communication lines and input modules to be installed in hazardous locations.

The Master Line Barrier is DIN rail mounted and is powered from iMAC. **A power supply is only required for the SLB (110VAC or 240VAC).** (See over for connection diagram).

To allow Intrinsically Safe communication lines into a hazardous area connect the L1 terminals of the iMAC Controller to the L1 'Safe Area' terminals of the Master Line Barrier. **Ensure the Barrier is earthed.** Connect the communication lines into the 'Hazardous Area' terminals of the Barrier. I/O Modules that have been approved as Intrinsically Safe can be directly connected to the communication line.

Note:

To maintain IECEx approvals, 3 earths of 4mm² should be used (See over for connection diagram).

If a cable with continuous screening is used for the control line, the screening should be earthed at the iMAC earth connection on the Master Barrier. This is to avoid the possibility of multiple L1+ to screening faults defeating stop switches. There should be no iMAC earth connection on the controller. If screened cable is used between the Controller and the barrier, it should be earthed at the Barrier end only to avoid circulating earth currents, which introduces noise resulting in corrupt data.

To connect non IS Modules to the Intrinsically Safe communication line they must be connected through a SLB. The SLB and the module must be installed in a safe area or flameproof enclosure. Connect the Barrier to a 110V or 240V power supply. Connect the line terminals of the module to the L2 'Safe Area' terminals. The L2 'Hazardous Area' terminals are to be connected to the Intrinsically Safe communication line. Observe polarity.



Features

- Encapsulated, robust, reliable electronics
- Din Rail Mounted

LED Status Indication

No LED indicators

Data Mapping

Not applicable.

Programming Procedures

No programming necessary.

Specifications

Power Supply:

MLB is powered from iMAC Communication Line.
SLB is powered from 110VAC or 240VAC.

Communication:

500 to 1000 baud rate

Inputs:

L1 hazardous line

Outputs:

Isolated L1 line

Dimensions:

MLB Module: 25W x 75H x 110D mm
SLB Module: 55W x 75H x 110D mm

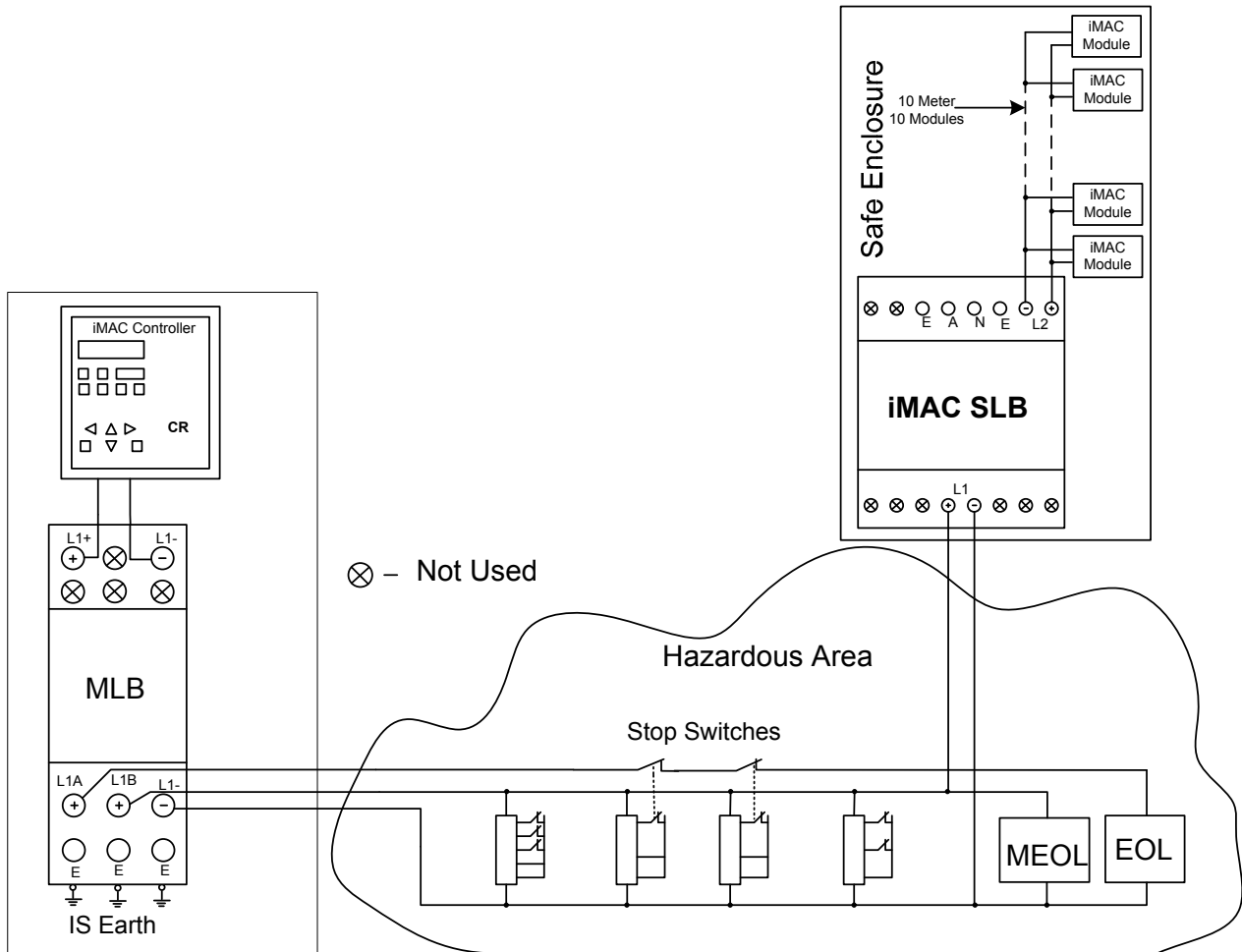
Operating Environment:

0 to 50°C

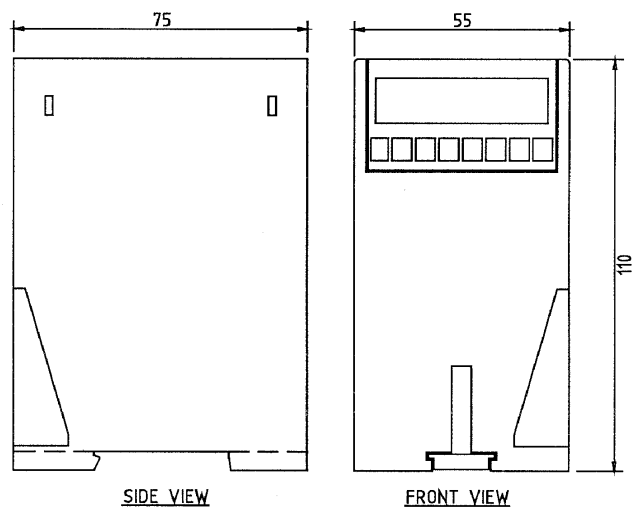
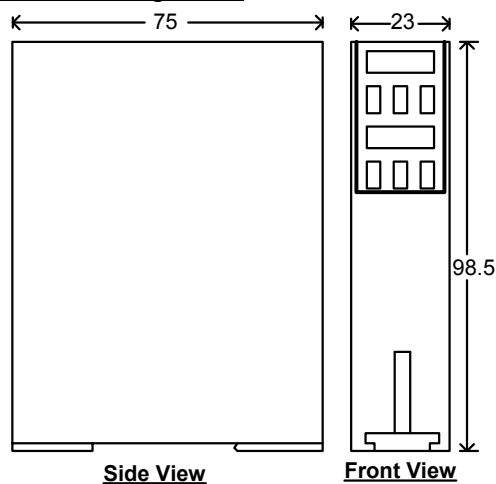
Equipment List

121923	iMAC MLB I.S.
141069	iMAC MLB I.S. SA
100333	iMAC SLB 110V I.S.
100347	iMAC SLB 240V I.S.

Connection Diagram



General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

EMM, CRM, ARM and GRM

Single Relay Modules

IECEX ITA 07.0017X



Description

The single relay modules are used to provide remote control or duplication of iMAC controller functions.

When connected to an iMAC Intrinsically Safe Communication line all single relay modules must be installed in a safe area or a flameproof enclosure.

The core function of the iMAC System is the End of Line Monitoring and the conditioning of the Control Relay (CR) with 'Signal Line Healthy'. This is the **key safety feature** of this relay that is located in the iMAC Controller. 'Signal Line Healthy' is generated if and only if the End of Line Module has successfully communicated with the Controller over eight (8) scans. The End of Line Module has a unique serial number that the Controller continually checks.

The end of line data is located in a separate part of the communication protocol to the 'user data' so that it cannot be corrupted by erroneous input addresses. The 'Signal Line Healthy' message is applied to the Control Relay unconditionally and cannot be corrupted or overridden by the user programmable sections.

EMM

The non-programmable iMAC-EMM End of Line Monitoring Module that will monitor the unique 'Signal Line Healthy' signal from the End of Line Module to provide an alternative control relay (CR) for the iMAC System. The Module is approved to Intrinsically Safe Standards.

The iMAC-EMM Module will tolerate 1 bit of data corruption in 8 scans and the CR contacts will open immediately if there is no reply from the End of Line Module or there has been more than 1 bit of data corruption. The EMM is best suited for 2 wire control applications.

CRM

The CRM operates in a similar way to the EMM with the exception that the CRM relay will not energise unless EOL data is present and iMAC signal line address 0, bit 0 is asserted from the iMAC controller. The CRM provides iMAC controller Control Relay (CR) functionality. The iMAC-CRM Module will tolerate 1 bit of data corruption in 8 scans of the EOL data and 1 corruption in 2 scans of the address 0 bit 0 data. The CR contacts will open immediately if these conditions are not maintained.

The CRM is best suited for 3 wire control applications.

ARM

The ARM operates if address 0, bit 1 is asserted from the iMAC controller. The ARM will tolerate 1 corruption in 2 scans of address 0, bit 1. The ARM provides a redundant iMAC controller Auxiliary Relay (AR) functionality.

The ARM is suited to either 2 or 3 wire control or monitoring applications. The ARM does not require the EOL data to operate.

The iMAC-EMM, CRM and ARM Modules can be used with tripper drives and higher-level safety systems.

GRM

The GRM provides a general purpose single relay output. The module can be installed along the length of a conveyor to provide a single relay output. The module reads address 0 in the iMAC controller and can be set to operate off any bit (0-7) via a rotary switch inside the module.

