



# 1S27 User Guide

## Arc Fault Monitoring System

relay monitoring systems Pty Ltd

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**Advanced Protection Devices**



User Guide



# 1S27 User Guide

## About This Manual

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This User Guide covers all 1S27 relays manufactured from August 2019. Earlier relays do not necessarily incorporate all the features described. Our policy of continuous development means that extra features & functionality may have been added.

The 1S27 User Guide is designed as a generic document to describe the common operating parameters for all relays built on this platform. Some relay applications are described but for specific model information the individual “K” number Product / Test manuals should be consulted.

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Due to RMS continuous product improvement policy this information is subject to change without notice. 1S27\_Guide/Iss A/10/12/19

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## Documentation

### Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the 1S27 are described in the product Technical Bulletin.

The order of precedence for product information is as follows:

- Technical Bulletin
- User Guide

### User Guide

This User Guide covers all 1S27 relay versions & describes the generic features & attributes common across all versions.

Different relay versions are required to cater for varying customer requirements such as auxiliary voltage range, I/O configuration, case style, relay functionality etc.

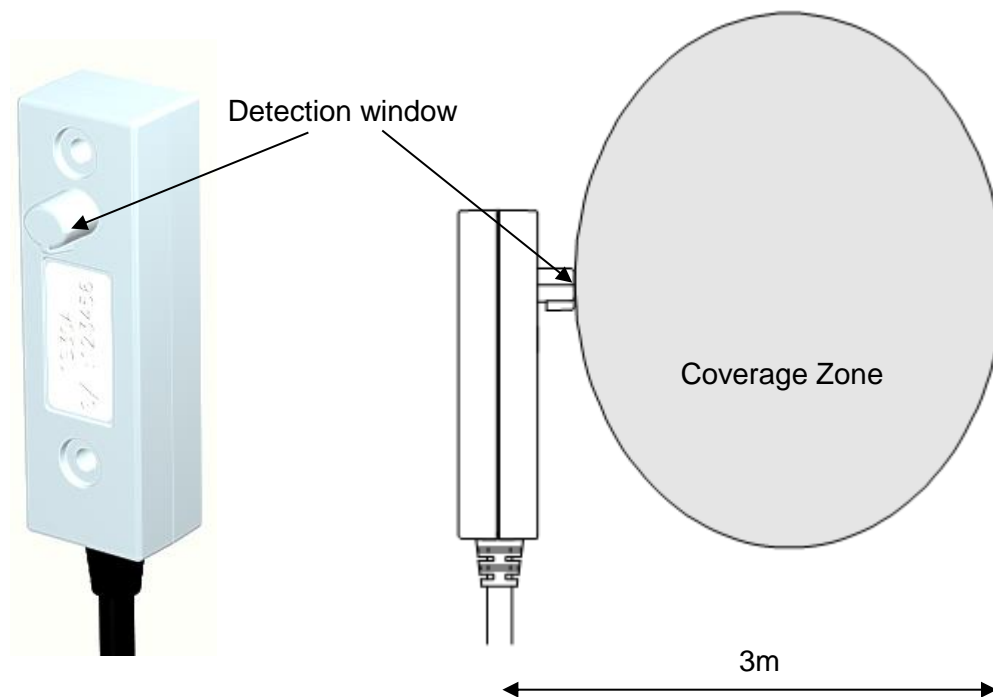
The product ordering code described in the Technical Bulletin is used to generate a unique version of the relay specification & is called a Type Number. This code takes the form 1S27Kxx where the Kxx is the “K” or version number.

## Sensor Installation

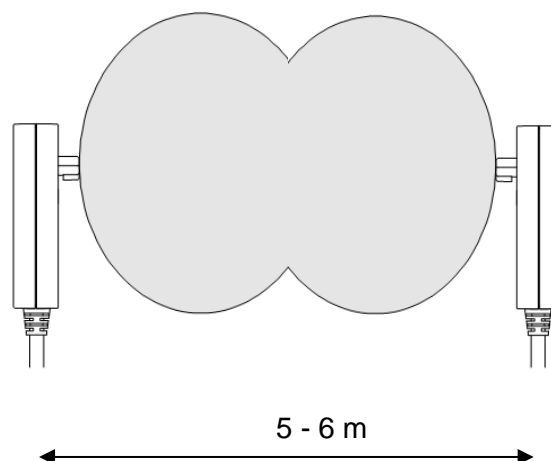
### 1S30 Sensors

The 1S30 sensor is available as a single detector or dual detector package.

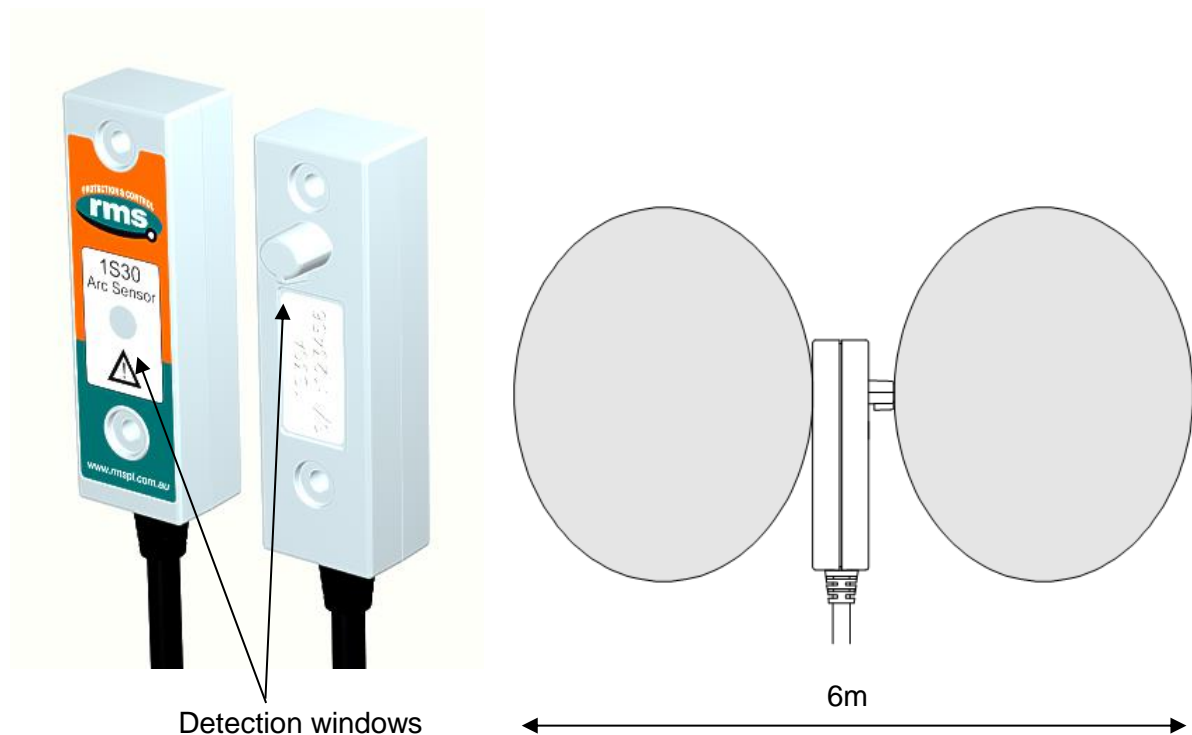
The 1S30A single detector version is depicted below showing the location of the detection window and the approximate coverage zone:



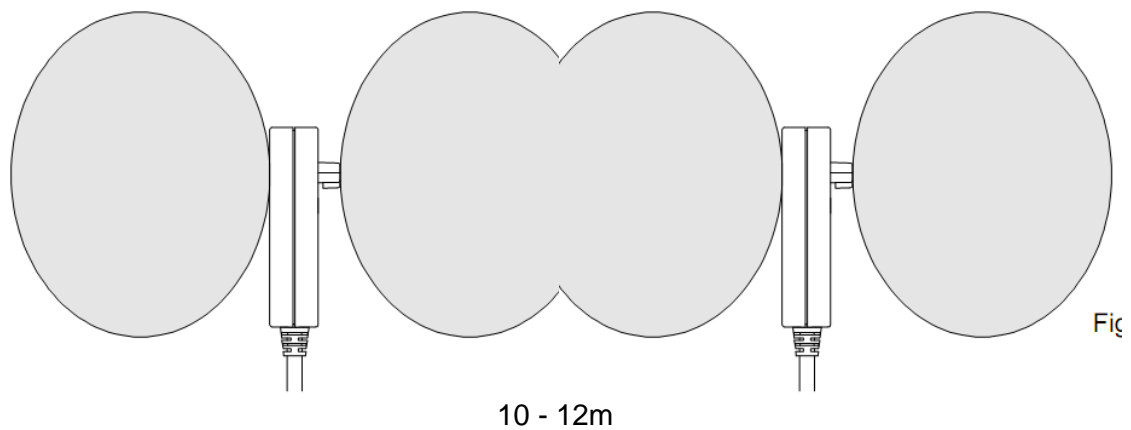
The recommended spacing for the 1S30A single detectors is approximately 5 - 6 m to ensure adequate detection overlap.



