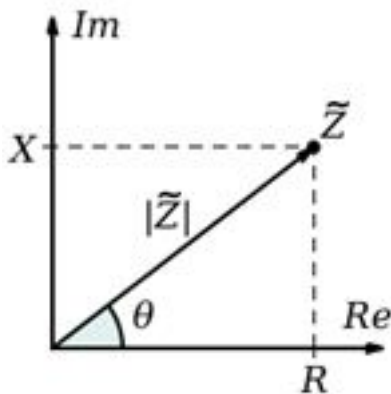


What is Electrical Impedance?

A Complex Impedance Diagram

-also called "impedance" in short- is an extension of the definition of resistance to alternating currents (AC). Impedance includes both resistance (the opposition of the electric current that causes heat) and reactance (the measure of such an opposition as the current alternates. In direct currents (DC), electrical impedance is the same as resistance, but this does not hold true in AC circuits.



Impedance can also be different from resistance when a DC circuit changes flow in one manner or another, like the opening and closing of an electrical switch. The opposite of impedance is admittance, which is the measure of the allowance of current. The figure above is a complex impedance plane, in which impedance is represented by a Z , resistance is depicted as R , and reactance is depicted with X .

Line Reactors are rated by impedance, voltage, and current.

1. Impedance (% impedance of load Z)

The load impedance (Z) is calculated by this formula:

$$Z = V \cdot I \quad Z = \text{load impedance in ohms}$$

I = current of Line in amps

V = Voltage of the Line

2. Voltage rating

Line Inductor is a current-sensitive device and voltage sensitive in its insulation.

3. Current rating (amperes)

This is the total current required by the load(s) in amps.

Why is Impedance Important?

Impedance and resistance both have applications. Your business electricity is controlled by a panel which has fuses in it. When you go through an electrical surge, the fuses are there to interrupt the power so that the damage is minimized. Your fuses are like very high-capacity resistors that will open at the proper time. Without them, your electrical

system would be ruined. Since alternating current delivers electricity at a fluctuating pulse, there needs to be a gate that aids in the control of the electricity and allows it to go smoothly so that the electrical circuit is not overloaded.

What devices can use line Inductors

AC Variable Frequency Drives, DC drives and other drives- drives for motors are some of the devices that may require Line Inductors.

Why are Line Inductors used

Line Inductors have somewhat replaced isolation transformers in many cases at lower cost. They are used to control power transients, provide line protection and isolate loads. They can provide a degree of short-circuit protection and reduce spikes, sags, and harmonics. Harmonics are currents flowing at frequencies which are multiples of the fundamental frequency (usually 60 Hz). allowing them to be used in any application. For simplicity sake you might think of a line inductor as a type of "electrical shock absorber" for your controls, motor and system.

Where is the Inductor connected

If used on the output side of a drive, the Line Inductor is connected in series with the motor leads which run from the drive to the motor.

If used on the input side of a drive for non-harmonic applications then the Line Inductor is connected in series with the power leads to the drive and should be on the load side of the drive disconnect.

If used on the input side of a drive motor for harmonic applications (a filter is also used), then the specialized Line Inductor with filter is connected in series with the power leads to the drive and on the line side of the filter.

How to size a Line Inductor

Take the amp of you motor or total motors on that line and select using that as the amperage of your Inductor for the input. Generally 3% will be ok for normal cases. The line voltage will decrease on the output of the inductor slightly. The same sizing would generally work for on the output of the drive if you are concerned about skin effects causing motor aging issues. Generally those appear on very long cables from the motor and depend on the switching frequency of the electronic components. Sometimes 5% is more appropriate or use an Inductor with a harmonic filter. Some devices such as Power Electronics International, Inc. drives are very robust and do not see much of that particular effect, but it is never an issue to add the devices except if there are severe low voltage dips on the line. Low voltages dips will be exacerbated by an inductor by slightly lowering voltages due to losses, but could help in other ways. Generally, those are rare cases and are detected in the field.