Specific user functionality can be programmed into the controller to operate a particular bit in address zero, this relay output can then be used to operate pre-start warnings along a conveyor as an example.

Features

- Compact design
- Din Rail mounted.
- Robust, reliable electronics

LED Indication

A red high intensity LED mounted on the front of the modules indicates the module's status.

Slow flash healthy

Two flash when module is roll called.

Three flash if there is an address clash

Fast flash checksum error

Data Mapping

For the CRM and ARM to operate the iMAC controller user software must contain procedures to assert address 0, bit 0 and 1 respectively when the iMAC controllers CR and AR relay are energised.

The single relay modules operate when the following conditions are met.

EMM	EOL data detected
CRM	EOL data detected + 0:0
ARM	0:1
GRM	0: Bit 0 - 7

Programming Procedures

The modules have fixed address which can't be changed. The GRM module has a rotary switch, used to select which bit it will operate from.

Specifications

Power Supply:

110VAC 50Hz
240VAC 50Hz
24VDC

Mounting

Din Rail

Dimensions:

55 W x 75 H x 110 D mm

Relay Contact:

1 N/O 8A 240V

Communication:

iMAC 2/3 wire Line
300 to 1000 baud

Operating Environment:

0 to 50°C

Equipment List

115153	iMAC-EMM 110V IS
115154	iMAC-EMM 240V IS
115151	iMAC-CRM 24VDC IS
115152	iMAC-CRM 110V IS
115149	iMAC-ARM 24VDC IS
115150	iMAC-ARM 110V IS
115155	iMAC-GRM 24VDC IS
115156	iMAC-GRM 110V IS
115146	iMAC-GRM 240V IS

Connection Diagram

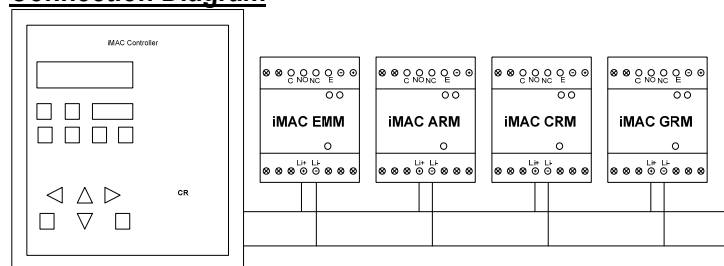


Figure 1: Connection diagram for EMM, ARM, CRM and GRM

General Information

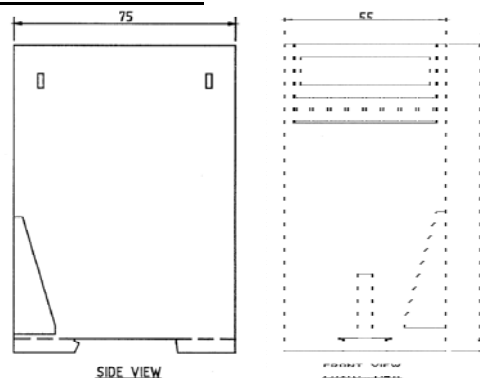


Figure 2: General Arrangement of EMM, ARM, CRM and GRM.

Technical Support

imacuser@ampcontrolgroup.com

AIM

Single Analogue Input Module

IECEX ITA 07.0017X

Description

The iMAC-AIM is an analogue input module for the monitoring of voltage or current field process signals. The iMAC-AIM is available in the following factory calibrated configurations:

- 0-20mA Current Input (P/N: 121882)
- 0-10V Voltage Input (P/N: 121881)

The iMAC-AIM requires a 9V to 24VDC local power supply. The power supply voltage is also monitored as an analogue input.

The iMAC-AIM is factory calibrated to 0-20mA or 0-10V ranges. The AIM performs multiple samples over a 20ms period to average out 50Hz noise. The absolute accuracy of the analogue input is 1%. The analogue input is electrically isolated from the iMAC communication line.

Features

- 16 Bit Word for setpoint thresholds and faults
- 16 Bit Word for analogue input
- 16 Bit Word for power supply voltage
- On line configuration from iMAC Controller
- Low cost installation
- LED Indication to aid fault finding

LED Status Indication

OK LED (RED): Indicates communication status:
Slow flash if the module is communicating to the Controller over the L1 line with no alarms active.
Two flashes when module is being roll called.
Three flashes if there is an address clash.
Fast flash if iMAC communications has failed.

Data Mapping

The iMAC-AIM occupies three iMAC addresses, which allows the module to publish three Data words onto the iMAC communication line

- Status Data,
- Analogue Input value,
- Power Supply analogue value

The Analogue input has three Setpoints. The Power Supply monitor has two Setpoints.

The low byte of the Status Data indicates the status of the Analogue and Power Supply inputs. There is an alarm bit for each of the Setpoints on the two analogue inputs, and an internal fault indication.

The high byte allows specific control to allow calibration of the two analogue inputs. If both bits 8 and 9 are SET the raw ADC values are transmitted instead of the engineered analogue values



Engineering Unit factory calibrated ranges:

Current Module	20% = 4000
	100% = 20000
Voltage Module	20% = 2000
	100% = 10000

Note: Setpoint values fall within the min and max ranges

Status Data:

Status Data Bit	Assert	
0 – LT Setpoint 1 analogue input	1	Output bits from AIM module to iMAC
1 – GE Setpoint 2 analogue input	1	
2 – GE Setpoint 3 analogue input	1	
3 – GE sp 1, LT sp 2 analogue input	1	
4 – GE sp 2, LT sp 3 analogue input	1	
5 – LT PowerSupply Setpoint 1	1	
6 – LT PowerSupply Setpoint 2	1	
7 – Internal Fault	1	Control from iMAC to AIM module
8 – Setup Mode	1	
9 – Assert Raw Values	1	
10 – 15 not used	n/a	

GE = Greater Than or Equal

LT = Less Than

Analogue Input Value:

The analogue input is converted to engineering units and output to the iMAC Controller. The Engineering units, are configurable.

Analogue Input Signal - Engineering Units

0mA	-	0
4mA	-	4,000
20mA	-	20,000
0V	-	0
10V	-	10000

Power Supply Analogue Value:

The Power Supply is monitored and converted to fixed engineering units and output to the iMAC Controller.

Battery Input Signal - Engineering Units

0V	-	Module Offline
10V	-	10,000
24V	-	24,000

Programming Procedures

Rollcall Address

The first roll call displays the Status Data register.

```
MAIN ROLLCALL PAGE
AIM Status      next>
Serial number: 1111
Address: 100,  read>
```


The second roll call displays the Analogue Register.

```
MAIN ROLLCALL PAGE
AIM Analog    next>
Serial number: 1111
Address: 101, read>
```

The third roll call displays the Power Supply Register.

```
MAIN ROLLCALL PAGE
AIM PowerSuppl next>
Serial number: 1111
Address: 102, read>
```

The Serial Number is the same in all Rollcalls because the same module (AIM module) replies to all rollcalls.

Status Programming Parameters

Parameter 1	iMAC Address
Parameter 2	Exception Trigger
Parameter 3	20% Engineering Unit
Parameter 4	100% Engineering Unit

Parameter 1: iMAC Address for the modules Status Data. Selecting 0 will put the Status Data offline. 0-255.

Parameter 2: Difference between successive analogue sample values that will cause an exception scan. Range 0 to 20,000. The default value is 1000 = a 5% change.

Parameter 3&4: Engineering units at 20% and 100%.

Analogue Input Parameters

Parameter 1	iMAC Address
Parameter 2	Set Point 1
Parameter 3	Set Point 2
Parameter 4	Set Point 3

Parameter 1: iMAC Address for the modules Analogue Data. Selecting 0 will put the Analogue Input Data offline.

Parameter 2: Setpoint 1 in Engineering units

Parameter 3: Setpoint 2 in Engineering units.

Parameter 4: Setpoint 3 in Engineering units.

Other bits are set or cleared in the Digital Status word as a result of these setpoints. See Digital Status above.

Battery Voltage Parameters

Parameter 1	iMAC Address
Parameter 2	Power Supply Set Point 1
Parameter 3	Power Supply Set Point 2
Parameter 4	Number of samples=500

Parameter 1: iMAC Address for the modules Analogue Data. Selecting 0 will put the Analogue Input Data offline.

Parameter 2: Setpoint 1 in Engineering units

Parameter 3: Setpoint 2 in Engineering units.

Parameter 4: Number of samples for both Analogues. Each sample takes 1msecond. Default=500. ie. 1 second to sample both Analogue and Power Supply. Should be a multiple of the base noise frequency (20ms for 50Hz)

Specifications

Power Supply:

9-16.5VDC (IS power supply) 9-24VDC (non IS)

4ma current draw from power supply.

1% absolute accuracy. 1ma load on L1 line

Inputs:

Analogue Inputs

0-20mA Input Z=62ohms

Communication

iMAC 2 Wire Line

0-10V Input Z=10,000ohms
1% absolute accuracy.

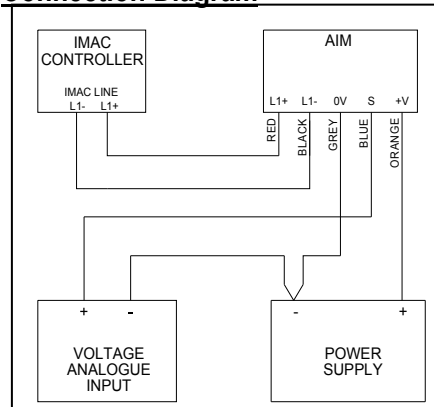
300 to 1000 baud
1ma load on L1 line

CAUTION: Shorting analogue input (blue) with live +V (orange) will cause module internal fuse to blow rendering the module permanently inoperative.