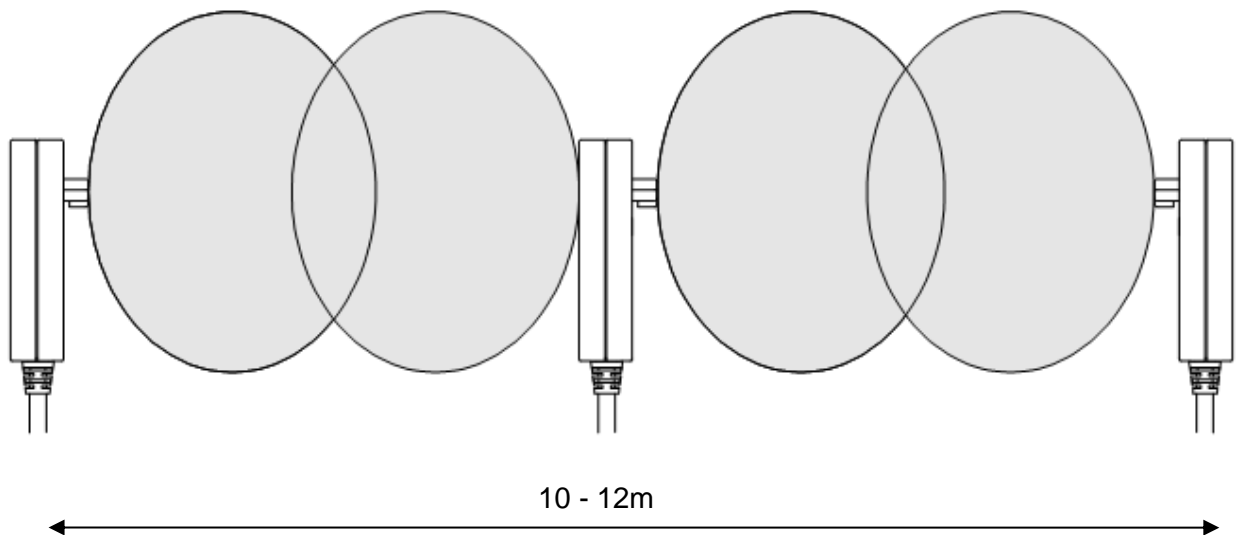
The 1S30B Dual detector version provides an additional detection window for dual zones of coverage as depicted below :



The recommended spacing for the 1S30B single detectors is approximately 5 - 6 m to ensure adequate detection overlap, this combination provides an overall coverage zone of approximately 10 - 12 m.



The 1S30A and 1S30B sensors may also be mixed to provide various coverage combinations, spacing's of approximately 5 - 6 m should be observed to ensure adequate detection overlap.



### Sensor Placement

Sensors need to be mounted to provide full coverage of the switchgear cubicles to be protected. Where the protected zone is larger than the sensor coverage then the use of multiple sensors is required.

Precise positioning of the sensors is generally not required as the light caused by the arc is reflected from the walls.

### Sensor Mounting

The 1S30 is suitable for flush panel mounting in a number of configurations, for further information on mounting arrangements and mounting hardware refer to the 1S30 Technical Bulletin.



### Example Sensor Placement

The following are some typical examples of sensor placement.



Sensor placement inside CB racking chamber



Sensor placement inside busbar chamber



Sensor placement inside cable termination chamber



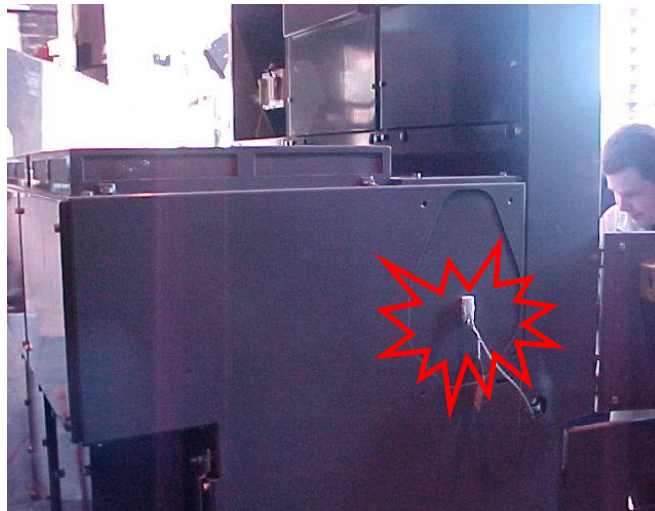
Sensor placement for switchgear Busbar coverage (External through Hole Detector)



Sensor placement near Low Voltage Contactor for a Variable Speed Drive



Sensor placement for Switchgear cable termination chamber (External through Hole Detector)



Sensor placement for end of Bus chamber (External through Hole Detector)



Sensor placement for Switchgear cable termination chamber (External through Hole Detector)



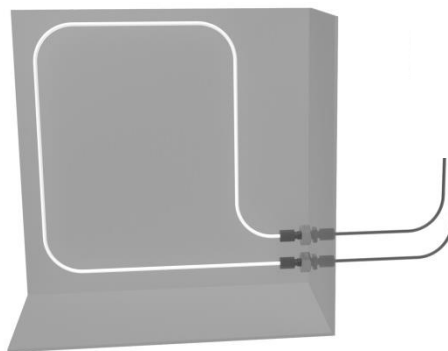
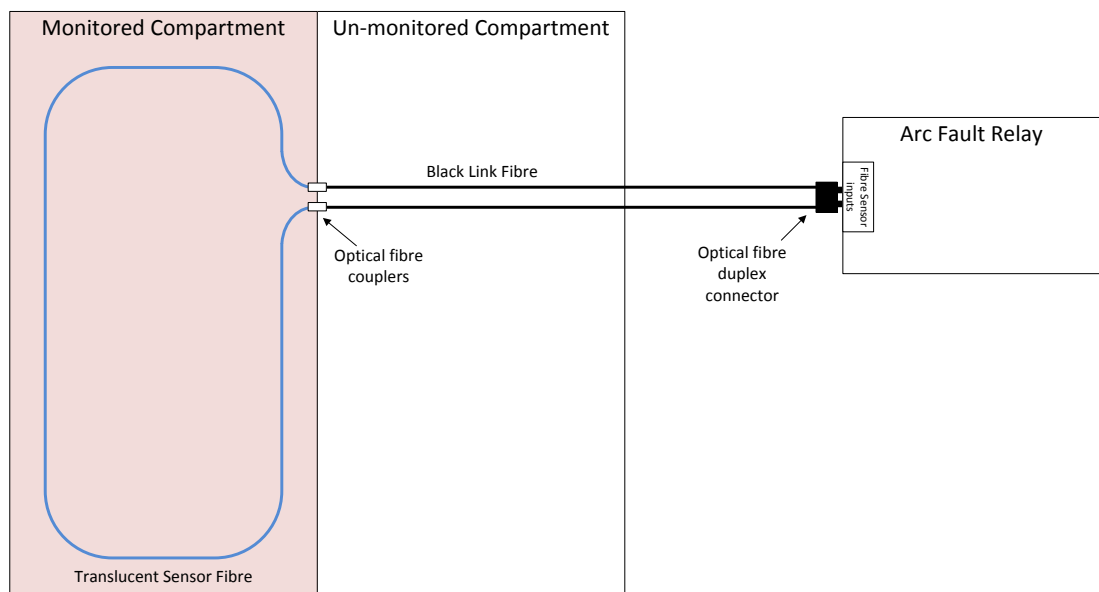
## 1S40 Linear Sensors

The 1S40 linear sensor may be applied to protect large volumes where multiple point sensors would otherwise be required.

A separate 1S40 linear sensor is required for each segregated protection zone.

The linear sensor kits provide both a black link fibre and a translucent arc sensor fibre. The translucent fibre needs to be located within the detection zone and black link fibres allow routing of the linear sensor back to the relay.

Translucent and black link fibres are joined through the use of optical fibre couplers. An optical fibre duplex connector is utilised for relay connection



For the most effective coverage it is preferable to loop the translucent fibre within the monitored compartment or chamber as shown in the diagrams above. A light intensity of  $>7,500$  Lux over a length of 300mm is required to cause an arc trip.

The 1S40 kit comprises of lengths of black link fibre (pre-terminated with a duplex connector for relay connection), unterminated translucent fibre, 2 x optical fibre couplers and a fibre optic fibre cutter.



