

Save energy and reduce electricity costs

Power factor correction



Improve energy efficiency

Reduces system currents and saves kw losses.

Eliminates reactive power charges

Excess kvar charges and power factor adjustments all eliminated. Supply kVA reduced.

Releases additional capacity

Operating current capacity in transformers, switchgear and supply cables made available.

Security of supply

Reduces peak currents to prevent fuse failure and loss of supply.

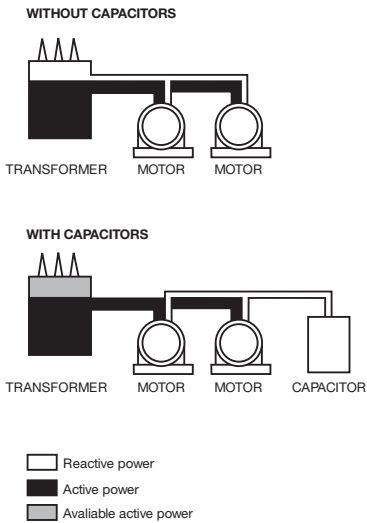
Environmentally friendly

Reduces kwh losses on the system and consequent harmful generation of CO₂.

What is Power Factor?

Power factor is the relationship between working (active) power and total power consumed (apparent power). Essentially, power factor is a measurement of how effectively electrical power is being used. The higher the power factor, the more effectively electrical power is being used and vice versa.

A distribution system's operating power is composed of two parts: Active (working) power and reactive (non-working) magnetising power. The ACTIVE power performs the useful work ... the REACTIVE power does not as its only function is to develop magnetic fields required by inductive devices.



With appropriately rated capacitors connected in parallel with the motors the reactive power drawn from the supply is neutralised and the transformer only feeds active power.

Why improve low power factor?

Low power factor means poor electrical efficiency. The lower the power factor, the higher the apparent power drawn from the distribution network.

When low power factor is not corrected, the utility must provide the non-working reactive power in addition to the working active power. This results in the use of larger generators, transformers, bus bars, cables, and other distribution system devices, that otherwise would not be necessary. As the utility's capital expenditures and operating costs are going to be higher, they are going to pass these higher expenses down the line to industrial users in the form of power factor penalties.

Basic concept

Most loads on an electrical distribution system can be placed in one of three categories: Resistive, Inductive or Capacitive.

The most common of these three on modern systems is the inductive load. Typical examples include transformers, fluorescent lighting and AC induction motors. All inductive loads require two kinds of power to function properly:

- Active power (kW) - actually performs the work
- Reactive Power (kvar) - sustains the electro-magnetic field

As an example with an unloaded AC motor, one might expect the no-load current to drop near zero. In truth, however, the no-load current will generally show a value between 25% and 30% of full load current. This is because of the continuous demand for magnetising current by any induction load.

How to produce reactive power

In electrical terms, capacitance is also considered as a "reactive power" component but in fact its characteristic in an electric circuit is to neutralise or compensate for the inductive reactive power.

Thus we have an item of electrical equipment which can be used to effectively offset a proportion of the reactive power drawn from the supply.

Without capacitors connected the motors draw active and reactive power and the transformer feeding the installation is fully loaded.

With appropriately rated capacitors connected in parallel with the motors the reactive power drawn from the supply is neutralised and the transformer only feeds active power. This means that the reactive power supplied by the Electricity Board is reduced and reactive power charges eliminated.

The power capacitor is however a static device (no moving parts) so maintenance is minimal. They are also electrically very efficient so their use on a network makes no significant increase in the active power requirement from the supply authority.

