Power Factor Corrector Inductors

Falco is among largest worldwide developer and manufacturer of Power Factor Corrector Inductors for high current applications. This is the result of many years of experience in meeting the needs of world leading UPS and SMPS manufactures which has driven us to perfect designs based on T18 and T23 toroidal types.

Our specialized winding equipment and techniques allow us to meet any mounting and pin layout on a variety of different types of headers. Competitive pricing is achieved due to our strong manufacturing capacity of over 60 specialized winding machines, manufacturing techniques, high volume handling of quality raw material, and above all product knowledge.

A wide range of inductance and current values are illustrated in our PFC selector chart in order to help you pick the right value for your needs. All parts in our catalogue are in production and can be delivered in a very short time. Any modified value can also be accommodated quickly.

Sendust based core mixes with low magnetic losses are used in the T18 and T23 series construction in order to help minimizing the AC high frequency losses in the PFC circuitry. The use of “soft” DC saturation magnetic cores extend the T18 and T23 series on peak current capability allows up to 60% initial inductance roll-off and prevents abrupt saturation even at high temperatures.

Power Mag

FEATURES

- **Sendust or Kool - μ® core employed with significant low core loss**
- **Toroidal geometry allows use of thicker wire which decreases the DC resistance; yielding higher current capacity**
- **Different material permeabilities like 26μ, 60μ, 75μ and 120μ allows good inductance vs DC balance roll off**
- **Peak current as high as 128 Amperes**
- **Auxiliary winding options available at competitive costs**
- **Vertical or Horizontal through hole mounting**
- **In-process impulse surge test of 2,000 Volts applied to all units**
- **Built to meet insulation class systems B (130°C), F (155°C) or H (180°C)**
- **Operating temperature range –20 to +105 °C**

APPLICATIONS

The equipment connected to an electricity distribution network, usually needs some kind of power conditioning (typically rectification) which produces a non-sinusoidal line current due to the non-linear characteristics.

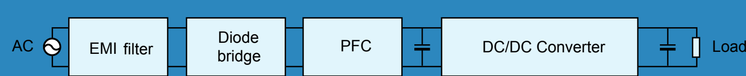

Figure 1) Location of a PFC stage within a Switched Mode Power Supply.

With the increase of power line current harmonics have become a significant problem. Typical problems include increased magnitudes of neutral currents in three-phase systems, overheating in transformers or induction motors, as well as degradation of system voltage waveforms among others.

Several international standards have been issued to regulate and limit the harmonics of equipments connected to the electricity distribution network. High frequency switching converter topologies include a PFC circuitry section or Preconverters where the heart is the PFC inductor operating in either Continuous or Discontinuous Mode Current (DCIM or CCIM).

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Passive PFC methods use additional passive components in conjunction with the diode bridge rectifier from *Fig. 1*. One of the simplest methods is to add an inductor at the AC-side of the diode bridge, in series with the line voltage as shown in *Fig.2a*, and to create circuit conditions such that the line current is zero during the zero-crossings of the line voltage. The maximum power factor that can be obtained is 0.76, with the theoretical assumption of constant DC output voltage. The DC output voltage of the PFC circuit has a ripple at twice the line-frequency. The ripple is also dependent on the load current. Simulated results for the rectifier with AC-side inductor are presented in *Fig. 2b*, where the inductance ΔL has been chosen so as to maximize the power factor.

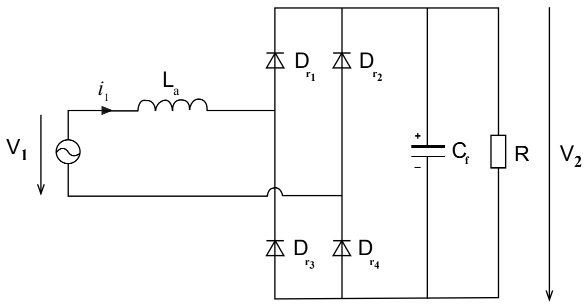

Figure 2a) Rectifier circuit PFC with inductor on AC side.

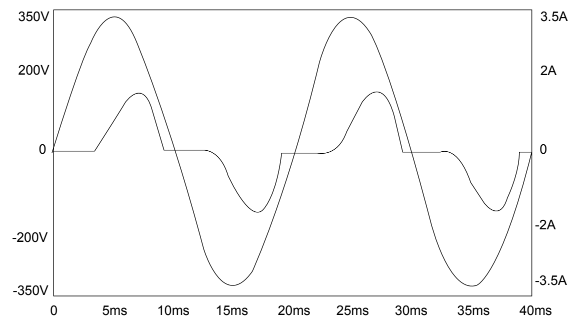

Figure 2b) Waveform example for PFC correction with inductor on AC side

The inductor can be also placed at the DC-side, as shown in *Fig. 3a*. The inductor current is continuous for a large enough inductance L. In the theoretical case of near infinite inductance, the inductor current is constant, so the input current of the rectifier has a square shape and the power factor is 0.9. However, operation close to this condition would require a very large and impractical inductor, as illustrated by the simulated line current waveform for ΔH L (without C_a), shown in *Fig. 3b*.

For lower inductance ΔL , the inductor current becomes discontinuous.
The operating mode being identical to the case of the AC-side inductor previously showed. An improvement of the power factor can be obtained by adding the capacitor C_a as shown in *Fig. 3a*, which compensates for the displacement factor cos p. A design for maximum purity factor p *K* and unity displacement factor cos is possible, leading to a maximum obtainable power factor 0.905. This is exemplified by the simulated line current for Δ 275mH L and a 4.8 μC which is shown in *Fig. 3b*.

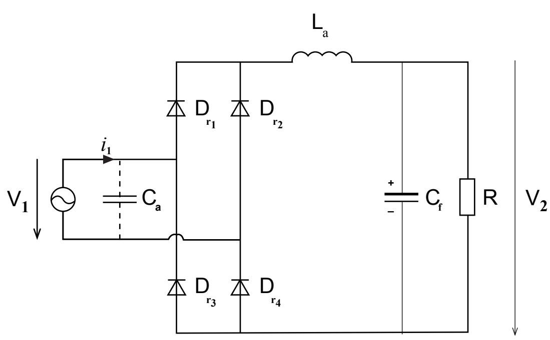

Figure 3a) Rectifier circuit with PFC inductor on DC side.

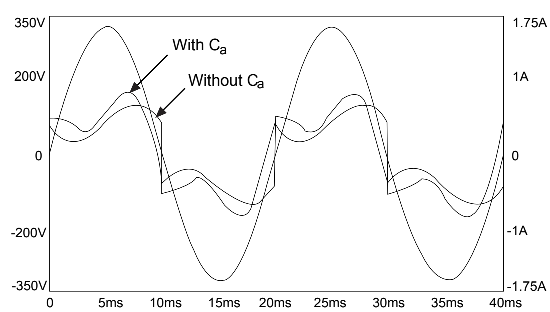

Figure 3b) Waveform example for PFC correction with inductor on DC side.