Black Link Fibre Assembly



Translucent Sensor Fibre

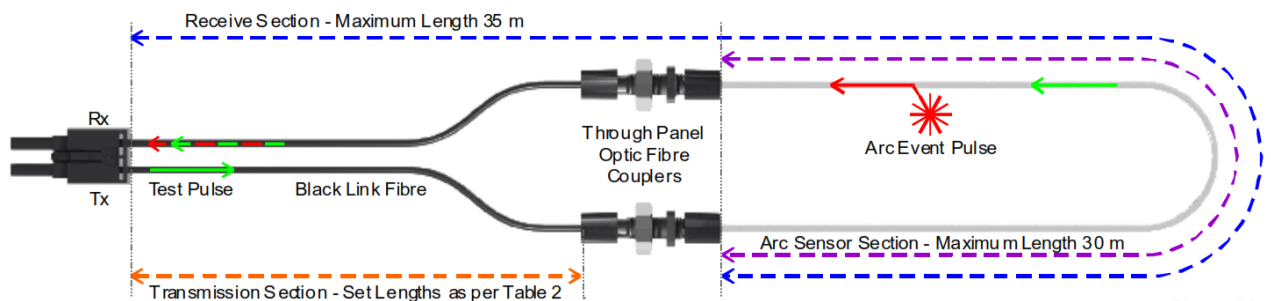


Optic Fibre Couplers



Optic Fibre Cutter

The individual components are combined per the diagram below :



The following sensor dimensioning criteria must be satisfied for the arc fault relay linear sensor input to self-calibrate and function correctly:

1. Transmission Section (section of clad fibre from relay Tx connection) to optic fibre coupler must be  $\leq 30\text{m}$  and cut to the set lengths in Table 1 within a tolerance of  $\pm 10\%$
2. Receive Section (section of bare and clad fibre back to the relay Rx connection) must be  $\leq 35\text{m}$
3. Arc Sensor Section (section of bare fibre) must be  $\leq 30\text{m}$

Transmission Section Length	Setting
<1 metre	A
1 metres	B
5 metres	C
10 metres	D
20 metres	E
30 metres	F

Table 1

The chosen Transmission Section Length must be configured in the 1S27 using the rotary configuration switch – refer to Linear Sensor Configuration.

### 1S40 Linear Sensor Assembly

Once the lengths of black link fibre and translucent sensor fibre have been determined cut them using the optic fibre cutter provided – other cutting tools must not be used as this will lead to excessive attenuation within the fibre and result in incorrect operation.

The cut sections of black link fibre and translucent fibre are coupled using the provided optic fibre couplers. Slide the cut lengths completely into the couplers and hand tighten the coupler cinch nuts taking care not to strip the cinch nut threads.



Coupled Black Link and Translucent Sensor Fibres

## **1S40 Linear Sensor Compartment Fixing**

The optic fibre couplers may be positioned and held in place with the provided fixing nuts at a compartment interface.

The optic fibres may be retained using cable ties or silicon adhesive. When using silicon adhesive no more than 10% of the sensor fibre shall be masked by the silicon.

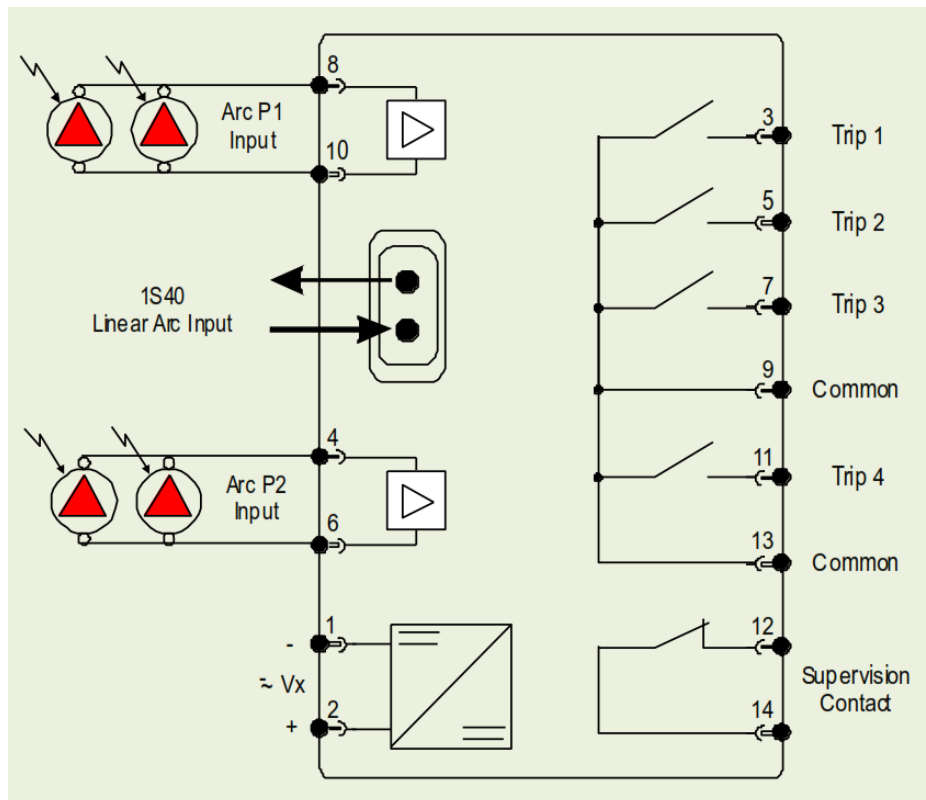
Care should be taken not to apply excessive force when fixing the 1S40 sensor. Excessive force or rough handling may result in damage to the fibre sensor.

Care should also be taken when bending the 1S40 sensor to ensure that the minimum bending radius of 50mm is adhered to.



## Scheme Wiring

### 1S27 Connection diagram



The above diagram shows the 1S27 connections (1S40 connection with 1S27 B only).

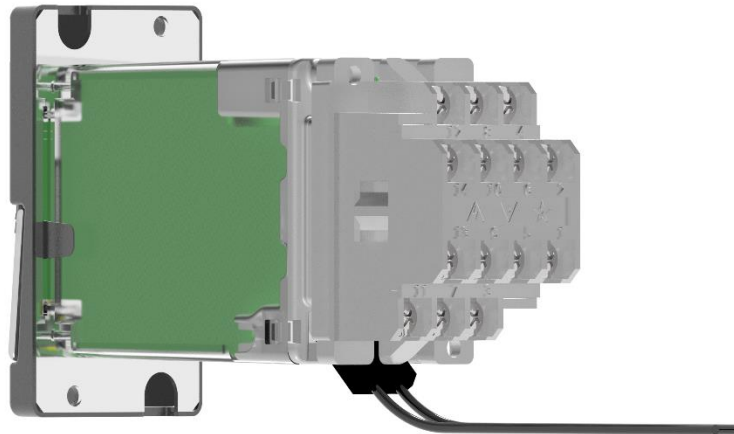
Two point sensor inputs are provided for point sensor connection with each input able to accept up to 2 point sensors connected in parallel.

The sensor inputs need to be configured according to the number of sensors connected, instructions on 1S27 configuration are provided in subsequent sections of this user guide. Configuration is essential to:

- Allow connected sensor inputs to operate for an ARC Fault
- Allow connected sensor inputs to be supervised
- Ensure unconnected sensor inputs do not indicate an Arc sensor Alarm condition

## Linear Sensor Connections

The 1S27-B provides a Linear sensor input:



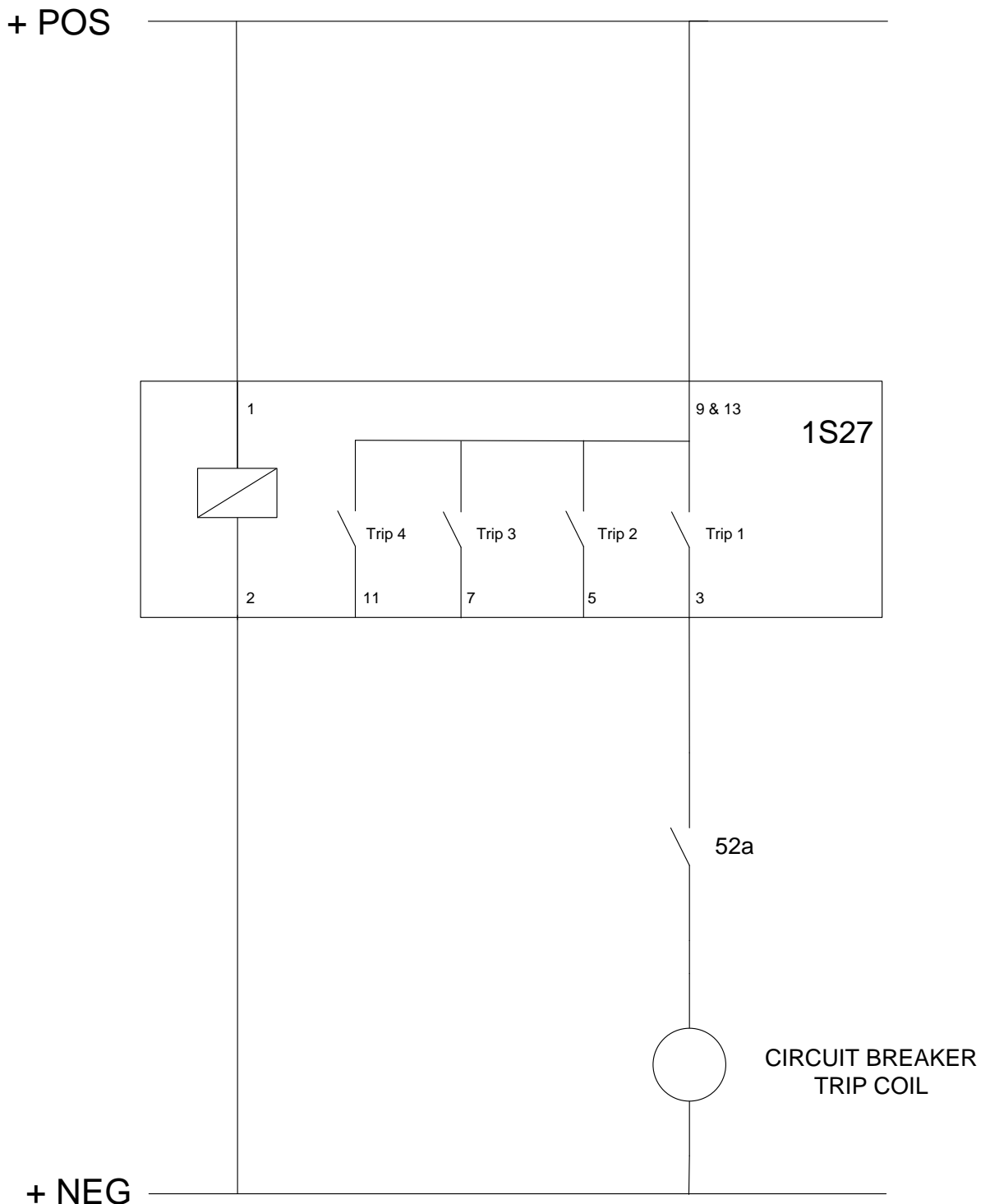
Linear Sensor equipped units provide inputs for 1 Linear sensor and 4 point sensors.

