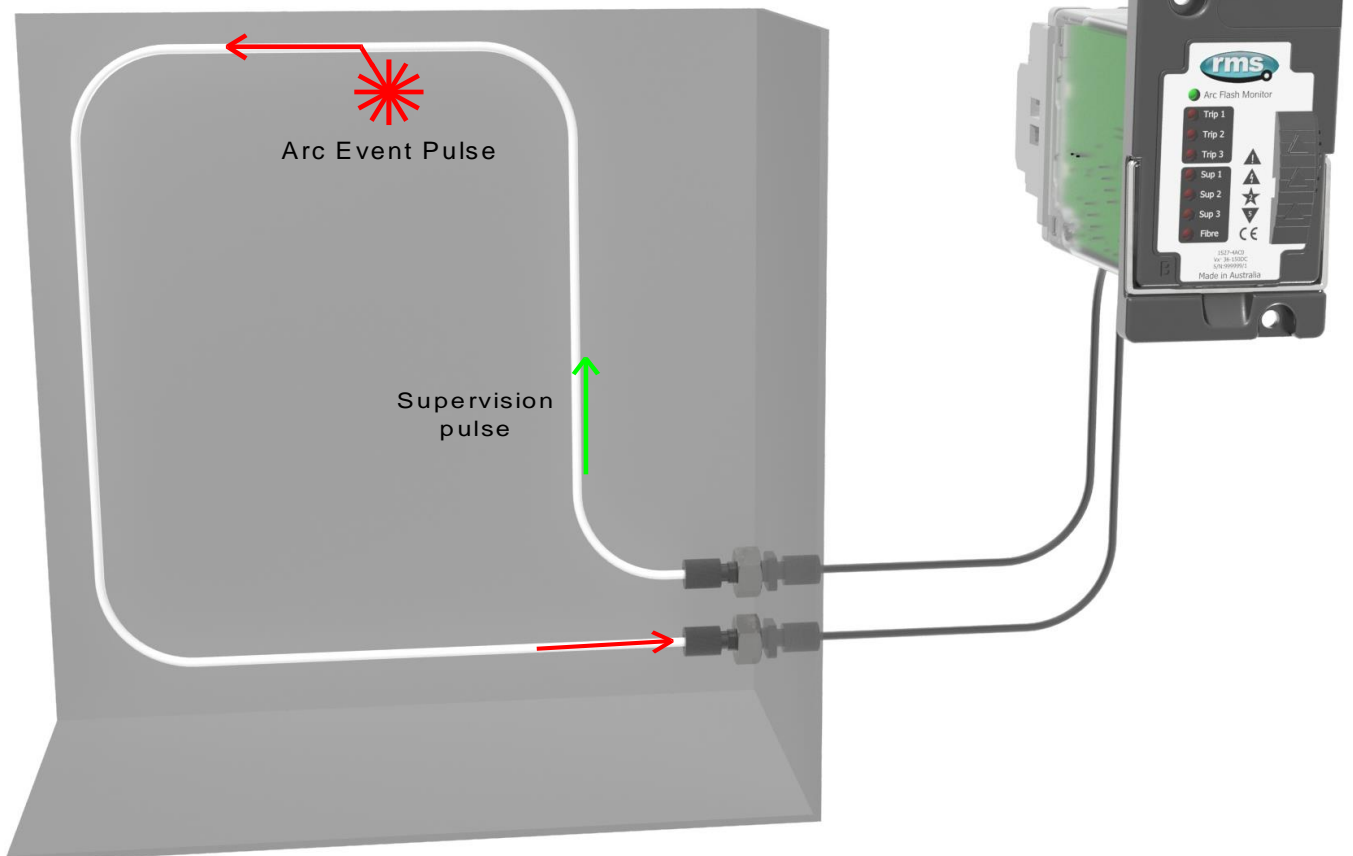


Linear Arc Flash Sensor

High speed arc fault protection for metal clad air Insulated switchgear utilizing optical sensors.

