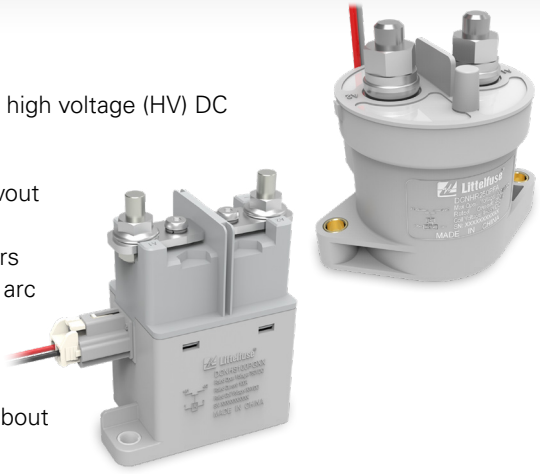
POLARIZED VS. NON-POLARIZED

TECHNICAL BULLETIN

Do I really need a Non-Polarized DC Contactor?

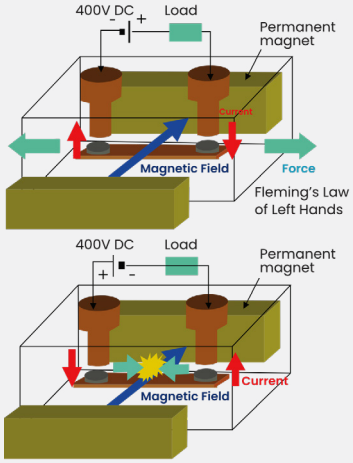
This technical bulletin discusses the differences between polarized and non-polarized high voltage (HV) DC contactors or relays for electric vehicle (EV) applications.



Polarized vs. Non-Polarized contactors relates the position and orientation of the blowout magnets designed to kill arcing during open and close cycles. **While both Polarized and Non-Polarized contactors carry current in both directions,** polarized contactors have advantages in terms of make and break electric cycle life due to their optimized arc quenching when current flows from positive to negative. They do suffer a significant drop in make and break cycles when the current is flowing from negative to positive. Non-polarized relays, while equalizing the capability to make and break current travelling in both directions, have less effective arc quenching and therefore about 50% shorter cycle life than the polarized contactor in the primary current direction.

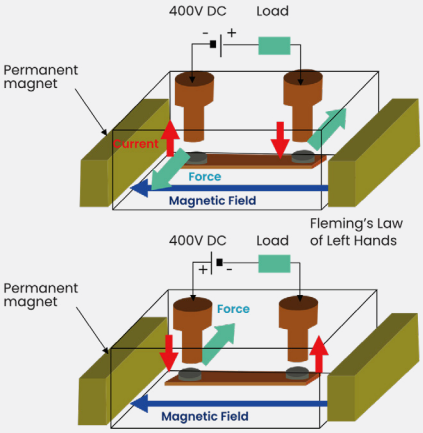
Polarized

Mono-directional current flow while opening or closing contactor



Non-Polarized

Bi-directional current flow while opening or closing contactor

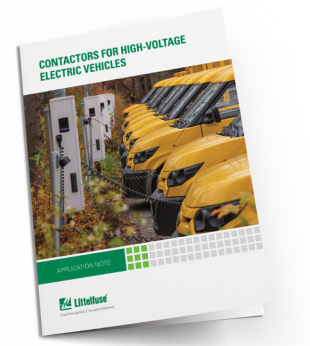


Polarized magnets in relays offer better alignment of the magnetic field lines and arc displacement, leading to superior arc quenching when current flows in the correct direction. Non-polarized magnets are a compromise, providing better alignment than polarized magnets when current is reversed but still inferior to polarized magnets in optimal conditions.

Choosing between polarized and non-polarized contactors depends on understanding the make/break and electrical cycle life requirements of the application. While non-polarized contactors may fit cases with frequent current flow reversals, polarized contactors are generally preferred for HV EV applications above 350V due to their longer cycle life and better performance under typical operating conditions. The evaluation by customers on the likelihood of fault occurrence during reverse current operations such as regenerative braking and charging often will lead to the selection of polarized contacts for their superior durability in the primary current direction.

Related Collateral

DC Contactor
Selection Guide



DC Contactor
Application Note

More Product Information & Resources Available at littelfuse.com/dcn