Each Linear Sensor input provides a Transmit (TX) and Receive (RX) set of connections.

Note that the linear sensor cannot be used in conjunction with the retention plates supplied with the TBD-R2 terminal block. When using a linear sensor order either the TBD-R1 terminal block or the TBD-F terminal block.

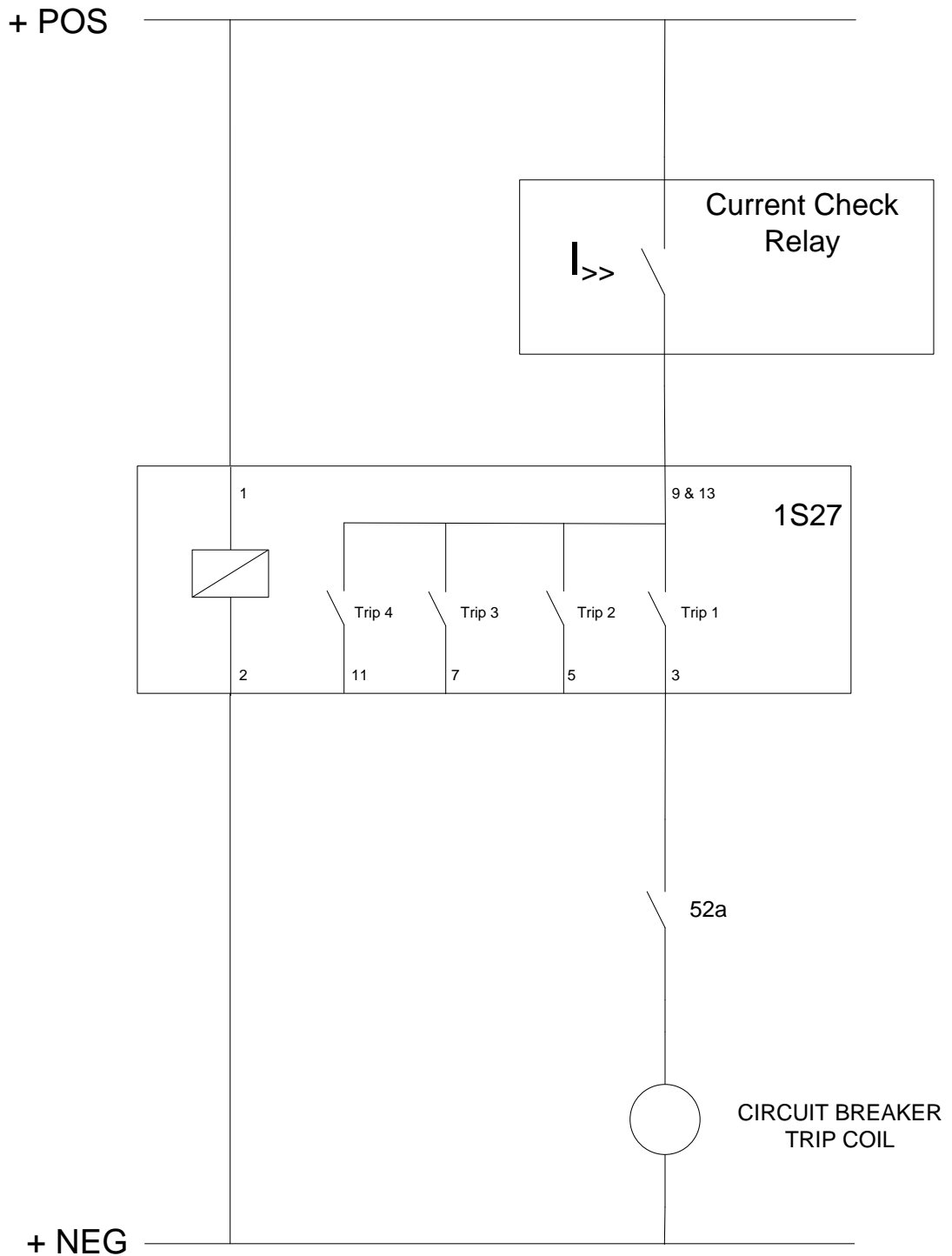
For details of the Linear Sensor refer to the 1S40 Technical Bulletin.

**Example Schematic – Direct Arc Trip Only Application**



CIRCUIT BREAKER SHOWN IN THE OPEN POSITION AND RELAY SHOWN IN THE DE-ENERGISED STATE

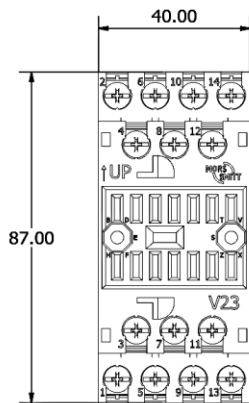
**Example Schematic – Current Checked Arc Trip Application**



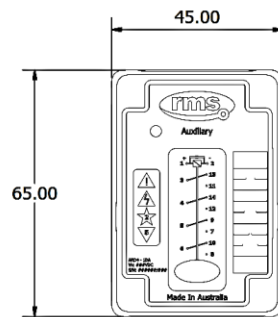
CIRCUIT BREAKER SHOWN IN THE OPEN POSITION AND RELAY SHOWN IN THE DE-ENERGISED STATE

## Terminal Layout and Module Dimensions

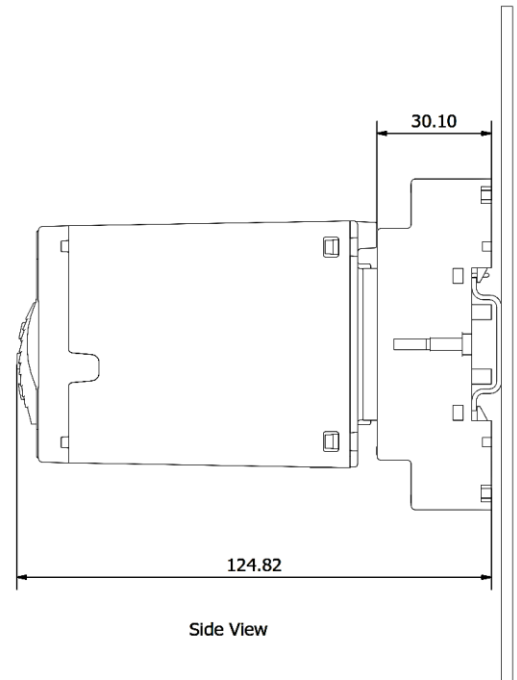
Surface or Din Rail Mount Using Front Connect Relay Base (TBD-F Terminal Block)