- > Linear sensor for wide area arc protection coverage
- > Selectable sensor fibre length
- > Selectable link fibre length
- > Loop topology allows sensor supervision
- > Robust and durable 2.2mm plastic optical fibre (POF)
- > Suits RMS 1S24 and 1S27 arc fault monitors



Description

The 1S40 is an optical sensor that is used to transmit the flash of light emitted during the incidence of an arcing fault back to an arc fault monitor such that detection of arcing faults can be achieved in as little as a few ms.

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 sensors kits provide both black (cladded), and translucent (bare), fibres. The bare fibres are located within the detection zone and cladded fibres allow routing of the linear sensor back to the relay.

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

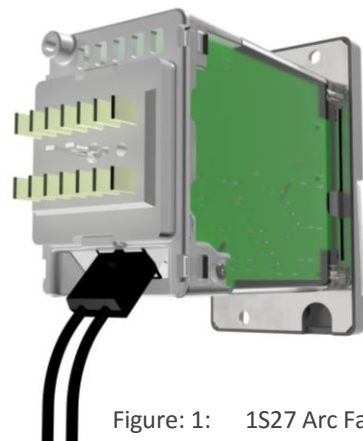


Figure 1: 1S27 Arc Fault Monitor
Dual Optic Fibre Connection Plug

Features

- > Sensor fibre length up to 30 meters
- > Link fibre length up to 40 meters
- > Robust & durable 2.2mm plastic optical fibre
- > No special tools required for installation
- > Supplied with 2x fibre couplers
- > Supplied with fibre cutter

Linear Sensor Topology

The 1S40 Linear Arc Sensor consists of four (4) elements as depicted in Figures 2 to 5:

1. Dual optic fibre connection plug to allow interface to an arc flash monitor such as the RMS 1S24 or 1S27;
2. A section of translucent optical fibre that acts as the collector for the intense visible light emitted during an arc fault event;
3. Through panel couplers for in-line connection of the sensor and link fibres;
4. Sections of opaque (Black) link fibre to connect both ends of the sensor fibre back to the arc flash monitor.

Figure 1 depicts how the dual optic fibre connection is plugged into an arc fault monitor.

Figure 8 describes the function of each section and the practical limitations for installation.

