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Application Note: Fire and Arc Detection Protection Relay

FAPR

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General Installation of Dimako Fire and Arc Protection Relay Type FDR xxxxxx





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1. General

The FDR relay requires a 12 Volt nominal DC power supply for operation. However different voltage units are available, with a built in power supply and battery **backup**. The integrity of the unit is generally determined by the power supply and different options are available. Battery **backup** should always be used when the relay is used in conjunction with fire extinguishing aerosol canisters. Normally relays that detect a fire or an arc are also configured to trip the incoming supply. If the power for the relay is derived from this power supply a condition may exist where the power supply is removed before a canister is ignited... hence the battery **backup**.

The relay senses bright arcing conditions via Arc Sensor Heads that are connected to the unit on terminal block J1 (3 -ve, and 13 +ve). Fire is detected by connecting a fire sensitive fibre cord to terminals J5 and J6.

For a general schematic showing the relay connections, **please refer** to Dimako Drawing Number 060818A rev 0.

2. Trip contacts

The main trip contacts are terminals J1 (10 -ve **and** 20 +ve). These terminals supply 12 Vdc to either ignite a canister directly or optionally to trigger a trip relay. The output can supply 1 Amp @ 12 Vdc: if more power or a different voltage is required an interposing relay must be used. Be sure to use a free wheel diode in conjunction with any external relay used. (See schematic for connection details). The trip terminals are powered whenever an arc fault or fire fault is detected. A red mechanical flag on the relay indicates the nature of the trip. The mechanical flag will require resetting before the relay can be used again. The flag is useful for determining the nature of the fault in the absence of control power.

The relay also has an internal monitor circuit which checks for certain internal faults, and in the event of such a fault, a mechanical flagging relay is also activated. This fault feature can also be factory programmed to trip the main trip relay. As a standard the internal fault only provides a potential free change over contact for customer use. These contacts are limited to 3 Amps @ 110 Vac or 2 Amps @ 220 Vac. The contacts are mechanically latching and remain in the tripped position even after removal of the control power supply.

The relay is also provided with two potential free change over contacts for the Arc and Fire detection circuits. These can be used for remote indication or tripping. These contacts are limited to 3 Amps @ 110 Vac or 2 Amps @ 220 Vac. The contacts are mechanically latching and remain in the tripped position even after removal of the control power supply.

3. Operational Hint

It may be convenient to fit an "enable switch" to allow access by service personnel without inadvertent tripping. If this is done indication should be fitted to provide positive feedback that the unit has been reactivated after the access.



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4. Indications

The FDR relay provides outputs for three indication LEDs. No current limiting resistors are necessary for the latter as these are internally fitted to the relay. Drawing Number 060818AA shows an LED connected to the Arc Sensor Enable **Switch**: this LED requires a current limited resistor.



Note: The indications are flashing in order to conserve power for battery backed up installations.

Drawing Number 060818AA shows an LED connected to the Arc Sensor Enable **Switch**: this LED requires a current limited resistor. This light is not normally fitted to installations with battery backup. If an energy efficient lamp is required for such an installation, please contact Dimako.

System Healthy	Indicates that the unit is Reset, Healthy and Ready for Operation
Canister Healthy	Provides positive feedback to the user that the extinguishing canister or trip relay is electrically in circuit, ie enabled
Trip	Indicates that the unit has tripped and that one or more of the detection circuits have been activated.

Note 1: If the **Trip indication** is active System Healthy and Canister Healthy indications should be inactive.

Note 2: If this is not the case it is possible that the unit has suffered some mechanical damage and should be sent for repairs.

5. Fire Detection Circuit

The fire detection cord is not electrical in nature and therefore can be run in close proximity to electrical connections. Care must however be taken not to compromise OEM tracking distances and clearances. If in doubt refer to SANS specifications.

Care must be taken not to bend the fibre cord around sharp corners and the minimum bend radius should not be less than 50 mm. (100 mm diameter). Tighter bends will permanently damage the fibre cord.

Cord **lengths up** to 10 metres are available, but remember shorter is always better in order to provide more reliable operation. Longer cords tend to get damaged more easily and are not as easy to work with.



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6. Arc Detector Circuit

The Arc Detector Heads are directional and come with a swivel base for convenient installation and positioning. Standard units are supplied with 2 meters of electrical screened cable. The Sensor Heads are sensitive devices and the screen of the cable must always be connected to terminal J1 - 2, to prevent coupling with noise sources.

Care should be taken with the wiring and the cables should be routed well away from potential noise sources such as high current carrying cables or variable frequency drives and their connection cables.

Filters Lenses are available for the units. These however **do reduce** the operating range of the unit, and some experimentation with a light source is normally necessary to determine their influence.

Up to five sensor heads can be connected to the relay. These should be connected in parallel. However it should be remembered that for reliable operation less is better, for the following reasons:

The sensor heads respond to ambient lighting as well as arcs, and by **paralleling** units each unit makes a contribution towards tripping the circuit. This makes multiple sensor head installations very sensitive to ambient lighting.

If more than two units are connected in parallel the user must make sure that under normal conditions the ambient lighting is kept low in intensity. This is normally acceptable if the units are fitted **behind closed** doors of a distribution enclosure.

Care must be taken however that the circuit is not triggered when the panel doors are opened. A key operated enable switch or door switch is useful to inhibit the circuit when the doors are opened. If this is done a light should be connected to the enable or door switch concerned to provide positive feedback that the circuit is subsequently re-activated.

The sensor heads are temperature sensitive and become a lot more sensitive at elevated temperatures. Up to 60°C five units in parallel should perform satisfactorily. Above this temperature the number of paralleled units should be reduced. There are other solutions to the above problem, and the factory should be contacted with any queries.

7. Installation

- i. See the connection diagram 060818AA for typical wiring details.
Please contact Dimako for advice on any non-standard installations
- ii. **DO NOT REVERSE THE POLARITY OF THE ARC SENSOR UNITS** as damage will occur.
- iii. Keep normal operating temperatures as low as possible and below 60°C.
Contact the factory if the installation is required to operate above this temperature.
- iv. The arc sensor heads are directional and should be aimed at potential arc sources.
- v. The effectiveness of the units is affected by the distance of the arc from the unit. The target area also gets bigger the further away the potential arc is. With increasing distance a stronger arc is required to activate the unit. Sensor performance is inversely proportional to the square of the distance from the unit. Arcs are normally quite intense and in general this does not affect operation of the unit. A good range is between 100 mm and 800 mm. An excellent test for the range of the unit is to use a 20 or 40 watt incandescent light bulb (or small torch) to simulate a flash. This can be moved around and turned ON and OFF to prove operation of the sensor head.
- vi. The arc sensor heads also respond to ambient lighting and they should be shielded from such sources. If required, Dimako can supply filters that can be clipped onto the front of the unit.



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These reduce the effect of ambient lighting but also affect the working range of the sensor. Once again a light can be used as a test as described above.

- vii. DO NOT aim the sensor head at units that arc under normal conditions. Devices such as circuit breakers and contactors do arc under normal conditions when breaking loads and this can inadvertently trigger the sensor head.
- viii. Care should also be taken to prevent reflected light from triggering the sensor heads. This can simulated to some extent by using a powerful spot light, positioned at the prospective source of the arc and shining in various directions to determine if the sensor head will trip.