Front View Relay Base

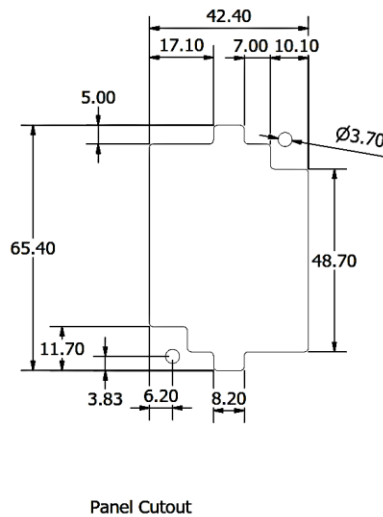
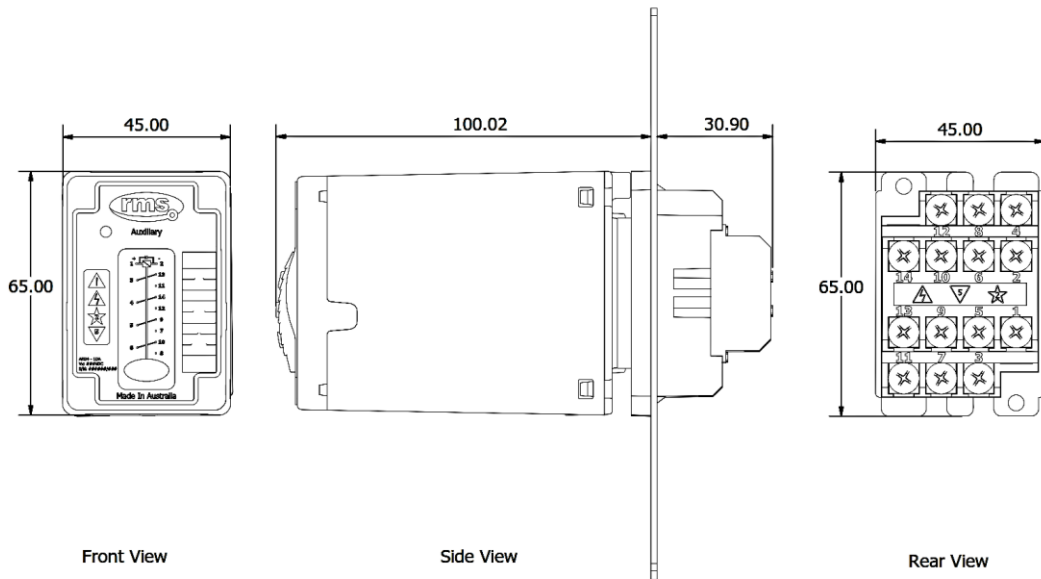


Front View

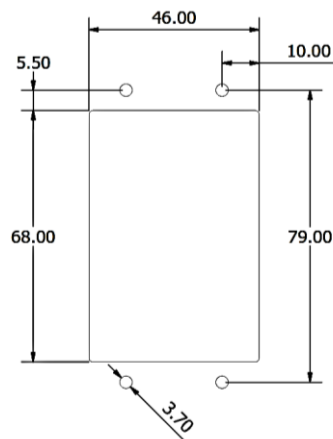
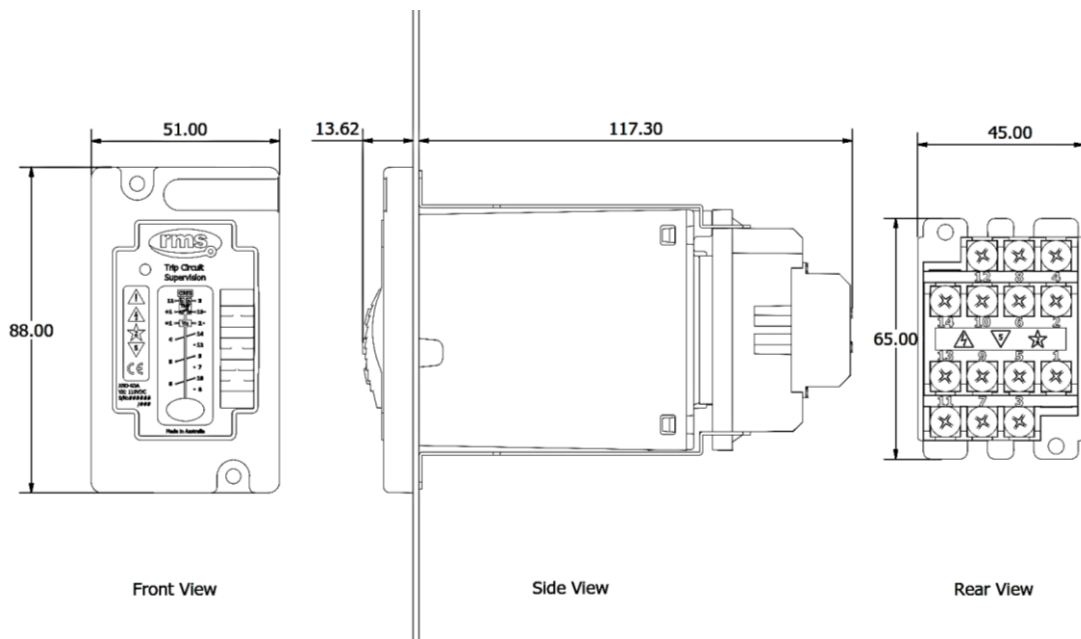


Side View

**Surface Mount Using Rear Connect Relay Base (TBD-R1 Terminal Block)**



**Flush Panel Mount Using Rear Connect Relay Base and Retention Plates (TBD-R2 Terminal Block)**

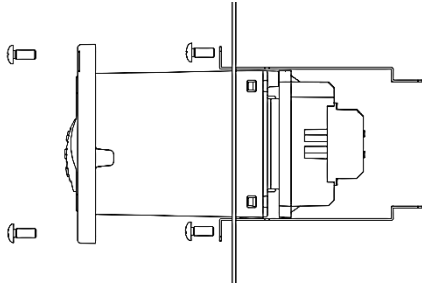


Panel Cutout

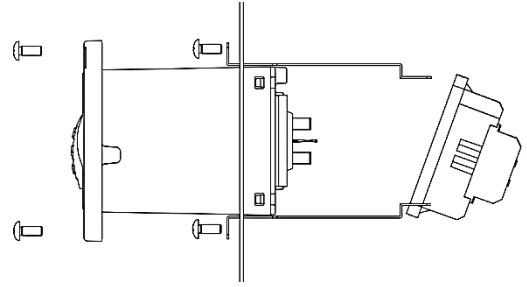
Note: The linear sensor cannot be used in conjunction with the retention plates supplied with the TBD-R2 terminal block.

When using a linear sensor order either the TBD-R1 terminal block or the TBD-F terminal block.

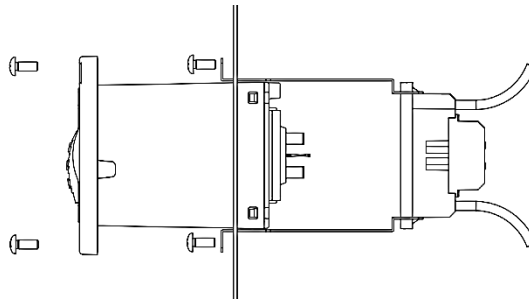
**Rear Connect Relay Base Insertion for Flush Panel Mounting (TBD-R2 Terminal Block)**



Insertion of relay and base for capturing relay base into retention plates



Alternative method for capturing relay base into retention plates



Retention of relay base when relay is removed

Note: The linear sensor cannot be used in conjunction with the retention plates supplied with the TBD-R2 terminal block.

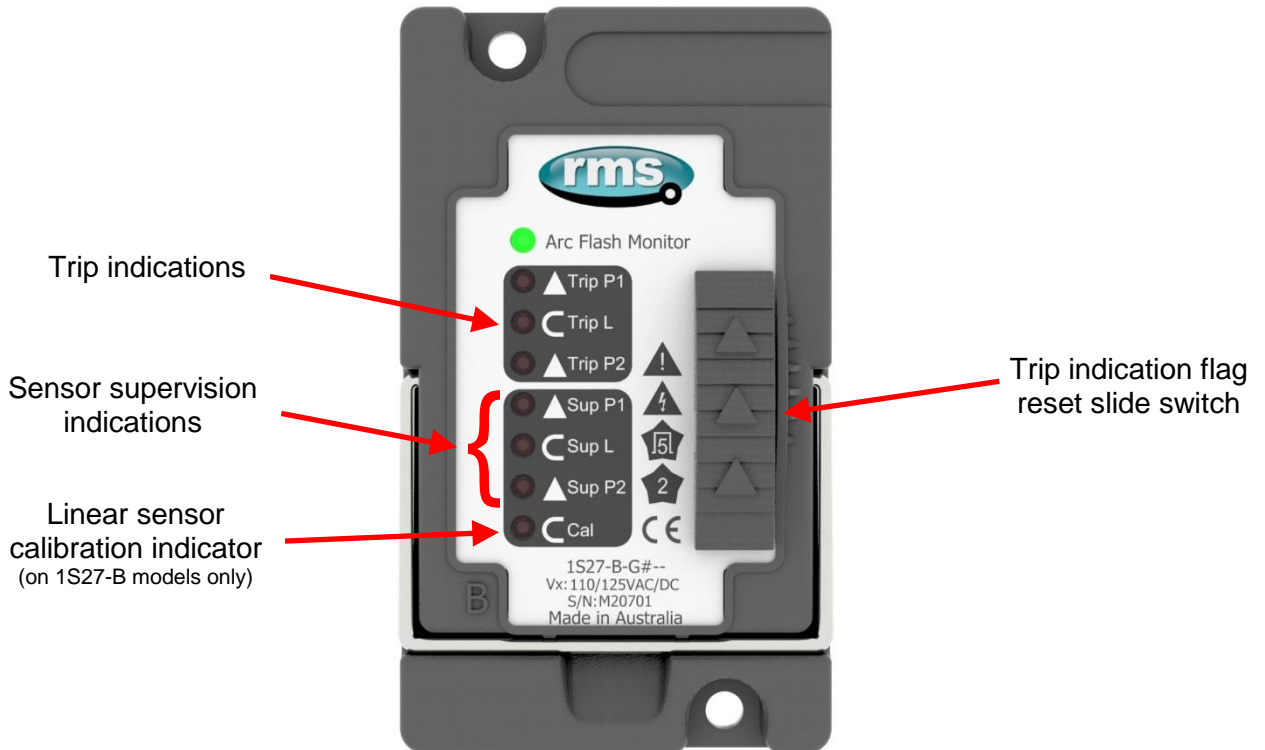
When using a linear sensor order either the TBD-R1 terminal block or the TBD-F terminal block.