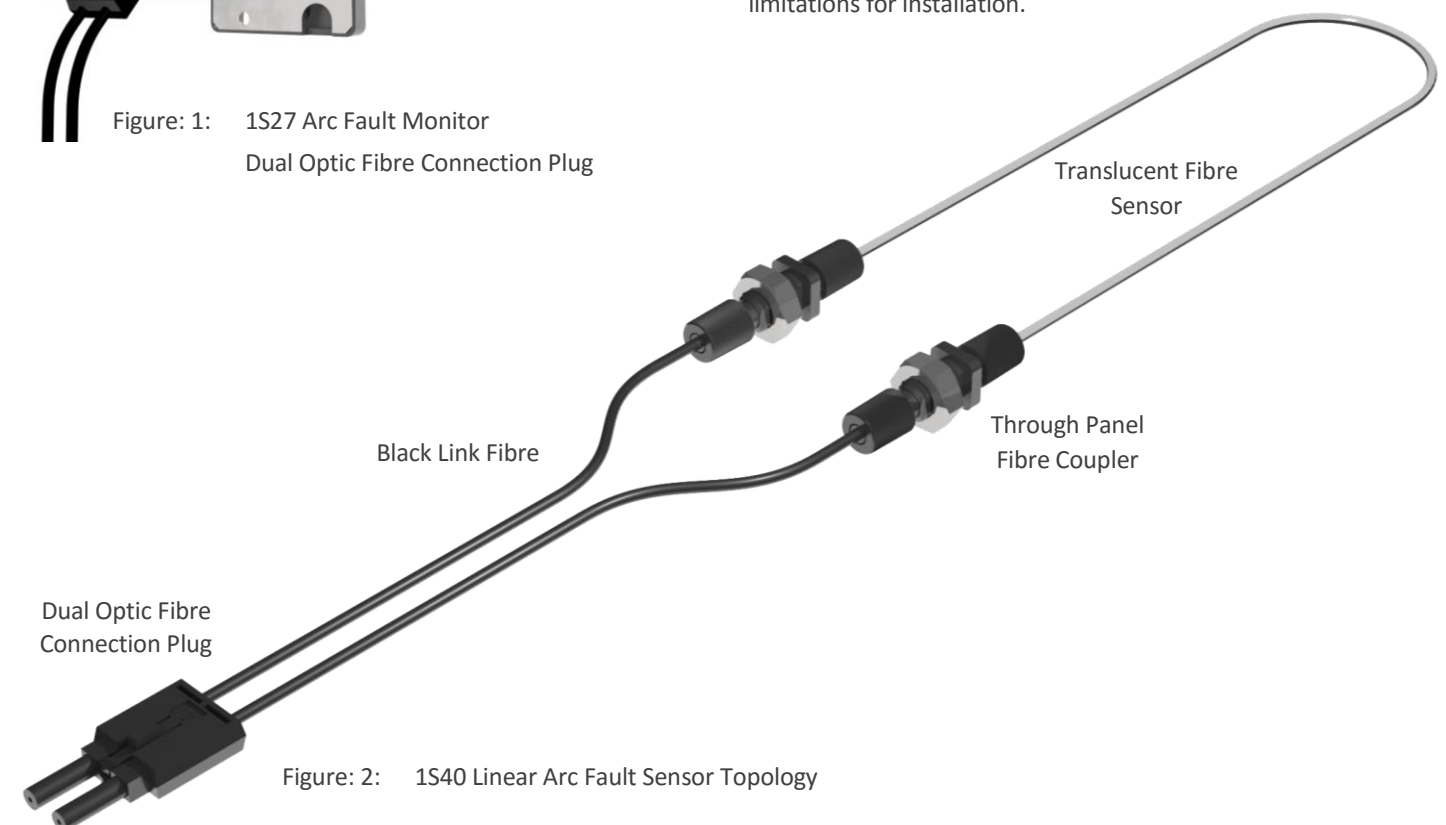


Figure 2: 1S40 Linear Arc Fault Sensor Topology

Link Fibre Assembly

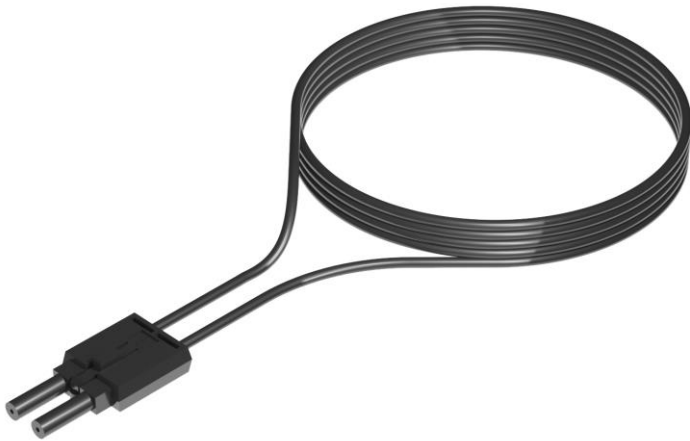


Figure 3: Link Fibre Assembly

The black Link Fibre assembly is supplied pre-terminated to the dual fibre connector ready to plug into the 1S24 or 1S27 Arc Fault Monitor. The link fibre is not sensitive to light and is used to make a connection between the optically sensitive fibre and the arc fault monitor. The length of link fibre required is specified in the Order Code section.

Sensor Fibre



Figure 4: Sensor Fibre

The sensor fibre is a 2.2mm OD translucent plastic optical fibre with is both robust and durable for application in metal clad switchgear and bus duct environments. The length of sensor fibre required is specified in the Order Code section.

Optic Fibre Coupler



Figure 5: Optic Fibre Coupler

Two Optic Fibre Couplers are provided per 1S40 kit and are used to connect the link fibre and sensor fibre together at an appropriate position such as a compartment interface.

