

How can Power Factor Correction equipment be installed on a system subject to high levels of Harmonics?

Reactor connected (detuned) Capacitors can be installed which are designed to prevent system resonance. They can also be designed to reduce the level of harmonics as indicated below.

Blocking Reactor System

This reactor / capacitor combination is designed to have a resonant frequency of 189Hz. In this case, system resonance is avoided and approximately 17 to 20% of the 5th harmonic current can be absorbed. This is suitable for variable loads.

Partial Filter System

Here the reactor / capacitor combination is designed to resonate at a frequency of 210Hz, again system resonance's are avoided and approximately 40 to 50% of the 5th harmonic current can be absorbed. This is suitable for variable loads where harmonic reduction is also required.

Full Filter System

In this system the capacitor / reactor legs are tuned to a given harmonic frequency producing almost zero impedance to that harmonic current. Therefore most of the current is absorbed by the filter.

This type of filter is typically constructed with multiple legs, each being tuned to a specific harmonic frequency and can realistically reduce the harmonic current flowing in the supply network by up to 90%. Ideally, this is suited for constant loads.



*A single-width type partial filtration system.
Cabling is accessed from above with this example*

A solution to the problems associated with Power Factor Correction and Harmonics

PFC Engineering Limited have over 25 years experience in the design and manufacture of Harmonic Filter systems and are able to offer:

- Fully qualified team of engineers to provide assistance and advice
- Complete harmonic analysis capability
- Design, manufacture and installation specifically to meet customers requirements
- Systems manufactured using high quality components



A double-width "wardrobe" style partial filter system. Cabling is accessed from above-right with this example

Typical examples of non-linear loads:

- Static Power Converters (SCR's) such as variable speed drives, frequency converters, soft starts, battery chargers etc
- Arc furnaces and electric welding equipment
- Certain U.P.S. systems
- Single phase electronic equipment employing AC to DC power supplies
- Electronic lighting control
- Transformers and reactors having a non-linear magnetising curve

Equipment Size	Width	Height	Depth
To 50 kVAr	600	850	325
To 100 kVAr	600	1450	400
To 150 kVAr	600	1850	400
To 200 kVAr	600	2250	450
To 250 kVAr	1200	1850	400
To 300 kVAr	1200	1850	400
To 350 kVAr	1200	2250	450
To 400 kVAr	1200	2250	450

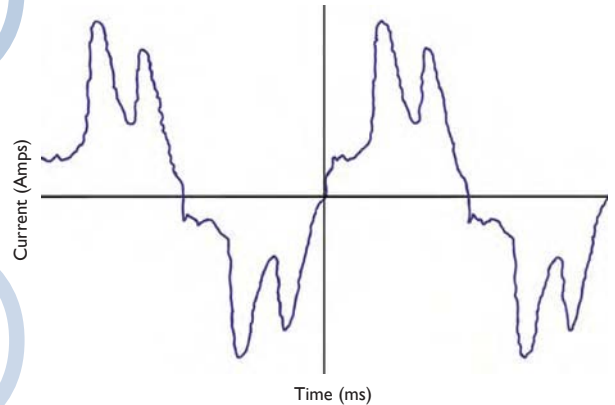
All Dimensions are in millimetres.

Other sizes and specialised enclosures are available upon request

What type of equipment causes Harmonic interference?

Harmonics are generated by equipment termed "Non-Linear", that is to say that they present a non-constant voltage to current ratio and will absorb a non-sinusoidal current when supplied by a sinusoidal voltage.

A typically distorted Current oscillogram



What are the main problems associated with Harmonic Interference?

- Increased losses both on the network and within supply transformers
- Nuisance tripping of circuit breakers
- Premature ageing of electrical insulation
- Malfunction or failure of some electronic circuits
- Certain types of metering can be subject to erroneous operation
- De-rating of fuses due to the heat generated by harmonics during normal operation
- Possible cause of system resonance when Power Factor Correction equipment is present on the system. This occurrence can impose high voltages and currents on the system which is most undesirable
- Premature failure of unprotected Power Factor Correction / Capacitor installations

Our policy is one of continuous improvement and we reserve the right to alter any details of design from that shown in this leaflet without prior notice.