



LITERATURE

OVERWATCH HEFPD



INTRODUCTION

Dairyland Electrical Industries' Overwatch™ HEFPD (high-energy fault protection device) is a first-of-its-kind device specifically designed to divert high-energy AC faults from railroad signaling circuits to ground. It operates as a normally open voltage-triggered solid-state switch, closing immediately upon sensing voltage above a predetermined threshold, and reopening once the over-voltage event has cleared.

WHY IS AN HEFPD NEEDED?

Railroad systems are increasingly required to operate in a common corridor with power transmission and distribution lines presenting new equipment protection challenges. Damaging AC faults caused by failure of power utility equipment on overhead power lines present high energy, long duration events that typical lightning surge protective devices are not capable of withstanding. Unlike lightning surge events which have an extremely short duration measured in microseconds, high-energy AC faults can last for up to two seconds creating significantly higher total energy than traditional lightning surge arrestors are designed for. These events pose a risk to track connected signaling and crossing warning systems as well as other protective equipment. These damaging occurrences were recognized by the railroad industry and became the basis for an entirely new class of device. AREMA Manual part 11.3.7 provides detailed guidance regarding the performance of high-energy fault protective devices (HEFPD).

Dairyland's Overwatch™ HEFPD is suited for protecting sensitive track-connected equipment such as signaling circuits. The Overwatch has been extensively tested for its capability to withstand repeated high-energy AC faults. In addition, the Overwatch may serve as a primary lightning surge arrestor, meeting the applicable requirements of AREMA Manual part 11.3.1. Key characteristics of the Overwatch allow it to be track connected while minimizing the probability of a low impedance rail-to-ground or rail-to-rail failure.

APPLICATIONS

The Overwatch HEFPD can be used in a number of scenarios, with the most common highlighted here. Important aspects of these applications are explained in more detail in the High-Energy Fault Protection Application Guide available at dairyland.com.

Rail-To-Ground Connection: Signal Circuit Protection Application

When attempting to protect sensitive track signaling equipment, the Overwatch should be installed between each rail of the track and the bungalow signaling equipment. During normal conditions, the device will present as an open circuit between the signal wire and ground. In the event of a high-energy AC fault on the railroad tracks that induces a voltage above the Overwatch's trigger voltage (or Voltage Break Point- V_{BP}), the device will quickly switch closed and divert any current to ground. Once the fault is cleared, the device immediately reverts to an open state.

Rail-To-Rail Connection: Signal Circuit Protection - Equalizer Application

When attempting to minimize voltage differential between the individual railroad tracks, the Overwatch can be connected between the two rails. Again, under normal conditions, the device presents as an open circuit between the rails. As any voltage differential from one rail to the other reaches the V_{BP} of the device, it will switch closed.

Note that the application of a single-channel device in an equalizer arrangement is an alternative to the connection of a dual-channel device from rail-to-ground. However, a dual-channel device connected from rail-to-ground will typically limit the voltage from rail-to-rail in a fault event to a much lower level. See Model Numbers and Ordering Information section for more information on single and dual channel models.

Across Rail Isolation Joints: AC Fault Mitigation

Placement of the Overwatch devices across each of the rail isolation joints will provide another form of over-voltage protection from high-energy AC faults. Often, the best mitigation method (lowest resistance path for fault current) comes from shunting the fault around the joint to the next section of track.

AC modeling by specialized consulting firms can determine the best approach to take regarding rail system fault protection, including the placement and rating of Overwatch HEFPD devices.

OVERWATCH™

HEFPD SYSTEM



FEATURES AND BENEFITS

The Overwatch HEFPD builds on 40 years of Dairyland experience in AC fault and over-voltage protection. It is designed using many of the same tried and true components and technologies used by Dairyland world-wide for handling high-energy faults. Highlights of the Overwatch include:

- Proven solid-state components that eliminate arc or spark concerns.
- Provides both high-energy AC fault and primary lightning surge protection.
- Withstands multiple AC fault or lightning surge events within ratings without failure.
- Automatic reset (following an AC fault or lightning surge event) in the presence of up to 3V DC steady state.
- NEMA 4X stainless steel, powder coated, and lockable enclosure.
- Configurable connections to optimize ratings and performance for multiple applications.
- Serviceable fuse module should an AC fault or lightning surge event exceed product ratings.

SPECIFICATIONS

The Overwatch meets all of the following AREMA 11.3.7 specifications.

- AC Fault Current Ratings: While the class of the Overwatch is determined by its capability in a 12 cycle (0.2 second) duration AC fault event, it may be helpful to understand the full scope of AC fault capabilities. The following table illustrates the current and duration capabilities of the Overwatch.

