Relay protection braking coil

Article Overview

A braking coil in relay protection refers to the use of suppression techniques across a relay coil to control the release speed, prevent voltage spikes, and protect the driving circuitry.

Purpose of a Braking Coil

When a relay coil is de-energized, the collapsing magnetic field generates a back electromotive force (Back EMF), which can reach hundreds or thousands of volts. This transient voltage can damage solid-state relay drivers or other electronic components in the control circuit . A braking coil or suppression device provides a controlled path for the coil current to decay, reducing the peak voltage and ensuring safe operation. In protective relays, which are designed to trip circuit breakers during faults, rapid and reliable release of the relay armature is critical. Without suppression, the armature may open slowly, bounce, or even reverse momentarily due to residual magnetic forces, potentially delaying breaker operation and compromising system protection .

Common Suppression Techniques

Several methods are used to implement a braking coil effect:

o Diode across the coil (flyback diode): Provides a path for the induced current, limiting voltage spikes. While effective at protecting the driver, it slows the relay release time, which can be problematic in fast-acting protection circuits .
o Diode in series with a Zener diode: Placed in parallel with the coil, this arrangement allows faster release while still suppressing voltage spikes, optimizing both protection and relay dynamics .
o Metal-Oxide Varistor (MOV): Clamps voltage spikes but may have higher clamping voltage, suitable when the driver can tolerate it .
o Resistor or resistor-diode combinations: Can be used to control the decay of coil current, balancing protection and release speed .
o Resistor-capacitor snubber: Less common today due to cost and complexity, but can also limit transients .

Application in Protective Relays

Protective relays, whether electromechanical or solid-state, rely on coil actuation to trip breakers. The braking coil or suppression ensures that:

o The relay armature releases promptly after de-energization.
o Contact bounce is minimized, preserving contact life.
o The driving electronics are protected from high-voltage transients.

o The relay operates reliably under fault conditions, maintaining system safety . In modern systems, microprocessor-based relays may emulate these functions digitally, but electromechanical relays still benefit from physical coil suppression to maintain fast and reliable operation .

Key Considerations

o The choice of suppression method affects release time, contact life, and driver protection.
o For DC relays, a simple diode may slow release, while a diode-Zener combination provides a better compromise.
o Correct polarity is essential when using diodes; incorrect installation can prevent relay operation . In summary, the braking coil in relay protection is a critical design feature that controls the decay of coil current, protects the driving circuitry, and ensures reliable and fast operation of protective relays in power systems.

The Conclusions section presents the result of this work, which is the creation of resource-saving protection on

In most of the DC relays we use a diode (like in the pic below) to protect the components like transistors, MOSFETs

Read guidance from TE engineers on how to maximize relay performance and reliability while providing

What measures can be taken to protect the relay itself and handle electrical surges and spikes in an industrial

Learn about basic techniques for relay coil suppression with DC relays and avoid application problems.

The brake coil can be adapted to different connection voltages. It is powered via a brake control which is either placed in the terminal

A protection relay tripping circuit connects relays to breakers for fast fault isolation. Key components include trip/close

In high voltage and high current systems, circuit protection is usually provided by relays or circuit breakers.

Although it is good at protecting the relay drive circuit, there is a downside to using a diode for Back EMF

I am building a simple engage/bypass switch for musical (e.g. electric guitar) effects. The signal switching will be done

The protection circuit, such as a surge suppressor, should be attached in the area where the surge exceeds the

withstand voltage

Like (protective) current relays, this voltage signal powers the internal mechanism of the relay, closing a contact to switch 125 Volt

Several operating coils can be used to provide "bias" to the relay, allowing the sensitivity of response in

Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from

Introduction To Relay and Different Types of Relays | Its Terminals, Working and Applications Relays are the essential component

Auxiliary relays are valuable for installations where high operating time and contact rating (heavy breaking duty) requirements exist

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