Optic Fibre Cutter

An optic fibre cutter tool is supplied to allow preparation of the Link Fibre and Sensor Fibre to the required length for installation.



Figure 6: Optic Fibre Cutter

Assembled Optic Fibre Sensor

Once the optic fibre sections have been cut no special tools are required to achieve in-line connection using the optic fibre couplers.



Figure 7: Link and Sensor Fibres Connection

Functional Overview

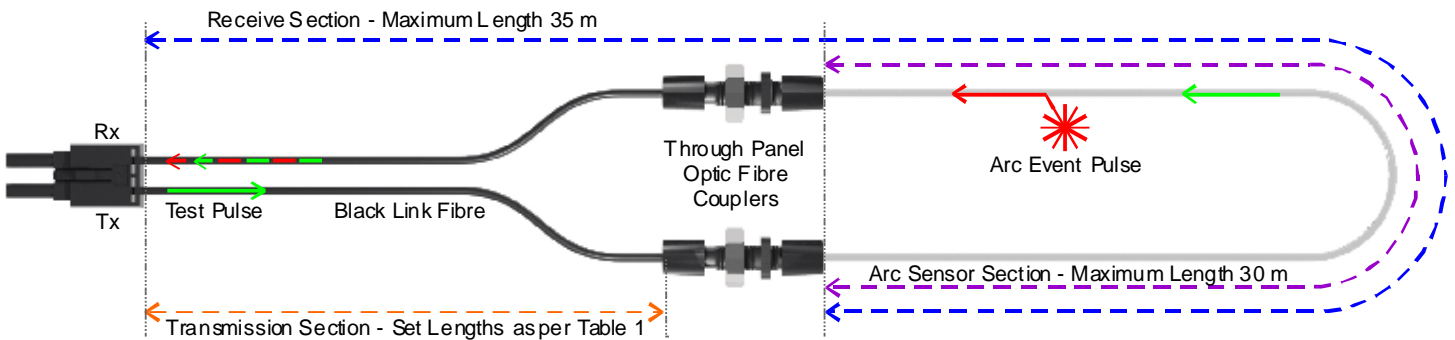


Figure 8:
1S40 Component Function and Installation Limitations

Arc Sensor Detection Function

Figure 8 shows the transmit (Tx) and receive (Rx) ends of the sensor terminated at a duplex plug ready to plug-in to an arc fault monitor. Visible light generated by an electrical arc event enters the translucent section of the sensor fibre and is guided along the fibre through the couplers and into the monitor Rx connection where an optical detector is employed to sense the arc flash. While the arc light will travel down the fibre in both directions, only the Rx end will detect the arc flash. The optical detector threshold is set above the level below that would otherwise cause nuisance tripping under ambient lighting conditions. A light intensity of >10,000 Lux over a length of 300mm is required to cause an arc trip. Additional safety against mal operation is provided to allow only sharp increases in light level to be detected.

Arc Sensor Supervision Function

To monitor the integrity of the linear sensor the arc fault monitor transmits a periodic optical test pulse. Provided this signal is received by the detector the arc monitor front panel green LED will remain energised to confirm correct sensor function. Refer to the appropriate arc flash monitor technical information for further details.

Arc Monitor Configuration Setting

The arc monitor must be configured with the correct setting corresponding to the length of the optic fibre transmission section shown in figure 8 and listed in Table 1. The transmission section fibre must be cut to one of the set lengths as specified in Table 1 within a tolerance of 10%.

