

# PFC2000

## Harmonic Filter



### Overview

Harmonic currents and the voltage distortion they create can have devastating effects on a power distribution system and its connected equipment. Present methods of harmonic treatment—line reactors, multipulsed systems, tuned or broadband passive filters, and active filters—are often only moderately effective, too costly, and somewhat unreliable.

The PFC2000 Harmonic Filter is an innovation in passive harmonic mitigation. It is an easy-to-apply passive harmonic filter capable of reducing variable-speed drive harmonics with none of the inherent problems of conventional filters.

### Description and Application

The PFC2000 is a purely passive device consisting of a novel inductor combined with a relatively small capacitor bank. Its innovative design achieves cancellation of all the major harmonic currents generated by VSDs and other similar three-phase, six-pulse rectifier loads, including the 5th, 7th, 11th, 13th, and so forth.

### Leading Power Factor

The large capacitor banks in both trap and broadband filters present a capacitive reactance to the system, especially under light loads. This can be beneficial where inductive loads require a compensating reactance to improve a low displacement power factor. However, in many VSD applications, the displacement power factor is quite high even though overall power factor is low due to the harmonic content. Compensation for inductive loads is not necessary and, in fact, can cause problems,

## Features & Benefits

especially when supplied by an emergency standby generator. To address this, more sophisticated filters are equipped with a mechanism for switching out the capacitors under light loads, increasing their cost and complexity. In contrast, the capacitive reactance of the PFC2000 is so low, even under no-load conditions, that switching out the capacitors is unnecessary.

### Harmonic Reduction

The effectiveness of a trap filter is dependent upon the amount of harmonics present at untuned frequencies as well as the residual at the tuned frequency. To obtain performance better than 15% THDI, multiple tuned branches are often required. Broadband filters claim less than 12% THDI but require relatively large capacitor banks to achieve this. Even larger capacitors are required if further reduction in THDI is desired. The PFC2000 reduces current distortion to less than 8% or 12% THDI, depending upon the model selected, and typically achieves near 6% or 10% when operating near full load. This allows the filter to achieve 8% or 12% of actual demand even on loads as low as half the filter rating.

- Does not require costly harmonic studies or system analyses
- Applies easily to the input of single or multiple drives
- Available for economically satisfying harmonic limits
- Will not be overloaded by other line-side harmonic sources
- Improves overall system power factor by removing harmonics
- Suppresses overvoltages caused by capacitor switching or other loads
- Saves energy by reducing upstream harmonic losses
- Reduces inrush currents of motors started across the line in bypass mode
- Reduces DC bus ripple and associated stress on bus capacitors

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## Performance Comparisons

The typical performance of a variable-speed drive with various passive harmonic treatments is shown below.

Configuration	Input Current Waveform	Spectrum	Power THDI	Factor
6-pulse drive			72.9%	0.79 lag
6-pulse drive with AC line reactor			35.6%	0.90 lag
6-pulse drive with DC link choke			30.9%	0.95 lag
12-pulse drive with DC link choke			9.8%	0.94 lag
18-pulse drive with DC link choke			4.3%	0.97 lag
12% 7110 Harmonic Filter			10.8%	0.99 lag
8% 7110 Harmonic Filter			6.3%	0.99 lag

## Dimensions & Weights

Type No	Current (Ams)	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
PFC2000-15/0.4	15	400	300	250	23
PFC2000-20/0.4	20	400	300	250	26
PFC2000-30/0.4	30	400	300	250	30
PFC2000-40/0.4	40	520	350	300	41
PFC2000-50/0.4	50	520	350	300	45
PFC2000-80/0.4	80	520	350	300	58
PFC2000-100/0.4	100	950	460	450	76
PFC2000-120/0.4	120	950	460	450	100
PFC2000-150/0.4	150	950	460	450	140
PFC2000-200/0.4	200	950	460	450	170
PFC2000-250/0.4	200	950	460	450	200
PFC2000-300/0.4	300	1200	600	500	250