

Relay Protection Settings for High Voltage Capacitor Banks



Article Overview

High-voltage capacitor banks require coordinated relay protection including unbalance, overvoltage, and harmonic-sensitive relays to prevent internal faults and cascading failures.

Key Protection Considerations

High-voltage capacitor banks are critical for reactive power compensation, voltage stability, and harmonic mitigation, but they are vulnerable to internal faults, unbalance, and overvoltage conditions. Traditional fuses or simple overcurrent relays are insufficient for EHV applications because they cannot detect progressive dielectric failures or small unbalance currents, which are the most common failure modes in large series-parallel banks .

Essential Relay Protection Functions

- Unbalance Protection (ANSI 51NC / Neutral Current Differential)
 - Detects asymmetry caused by single or multiple capacitor unit failures.
 - Uses Neutral Current Transformers (NCTs) or voltage differential methods to sense small unbalance currents that fuses or overcurrent relays cannot detect .
 - Settings typically include:
 - Alarm threshold: triggers when a single unit fails or partial unbalance occurs.
 - Trip threshold: trips the bank if internal overvoltage threatens cascading failures .
- Overvoltage Protection (ANSI 59)...

Article Content

Mar 04, 2026

Capacitor Bank Protection for Simple and Complex Configurations

Microprocessor-based relays make it possible to provide sensitive protection for many different types of capacitor banks. The protection methodology is dependent on the configuration of

May 16, 2026

Protection and Control of HV Capacitor Banks Standard

Where a capacitor bank is connected as per figure 2, the protection settings shall also be applied with consideration to the settings on the feeder CB and the requirements outlined in the Protection of HV

Jul 22, 2026

ESTAsym MD_Operating instructions_13173_02

The microprocessor-based capacitor protection relay ESTAsym MD is a versatile integrated current measuring multi-function relay design, to be used for the protection of medium and high voltage

Aug 28, 2025

Power System Protective Relays: Principles & Practices

Abstract: Protective relays and devices have been developed over 100 years ago to provide “last line” of defense for the electrical systems. They are intended to quickly identify a fault and isolate it so the

Dec 02, 2025

Capacitor and filter bank

Capacitor and filter bank protection Shunt capacitor banks, also called filter banks, are widely used in transmission and distribution networks to produce reactive power support. ABB's capacitor bank

Jun 29, 2026

Capacitor bank protection and control REV615

Compact and versatile solution for utility and industrial power distribution systems REV615 is a dedicated capacitor bank protection and control IED (intelligent electronic device), perfectly aligned

Jul 30, 2025

Capacitor Bank Protection by Relay Protection Engineer

Capacitor Bank Protection: Best Practices for Relay Engineers The electric power transmission, control, and distribution industry is at the forefront of modern infrastructure development and reliability. In this

May 21, 2026

Capacitor Bank Protection and Control REV615

Capacitor bank protection and control in medium voltage networks The relay is intended for protection, control, measurement and supervision of single Y, double Y and H-bridge connected capacitor banks

Nov 06, 2025

The basics of capacitor banks protection

This relay is called SPAJ 160C and includes unbalance protection, overload protection and undercurrent relay. The undercurrent function is used

Nov 01, 2025

Capacitor Bank Protection Relay Settings for 13.8kV Double-Wye ...

Calculate capacitor bank relay pickups for 13.8kV ungrounded wye systems. Covers 50/51 phase relay, 59N neutral displacement, VT ratio, and ground alarm/trip settings.

Dec 15, 2025

Capacitor bank protection and control REV615

Extensive range of protection and control functionality for H-bridge, double-Y-connected and single-Y-connected capacitor banks and feeder cables as well as for harmonic filter circuits. REV615 is a

May 25, 2026

GUIDELINES TO INSTALL, OPERATE AND MAINTAIN HT CAPACITORS

For capacitor bank the following protections are recommended: Over Current and Earth Fault: This protection is provided to trip the capacitor bank in case of overloading due to over voltage or

Feb 22, 2026

Transformer Protection Relay Settings Guide | PDF | Transformer | Capacitor

This document provides guidelines for setting protection relays for traction transformers and 25kV shunt capacitor banks according to RDSO specification TI/SPC/PSI/PROTCT/6070 (9/08). It outlines

Jul 25, 2025

Protection relays for capacitor banks

KSR-Z relay is a product variation of the KSR, but it is equipped with more features. It has been designed for MV or HV applications, to protect the capacitors from overload, over voltage and

Apr 25, 2026

Capacitor Bank Balancing: Causes and Practical Levels of Unbalance

High-voltage (HV) capacitor banks are constructed using combinations of series and parallel capacitor units to meet the required voltage and kilovar requirements. These capacitor banks utilize protective

Nov 06, 2025

Principles of Shunt Capacitor Bank Application and Protection

Principles of Shunt Capacitor Bank Application and Protection Satish Samineni, Casper Labuschagne, and Jeff Pope, Schweitzer Engineering Laboratories, Inc.

Dec 02, 2025

Installation, protection and connection of capacitor banks

In an low voltage electrical installation, capacitor banks can be installed at three different levels - global, segment (or group) and individual.

Mar 07, 2026

Achieving Optimum Capacitor Bank Protection and Control

Some of these are hunting - trying to find a stable voltage within an operating bandwidth, bandwidth operation transfer, auto to manual transfer and balanced switching operations of up to six capacitor

May 12, 2026

Capacitor Bank Protection Fundamentals and Protection

Relay protection of shunt capacitor banks requires some knowledge of the capabilities and limitations of the capacitor unit and associated electrical equipment including: individual capacitor unit, bank

Apr 29, 2026

Capacitor Bank Unbalance Protection Calculations and Sensitivity

Abstract—In this paper, we introduce a method for performing unbalance calculations for high-voltage capacitor banks. We consider all common bank configurations and fusing methods and provide a

Jan 07, 2026

Product Guide REV615 Control Capacitor Bank Protection and

The relay offers three-phase overload protection with undercurrent and reconnection inhibit functionality for capacitors, single or three-phase current-based unbalance protection for capacitors including

Oct 07, 2025

Shunt Capacitor Bank Design and Protection Basics

Shunt capacitor bank arrangements The function of fuses for protection of the shunt capacitor elements and their location (inside the capacitor unit on each element or outside the unit) is a significant topic

Mar 12, 2026

Reyrolle 7SR191: Capacitor bank protection | Siemens

Reyrolle 7SR191 provides dedicated protection for capacitor banks in power systems. This numerical relay ensures safe operation by detecting unbalance and fault conditions quickly, reducing risk of

Jun 06, 2026

Capacitor bank protection design consideration white paper

Capacitor banks provide an economical and reliable method to reduce losses, improve system voltage and overall power quality. This paper discusses design considerations and system implications for

Jun 09, 2026

Capacitor bank protection and control REV615

REV615 is a dedicated capacitor bank protection and control relay for protection, control, measurement and supervision of capacitor banks used for compensation of reactive power in utility and industrial

Dec 27, 2025

How to control and protect capacitor banks before something goes

The purpose of a capacitor bank's protective control is to remove the bank from service before any units or any of the elements that make up a capacitor unit are exposed to more than

May 13, 2026

Capacitor Bank Unbalance Protection Calculations and Sensitivity

Section II reviews the common high-voltage capacitor bank configurations and the applicable unbalance protection elements. The section states the scaling and measuring polarity conventions for the

Dec 17, 2025

Protection of Capacitor Bank in EHV Substations – Practical Guide

Learn practical protection of capacitor banks in EHV substations. Covers unbalance, overvoltage, overcurrent, and relay settings to improve reliability.

Contact Us

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