

How to Use Coordinaide™ to Coordinate Two Fuses in Series.

This is the first in a series of articles describing how Coordinaide™ — The S&C Protection and Coordination Assistant can be used to select the optimal S&C fuse or Vista® Underground Distribution Switchgear TCC curve to protect transformers, capacitor units, lines, cables, or motors, or to selectively coordinate with one or more protective devices in series.

This installment explains how to coordinate two fuse links that are electrically in series; for example, a source-side lateral (sectionalizing) fuse link and a load-side transformer fuse link.

Let's assume that the lateral fuse link is rated 65K amperes and the transformer fuse link is rated 8K amperes. An 8K-ampere fuse link is appropriate for a 25-kVA pole-top distribution transformer on a 12.47-kV system and has the following peak-load capability values, expressed as a percent of the transformer's self-cooled full-load current: *345% continuous*, *320% hot-load pickup*, and *155% cold-load pickup*.

To complete the series coordination exercise describe above, you'll need to launch Coordinaide. Additional links to Coordinaide can be found on all applicable product pages within this web site.

The Coordinaide opening page contains a brief description of the protective applications Coordinaide is designed to handle. (When you launch the program, you'll be directed to a second page that contains a brief "Conditions of Use" disclaimer, followed by a short note detailing minimum web browser requirements and a link to a "Helpful Hints" page.) One final click launches the program and takes you to the "General Information" page. Please follow these directions to select the lateral (sectionalizing) fuse, the transformer fuse, and, finally, to determine the value of current up to which the two fuses coordinate. Values in *italics* are to be entered into Coordinaide.

Enter the Project's General Information

- Project Name: *Series Coordination Exercise*
- Date: [provided by Coordinaide]
- By: *Optional*
- Voltage, kV (Three-Phase): *12.47* (default value)
- Available Fault Current (RMS Symmetrical Amperes): *10000* (no comma)

Select Device #1 Type

- *Fuse Link*

Select Device #2 Type

- *Fuse Link*

Click "Continue" after specifying the fuse links for Devices #1 and #2.

Select Parameters for Device #1

- Manufacturer: S&C
- Speed: *K*
- Rating: *65K*
- Preload Adjustment, Percent: *100*
- Ambient Temperature Adjustment: 25 Degrees Celsius (default value)

Click “Continue” after selecting the parameters for Device #1. The time-current characteristic curve for Device #1 will display.

Select Parameters for Device #2

- Manufacturer: S&C
- Speed: *K*
- Rating: *8K*
- Preload Adjustment, Percent: *0*
- Ambient Temperature Adjustment: 25 Degrees Celsius (default value)

You do not need to adjust the minimum melting curve of the 8K transformer fuse link for preload. In this exercise, we are only interested in its total-clearing performance, which is unaffected by preload.

Click “Continue” after selecting the parameters for Device #2. The time-current characteristic curve for Device #2 will display.

Results Page

Click on the tab at the top labeled “Results”.

If desired, you can change the current scale of the grid from the default, 5 to 100,000 amperes, to 0.5 to 10,000 amperes. You can also zoom in on a particular section of the grid by entering the upper and lower current and time values into the appropriate cells.

To determine the exact value of current up to which the two fuse links coordinate, place the “cross hair” cursor over the intersection of the total-clearing curve of the 8K transformer fuse link and the minimum-melting curve of the 65K lateral (sectionalizing) fuse link, and click once. The current value up to which the two fuse links coordinate (intersect)—with the lateral fuse link preloaded to 100% of its rating—is displayed at the top of the grid: approximately 2250 amperes. If the lateral fuse is loaded to less than 100% of its rating, the current value up to which the two fuse links coordinate will, of course, be slightly higher. However, it is good practice to assume that the lateral fuse link is carrying at least some load.

If the available fault current at the transformer is greater than 2250 amperes, the lateral fuse link will operate in addition to the transformer fuse link, resulting in an outage affecting more customers than would be the case had only the transformer fuse link operated. To improve coordination, you can:

1. Use a lateral fuse link having a larger ampere rating (e.g., 100K ampere);
2. Use a lateral fuse link of the same or larger ampere rating but a slower speed characteristic (e.g., "T" Speed instead of "K" Speed); or
3. Use a Coordinating Speed Fuse Link in the lateral position (e.g., 101, 102, or 103 ampere).

You may wish to repeat this exercise using one or more of the options noted above, to determine the increase in the current level up to which the lateral fuse link and the transformer fuse link coordinate. You will likely discover that an S&C Coordinating Speed Positrol Fuse Link, as its name suggests, provides optimum coordination with the load-side transformer fuse link up to high levels of fault current . . . making it ideally suited for use near substations.

You will also find that S&C Positrol Fuse Links, with their 10% tolerance in terms of current, coordinate to higher levels of current than fuse links having 20% or more tolerance in terms of current. You can prove this by repeating the first exercise using non-S&C-manufactured fuse links.

For additional information on protecting pole-top transformers, request a copy of S&C Data Bulletin 350-110, "Selection Guide for the Protection of Overhead Distribution Transformers" or obtain a copy from your local S&C Sales Representative.