

Application of Line Reactors for Variable Frequency Drives used in Air Compressors Installations



NIRVANA



VFD

Three phase AC Line Reactors offer an economical solution to power problems encountered with the use of variable-speed drives in Air Compressor installations.

Line reactors are intended for use as input filters for adjustable speed DC drives and as input or output filters for AC-PWM (Pulse Width Modulated) variable frequency drives. With the addition of a Line Reactor, drive performance is significantly improved, the drives input rectifier is protected from failure or damage, and drive harmonic demands are tamed. Line Reactors act as an interface buffer between solid state power circuits and the line or the motor. (Not unlike the surge protector for your desk-top PC). All drives, in any application, will benefit when applied with Line Reactors.

As the name implies, Line Reactors are typically used on the line side of an adjustable-speed drive for single and multiple motors. So can be used in conjunction with Ingersoll-Rand's Nirvana drives and our full range of VFD drives.

Benefits of Input Line Reactors

As a value added benefit, if a line reactor is purchased with a Nirvana, Ingersoll-Rand will back the drive with a 5 years parts only warranty.

- Virtual elimination of nuisance tripping of drives due to utility power factor correction capacitor switching
- Attenuation of line harmonics
- Extended switching component life (Transistors, SCR's)
- Extended motor life
- Reduced motor operating temperature
- Reduced audible motor noise
- Minimized power disturbances
- Filtered electrical noise (pulse distortion and line notching)
- Waveform improvement
- Elimination of equipment downtime

Line Reactors used in Air Compressor installations insure an increase in system reliability. Considering the cost-to-benefit ratio, the addition of a Line Reactor will insure the elimination of Compressor downtime and costly production delays.

Minimising Nuisance Trips Due to Line Transients

Air Compressors are installed in industrial environments where power is typically not conditioned. Utilities Companies use capacitor banks in their distribution and transmission circuits primarily for

voltage support and power factor correction. Based on system load conditions, capacitors are switched in and out of the circuit in a daily, weekly or seasonal pattern. While this is a very old utility practice, in light of the increased sensitivity of electronic equipment, even this practice, which is primarily intended to provide customers with quality power, is now the culprit for nuisance trips on drives.

These transient voltage conditions caused by utility capacitor switching will cause drives to shut down without warning. (See Figure 1) The addition of a Line Reactor will limit the magnitude of inrush current, preventing trips and component failures. (See Figure 2.)

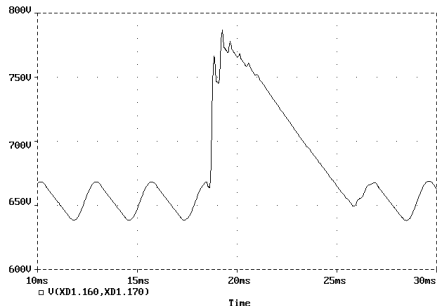


Figure 1
Typical waveform of capacitor switching transient (Ringing freq. 400-600Hz.)

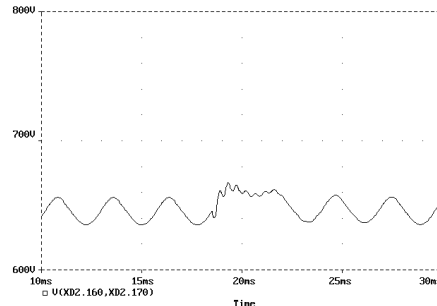


Figure 2

Line Reactors provide additional circuit inductance, which slows rapid changes in current that are at the heart of the problems listed above.

The application of a Line Reactor causes the discontinuous current to become continuous.

Frequently Asked Questions



1. What is a line Reactor?

A 3-phase line reactor is a set of three coils (also known as windings or inductors) in one assembly. It is a series device, which means it is connected in the supply line such that all the line current flows through the reactor.

2. What are some other problems that could occur?

Transient voltages often appear on the power distribution system when the utility switches capacitors on line to improve voltage regulation. This switching transient voltage forces a high current to rush into the AC PWM drive, creating a DC Bus over voltage condition that can lead the drive to shut down. However, the Line Reactor's inductance restricts this current surge and prevents nuisance tripping and component failures.

3. Can a Reactor be applied at 50 Hz?

Line Reactors are rated to handle both 50 and 60 Hz.

4. What Happens when a Reactor is applied at a Current that is lower than its rated current?

A Line Reactor's impedance is based on use at its full load rated current. If the reactor is used at less than full load, the impedance value will drop by the same ratio: If a reactor rated at 110 amps, 2% impedance is used at 55 Amps, the reactor will only offer 1.5 % impedance ($55 / 110 \times 2\%$).

5. How will the warranty work?

If you buy the Premium option (Package) for AirCare with Nirvana, it will be mandatory to have a line reactor fitted. For AirCare standard (Drivetrain) and factory extended warranty you will get additional cover (Parts only) on the drive if you buy an IR line reactor.