## Monitor Indications and Human Machine Interface

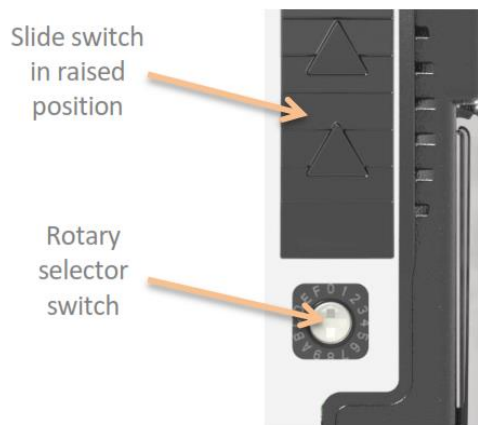
### Front Layout

The picture below depicts the indications provided on the front of the Arc Fault Monitor.



### Device Configuration

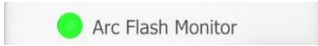
The configuration is set via a rotary switch accessible when the front panel slide switch is operated as shown below.



## Power Up


When powering up, all the LEDs will illuminate and then extinguish before indicating the current 1S27 state.

## Healthy Led

	<p>The Arc Flash Monitor LED illuminates when the 1S27 is powered up and all connected sensors are operating correctly, in this state the supervision alarm contact is also picked up.</p> <p>If there is a supervision error or a calibration issue the LED will extinguish and the supervision alarm contact will drop out.</p>
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## Arc Sensor Trip Indicators

Indicate solid when an Arc Sensor has detected an Arc, the LEDs are reset after operating the reset slide switch.

	<p>A point sensor connected to Arc P1 Input has operated</p> <p>Linear sensor has operated</p> <p>A point sensor connected to Arc P2 Input has operated</p>
---	---

### Arc Sensor Supervision Alarm Indicators

Each sensor input is provided with a sensor supervision alarm indicator to determine when an Arc Sensor has faulted either due to an open circuit, sustained short circuit or high ambient lighting.

	<p>Sensor supervision Alarm for sensors connected to Arc P1 input</p>
	<p>Sensor supervision Alarm for Linear sensor</p>
	<p>Sensor supervision Alarm for sensors connected to Arc P2 input</p>
	<p>Linear sensor is not calibrating correctly, check the Linear Sensor Configuration</p>

The Sensor Supervision indications will self-reset upon the alarm conditions being corrected.

## 1S27 Arc Fault Monitor Configuration

### Device Variants

The 1S27 is available in 2 basic variants:

- 1S27-A Accepts up to 4 x 1S30 Point sensors
- 1S27-B 1 x 1S40 Optic fibre linear sensor\* and up to 4 x 1S30 Point sensors

\* The 1S27-B must have the 1S40 Optic fibre linear sensor connected for the unit to function correctly.

The function of the 1S27 will be dependent on application, the number of sensors connected and the mode of configuration.

### Relay Display Modes

To aid with operation, configuration and the display of applied settings the 1S27 has three visual display modes:

1. Normal Operating Mode
  - The 1S27 starts in this mode when powered up.
2. Setting Display Mode
  - Lift and hold the reset slide switch until a combination of LED's commence flashing.

#### 1S27-A

LED's for trip and sensor configuration will be displayed in accordance with Table 2.

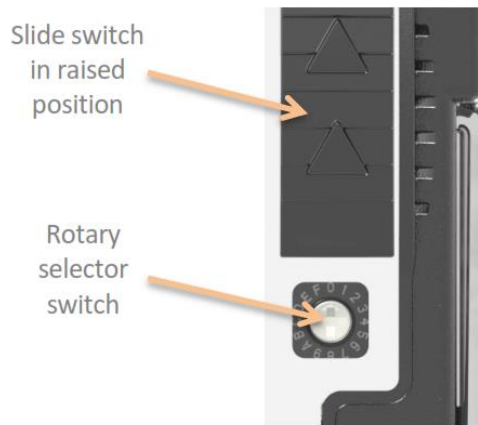
#### 1S27-B

As per the 1S27-A (Table 2) and then alternating with the linear sensor transmission length in accordance with Table 5.

3. Configuration Mode
  - The configuration mode is entered when a setting change is made by adjustment of the rotary selector switch. When this occurs the green Arc Flash Monitor LED will commence flashing. Refer to Function Configuration.

### Function Configuration

The configuration mode is set via a rotary switch accessible when the front panel slide switch is operated as shown below. Positions 0-9 are employed for trip and sensor function configuration.



The single digit configuration code required to set the 1S27 is determined from the selection matrix shown in Table 2. The slide switch is released for the setting to be stored in memory.

The configuration switch is set according to the sensor connections, device variant and the required tripping configurations per Table 3 or Table 4 .

Note that the setting must be carried out with the 1S27 powered up so that the selected configuration is stored at the completion of the setting process when the slide switch is released.

































		Configuration Switch Setting									
		0	1	2	3	4	5	6	7	8	9
		Front Panel Indication During Function Configuration									
		Flashing  Arc Flash Monitor									
1S27-A	1S27-B										
 ▲ Trip P1	 ▲ Trip P1										
	 C Trip L										
 ▲ Trip P2	 ▲ Trip P2										
 ▲ Sup P1	 ▲ Sup P1										
	 C Sup L										
 ▲ Sup P2	 ▲ Sup P2										
	 C Cal										

Table 2

### Common Tripping Configuration

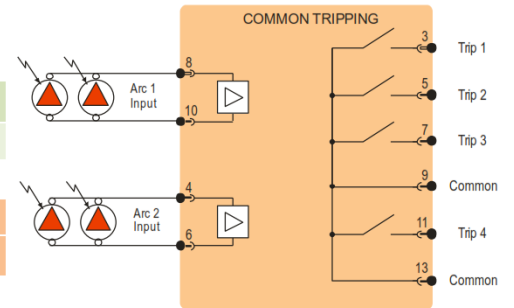
In this configuration any sensor operation will cause all of the tripping outputs to operate.

The configuration switch is set according to the sensor connections and device variant:

Common Tripping – All connected sensors are mapped to trip contacts 1, 2, 3 and 4.

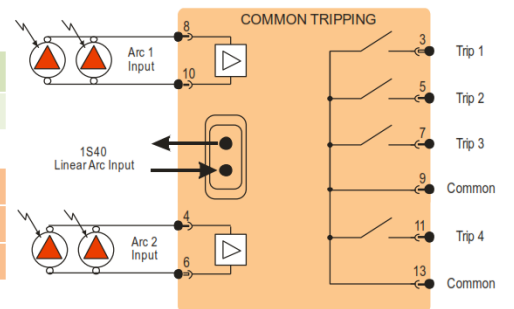
**1S27-A**

Common Tripping Scheme		Sensor Type	Configuration Switch Setting				
			0	1	2	3	4
Number of Sensors Connected	Input 1	1S30	0	1	1	1	2
	Input 2	1S30	0	0	1	2	2

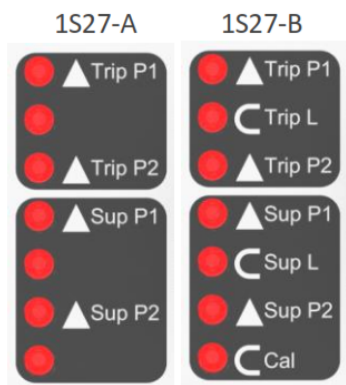


**1S27-B**

Common Tripping Scheme		Sensor Type	Configuration Switch Setting				
			0	1	2	3	4
Number of Sensors Connected	Linear	1S40	1	1	1	1	1
	Input 1	1S30	0	1	1	1	2
	Input 2	1S30	0	0	1	2	2



Configuration Switch Setting				
0	1	2	3	4



Front Panel Indication During Function Configuration				
● Arc Flash Monitor				
●				
	●			
		●		
			●	
				●

Table 3

### Zone Tripping Configuration

In these configurations all sensors connected to Input 1 and the Linear Sensor Input will cause operation of the Zone 1 tripping outputs. All sensors connected to Input 2 will cause operation of the Zone 2 tripping output.

