



ENERGY AUTOMATION PRODUCTS

SIPROTEC 5 - Arc-Suppression Coil Control rethought

Petersen coil control in SIPROTEC 5 devices integrated
[siemens.com/asc-control](https://www.siemens.com/asc-control)

Arc-Suppression Coil Control

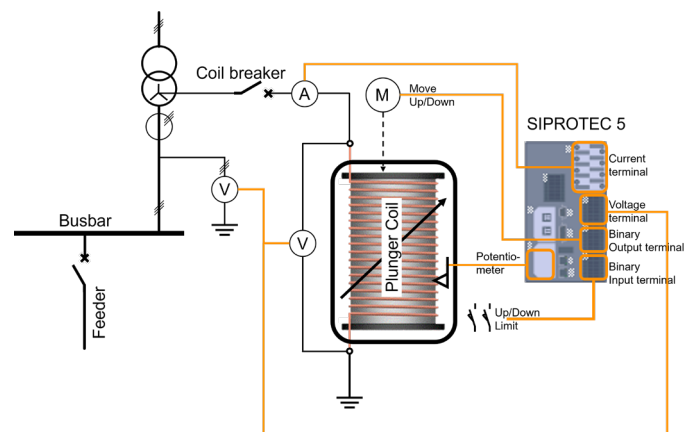
The Arc-Suppression Coil (ASC) Control (also known as Petersen Coil Control) is now available and can be easily integrated into the SIPROTEC 5 devices, saving a dedicated ASC Control physical device.

How it works

The platform function Arc-Suppression Coil Control provides a user-friendly and efficient solution for coil tuning in compensated electrical power systems. It is available as a standalone device or integrated into the SIPROTEC 5 series. This control function is particularly useful in compensated grids with arc suppression coils (especially plunger core coils).

The arc-suppression coil provides an inductive current to compensate the capacitive ground-fault current during a 1-phase-to-ground fault. When a transient 1-phase-to-ground fault occurs, the arc-suppression coil can reduce the reactive component of the current to a level at which the arc extinguishes itself, which ensures a stable power supply. The adjustable plunger-core arc-suppression coil suits a multi-feeder system where the capacitive current varies when different feeders are switched on or off. The arc-suppression coil is installed between the neutral point and the ground in a resonant-grounded system.

When a sustained ground fault occurs, the faulty feeder should be tripped by the protection function of the feeder or switched off by the operator (after the fault is located). In a compensated network, a resistor can be installed in parallel to the arc-suppression coil. When a sustained ground fault is detected, the resistor is switched on temporarily to increase the ohmic ground-fault current so that the feeder's protection function can better determine the direction of the fault.



The function group Arc-Suppression Coil (ASC) is used to control the plunger-core arc-suppression coil and the parallel resistor. The ASC control is suitable for various network configurations and offers high flexibility in hardware and software for complex applications. It supports up to four instances of the arc-suppression coil function group and can be configured via the Global DIGSI 5 Library.

Characteristics

The Arc-Suppression Coil Control system is characterized by

- automatic calculation of the resonance curve in when the network configuration changes
- automatic tuning of the coil to always ensure compensation (or defined tuning position over-/undercompensation) of the grid

The system undergoes an automatic calibration process to determine key parameters such as higher and lower end positions, motor speed, coil overrun, and linearity error of the potentiometer.

The coil position is measured/acquired by a measuring-transducer input, e.g. the "ANAI-CE-2EL Revision 2" module with potentiometer input or "ANAI-CA-4EL" or via a fast-measuring transducer input from a module such as "IO210" or "IO212" with 0 - 20mA analog value.

The modules had interfaces with various measuring points, including V_N for neutral-point displacement voltage, V_{bus} for reference voltage, and optional 1-phase current for measuring the neutral-point current. The system offers various control models, including direct with normal security, SBO (Select Before Operate) with normal security, direct with enhanced security, and SBO with enhanced security, providing different levels of control and feedback monitoring.

Manual linearization is supported to improve accuracy in converting percent values to ampere values. The system also includes an emergency stop function that can halt the coil's movement during tuning or calibration processes, ensuring safety.

Applications

The Arc-Suppression Coil Control system has diverse applications across various sectors.

- In utilities, it optimizes reliability of power supply by precisely compensating for ground-fault currents, thus enabling the grid to continue operating even in the case of an earth fault.
- In industrial plants, it provides a constant and stable power supply essential for sensitive production processes, minimizing disruptions and equipment damage.

These applications highlight the system's versatility and importance in ensuring reliable and efficient energy supply.

Key Features

- **Automatic and Manual Tuning:** Automatic tuning is triggered by jumps in the zero seq. voltage caused by changes of the I_{ce} of the grid / of the grid configuration, while manual tuning can be initiated via binary inputs, function keys, Web UI, or control center.
- **Automatic Calibration:** Before connecting the arc-suppression coil to the network, the calibration (of the controller) is performed to determine.
- **Built-in Supervision Functions:** Continuous monitoring of neutral-point displacement voltage, coil position, and motor movement.
- **Parallel Resistor Control:** Switching a resistor on and off via a time-based or thermal model when a sustained 1-phase-to-ground fault is detected.
- **Flexible Configuration:** Supports up to four instances of the arc-suppression coil function group.
- **Motor Control:** Adjusts the coil position through motor control with commands for higher and lower movements.
- **Emergency Stop Function:** Allows stopping the coil movement during tuning or calibration processes.
- **Recording Functions:** Supports slow-scan and continuous recording functions for capturing signals and measured values for later analysis.

Advantages

- **Enhanced Reliability of Power Supply:** The arc-suppression coil reduces the reactive component of the current during a 1-phase-to-ground fault, ensuring a stable power supply.
- **Fault Detection and Power Supply:** Despite a detected earth fault, the grid is compensated according to the current grid status and the power supply can continue..
- **Comprehensive Supervision:** Built-in supervision functions monitor key parameters such as neutral-point displacement voltage, coil position, and motor movement, enhancing reliability.
- **Efficient Calibration:** Automatic calibration ensures accurate determination of key parameters, reducing manual intervention and improving efficiency.
- **Safety Features:** The system includes an emergency stop function and supervision of motor speed and coil position, ensuring safe operation.
- **Recording Capabilities:** Slow-scan and continuous recording functions enable detailed analysis of system performance, aiding in troubleshooting and optimization.
- **Only one device:** by integrating the controller into a SIPROTEC 5 protection device, you save on additional hardware in the form of an ASC control unit.