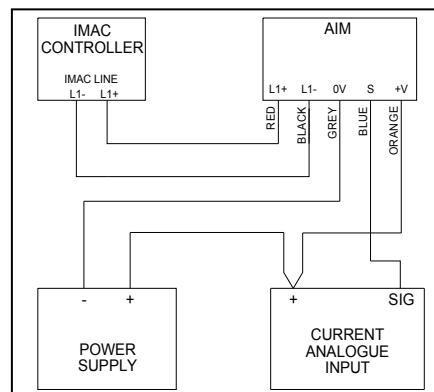
Equipment List

121881 iMAC AIM IS 0-10V Module
121882 iMAC-AIM IS 4-20ma Module

Connection Diagram

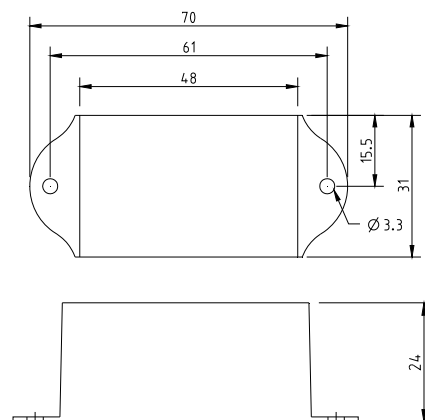


0-10 Volt Module



0-20 mA Module

General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

RTD1

Temperature Module

IECEX ITA 07.0017x



Description

The iMAC-RTD1 Temperature Module is an intrinsically safe field module for monitoring temperature using a RTD PT100 temperature transducer. The supported RTD temperature measurement range is from -20°C to 300°C. The PT100 is connected using a 3-wire configuration.

The iMAC-RTD1 Module publishes two 16 bit words onto the iMAC communication line. One 16 bit word for the PT100 temperature value and one 16 bit word for PT100 status and error bits.

The iMAC-RTD1 Module is powered from the iMAC L1 line. Each Module draws 7mA peak current from the iMAC controller.

There is a precision resistor used in the RTD1 Module to calculate the resistance of the PT100 sensor. The RTD1 Module uses a 10 bit Analog to Digital Converter and corrects the parabolic RTD response using a high order piecewise linear approximation method. The RTD1 Module corrects for the temperature effects on reference voltages.

Features

- 1x 16 bit PT100 temperature data word (Addressable 1..255)
- 1x 16 bit PT100 status word (Addressable 1..255)
- On line configuration from iMAC Controller
- Monitors 1x PT100 Temperature Sensor
- 3-wire PT100 termination
- Low cost installation
- LED Indication to aid fault finding
- Down line powered – over communication pair

Led Status Indication

- **Slow flash** if the module is communicating to the Controller over the L1 line with no alarms active.
- **Two flashes** when module is being roll called.
- **Three flashes** if there is an address clash.
- **Fast flash** the RTD1 Module has an active alarm.

Data Mapping

The RTD1 Module publishes Status Data and Temperature Data onto the iMAC communication line. The Status Data and error bits indicate the status of the PT100 transducer and help identify faults (not-connected, over-range, under-range, etc.)

Bit								Bit							
15								8	7						0
X	X	X	X	X	X	X	X	X	X	HT	LT	TR	WF	OC	SC

RTD 16-Bit Status Word (A1..255)

SC – RTD Short Circuit	1=Fault	0=OKAY
OC – RTD Open Circuit	1=Fault	0=OKAY
WF – RTD sense Wire Fault	1=Fault	0=OKAY
TR –Temperature out of Range	1=Fault	0=OKAY
LT – Low Temperature alarm	1=Alarm	0=OKAY
HT – High Temperature alarm	1=Alarm	0=OKAY
X – not used		

RTD short circuit =>RTD sensor resistance is less than ~50 ohms.

RTD open circuit =>RTD sensor resistance is greater than ~250 ohms.

RTD sensor wire fault =>abnormal sensing signal.

The temperature data word is defined as follows:

Bit								Bit							
15								8	7						0
T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

RTD 16-Bit Temp Data Word (A1..255)

16 bit 2s Compliment representation of temperature in 1degree Celsius.

If there is any fault, temperature value is set to 999.

Programming Procedure

Select the Rollcall and Program page from the Controller menu.

- Press <F2> to rollcall each module. The modules are rollcalled in address order. Keep pressing <F2> until the correct module with the correct serial number is displayed.

- MAIN ROLLCALL PAGE
RTD1 Temp next>
Serial number: 1111
Address: 21, read>
- Press <F4> to read address parameters. Pressing <F4> will cause the Controller to read the programming parameters from the module and display the parameters on the "Programming Page"
- Edit the parameters by pressing the function key corresponding to parameter for editing. Use the arrow keys to edit the value. Save edits by re-pressing the corresponding function key. To cancel edits press the <ESC> key.
- Write the edited parameters to the module by pressing the function key corresponding to the "Write Parameters ?" message. Note the down arrow may have to be used to locate this message. This writes the parameter values into the module non-volatile memory.
- The Serial Number is the same in all Rollcalls because the same module (RTD1 module) is producing all rollcalls.

MAIN ROLLCALL PAGE
RTD1 Status next>
Serial number: 1111
Address: 20, read>

- Parameter 1:** Is the iMAC Address into which the temperature will be published. Selecting 0 will put the temperature variable offline.
- Parameter 2:** Temperature LOW set point for the alarm bit in the Status Word. Set point is a 16 bit, 2s compliment representation of temperature in Celsius.
- Parameter 3:** Not used
- Parameter 4:** Temperature HIGH set point for the alarm bit in the Status Word. Set point is a 16 bit, 2s compliment representation of temperature in Celsius.

Status Address

Parameter	Meaning	Range
Parameter 1	iMAC RTD1 Status Address	1..255d
Parameter 2	Not Used	N/A
Parameter 3	Not Used	N/A
Parameter 4	L1+ voltage (1/10V)	0..200d

Temperature Address

Parameter	Meaning	Range
Parameter 1	iMAC RTD1 Temp Address	1..255d
Parameter 2	Low Set point	
Parameter 3	Not Used	N/A
Parameter 4	High Set point	

Specifications

Power Supply:

Powered from iMAC Communication Line.

Inputs:

1 x PT100 Temperature Sensor (3-wire connection)
-20°C to 300°C

Communication:

iMAC 2/3 Wire Line.
300 to 1000 baud

Operating Environment:

0 to 50°C.

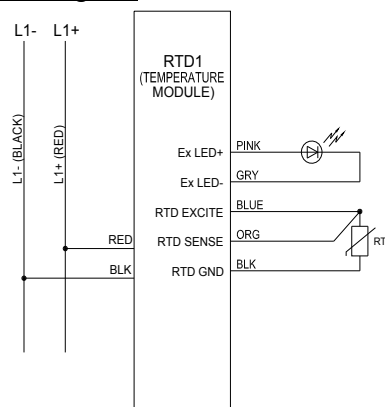
Overall Dimensions:

70L x 31W x 24H mm

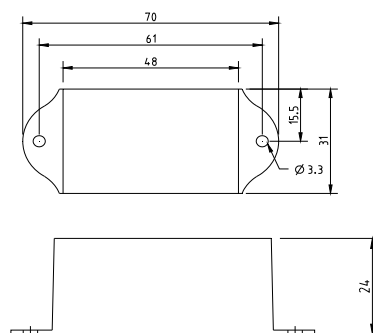
Equipment List

121890	iMAC-RTD1 Temperature Module Without LED
121889	iMAC-RTD1 Temperature Module With LED
141063	iMAC RTD1 I.S. cw LED lecEx SA

Connection Diagram



General Arrangement



Technical Support

imacuser@ampcontrolgroup.com

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285
Phone: (02) 4903 4800
Fax: (02) 4903 4888
E-mail: electronics@ampcontrolgroup.com
Web site: www.ampcontrolgroup.com



VCA VOICECOM CONTROLLER

COMMUNICATIONS

Applications

The Voicecom Controller (VCA) is the master controller for the Ampcontrol Voicecom system. The Voicecom system can be easily configured and interrogated from the VCA. The VCA also allows the Voicecom system to be interfaced with a control system such as a PLC, which enables remote monitoring.

Typical applications for the communication system include longwall and conveyor communications, point-to-point intercom and messaging systems. The system provides pre-start warning alarms, push to talk voice intercom and pre-recorded voice message paging functions.



Features and Benefits

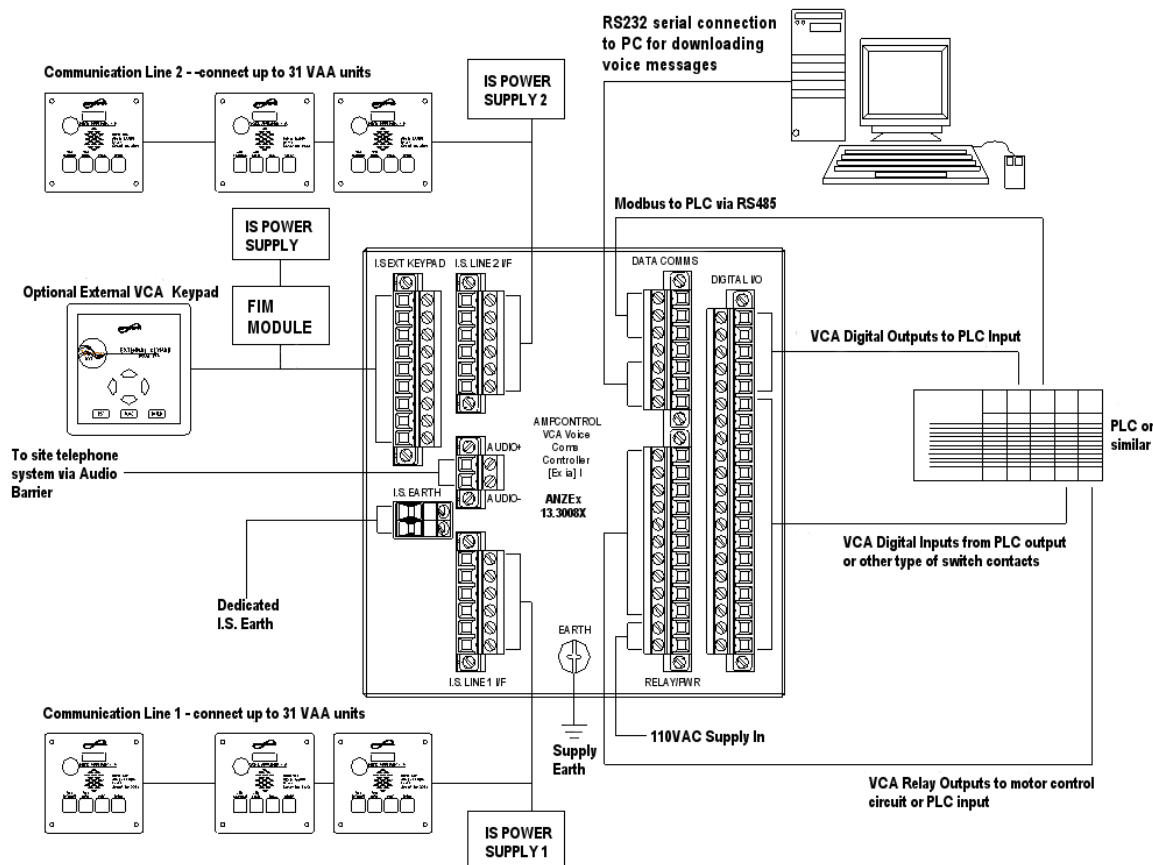
- Two communication lines, each supporting up to 31 VAA amplifiers
- Supports up to 255 user recorded messages
- Supports messages saved in the standard WAV audio format that can be recorded using any freely available PC based audio software and downloaded into the VCA via its RS232 interface
- Modbus RS485 interface for PLC/SCADA connection allowing system monitoring, trending and control of voice messages
- Hard wired digital I/O interface for controlling pre-start alarm functions and voice messages
- Intrinsically Safe remote keypad digital inputs for easy integration with flameproof enclosures
- Pre-start warning alarm, PTT intercom and voice message control in a single, compact unit
- Independent pre-start alarm control on two lines allows one central unit for longwall operations (eg separate prestart control for BSL and AFC operations)
- Eight selectable pre-start tones to distinguish between different equipment (eg different pre-start tones for BSL and AFC operations)
- Pre-start warning alarm confirmation operation from every VAA
- Monitoring of battery voltage and battery current from every VAA allows the user to identify aging batteries and replace them during a maintenance shift
- Monitoring of line voltage from every VAA allows line faults to be identified and located quickly
- Speaker volume level at every VAA can be controlled from the VCA and altered to meet location requirements
- Amplifier turn-on threshold level at every VAA can be controlled from the VCA to prevent false amplifier operation
- Auxiliary audio interface allows connection to telephone systems using optional certified barriers.