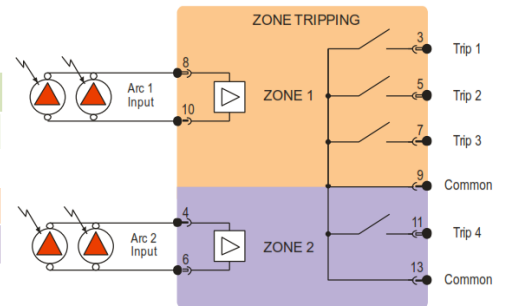
The configuration switch is set according to the sensor connections, device variant and zoning:

Zone Tripping – All sensors connected to INPUT 1 and LINEAR are mapped to trip contacts 1, 2 and 3 for ZONE 1.

Zone Tripping – All sensors connected to INPUT 2 are mapped to trip contact 4 for ZONE 2.

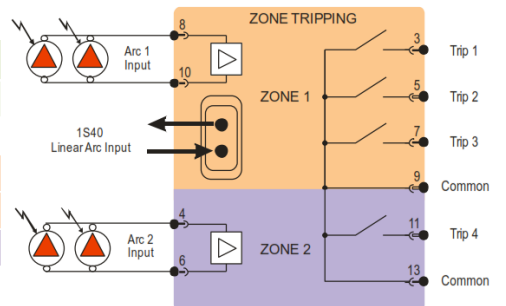
#### 1S27-A

Zone Tripping Scheme		Sensor Type	Configuration Switch Setting				
			5	6	7	8	9
Number of Sensors Connected	Input 1	1S30	1	1	1	2	2
	Input 2	1S30	0	1	2	1	2



#### 1S27-B

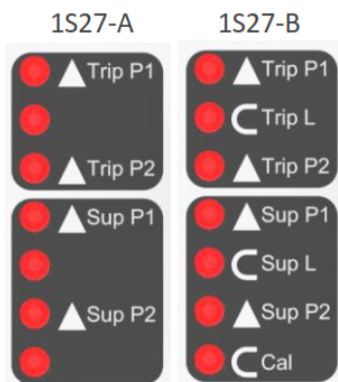
Zone Tripping Scheme		Sensor Type	Configuration Switch Setting				
			5	6	7	8	9
Number of Sensors Connected	Linear	1S40	1	1	1	1	1
	Input 1	1S30	1	1	1	2	2
	Input 2	1S30	0	1	2	1	2



#### Configuration Switch Setting

					5	6	7	8	9

#### Front Panel Indication During Function Configuration



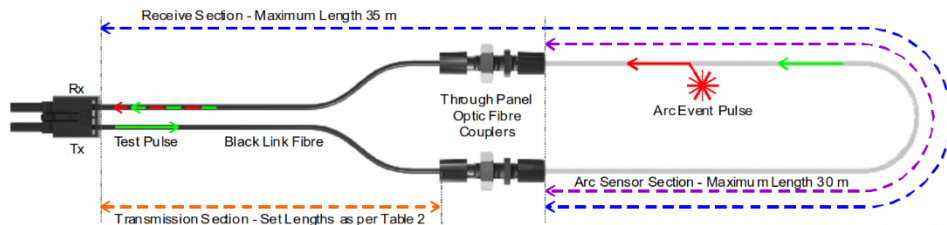
					Arc Flash Monitor				
					•	•	•	•	•
					•				
						•			
							•		
								•	
									•

Table 4

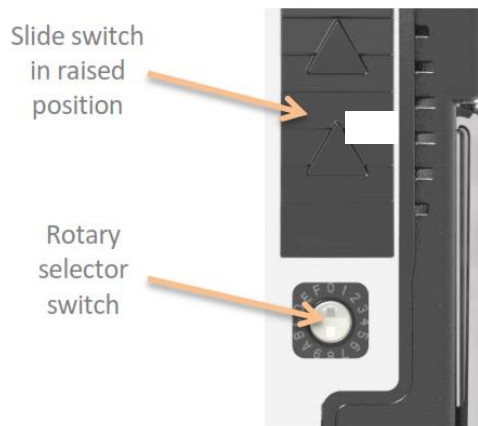
### Linear Sensor Configuration

1S27-B relays are fitted with 1 Linear Sensor input and it is compulsory to have a Linear Sensor fitted to the input. The 1S27-B relay needs to be configured for the Fibre Cable Topology to ensure correct arc detection and supervision.

The transmission section length needs to be configured in accordance with the following fixed lengths nominated in Table 5



The 1S27-B Linear Sensor input transmission section length is set using the rotary setting switch.



The Transmission Section Length setting must be undertaken after the 1S27 Mode configuration has been completed.

Transmission Section Length	Setting
<1 metre	A
1 metres	B
5 metres	C
10 metres	D
20 metres	E
30 metres	F

	Configuration Switch Setting					
	A	B	C	D	E	F
1S27-B						
▲ Trip P1	●					
○ Trip L		●				
▲ Trip P2			●			
▲ Sup P1				●		
○ Sup L					●	
▲ Sup P2						●
○ Cal	●	●	●	●	●	●

Flashing ● Arc Flash Monitor

Table 5

The slide switch is released for the setting to be stored in memory.



## Commissioning

### Commissioning Preliminaries

Carefully examine the module to ensure that no damage has occurred during transit. Check that the model number and rating information are correct.

#### Insulation

The relay, and its associated wiring, may be insulation tested between:

- all electrically isolated circuits
- all circuits and earth

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1000V. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests, subsequently must be replaced.

#### ARC Trip Verification

ARC Trip Verification will require a flash source to initiate sensor operation.

A high powered photographic flash is the most convenient means of initiating positive sensor operation.

Note that mobile phone or small compact camera flashes may not have sufficient power to cause sensor operation.

The RMS 'Arc Flash Timing Test Guide' outlines a suggested test setup to provide a flash source and determine ARC Trip times. The 'Arc Flash Timing Test Guide' is available on the RMS Mors Smitt:

[https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide\(3\).pdf](https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide(3).pdf)

Arc only tests are conducted as per the section 'Timing test of 1S25 (no current check)' substituting the wiring for the 1S25 with equivalent wiring for the 1S27.

Current check tests are conducted as per the section 'Timing test of 1S26', with the 1S30 connected to the 1S27, the current source connected to the current check relay.

The 'Arc Flash Timing Test Guide' only requires the use of a conventional test set.

Note that the nominated RMS test guide makes use of conventional binary outputs for flash initiation, whilst this is convenient and will work with the majority of test sets the technique will introduce some minor delays in the timing test results due to the latency of the conventional binary output.

Where more precise timing is required then specialised test equipment should be employed that utilises solid state outputs for arc flash initiation. There are commercially available test sets on the market that provide this capability.

### Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

The following tests are undertaken following the completion of all 1S27 ARC Monitor configurations, scheme wiring and the wiring of all 1S30 sensors.

#### System Power Up

Item	Description	Complete
1	Confirm all necessary primary equipment isolations	
2	Confirm all necessary secondary equipment isolations (including trip outputs)	
3	Check fitment of 1S30 and or 1S40 optical sensors and check sensor lead/fibre condition	
4	Check panel installation of the 1S27 monitor	
5	Check the 1S27 is wired per 1S27 Connection diagram and to the site protection design schematic	
6	Confirm that the Supervision contact is closed (Terminals 12 and 14)	
7	Apply correct Auxiliary voltage to power up the 1S27	
8	When powering up the 1S27, all the LEDs will illuminate and then extinguish before indicating the current 1S27 state.	
9	<p>Lift and hold the front panel slide switch to display the relay configuration and check that the configuration is in accordance the site application and the number of connected 1S30 point sensors (refer Table 2, Table 3 &amp; Table 4) and in the case of the 1S27-B the linear sensor transmission section length (Table 5).</p> <p>If correctly set, there should be no sensor supervision alarms or linear sensor calibration indications and the green Arc Flash Monitor LED should be illuminated.</p> <p>If there are any alarm indications recheck all of the sensor connections, the configuration settings and adjust settings if necessary.</p>	
10	Confirm the green Arc Flash Monitor LED is illuminated and the supervision contact is open (Terminals 12 and 14)	

### Sensor Failure Alarm Verification

Item	Description	Complete
1	Disconnect each sensor from the associated 1S27 sensor input	
2	Confirm the associated sensor supervision alarm LED illuminates, the green Arc Flash Monitor LED extinguishes, and the supervision contact is closed (Terminals 12 and 14)	
3	Reconnect each sensor back to the associated 1S27 sensor input	
4	Confirm the associated sensor supervision alarm LED clears, the green Arc Flash Monitor LED illuminates and the supervision contact opens (Terminals 12 and 14)	

### Arc Trip Testing

Item	Description	Complete
1	Initiate the operation of each sensor by the use of a suitably powered camera flash  * If a current check interlock is employed in your ARC Fault protection scheme ensure that current is injected into the associated Overcurrent relay to cause operation of the current check element at the same time the sensor is flashed	
2	Check operation of the corresponding sensor Trip LED and the arc fault trip output contacts	
3	Display the 1S27 relay configuration to explain any unexpected behavior	
4	Confirm operation of the trip indicator Reset after each tripping operation	

Refer also to the RMS 'Arc Flash Timing Test Guide' for a suggested test setup to provide a flash source and determine ARC Trip times. The 'Arc Flash Timing Test Guide' is available on the RMS Mors Smitt website:

[https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide\(3\).pdf](https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide(3).pdf)

Alternatively utilise commercially available test sets that provide Arc Flash testing capability.

