

Application Note AN-002

Two Coil Economizer Principles and Operation

In order to provide contactors with the highest possible performance in the smallest package the GX14, GX16, MX14, and MX16 contactors use a coil economizer. This allows the contactor to use a high powered coil during pull-in and a lower powered coil to hold the contacts in place once they have transferred.

There are several methods for providing coil economization including those shown in Table 1.

Table 1. Coil Economization Methods

Economization method	Efficiency	Cost	EMI
Two Coil	Good	Low	Low
Pulse width modulation – voltage feedback	Better	Moderate	High
Pulse width modulation – current feedback	Best	High	High

While Pulse Width Modulation based economizers have better efficiency, the GX and MX high power contactors use a two coil economizer to eliminate the possibility of EMI emissions and/or cross-talk on system control power.

Operation

Figure 1 shows the schematic for a two coil economizer. When power is applied to the coil leads the Timing Circuit turns on the Pickup coil for a period long enough to ensure that the contacts have transferred. Figure 2 shows the Input Current draw when the contactor is turned on. For Pick-up testing of contactors with dual coils, the voltage cannot be ramped up slowly, but must be applied instantly (<1ms rise time) to at least the maximum pickup voltage. Otherwise, the contactor will not pickup.

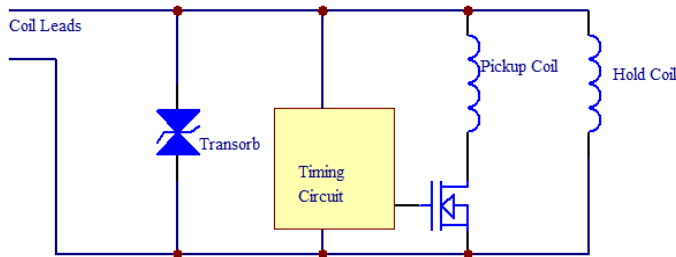


Figure 1. Two Coil Schematic

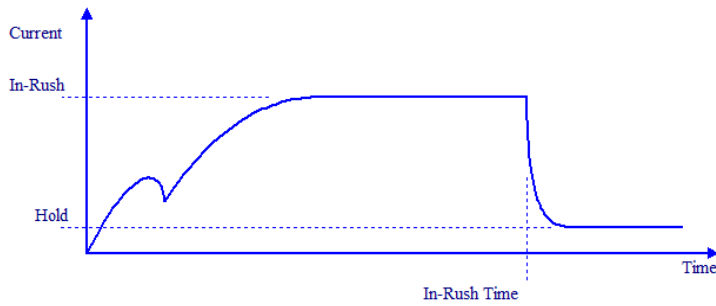


Figure 2. Input Current Draw

Application

Figure 3 shows a typical driver circuit. Coil suppression not used since the GX/MX contactors have integrated suppression. Placing a diode, capacitor, or zener with a voltage rating lower than the specified Coil Back EMF can slow the release time and invalidate the life cycle ratings, or can cause the contactor not to be able to interrupt the maximum current specified. Figure 4 shows both the coil voltage and the voltage across the FET (V_d) when the contactor is turned off. Note that the FET needs to be rated for at least V_{in} plus the Specified Back EMF.

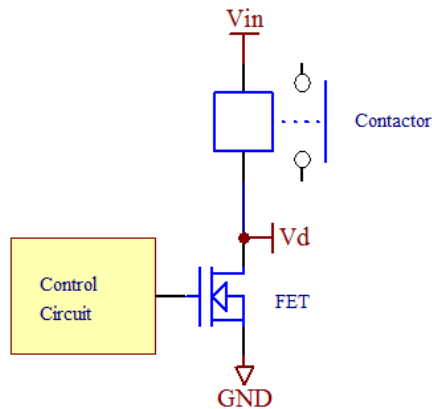


Figure 3. Typical Driver Circuit

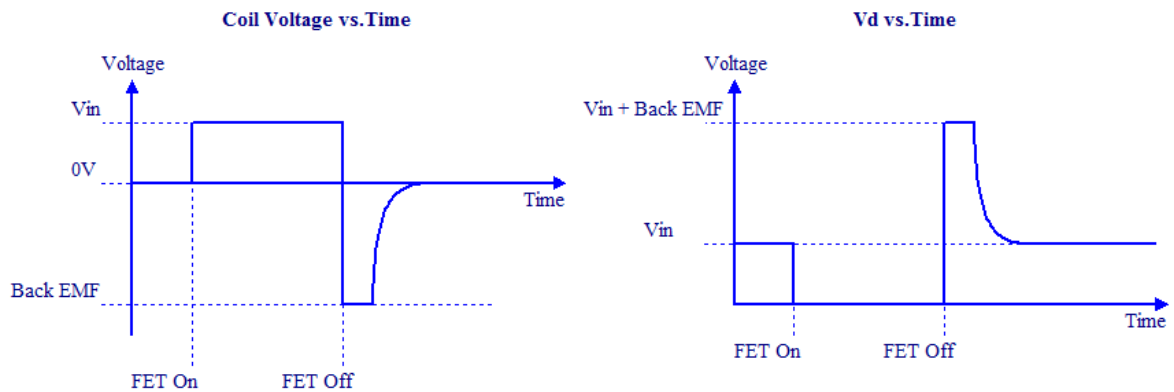


Figure 4. Coil Voltage and V_d vs. Time

If you have any questions you can always call us at 805-684-8401.