Description

The Ampcontrol VCA controls two communication lines with up to thirty-one (31) Voicecom Amplifiers (VAA) per line. The controller provides seamless audio communication between the two communication lines, controls and monitors pre-start alarms via a digital communication link and allows the user to set VAA amplifier parameters such as volume, audio threshold and battery charging current.

The VCA is designed to be panel mounted and provides IP65 protection once installed.

Typical Connection Diagram (refer to Voicecom Product Manual for detailed information)



Specifications

Certificates/Approvals

Type	[Ex ia] I (Intrinsically Safe)
Certificate Number	ANZEx 13.3008X

Power Supply

Voltage	110VAC +/- 20%, 50/60Hz
Power Rating	<8W

Environmental Conditions

Temperature Range	0°C to +50°C
-------------------	--------------

Mechanical

Dimensions (HxWxD)	155 x 155 x 138mm (135 x 135mm panel mount cut-out)
--------------------	--

IS Parameters¹

Input Parameters

Parameters	Non-IS Connectors COMMs, DIGITAL I/O, RELAY/PWR	IS LINE I/F Connectors LINE 1, LINE 2 (0V, Audio, Call, -VLine, -VPS)	J1 – IS EXT KPD Connector (KP1, KP2,...KP8, COM)
Maximum Non-IS Voltage U_m	250V		
Maximum Input Voltage U_i		19V	19V
Maximum Input Current I_i		3A	
Maximum Input Capacitance C_i		Negligible	Negligible
Maximum Input Inductance L_i		Negligible	Negligible

Output Parameters			
Parameters	IS LINE I/F Connector: AUX (Audio+, Audio-)	IS LINE I/F Connectors LINE 1, LINE 2 (0V, Audio, Call, -VLine, -VPS)	J1 – IS EXT KPD Connector (KP1, KP2,...KP8, COM)
Maximum Output Voltage Uo	8.94V	Parameters of the certified power supply used to connect to LINE 1 / LINE 2 (19V max.)	Parameters of the certified power supply used to connect to J1 (19V max.)
Maximum Output Current Io	23mA		
Maximum Output Capacitance Co	1.8μF		
Maximum Output Inductance Lo	38mH		
¹ Refer to Certificate of Conformity ANZEx 13.3008X for all conditions of certification.			

Digital I/O – for status, pre-start and message initiation	
Inputs	14 (opto-isolated, 2 for pre-start control, 12 for voice message initiation)
<i>Voltage</i>	12-24VDC, 24VDC nominal (28VDC max.)
<i>Current</i>	<6mA (4.7kΩ input impedance per input)
Outputs	4 (common collector, open emitter opto-outputs)
<i>Voltage</i>	24VDC nominal (28VDC max.)
<i>Current</i>	<11mA (2.2kΩ collector impedance per output)

Relay Outputs – for status and pre-start confirmation	
Relay	4 (2 C/O, 2 N/O)
Voltage	250VAC max.
Current	5A

Communications	
Type	RS232 to PC (dedicated for Voice Message Bank downloading only) RS485 to PLC (Slave Modbus RTU protocol)
Message Bank Memory	
<i>Capacity</i>	16MB Flash Memory (190 seconds of messages at 44kHz/16-bit CD audio quality or 1520 seconds of messages at 11kHz/8-bit uLaw AM audio quality)
<i>No. Messages</i>	255 max.
<i>Supported Audio Files</i>	WAV

IS Interfaces	
L1 and L2 Communication Lines	Four terminals for communication line (0V, Audio, Call, -VLine). Two terminals for I.S power supply connection (0V and –V PS1)
Auxiliary Audio Interface	Two terminals for bi-directional connection to external telephone system via optional certified barriers
Remote Keypad Interface	Nine terminals for connection to Remote Keypad with I.S. power supply
Earth	Two terminals for minimum 2x4mm ² earth wires to local I.S. Earth.

Ordering Information	
Part Number	Description
101269	CONTROLLER VCA VOICECOM ANZEx

Accessories	
Part Number	Description
120664	KEYPAD VOICECOM VCA REMOTE
142315	MODULE FIM FIELD INTERFACE 1W IECEx
121100	MODULE VIA VCOM AUDIO ISOLATION
121225	S/ASSY PCB VRA 2 TO 4 WIRE VOICE AMP

VAA VOICECOM AMPLIFIER

COMMUNICATIONS

Applications

The Voicecom Amplifier (VAA) is the field communication module for the Ampcontrol VoiceCom System. The module is approved to Ex ia Intrinsically Safe Standards for use in Group I, Zone 0 hazardous areas.

Typical applications of the communication system include Longwall and conveyor communications, point-to-point intercom and messaging systems. The system provides pre-start warning alarms, push to talk voice intercom and pre-recorded voice message paging functions.



Features

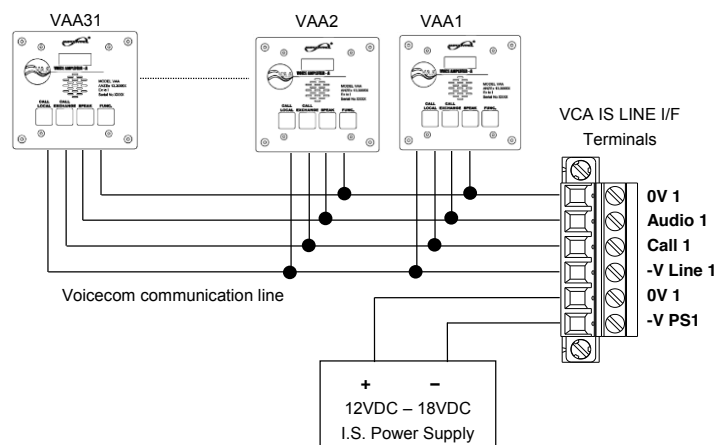
- LCD indication for Line Voltage, Battery Voltage, Battery Current, VAA Address, Communications Status, Amplifier Status and Low Battery Warning
- Local generation of pre-start warning alarm tones and call function tones
- Adjustable pre-start warning alarm pass/fail monitoring
- Digital communication of VAA status back to VCA Controller
- Remote diagnostics (Modbus RTU communications via VCA)
- Settings configurable locally (at VAA) or remotely (via VCA)
- High quality weather proof loudspeakers (Mylar cone)
- Long battery life due to efficient Class-D amplification and low power circuitry design
- Replaceable battery pack

Product description

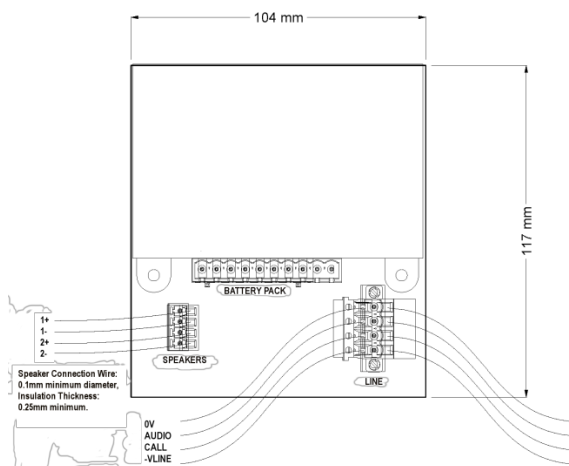
The VAA has an integral microphone and connections for two loud speakers. Four push buttons provide calling functions and a LCD display provides status indication.

The VAA is available as a sub-assembly suitable for panel mounting or as standard unit housed in a specialised stainless steel enclosure with integral speaker grills and options for plug and socket or glanded cable entries.