### ARC Sensor Supervision Trouble Shooting

Item	Description	Complete
1	If any arc sensor supervision alarm LED's are illuminated re-check the 1S30 wiring integrity or continuity of the 1S40 linear sensor fibre and associated connections	
2	Check that the sensors are connected to the correct sensor inputs	
3	Display the relay configuration and check for correct sensor input configuration	
4	Check for high ambient lighting conditions for all the sensors	

### ARC Trip Trouble Shooting

If an arc trip occurs without an ARC being present this indicates either:

- a very high ambient light condition is triggering a sensor

or

- short circuit wiring of a 1S30 sensor

In both cases if the condition persists a supervision alarm LED will illuminate, and the supervision output contact will open (for high ambient lighting conditions there will be 10 sec delay before a supervision alarm LED is illuminated).

Item	Description	Complete
1	Check the 1S30 wiring integrity	
2	Check for high ambient lighting conditions for all the sensors	

### Interpreting the green Arc Flash Monitor LED Indication

The Arc Flash Monitor LED will be illuminated solid to indicate normal operation of the 1S27.

The Arc Flash Monitor LED is also utilised to indicate other operational and error conditions to provide feedback and assist in troubleshooting.

The following table summarises the Arc Flash Monitor LED indications:

LED State	Meaning
On Solid	Healthy
Flashing	Settings in the process of being adjusted
Off	Sensor supervision alarm or Linear sensor calibration problem or Auxiliary supply failure or Internal 1S27 failure

## Installation

### Handling of Electronic Equipment

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent, but the reliability of the circuit will have been reduced.

The electronic circuits of Relay Monitoring Systems Pty Ltd products are immune to the relevant levels of electrostatic discharge when housed in the case. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board.
3. Avoid touching the electronic components, printed circuit track or connectors.
4. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
5. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as you.
6. Store or transport the module in a conductive bag.

If you are making measurements on the internal electronic circuitry of equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build-up of static.

Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

## Safety Section

This Safety Section should be read before commencing any work on the equipment.

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

### Explanation of Symbols & Labels

The meaning of symbols and labels which may be used on the equipment or in the product documentation is given below.

**Caution:** refer to product information

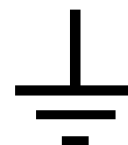


**Caution:** risk of electric shock



### Functional earth terminal

**Note:** this symbol may also be used for a Protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.



## Unpacking

Upon receipt inspect the outer shipping carton or pallet for obvious damage.

Remove the individually packaged relays and inspect the cartons for obvious damage.

To prevent the possible ingress of dirt the carton should not be opened until the relay is to be used.  
Refer to the following images for unpacking the relay:



Outer packing carton showing the shipping documentation pouch.  
Address label on top of carton.



Example of the inner packing carton of 10 relays showing the front label detailing the serial number range, the relay part number & description.





Example of a single Delta relay package showing the label detailing the serial number, relay part number & description.



Inner packing carton with lid open showing protective insert and relay.



**Terminal Block Accessories**

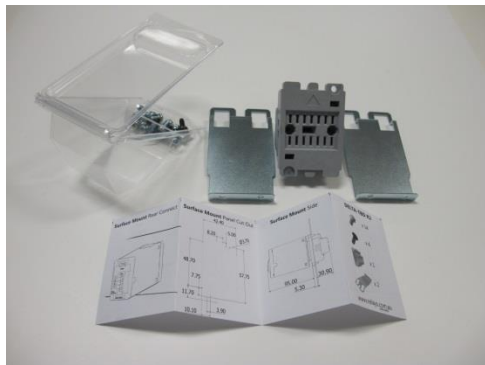


**TDB-F Terminal Block**  
For wall or DIN rail mounting  
complete with terminal screws



**TDB-R1 Terminal Block kit**  
For projection, flush panel or rack  
mounting  
complete with terminal screws and base  
fixing screws

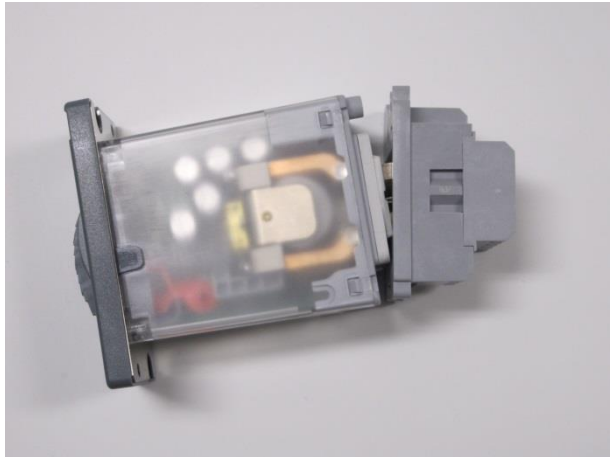




**TDB-R2 Terminal Block kit**  
For flush panel or rack mounting  
complete with terminal block retention  
plates, terminal screws and relay fixing  
screws



Relay plugged into a terminal block



Relay partially removed from terminal block

### **Storage & Handling**

If damage has been sustained a claim should immediately be made against the carrier, also inform Relay Monitoring Systems Pty Ltd and the nearest RMS agent.

When not required for immediate use, the relay should be returned to its original carton and stored in a clean, dry place.

Relays which have been removed from their cases should not be left in situations where they are exposed to dust or damp. This particularly applies to installations which are being carried out at the same time as constructional work.

If relays are not installed immediately upon receipt, they should be stored in a place free from dust and moisture in their original cartons.

Dust which collects on a carton may, on subsequent unpacking, find its way into the relay; in damp conditions the carton and packing may become impregnated with moisture and the de-humidifying agent will lose its efficiency.

### **Equipment Operating Conditions**

The equipment should be operated within the specified electrical and environmental limits.

Protective relays, although generally of robust construction, require careful treatment prior to installation and a wise selection of site. By observing a few simple rules, the possibility of premature failure is eliminated, and a high degree of performance can be expected.

Care must be taken when unpacking and installing the relays so that none of the parts are damaged or their settings altered and must always be handled by skilled persons only.

Relays should be examined for any wedges, clamps, or rubber bands necessary to secure moving parts to prevent damage during transit and these should be removed after installation and before commissioning.

The relay should be mounted on the circuit breaker or panel to allow the operator the best access to the relay functions.

## Equipment Connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

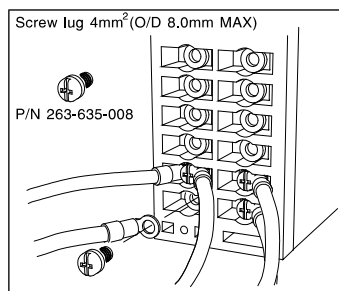
Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment, it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm<sup>2</sup>, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

1. Voltage rating and polarity;
2. CT circuit rating and integrity of connections;
3. Protective fuse rating;
4. Integrity of earth connection (where applicable)



## Decommissioning & Disposal

**Decommissioning:** The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

**Disposal:** It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner.

## Maintenance

### Mechanical Inspection

#### Relay Assembly

Inspect the relay for obvious signs of damage or ingress of moisture or other contamination.

#### Relay Module

Isolate the relay, remove any securing screws where fitted and unplug the relay from the terminal base.

Inspect the relay for signs of any overheating or burn marks which may have been caused by overvoltage surge or transient conditions on the power supply.

### Test Intervals

The maintenance tests required will largely depend upon experience and site conditions, but as a general rule it is recommended that the following inspection and tests are performed every twelve months.

- ◆ Mechanical Inspection
- ◆ Check of Connections
- ◆ Insulation Resistance Test

**Defect Report Form**

*Please copy this sheet and use it to report any defect which may occur.*

Customers Name & Address:	Contact Name:
	Telephone No:
	Fax No:
Supplied by:	Date when installed:
Site:	Circuit:

*When Defect Found*

Date:	Commissioning?	Maintenance?	Systems Fault?	Other, Please State:
Product Part No:			Serial Number:	
Copy any message displayed by the relay:				
Describe Defect:				
Describe any other action taken:				
Signature:		Please Print Name:		Date:

*For RMS use only*

Date Received:	Contact Name:	Reference No:	Date Acknowledged:	Date of Reply:	Date Cleared:
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