Transmission Section Length	Setting	
	1S24	1S27
0 metres	00	A
1 metres	01	B
5 metres	05	C
10 metres	10	D
20 metres	20	E
30 metres	30	F
40 metres	40	-

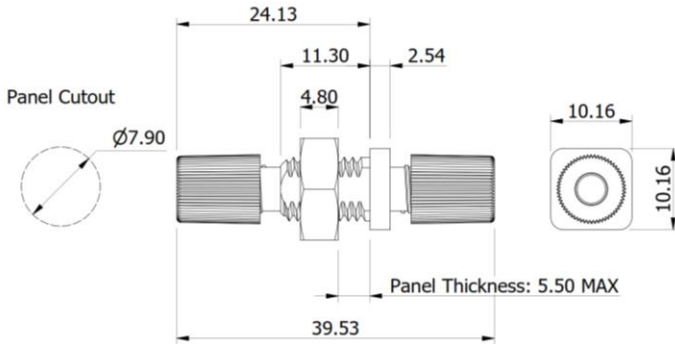
Table 1

Arc Sensor Auto Calibration

When the arc monitor unit is powered up or a setting change confirmed, a calibration routine is automatically initiated to adjust the detection gain and threshold for the deployed sensor. The level of the supervision pulse used for the calibration is set based on the configuration setting. If a suitable threshold cannot be set during calibration a Calibration fail LED is illuminated to indicate that the 1S40 connections and configuration setting should be checked.

Optic Fibre Coupler Dimensions

The optic fibre coupler allows easy in-line connection of the link and sensor fibres as per Figures 7 and 8. The clean cut fibre ends are simply inserted into either end of the coupler and the clamp screws finger tightened. The coupler may be mounted through a panel or left to be supported by the optic fibres.



Optic Fibre Sensor Location

The translucent optic fibre sensor must be located within the switchgear or bus chamber where arcing faults could occur during operation. Care should be taken to ensure a minimum length of 300mm of fibre is exposed within the chamber. For long bus chambers the fibre may be run the full length and then returned back to the starting point to provide maximum coverage. The sensor fibre should not extend beyond the chamber to be monitored and certainly not to an area that may be subject to high ambient light, flash photography or pulse-width modulated LED lighting (eg. head torches etc). Ambient light will not mis-trigger the 1S40, but very high levels can affect the calibration.

Link Fibre Sensor Location

The opaque black link fibre may extend inside the chamber to be protected or terminate at the chamber interface using the in-line couplers provided.

Optic Fibre Retention

Both the translucent and opaque optic fibres may be retained using cable ties or silicon adhesive provided not more than 10% of the sensor fibre is masked by the silicon.

Optic Fibre Bend Radius

The absolute minimum bend radius for both the translucent and opaque optic fibres is 35mm.

Temperature

Standard	IEC 60068-2-1/2
Operating Range	-40 to +85 degrees Celsius
Storage Range	-40 to +85 degrees Celsius

Humidity

Standard	IEC 60068-2-78
Operating Range	40 degrees Celsius and 93% RH non condensing

IP Rating

Standard	IEC 60529
Installed	IP5x

Vibration - Sinusoidal

Standard	IEC 60255-21-1 Class I	
Vibration Response	0.5gn	≤5%
Vibration Endurance	1.0gn	≤5%

Shock and Bump

Standard	IEC 60255-21-2 Class I	
Shock Response	5gn, 11ms	≤5%
Shock Withstand	15gn, 11ms	≤5%
Bump Test	10gn, 16ms	≤5%

Seismic

Standard	IEC 60255-21-3 Class I	
Seismic Response	1gn	≤5%

Flammability Rating

The components of the 1S40 which are directly in contact to the monitoring relay are made from flame retardant material.

The Duplex connector plug is made from SABIC ULTEM flame retardant plastic (UL file E121562).

The black Opaque Plastic Optical Fibre is made from a fire-resistant polyethylene (FRPE) which meets UL VW-1 flame retardant specification (UL file E116331, Style 5538).

1S40 Linear Arc Sensor Order Codes

1S40 -		<input type="text"/>	<input type="text"/>
Arc Sensor Fibre Length	05	Length in metres	
	10		
	20		
	30		
Black Link Fibre Length	05	Length in metres	
	10		
	20		
	40		
	80		

1S40 Accessories

Optic fibre couplers	994-677-103	Fibre Optic Connector Splice 1.0mm x 2.2mm
Optic fibre cutter	994-677-102	Disposable
Arc sensor translucent fibre	994-677-105	State number of metres required



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