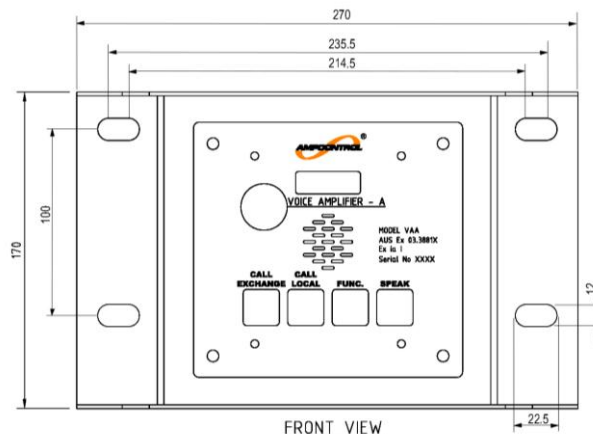
Typical Connection Diagram (refer to VoiceCom Product Manual for detailed information)



General Arrangement



Panel Mount VAA Sub-assembly
(rear view - terminals)





Standard VAA in Steel Enclosure

Specifications	
Certificates/Approvals	
Type	Ex ia I (Intrinsically Safe)
Certificate Number	ANZEx 13.3005X
Power Supply	
Voltage	-10VDC to -19VDC
Charge Current	Selectable from 5mA to 40mA in 1mA increments (per VAA)
Environmental Conditions	
Temperature Range	0°C to +50°C
IS Parameters¹ (LINE connector terminals: 0V, AUDIO, CALL, -VLINE)	
Maximum Input Voltage (Ui)	19V
Maximum Input Current (Ii)	3A
Maximum Input Capacitance (Ci)	Negligible
Maximum Input Inductance (Li)	Negligible
¹ Refer to Certificate of Conformity ANZEx 13.3005X for all conditions of certification.	
Battery	
Type	Sealed Lead Acid (SLA)
Voltage	6V
Capacity	1200mAh
Typical Battery Loads	Pre-start Warning Alarm: 150mA approx. Voice Message Playback: 20mA avg approx. Stand-by (no audio output): 2mA approx. Sleep Mode: 20µA approx.
Sound Output	
Output	90dB approx. at 1m for pre-start warning
Mechanical	
Dimensions (panel mount sub-assembly)	137 x 145 x 57mm (depth with battery pack installed 98mm) (H x W x D)
Dimensions (standard enclosure)	170 x 270 x 121.5mm (H x W x D)
Dimensions (battery pack)	78 x 104 x 50mm (H x W x D)

IP Rating (panel mount sub-assembly)	IP66 (fascia seal) Note: fascia must be installed in a minimum IP55 enclosure
IP Rating (standard enclosure)	IP66

Ordering Information

Panel Mount VAA	
Part Number	Description
168799	S/ASSY VAA PANEL MNT V3 ANZEx
120281	MODULE VAA BATTERY PACK ANZEx
120712	KIT VCOM SPEAKER 8ohm 12W 400mm LEAD & GSKT
144372	KIT VCOM SPEAKER 8ohm 12W 400mm LEAD & GSKT & GRILL

Standard Enclosure VAA		
Longwall		
Part Number	Description	 (P/N 101178 shown)
101178	VAA NEW MACEY LSRB# ANZEx	
120284	VAA NEW MACEY LBRB# ANZEx	
121006	VAA NEW MACEY LSRB# ANZEx	
Conveyor		
Part Number	Description	 (P/N 121493 shown)
120756	VAA GLND LBRB# ANZEx	
120996	VAA WEILAND LSRB# ANZEx	
121493	VAA BULGIN LSRB# ANZEx	
121382	VAA GLND LSRB# HORN SPKRS NON-IS	

Accessories	
Part Number	Description
Replacement Battery	
120281	MODULE VAA BATTERY PACK ANZEx
Replacement Speaker	
120712	KIT VCOM SPEAKER 8ohm 12W 400mm LEAD & GSKT
Interconnect Cable²	
121113	CABLE VCOM V2 2x50ohm COAX 2x4mm2
161480	CABLE VCOM V2 LS0H 2x50ohm COAX 2x4mm2

² Please contact Ampcontrol customer service to discuss your specific cabling requirements. Cables are available in a multitude of standard lengths pre-terminated with lugs or socket plugs.

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

PROGRAMMABLE IS CONTROLLER

IECEX ITA 07.0003X Ex ia I

Applications

Ampcontrol's Gasguard Programmable IS Controller is designed to operate with a range of gas sensors currently supplied by Ampcontrol and other manufacturers.

Features

- 4-20mA or 0.4-2V Selectable Input Channels
- Control and fault relay outputs
- 4-20mA outputs (for PLC monitoring)
- User programmable
- Start-up time delay
- Programmable Input/Output isolation
- RS485 Modbus Slave communications
- 12VDC powered
- DIN rail or foot mount
- Approved Intrinsically Safe – Ex ia
- LCD Display
- LED Indication to aid fault finding



Product description

The IS Controller is supplied with four (4) selectable 4-20mA or 0.4-2V programmable input channels. Each input channel has three (3) programmable setpoints with a hysteresis adjustment of 5%. Setpoints can be configured during programming to operate on a falling or rising action.

The controller has four IS relay outputs that can be assigned to any channel and are used for control and fault indication. The controller can be programmed to latch the relays, maintaining the relay status during a loss of power. A relay reset is provided on the front fascia of the controller.

The IS Controller also has three 4-20mA repeater outputs to operate remote displays or to allow monitoring by a PLC/SCADA system. This feature allows a single 4-20mA repeater output to be assigned to one or more channels to provide information of high and low gas readings.

The IS Controller is DIN rail mounted and has been approved to be intrinsically safe for use in a Zone 0 hazardous area. The Controller is powered from a 12V Intrinsically Safe power supply.

A two line LCD Display and a keypad provide an easy to operate user interface. The LCD Display provides access to all available information. A simple procedure allows adjustment of the IS Controller's settings.

There are seven (7) status LEDs located on the fascia. These provide indication of any alarms or faults, as well as indication of the relay outputs.

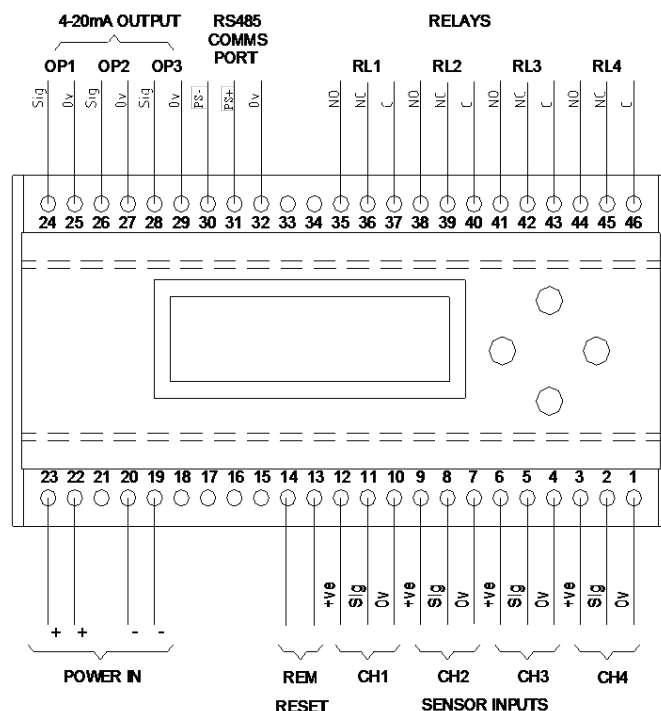
Programming

Parameters of the IS Controller are programmed by using the arrows and LCD Display located on the fascia of the Controller.

Programming allows control of functions including assigning channels and gas type, adjusting setpoint levels, calibrating input, assigning relay outputs, isolating channels/relays/outputs, setting direction of alarms, measuring supply voltage and setting the RS485 Modbus Address.

See User Manual for full programming details.

Connection Diagram



Specifications

General

Voltage	9 to 16VDC (Nominal 12V IS Supply)
Input Channels	Four Channels, 4-20mA or 0.4-2V (Selectable)

Outputs

Relay Outputs	Four IS relay outputs – can be configured normally energised, normally de-energise or latched
Contacts	1 C/O, 2A, 30VDC (Resistive)
Repeater	Three 4-20mA programmable outputs
Setpoints	3 programmable setpoints per channel
Hysteresis	5%
Communications	RS485 Modbus Slave

Mechanical

Dimensions (HxWxD)	110x148x74mm
--------------------	--------------

Ordering Information

Part Number	Description
105232	CONTROLLER G/G IS 4CH*
120875	MANUAL USER G/G CONTROLLER

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.

CO₂ GAS SENSOR / TRANSMITTER

Series 65-6552

Gasguard Carbon Dioxide Monitoring

Description

Ampcontrol's Gasguard Infrared Carbon Dioxide Sensor / Transmitters are supplied complete with an amplifier and a Liquid Crystal Display.

The Gas sensor is housed in a cast stainless steel enclosure, is certified intrinsically safe and is suitable for use in Zone 0 hazardous areas. A remote head version with up to ten metres of cable is also available.

The Gasguard Infrared Carbon Dioxide Sensor / Transmitters operate on the Infrared Absorption principal and provide a linear 4-20mA DC current output.

Features

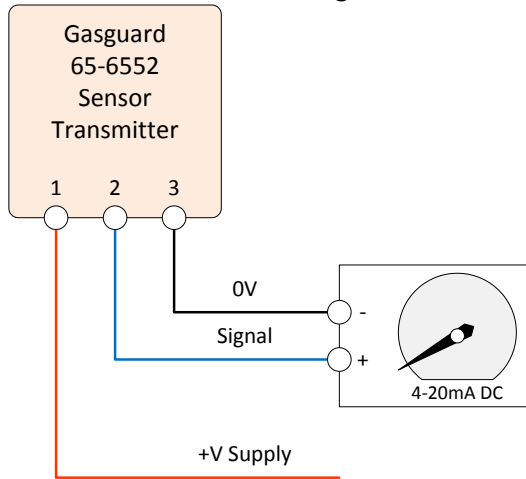
- Economical Fixed Gas Sensor / Transmitter
- Rugged Construction
- Reliable
- Certified Intrinsically Safe – Ex ia
- LCD Display
- Non-Intrusive Closed Case Calibration



Dimensions

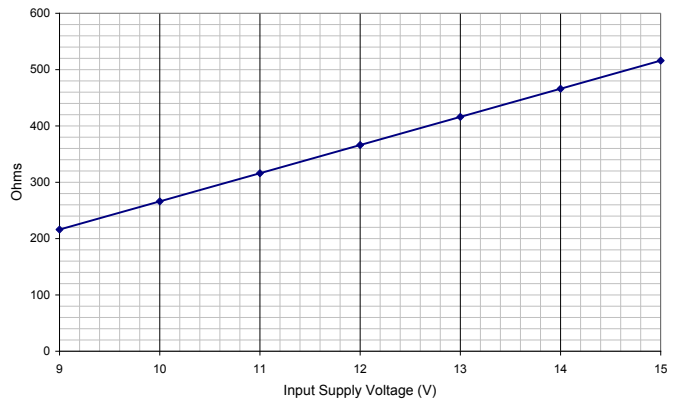


Connection Diagram



Loop Resistance Graph

Maximum Loop Resistance at 20mA



Specifications

Electrical

Supply Voltage	10 – 16.5 VDC
Analogue Output	4-20mA DC
Maximum Current	100mA

Mechanical and Environment

Humidity Range	0-95% RH, non-condensing
Temperature Range	-10°C to + 40°C
Housing Material	Cast Stainless Steel
Ingress Protection	Housing: IP66 Gas Inlet Port: IP66
Weight	3.8kg (approximately)
Cable Gland Entry Size	8 to 13mm O.D.

