R-Rated Medium Voltage Fuses

R-rated medium voltage fuses are back-up current-limiting fuses used in conjunction with medium voltage motors and motor controllers. These fuses are designed for short-circuit protection only and do not protect themselves or other components during extended overloads. Thus, this type of fuse does not have an amp rating, but rather an R-rating. Current-limiting fuses may be designated as R-rated if they meet the following requirements:

1. The fuse will safely interrupt an currents between its minimum and maximum interrupting ratings,
2. The fuse will melt in a range of 15 to 35 seconds at a value of 100 times the "R" number (ANSI C 37.46).

Cooper Bussmann R-rated current-limiting fuses are designed for use with medium voltage starters to provide short-circuit protection for the motor and motor-controller. These fuses offer a high level of fault current interruption in a self-contained, non-venting package which can be mounted indoors or in an enclosure. All of the R-rated product comes with open fuse indication. Some of the product is available with a hookeye option. A hookstick can be used for non-loadbreak isolation.

Application

Medium voltage motors are efficiently protected by overload relays applied in conjunction with back-up current-limiting fuses which are intended to open the circuit for high fault conditions. The overload relay is chosen to interrupt currents below the minimum interrupting rating of the fuse. Since multiple devices are used to provide protection it is very important that they be properly coordinated. The motor starter manufacturer typically chooses the proper fuse R-rating, overload relay, and contactor. The following guideline can be used to insure proper coordination.

Guideline for Applying R-Rated Fuses

The current-limiting fuse should be selected so that the overload relay curve crosses the minimum melting curve of the fuse at a current greater than 110% of the locked rotor current of the motor being utilized.

A preliminary choice is obtained through the following formula:

$$\frac{6.6 \times \text{Full Load Current}}{100} = \text{R rating of fuse}$$

This value is rounded up to the next R-rating fuse.

Example:

A 2300V motor has a 100 amp full load current rating and a locked rotor current of 600 amps.

The preliminary choice is

$$\frac{6.6 \times 100}{100} = 6.6$$

Thus one rounds up to the next standard R-rating, 9R. But this must be checked with the appropriate time-current characteristics curves.

The overload relay being used has the time-current characteristic as shown in the adjacent Figure. To choose the proper fuse one must plot 110% of the locked rotor current and the family of fuses on the same graph as the overload relay.

The fuse that should be selected is the smallest fuse whose minimum melting characteristic crosses the overload relay at a current greater than 110% of the locked rotor current. In this example, it would be a 2400V 9R fuse. This agrees with the quick selection choice. Depending on the type of installation and starter being used, a JCK-9R, JCK-A-9R, or JCH-9R would be the correct choice.