

Control of power factor correction capacitors in circuits with soft starters



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Application

In three-phase electric power distribution systems, capacitors are often used for power factor correction. The purpose of these capacitors is to counteract inductive loading from devices such as electric motors and transmission lines. While individual motors may have capacitors for power factor correction, larger electrical distribution systems often have banks of capacitors that can be switched in or out of the circuit to apply the desired degree of capacitance to achieve the required correction.

Power factor correction capacitors are used to increase the power factor to a higher level. A circuit with a power factor of 1, for example, is the most efficient, and all the power in the circuit is real power consumed by the load to do work. A circuit with a power factor of 0.85 is less efficient and takes more apparent power to do the same amount of work as a circuit with a higher power factor. As such, a circuit with a low power factor is more expensive due to higher energy consumption.

Power factor correction may be applied to one or more motors in a circuit.

Considerations

On circuits with Eaton reduced voltage soft starters, power factor correction capacitors should be installed in accordance with the following considerations:

- Installation to be only on the line side of the soft starter
- A minimum cable distance of at least 10 feet of cable between the capacitor(s) and the soft starter
- The power factor correction capacitors may be switched with a separate contactor. NEMA[®] ICS2-1988 Part 2-210.81.01 provides recommendations for when a separate contactor should be used to switch the power factor correction capacitor, including high inertia loads, reversing motors, frequently jogged motors, and multi-speed motors
- In case of multiple motors on a single branch or a single motor, it is recommended that the power factor correction capacitors be switched out of the circuit during the ramp-up phase of any motor. When the motor being started is up to synchronous speed and the internal bypass contactors close, the capacitors may be switched back into the circuit. Capacitors may affect the proper operation of the silicon controlled rectifiers (SCRs) if kept in the circuit during the START ramp.

It is not recommended that the power factor correction capacitors be used on the load side of the soft starter. If used on the load side, power factor correction capacitors may contribute to soft starter operating difficulties for the following reasons:

- Overload protection will not function correctly due to the combination of capacitor and motor current, resulting in improper or inadequate overload protection. This condition will exist both during the start period and when in bypass
- SCR failure may occur due to excessive current flow that exceeds the rating of the SCR. If the power factor correction capacitor is in the load circuit when the soft starter begins the start ramp, the initial current surge as the capacitor is initially charging may far exceed the current transmission capacity of the SCR
- During operation of the soft starter in bypass, failure of the internal bypass contactors may occur due to the apparent power exceeding the rating of the internal bypass contactor
- During the start ramp, the soft starter is monitoring counter emf from the motor. The phase shift caused by the power factor correction capacitor may interfere with the ability of the soft starter to detect the zero cross point, resulting in SCR misfiring of the unit

Support documents

Description	Reference Number
S801 User Manual	MN03902008E
S811 User Manual	MN03902002E
Program files	—
Outline drawings	—

Additional help

In the event additional help is needed, please contact the Technical Resource Center at 1-877-ETN-CARE, Option 2, Sub-Option 2.

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