Sensor

Detection Method	Non-Dispersive Infrared
Calibrated Range	0 to 2% Carbon Dioxide (CO2) 0 to 5% Carbon Dioxide (CO2)
Accuracy	0 to 2% $\leq \pm 2\%$ FSD 2 to 4% $\leq \pm 4\%$ FSD 4 to 5% $\leq \pm 5\%$ FSD
Drift	$\leq \pm 100$ ppm per month
Repeatability	$\leq \pm 0.05\%$ CO2
Sensing Element Life	>5 Years in Clean Air
Resolution	0.01% Carbon Dioxide (CO2)

Certification

IECEX	IECEX TSA 06.0044X – Ex ia I IP66
DPI	MDR 087482 GD (Design Registration)

Ordering Information

Part Number	Category	Description
115239	2%	CO2 Sensor / Transmitter - 2% - Integral Sensor Head
141569	2%	CO2 Sensor / Transmitter - 2% - 5 Metre Remote Sensor Head
141570	2%	CO2 Sensor / Transmitter - 2% - 10 Metre Remote Sensor Head
115240	5%	CO2 Sensor / Transmitter - 5% - Integral Sensor Head
141574	5%	CO2 Sensor / Transmitter - 5% - 5 Metre Remote Sensor Head
141579	5%	CO2 Sensor / Transmitter - 5% - 10 Metre Remote Sensor Head
140225	Accessory	Calibration Magnetic Tool
105693	Accessory	Calibration Cup
105703	Accessory	Allen Key

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

DISCLAIMER

While every effort has been made to assure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.



FLAMMABLE GAS SENSOR / TRANSMITTER

Series 65-6551

Description

Ampcontrol's Gasguard Flammable Gas Sensor / Transmitter is supplied complete with an amplifier and integrated Liquid Crystal Display.

The Gas sensor is housed in a cast stainless steel enclosure, is certified intrinsically safe and is suitable for use in a Zone 0 hazardous area. A remote head version with up to ten metres of cable is also available for use on mobile machinery such as roof bolters and continuous miners.

The Gasguard Flammable Gas Sensor / Transmitter, operates on the catalytic combustible gas detection principle. Combustible gases, once in contact with the heated catalytic sensor cause a small shift in sensor resistance proportional to the concentration of combustible gas. The sensor provides a linear current output proportional to gas concentration.

Features

- Economical Fixed Gas Sensor / Transmitter
- Performance Tested To Australian Standards
- Rugged Construction
- Reliable
- Certified Intrinsically Safe – Ex ia
- LCD Display
- Non-Intrusive Closed Case Calibration

Specifications

Sensor

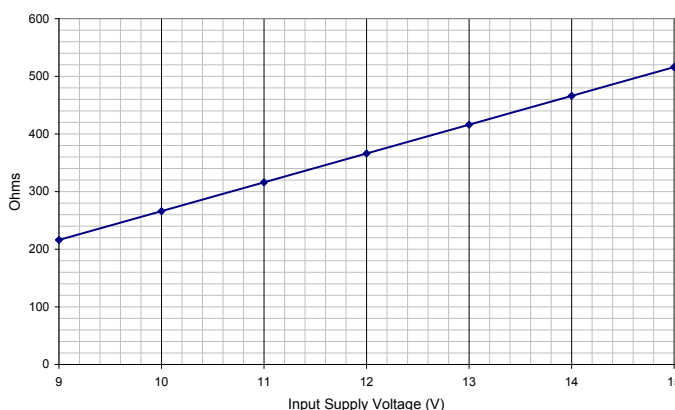
Ingress Protection	: Housing	: IP66
	: Gas Inlet Port	: IP66
Housing Material	: Cast Stainless Steel	
Calibrated Range	: 0 to 5% Methane (CH ₄)	
Accuracy	: 0 to 3% <± 2% FSD	
	: 3 to 4% <± 4% FSD	
	: 4 to 5% <± 5% FSD	
Long Term Zero Drift	: <± 0.5% FSD per month	
Long Term Sensitivity Drift	: <± 2% FSD per month	
Repeatability	: <± 1 % of Reading	
Sensing Element Life	: >2 Years In Clean Air	
Temperature Range	: -10°C to + 50°C	
Humidity Range	: 0-95% RH, non-condensing	
Resolution	: 0.01% Methane (CH ₄)	

Electrical

Supply Voltage	: 10-16.5 VDC
Analogue Output	: 4-20mA DC
Maximum Current	: 100mA



Maximum Loop Resistance at 20mA



Relative Sensitivity

Gas	Concentration	Reading (% v/v)
n-Hexane	1.2%	2.0
Hydrogen	4.0%	4.0
Methane	5.0%	5.0
n-Pentane	1.4%	2.0
Propane	2.1%	2.5

Relative sensitivity may differ from sensor to sensor and with ageing of the sensor

Approval & Certification

ANZEx	: ANZEx 03.4024X – Ex ia s Zone 0 I IP66
IECEX	: IECEX TSA 06.0044X – Ex ia I IP66
MDA	: MDA GD 5056
DPI	: MDR 086759 GD (Design Registration)

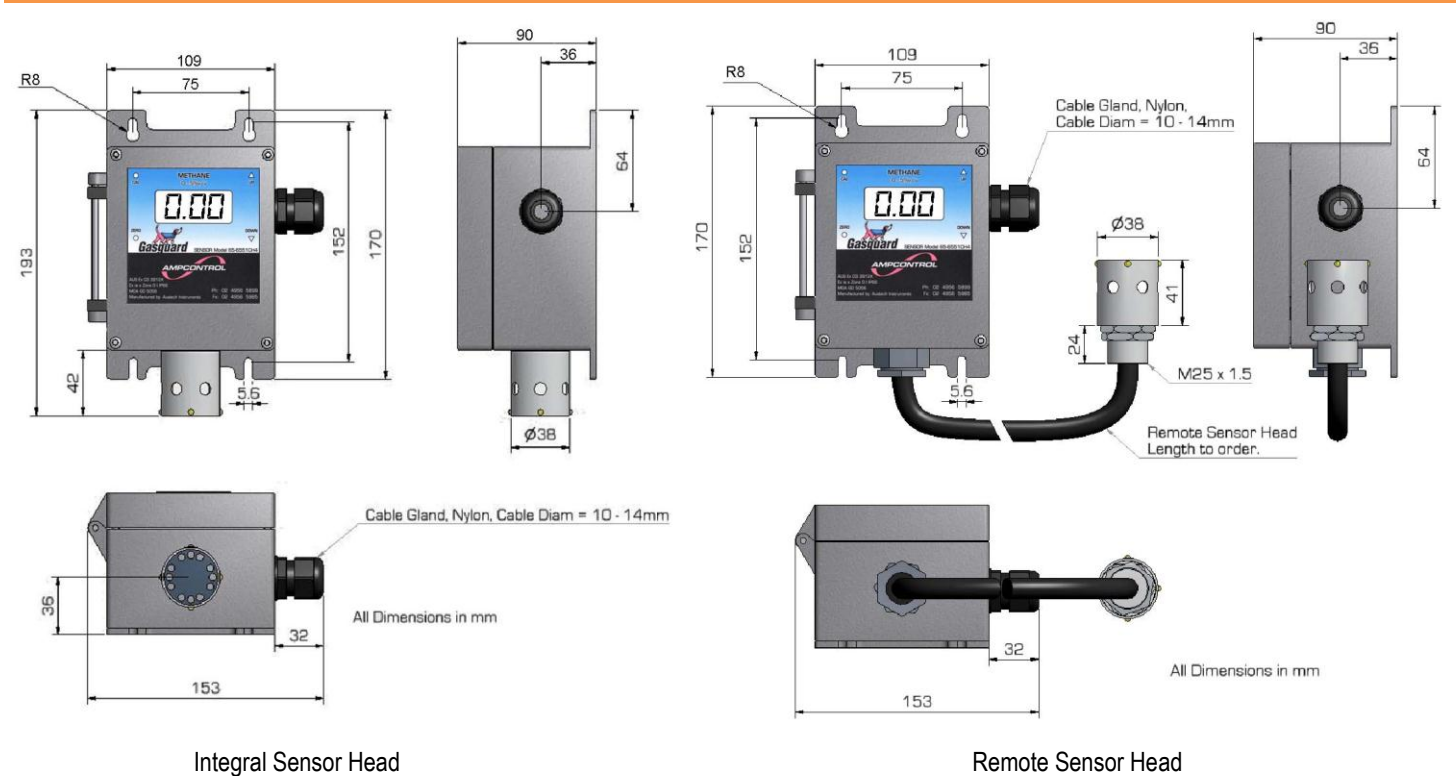
Ordering Information

Part Number / Descriptions

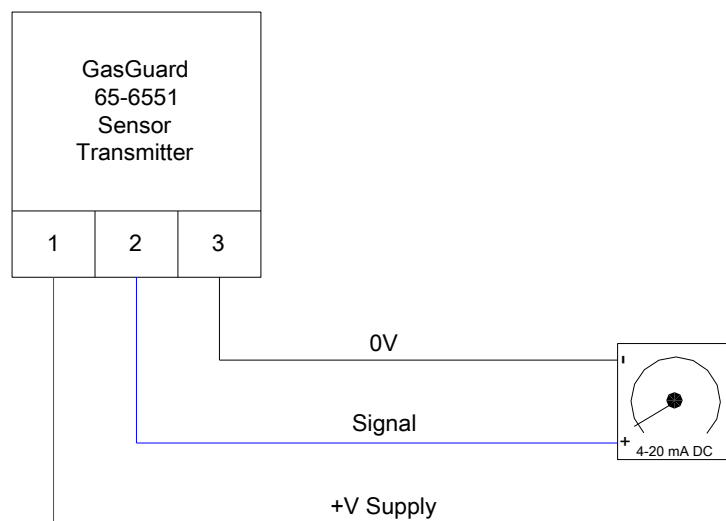
106198	Sensor / Transmitter - Integral Sensor Head
115217	Sensor / Transmitter - 5 Metre Remote Sensor Head
101768	Sensor / Transmitter - 10 Metre Remote Sensor Head
115189	Sensor Only - Integral Sensor Head
115197	Sensor Only - 5 Metre Remote Sensor Head
101713	Sensor Only - 10 Metre Remote Sensor Head
121012	Calibration Sealing Ring
101613	Calibration Magnetic Screwdriver
106024	Calibration Cup
121647	Vibration Clip
121016	Allen Key



Dimensions



Electrical Connections



Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285
Phone: (02) 4903 4800
Fax: (02) 4903 4888
E-mail: electronics@ampcontrolgroup.com
Web site: www.ampcontrolgroup.com

The logo for AMPCONTROL features the word "AMPCONTROL" in a bold, italicized, black sans-serif font. A registered trademark symbol (®) is located at the top right of the word. A large, stylized orange swoosh, resembling a stylized 'S' or a continuous loop, curves around the text, starting from the bottom left, passing behind the word, and ending at the top right.

