



VEBKO ONLINE HELP

Directional Earth Fault

Category	tester
Section	AMT Overcurrent Module
Language	English
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1 Imported Content

Directional Earth Fault protection" with ANSI code (67N) is widely used for detecting phase-to-ground faults and serves as a backup protection in transmission lines, as well as in power plants and other facilities where directional earth fault detection is required. Therefore, understanding the operation of this protection function is essential.

In this protection, the Self-Polarization method is used for fault detection, meaning the fault voltage and current are utilized to determine the fault direction. As shown in the figure, this voltage and current include $V_{Residual} = 3V_0$ and $I_{Residual} = 3I_0$.

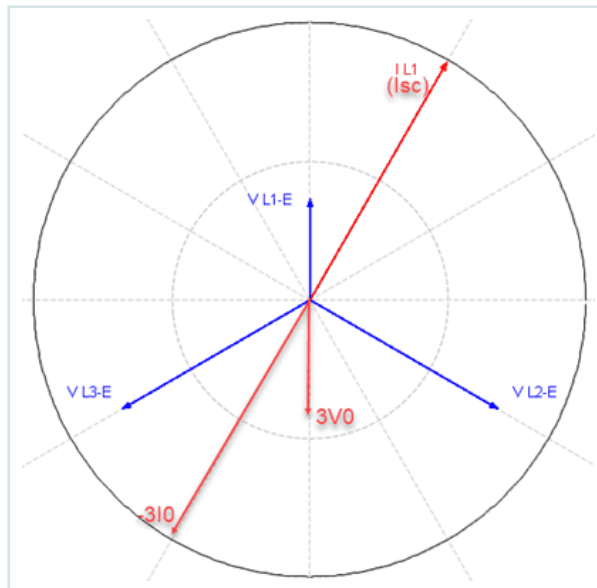


Figure 1

The reason for using $-3I_0$ relates to the relay's rear wiring configuration. In Siemens relays, the wiring setup is recommended as shown in the figure. As you can see from the wiring, the zero-sequence current enters the relay's neutral CT in the reverse direction.

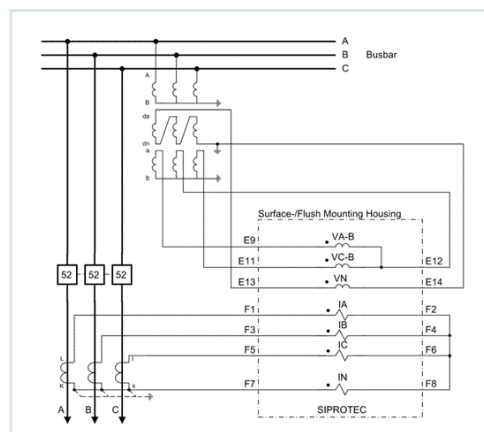


Figure 2

To determine the MTA (Maximum Torque Angle), the angle of $3V0$ is rotated by $\varphi_{\text{rotation}}$ in the clockwise direction. After determining the MTA, a zone is considered forward (as shown in the figure) that spans 90 degrees on either side of the MTA. As a result, the MTA angle is equal to: $\text{AngleMTA} = (-180 - \varphi_{\text{rotation}})$.

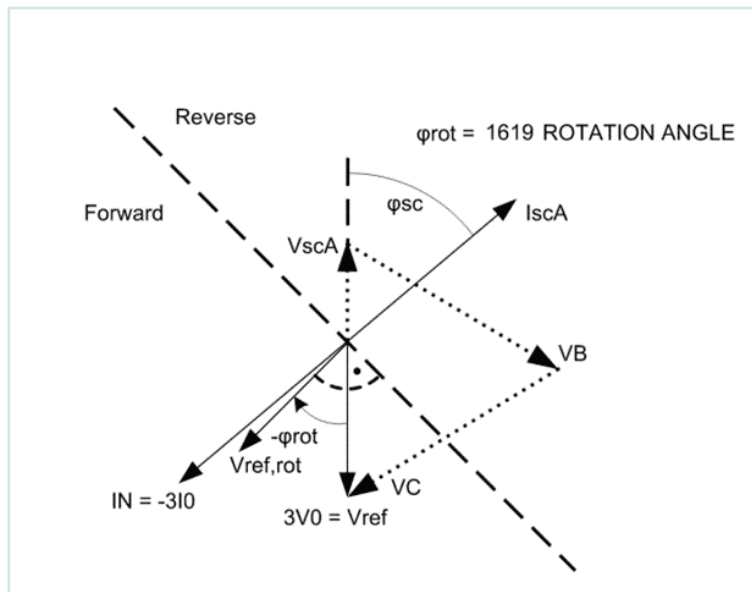


Figure 3

Since the fault current I_{sc} is injected from the tester during relay testing, the MTA and the Sector Opening range must be defined in the tester software based on the injected current. In this case, the calculations of $3V0$ and $-3I0$ are implemented within the relay and according to its algorithm. Therefore, if the MTA angle in the tester software is increased by 180 degrees, the calculations in the tester (due to the injection of I_{sc} current) will be as shown in the figure: $**\text{MTA} = (-180 - \varphi_{\text{rotation}}) + 180 \rightarrow \text{MTA} = -\varphi_{\text{rotation}}**$

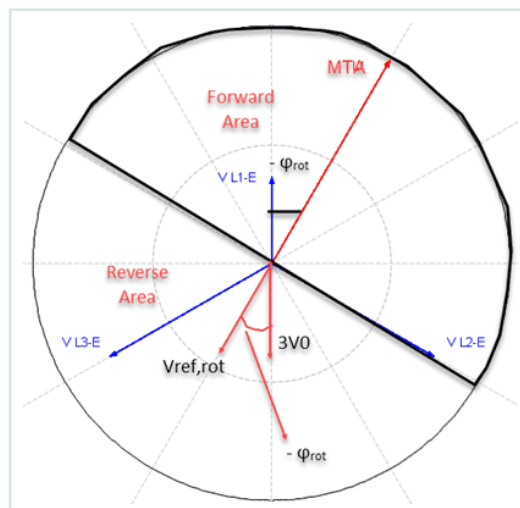




Figure 4

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