

## **1 Arc Flash Relay**

Arc Flash Detection and Arc Flash Overcurrent (50, 50TD, AFD)

### **1.2 Description**

Microprocessor-based relay that utilizes optical sensors to limit arc-fault damage by detecting the light from an arc flash and rapidly tripping two circuit breakers. Optional 5A secondary current transformers should be used to detect the rising current for validation purposes (detecting both light and current significantly reduces the potential of nuisance trips).

### **1.3 Optical Sensors**

Optical sensors and adjustable trip level reduce the chance of nuisance tripping by setting a threshold for ambient light. Optical sensors shall collect light over a wide angle and with high sensitivity.

#### **1.3.1 Optical Sensors per Relay**

AFR shall have the capability of receiving detection from six (6) photoelectric external point sensors or fiber sensors and one (1) local sensor located on the relay.

#### **1.3.2 Optical Sensors per System**

For systems that require more than six (6) sensors, AFR shall be capable of linking with three other AFRs, creating a system with up to a total of 24 external point sensors or fiber sensors. System shall be capable of tripping a single or multiple circuit breakers in different locations.

#### **1.3.3 Optical Sensor requirements**

Each optical sensor, either Point or Fiber, shall have the following characteristics:

Trip Level: 10 to 40 klux

Time Delay: 1 to 20,000 ms

Detection Zone: 180° x 2.5m for Point and 360° x 8m for Fiber

Electrical Cable: Shielded 3-wire 0.5 mm<sup>2</sup> (#20 AWG)

Sensor Check: Built-in LED for visual feedback and alarm if sensor is unplugged, broken wire, or damaged. Indication shall be on AFR and Sensor.

Sensor Trip Indication: Sensor shall indicate which sensor detected an arcing condition and tripped relay. Indication shall be on AFR and Sensor.

### **1.4 Sensor Location**

Coordinate with switchgear manufacturer to optimally mount 1 or 2 sensors per cubicle to cover all horizontal and vertical bus bars, breaker compartments, drawers, and anywhere that there is potential for an arc-fault.

## 1.5 Current Transformers

Current transformers reduce the chance of nuisance tripping by setting a user-definable threshold for phase currents.

Inputs: 3-phase 5 A secondary (10 A continuous, 75 A for 1 s)

Burden: <0.25 VA, inputs @ 5 A

Current range: 1.5-15 A

## 1.6 Display

Front-panel and sensor LED's shall indicate sensor health and which sensor detected the arc fault.

## 1.7 Supply Voltage

AC: 85 to 230 VAC

DC: 12 to 50 VDC, 100 to 250 VDC

The unit can charge a 24 V backup/trip battery – Lead-acid-gel cell

Operating Temperature: -25 to 70° C

## 1.8 Indication Contacts

Three Form C (N.O. / N.C.), (5 A Resistive, 250Vac or 30Vdc)

## 1.9 IGBT Response Time

Normal Operation: < 1 ms

On power-up, DC Supply: 2 - 4 ms

On power-up, AC Supply: 35 - 40 ms

## 1.10 Trip Coil Output

IGBT switch, 200  $\mu$ s on time, 1-5 s pulsed (configurable, thermally protected). Configure trip coil to trip main circuit breaker as shown on control schematics. AFR Relay shall continuously monitor the health of the wires and trip coil and alarm if faulty.

One Form A (N.O.), (IGBT Switch)

## 1.11 Safety Features

Redundant internal trip circuit – Relay shall have a redundant internal trip circuit that is independent on the microprocessor or its software. Any failure in the primary path (microprocessor) will cause the unit to automatically switch to its redundant path in order to ensure arc flash protection even in case of microprocessor failure or during microprocessor initialization right after power up of the relay.

### **1.12 Software / Communications**

Windows<sup>®</sup>-based PC Software shall be installed on relay and not on a PC. Upon plugging in a USB cable to relay, relay shall be identified as an external drive in Windows<sup>®</sup> Explorer. Configuration files and relay data (light and current) shall be viewed on a graph over time.

AFR shall have minimum Modbus<sup>®</sup> RTU communications.

### **1.13 Certifications**

AFR shall have the following certifications: UL, CSA, and CE.

### **1.14 Manufacturer & Warranty**

Littelfuse, or approved equal. AFR shall have a minimum of five (5) year warranty.