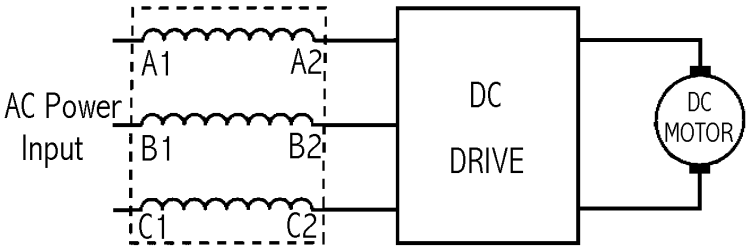
How to Select the Reactor That's Right for Your DC Drive!

This application note shows how to determine which reactor will work best for your DC motor drive. The selection methods described are step-by-step and easy to follow. These instructions are very helpful in determining the right reactor.

Reactor Selection for the Line Side of DC Motor Controllers

MTE three-phase AC reactors are not just for use with AC variable frequency drives. Use MTE reactors on the input of DC motor controllers to provide protection for the drives, and improve the quality of power supplied to other loads on the distribution system. To reduce the "notching" of the supply voltage that will be caused by a three-phase DC motor drive, apply a 3% impedance MTE reactor to the drive input.



Quick Selection

Selection of MTE reactors for DC drive input applications of lower horsepower are made directly from the MTE reactor selection table. Because higher horsepower DC drives may demand more line current than AC drives of the same HP, these applications should use the reactor for the next larger horsepower rating on the chart.

The DC motor drive applications (3-phase supply) for which the next larger reactor should be considered are:

600 Vac, $\geq$ 75 HP DC
480 Vac $\geq$ 100 HP DC
208-240 Vac $\geq$ 20 HP DC

For example, to select a reactor for a 200 HP DC drive application supplied by 480V 3-phase power, simply use the 3% impedance selection from the table for 480V, 250 HP. If a mathematical method of selection is desired, one is presented below.

Mathematical Selection

Data required to perform the calculations are: full-load DC current from the motor nameplate, three-phase supply voltage (line to line), and supply frequency. Determine the current that will be demanded from the AC supply under full load condition. This is about (0.85) * (full load amps of DC motor).

Calculate the inductance that provides 3% impedance for the application under full load. The formula for this is:

$$L = \frac{Z * V}{I * 2 * \pi * f * \sqrt{3}}$$

Where L = inductance in Henries
Z = percent impedance desired (0.03 in this case)
V = supply voltage (line to line)
I = fundamental load current demanded from AC line (Amperes)
f = supply frequency (Hz)

Once the required ampacity and inductance are known, a reactor may be chosen from the specification table for MTE reactors. The reactor's fundamental current rating should be equal to or somewhat greater than the calculated demand from the AC supply. The inductance of the reactor should be selected as near as possible to the ideal value calculated above.

Example:

An MTE reactor is required for the line side of a DC motor drive. The drive is supplied with 480V 60 Hz three-phase power. The motor is 500Vdc, 125 HP, having a full load current of 205A.

First, the current demanded from the supply at full load is calculated:
0.85 * 205 = 174.25, or a full load demand of about 175 Amperes.

Second, the required inductance is calculated:
L = (Z*V) / (I * 2 * π * f * √3)
L = (.03 * 480) / (175 * 2 * 3.1416 * 60 * 1.732) = 0.000126, or 0.126 mH

The MTE reactor fundamental current rating nearest to but not less than 175A is the 200A rating. The 200A MTE reactor inductance that is nearest to the calculated ideal value is the 0.110mH of the model RL-20002.