AC Fault Duration	AREMA CLASS / CONNECTION CONFIGURATION	
	Class 2000	Class 4000
6 Cycles (0.1 sec.)	2000	4000
12 Cycles (0.2 sec.)	2000	4000
30 Cycles (0.5 sec.)	1265	2530
60 Cycles (1.0 sec.)	894	1789
120 Cycles (2.0 sec.)	632	1265

Table 1: AC Fault Current Ratings – Amps-rms @ 60Hz

- Lightning Surge Protection Rating:
 - 20kA, 8x20 microsecond waveform
 - Peak let-through: <1,000V
 - 40kA, 8x20 microsecond waveform
 - Peak let-through: <1,500V
 - Fully functional after 15 repetitive tests at 40kA, 8x20
- Untriggered Electrical Characteristics:
 - MCOV Rating: 50V-AC rms +/- 3V-DC
 - 100 Ohm min. DC to 1kHz
 - 3mA max, 3rd & 5th Harmonic, 20Hz to 500Hz
- Trigger Voltage (V_{BP}): 100V rms +/- 10% (142V peak) @ 22C
- Environmental Specifications (per AREMA 11.5.1, Class B: Wayside Outdoors).
 - Temperature:
 - Operation: -40C to +70C (-40F to +158F)
 - Storage: -40C to +85C (-40F to +185F)
 - Relative Humidity (%) Non-condensing:
 - 5-95%
 - Vibration (3 axis):
 - 0.1" peak-peak @ 5-20 Hz
 - 2.0G peak @ 20-200 Hz
 - Dielectric strength: 3,000V-rms
 - Mechanical Shock: 10G
- Enclosure: NEMA 4X, stainless steel, powder coated, lockable
- Dimensions: 16" W x 20" H x 8" D. (2" mounting flanges top & bottom)
- Weight: 75 lbs.



MODEL NUMBERS AND ORDERING INFORMATION

The Overwatch HEFPD is available in dual or single channel models, depending on the application. Also available are dual or single channel replacement fuse modules. Fuse modules contain the fuses that protect the Overwatch circuitry and/or the bungalow signaling equipment should an AC fault or lightning surge exceed product ratings. It is suggested to keep a spare fuse module on hand if it is believed that AC faults and/or lightning surge events may exceed the product's ratings.

A dual-channel model simply means that for a typical rail-to-ground installation, two protection circuits (channels) are packaged in a common enclosure to connect each individual rail to ground. This is likely the most common application of the Overwatch. A dual-channel device could also protect a set of rail isolation joints. A single-channel model would more typically be used as an equalizer in a rail-to-rail connection.

The Overwatch is designed to meet the AREMA 11.3.7 voltage break point (V_{BP}) such that it will trigger to a closed state at 100V-AC rms (or 142V peak). If a different V_{BP} (trigger voltage) is desired, please contact Dairyland.

The Overwatch is designed to be configured in the field as either a Class 2000 or 4000 device per AREMA 11.3.7. The class of device equates to the AC fault current rating for a fault event that lasts 12 cycles (or 0.2 seconds). More information on installation configurations can be found in the High-Energy Rail Fault Protection Application Guide.

Note: In the event of fuse clearing, the entire fuse module should be replaced, even if only one of the two channel's fuses opens. This is to prevent degradation of other fusing components. For example, channel 1's fuse is cleared (tests as an open) due to an AC fault event while channel 2's fuse appears intact. Due to the nature of high-energy AC faults, it is likely that there was nearly enough energy to clear (open) the fuse in channel 2, and therefore cause degradation to that fuse such that subsequent fault events may cause the fuse to clear at a much lower current. Testing of the fuse module is described in detail in the Overwatch HEFPD Installation and Maintenance Instructions.

OVERWATCH HEFPD MODEL NUMBER

Choice of class is dependent on installed configuration

CLASS 2000 (W/ FUSED INSTALLATION CONFIGURATION)

CLASS 4000 (W/O FUSED INSTALLATION CONFIGURATION)

HEFPD-2000F/4000-142-D

142: Voltage Break Point (V_{BP})

(ALSO KNOWN AS TRIGGER VOLTAGE)

D: Dual Channel Device

S: Single Channel Device

REPLACEMENT FUSE MODULE MODEL NUMBER

Choice of class is dependent on installed configuration

CLASS 2000 (W/ FUSED INSTALLATION CONFIGURATION)

CLASS 4000 (W/O FUSED INSTALLATION CONFIGURATION)

HEFPD-FM-2000F/4000-142-D

FM: Fuse Module

142: Voltage Break Point (V_{BP})

(ALSO KNOWN AS TRIGGER VOLTAGE)

D: Dual Channel Device

S: Single Channel Device

Contact Dairyland Electrical Industries at dairyland.com or 608-877-9900 to request a quote or to discuss your application.