NO GAS SENSOR / TRANSMITTER

Series 65-6550

Gasguard Nitric Oxide Monitoring

Description

Ampcontrol's Gasguard Nitric Oxide Detector / Transmitter is supplied complete with an amplifier and a Liquid Crystal Display.

The Gas sensor is housed in a cast stainless steel enclosure, has been approved to be intrinsically safe and is suitable for use in Zone 0 hazardous areas.

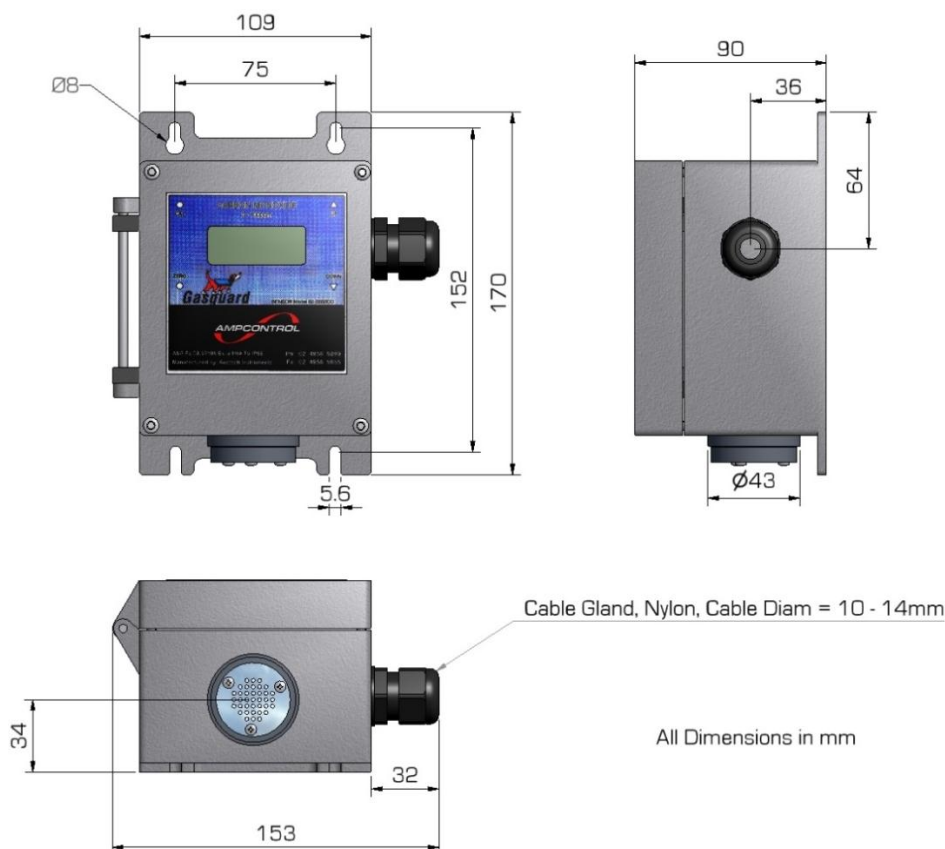
The Gasguard Nitric Oxide Detector / Transmitter, operates on the electro-chemical principal. The sensor is temperature compensated and provides a linear current output.

Features

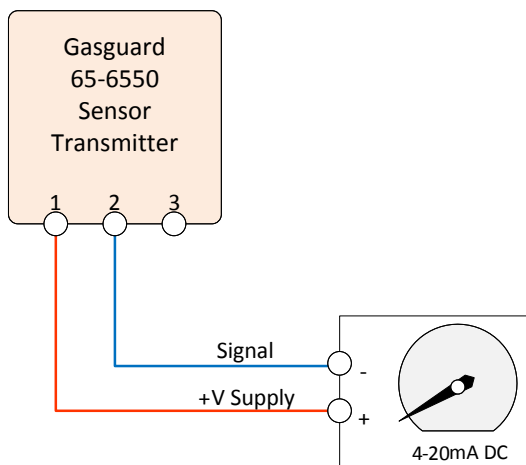
- Economical Fixed Gas Detector / Transmitter
- Temperature Compensation
- Rugged Construction
- Reliable
- Certified Intrinsically Safe – Ex ia
- LCD Display
- Non-Intrusive Closed Case Calibration



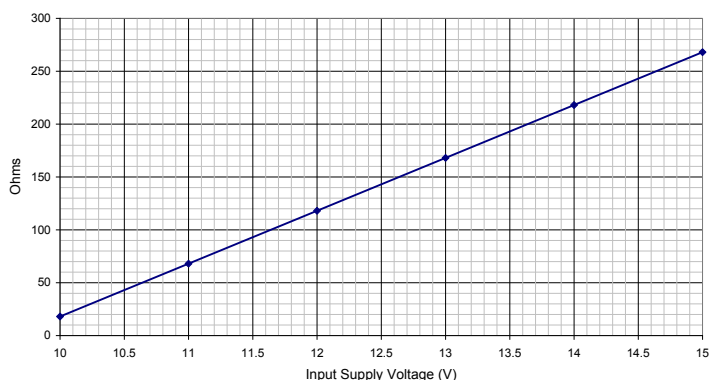
Dimensions



Connection Diagram



Maximum Loop Resistance at 20mA



Specifications

Electrical

Supply Voltage	10 – 16.5 VDC
Analogue Output	4-20mA DC
Maximum Current	100mA

Mechanical and Environment

Humidity Range	15-90% RH, non-condensing
Temperature Range	-10°C to + 40°C
Housing Material	Cast Stainless Steel
Ingress Protection	Housing: IP66 Gas Inlet Port: IP66
Weight	3.8kg (approximately)
Cable Gland Entry Size	8 to 13mm O.D.

Sensor

Detection Method	Electrochemical principle
Calibrated Range	0 – 50ppm Nitric Oxide
Accuracy	< 5% FS
Zero Drift	<0.3ppm per year
Sensitivity Drift	< 5% per year
Repeatability	± 1% of Reading
Sensing Element Life	>2 Years In Clean Air
Resolution	0.1ppm

Certification

IECEX	IECEX ITA 07.0002X – Ex ia I IP66
-------	-----------------------------------

Ordering Information

Part Number	Description
173670	NO Detector 0-50ppm 4-20mA
101702	Calibration cup for electrochemical sensors
140225	Calibration magnetic tool
105703	Allen key

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

DISCLAIMER

While every effort has been made to ensure the accuracy of this document at the date of issue, Ampcontrol assumes no liability resulting from any omissions or errors in this document, and reserves the right to revise content at any time.



Oxygen – O₂ Gas Detector / Transmitter Series 65-6550

Features

- Economical Fixed Gas Detector / Transmitter
- Temperature Compensation
- Rugged Construction
- Reliable
- Certified Intrinsically Safe – Exia
- LCD Display
- Non-Intrusive Closed Case Calibration

Description

Ampcontrol's Gasguard Oxygen Detector / Transmitter is supplied complete with an amplifier and a Liquid Crystal Display.

The Gas sensor is housed in a cast stainless steel enclosure, has been approved to be intrinsically safe and is suitable for use in Zone 0 hazardous areas.

The Gasguard Oxygen Detector / Transmitter, operates on the electro-chemical principal. The sensor is temperature compensated and provides a linear current output.

Sensor Specifications

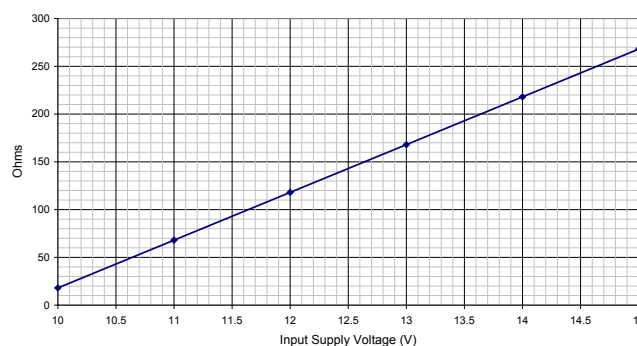
Ingress Protection	: Housing : IP66
	: Gas Inlet Port : IP66
Housing Material	: Cast Stainless Steel
Calibrated Range	: 0 to 25 %
Linearity	: $\leq \pm 1\%$ FSD
Drift	: $\leq \pm 2\%$ FSD per month
Repeatability	: $\leq \pm 1\%$
Sensing Element Life	: >2 Years In Clean Air
Temperature Range	: -10°C to + 50°C
Humidity Range	: 0-95% RH, non-condensing
Resolution	: 0.1 % Oxygen

Electrical Specifications

Supply Voltage	: 10-16.5 VDC
Analogue Output	: 4-20mA DC – Two Wire Loop Powered
Maximum Current	: 25mA



