

The E Class Advantage: Capacitor Size

The proliferation of potential relay type devices has resulted in the notion that one capacitor can be employed to start all compressors. That is, use the biggest capacitor and give the compressor a “big kick” to get it started. The voltage sensing device will drop the capacitor out of the start circuit when necessary and thus the compressor will not be harmed. This idea, however, is flawed. The use of a capacitor that is too large for the impedance characteristics of the windings in some compressors can actually result in compressor damage. Recent investigations indicate that this situation is particularly evident in voltage sensing devices.

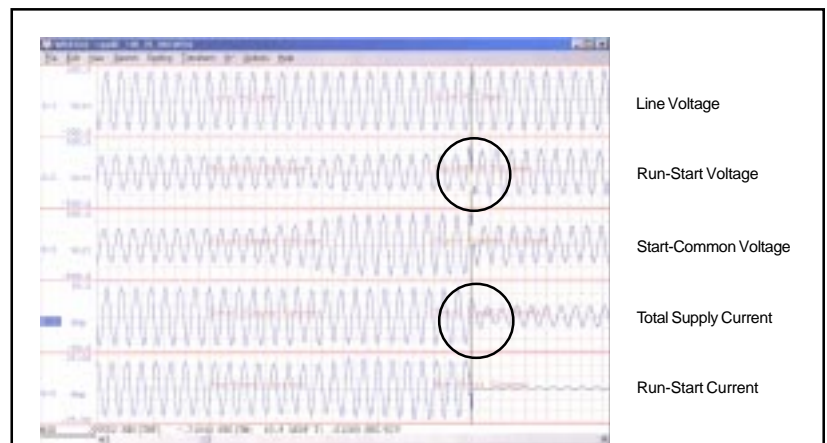
If the start capacitor is too large for the compressor, the capacitor can actually mask the developed voltage in the start windings and keep the start capacitor in the circuit continuously.

Figure 1. illustrates a compressor start with a capacitor that is too large. The motor is actually running, but the run-start voltage is suppressed below the trigger voltage of the start device. As a result, the start capacitor remains in the circuit as the motor runs. A secondary, fail-safe method (the safety timing circuit) is necessary to ensure that the start device is ultimately removed from the circuit. This event can be seen at the end of the start time duration total supply current highlighted in Figure 1.

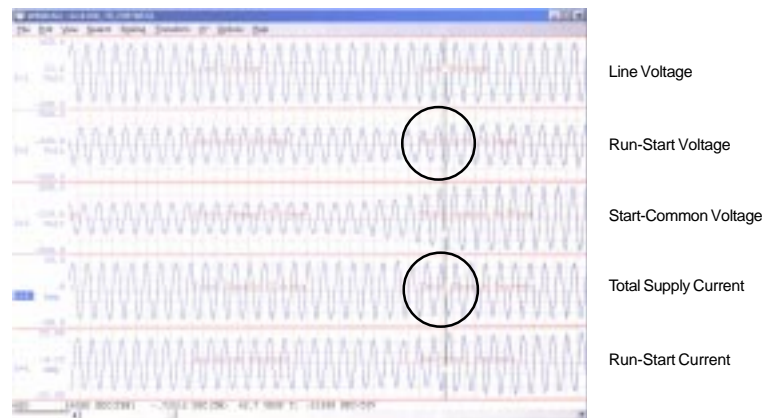
A start device that fails to remove the start capacitor from the circuit has the potential to cause premature failure of the start windings in the compressor or start capacitor.

Figure 2 shows the same compressor start using and oversized capacitor without a safety timing circuit. The run – start voltage is suppressed by the combined characteristics of the motor windings and the extra large capacitor. It never reaches the prescribed threshold voltage defined by the potential relay for removing the start capacitor from the circuit. The total supply current remains near the locked rotor value even after the motor has started (as highlighted in Figure 2).

If the capacitor is not removed from the start windings, premature winding failure could occur. As such, care should be taken when selecting capacitor sizes for an application. Care should also be taken regarding products that tout a “bigger capacitor is better” approach to compressor starting. SUPCO E-Class devices provide a secondary timing safety device to ensure that the start capacitor is dropped from the circuit in a fail-safe mode. Figure 1. also shows that the start winding current drops appropriately after the start capacitor has been removed in a SUPCO E-Class device.



**Figure 1. Start with Oversized Capacitor
with Safety Timing Circuit**



**Figure 2. Start with Oversized Capacitor
without Safety Timing Circuit**