Advance PFC equipment range

Power^{IT} factor controller RVC, the user friendly PF controller

The user-friendly PF controller

- Easy commissioning
- Complete auto set-up (starting current-C/k, number of active outputs, type of switching sequence, phase shift, special connections).
- Easy to use thanks to a user-friendly interface and ease of access to parameters for manual setting
- Highly efficient switching strategy combining integral, direct and circular switching. This allows to:
 - control the $\cos \varphi$ in presence of rapidly varying loads
 - reduce the number of switchings
 - avoid unnecessary intermediary switchings
 - increase the lifetime of the capacitors and contactors
- Suitable for hot environments thanks to max. ambient temperature rating of 70°C
- Insensitivity to the presence of harmonics
- Overvoltage and undervoltage protection
- An alarm contact is closed when the target $\cos \varphi$ is not reached within 6 minutes after all outputs have been switched on, the internal temperature of the RVC rises above 85°C or the power supply is out of range



Advance automatic capacitor banks

Powerful and compact

- High power density
 - small dimensions
- Proven technology
 - CLMD capacitors

Easy to select

- 4 executions: 2 wall mount & 2 floor mount cubicles
- Complete range
- Acute regulation

Easy to install

- Complete factory tested unit ready for connection
- Ample wiring space
- Wall fixations (A50, A100)
- Lifting lugs and floor mount (A200, A400)
- Bottom cable entry (optional top entry)

Easy to operate

- RVC PF controller with
- Complete auto set-up
 - Easy commissioning
 - User-friendly interface
 - Easy access to parameters for manual setting

Reliable and safe

- IP42 protection (closed door)
- Protected against direct contact (open door)
- HRC fuses
- Use of ABB components:
 - PF Controller
 - CLMD capacitors



Cubicle protective device

MCCB can be included within the enclosure and interlocked with the main access door to provide complete cubicle protection.

Auto control

Each ADVANCE Automatic cubicle has standard stage modules complete with appropriate contactors, line fuses and control circuitry.

Control relay

A multi-stage reactive kVAR control relay can be provided inside the assembly with PFI and stage on indication.

Selector switches

Each stage can be provided with selector switches and stage on indication.

Future extension

Modular switching section trays incorporating appropriate capacitor units, contactors and line fuses and are available for future extension.

A comprehensive solution for active filtering of harmonics

Power^{IT} PQF range LV Active Filters PQFS – PQFI – PQFM – PQFK

The ABB Power Quality Filter offers unprecedented ability to clean the network from harmonics. The PQF actively eliminates the harmonics present in the supply system in a controlled way. It is insensitive to large network impedance changes due to change in network topology like paralleling of sources, or switching between mains supply and generator operation.



The PQF monitors the line current in real time and processes the measured harmonics as digital signals in a high-power multi-DSP (Digital Signal Processor) based system. The digital controller generates Pulse Width Modulated (PWM) signals that drive IGBT power modules which through line reactors inject harmonic currents in the network with exactly the opposite phase to the components that are to be filtered.

The PQF also offers communication facilities with the customer's existing communication network. This feature which uses Modbus RTU, allows the PQF to be easily monitored and controlled from a remote location. The Modbus communication feature can be used by means of an RS-232 to RS-485 converter (optional).

Advantages of the PQF

- Filters up to 20 harmonics simultaneously
- Filters up to the 50th harmonic
- Harmonic attenuation factor better than 97%
- Fulfilment of International Guidelines like G5/4, IEEE 519, etc
- Filters with closed loop control for best accuracy
- Is not overloadable
- Has a programmable filtering strategy and free choice of harmonics selection
- Fault and event logging with real time stamp
- Direct connection up to 690V
- Top or bottom cable entry (optional for PQFI)
- Easy commissioning – Auto-detection of network frequency and CT Polarity
- May filter without generation of reactive power
- May generate reactive power and control power factor
- May balance the load current across the phases
- Has programmable task priorities
- Does not require detailed network analysis
- Does not require special CTs
- Is easy to extend on site
- Comes factory tested
- Auto-adaptation to network impedance changes
- Optical fibre isolation between power and control stages
- Programmable stand-by and re-start functions
- Programmable digital I/O interface
- Modbus RTU communication compatible
- Two sets of compensation parameters for different load type compensation.



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