Maximum Loop Resistance at 20mA



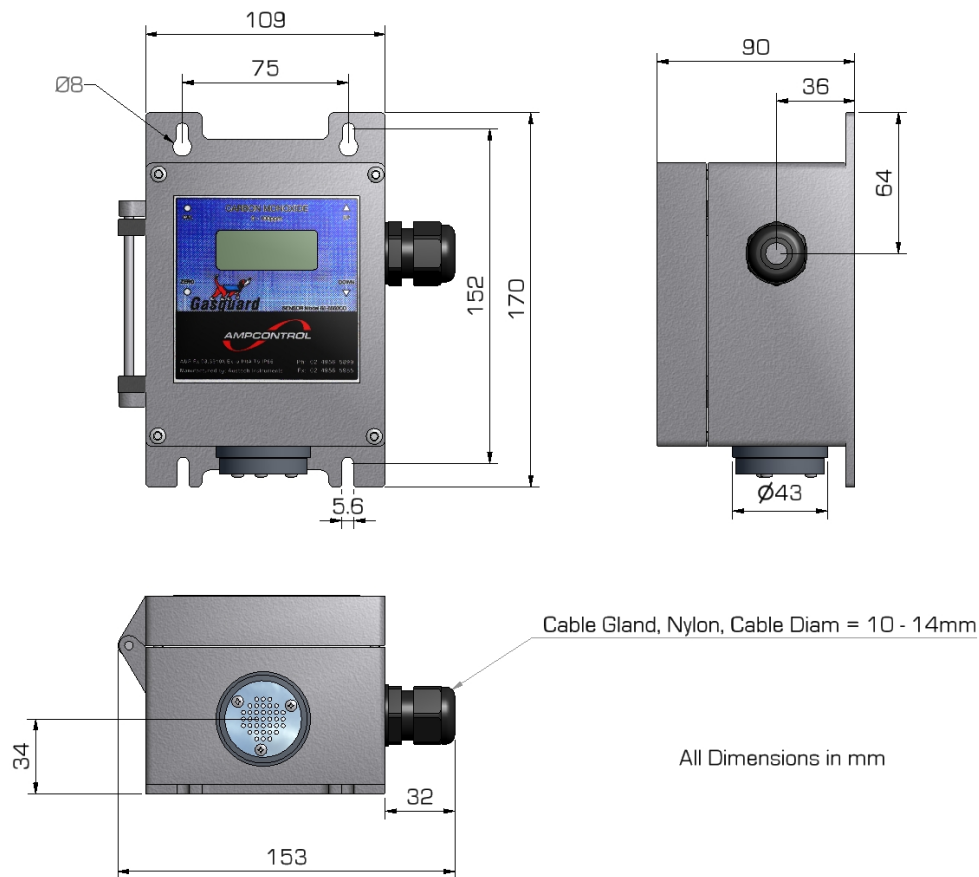
Approval & Certification

IECEX	: IECEX ITA 07.0002X – Ex ia I IP66
MDA	: MDA GD 5056
DPI	: MDR 086760 GD (Design Registration)

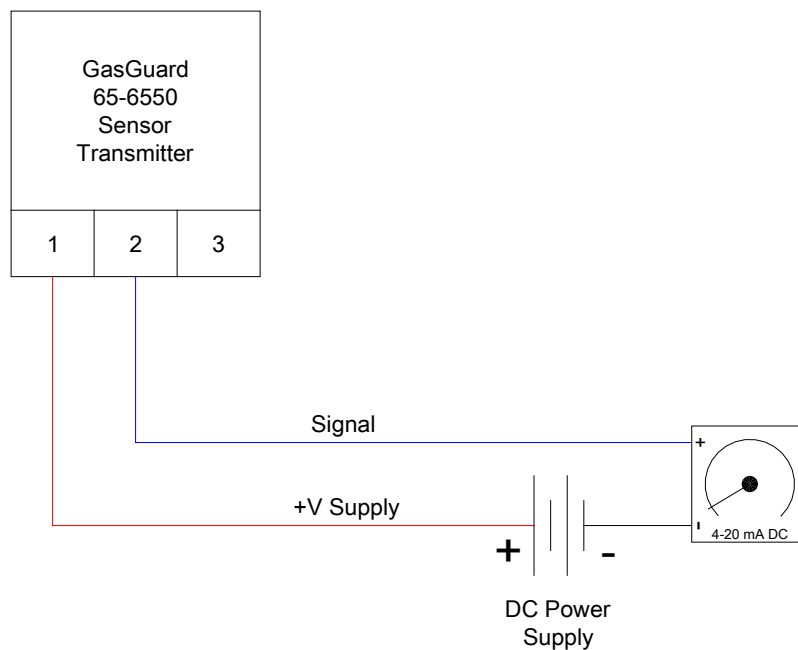
Ordering Information

Part Number	Description
101772	Detector / Transmitter – 0 to 25 %
115209	Electro-Chemical Sensor Assembly
115187	Barrier Insert Assembly
101613	Calibration Magnetic Screwdriver
102284	Calibration Magnetic Pen
101702	Calibration Cup
121016	Allen Key

Dimensions



Electrical Connection





Gas Sensor – General Purpose Carbon Monoxide CO (0-50ppm)

1. Description

Ampcontrol's Gasguard General Purpose Carbon Monoxide (CO) Gas Sensor is supplied complete with an amplifier and a Liquid Crystal Display (LCD).

The Gas sensor is housed in a stainless steel enclosure

The sensor operates on the electrochemical principle. Gas diffuses into the sensor and a chemical reaction creates a current flow between the sensing and reference electrodes proportional to the presence of gas in the atmosphere. The sensor is temperature compensated and provides a 4/20mA linear output for gas concentration.

The sensor is two (2) wire, 24VDC loop powered.

2. Features

- Economical fixed gas sensor for continuous monitoring of toxic gases.
- Signal – 4-20mA
- Temperature compensation
- Rugged construction
- Reliable
- 12-24VDC, 2 wire loop powered
- LCD Display
- Non-intrusive calibration

3. Sensor Specifications

Housing Protection	IP54
Housing Material	Stainless steel
Maximum Range	50ppm
Maximum Gas Applied	500ppm
Overall Linearity	<5%FS
Maximum Drift	<10% per 6 months
Repeatability	± 1% of Reading
Sensing Element Life	>3 years in clean air
Temperature Range	-20°C to + 50°C
Humidity Range	5-90%RH, non condensing
Resolution	<0.1ppm



4. Electrical Specifications

Supply	9 - 24VDC
Output	4 – 20mA

5. Servicing

The Gas Sensor is required by Australian Standards to be calibrated every six (6) months in a NATA approved workshop.

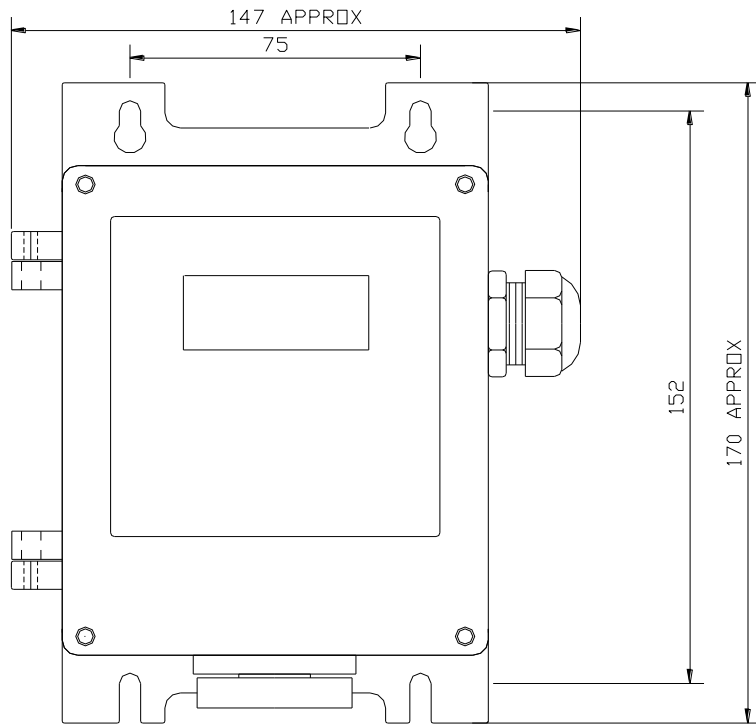
6. Cross Sensitivity Data

Gas	Concentration	Reading (ppm)
Acetic Acid	Sat. vapour	0
Alcohols (i.e. IPA)	1025ppm	0
Ammonia	100ppm	0
Carbon Dioxide	10%	0
Chlorine	1ppm	0
Gasoline Vapour	% Range	0
Hydrogen	3000ppm	1000
Hydrogen Sulphide	20ppm	0
Nitrogen Dioxide	10ppm	0
Nitrogen Oxide	100ppm	25
Sulphur Dioxide	20ppm	0

Note: Interference factors may differ from sensor to sensor and with ageing of the sensor.

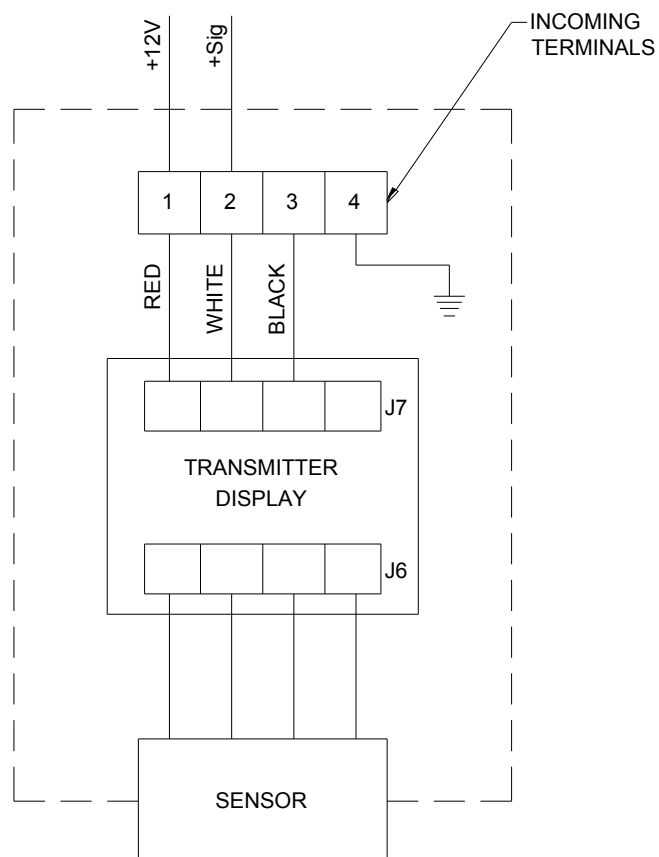
7. Equipment List

79-3500ACO	4/20mA Carbon Monoxide Transmitter c/- Display
33-6529L	Replaceable Filter for toxic sensors
33-1033	Replacement Filter Membrane



GENERAL DIMENSION

HEIGHT APPROX. 90mm



Typical Connection Diagram