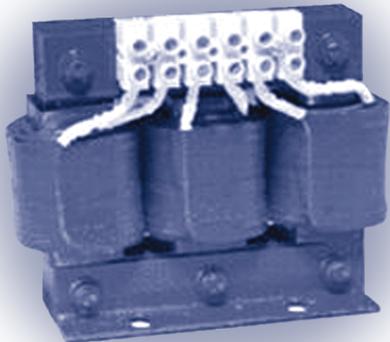
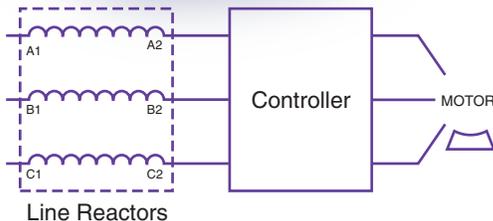


# Line Reactors and Adjustable Speed Drives



## Introduction

A Line reactor is an electrical device that is used to filter out high frequency voltage transients and is installed on each phase in series with an electrical load. A typical line reactor application (see illustration below) is to reduce harmonics and transient voltages on the line side of adjustable speed drives. Line reactors are specified by voltage, power ratings (in horsepower), and percent impedance. Line reactors reduce the line voltage by their rated percent impedance. For example, a 3% line reactor reduces the voltage by 3%.



## Transient Voltage Mitigation

Voltage transients can occur for a variety of reasons including utility capacitor bank switching or equipment switching. Sometimes, these transients are large enough to elevate an adjustable speed drive's DC bus voltage such that the drive's control circuitry will sense a trip condition and shut down the drive. In many cases, the installation of 3 – 5% line reactors may reduce these high frequency transients such that DC bus overcurrent trips are reduced or eliminated altogether.

## Reduced Current Harmonics and Line Current

Adjustable speed drives are known to increase current harmonics. These harmonics are sometimes injected back through the electrical supply and may interfere with a building's electrical distribution system. Harmonics cause the overheating of conductor insulation, which can lead to premature insulation failure. Line reactors will actually attenuate some of the current harmonics, and also reduce the overall line current.

## Are Line Reactors The Right Application?

Before installing line reactors, check the following:

1. Assure that the drive is at least 70% loaded. Line reactors installed on lightly loaded adjustable speed drives will not alleviate the transient voltage trips.
2. Assure that the adjustable speed drive can tolerate a reduction in steady state line voltage based on the rated percentage impedance. Most utilities will operate within a + or – 5% band above and below nominal voltage levels. If the supply voltage swings down to –5% at some parts of the day, a 5% line reactor will effectively reduce the voltage at the drive input terminals by 10% of nominal.
3. Some adjustable speed drive manufacturers install DC link reactors as a standard component of their products. If so, then a 3% link reactor may be enough to mitigate line voltage transients. Higher impedance ratings may be required for drives without integral DC link reactors.
4. Customer site power factor correction capacitors may have a resonant tuned interaction with utility-switched capacitors that actually amplify the voltage transient magnitude by as much as 2 – 3 times. Generally a 10 – 20:1 ratio between utility capacitors and power factor correction capacitors are the range of concern for this resonance effect.
5. Have a consulting electrical engineer evaluate your specific facility to determine if line reactors can be beneficial.