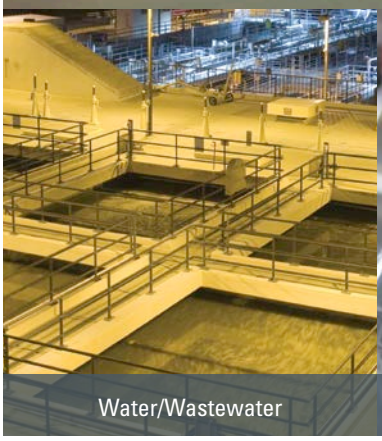
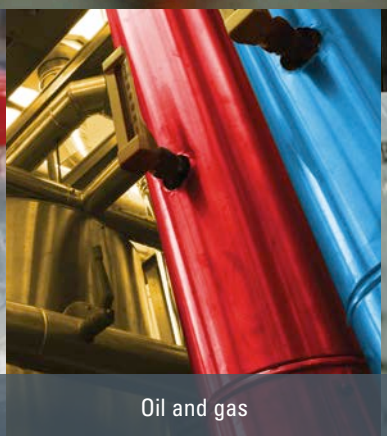
Capabilities overview

Power factor correction

Comprehensive solutions


Water/Wastewater


Processing

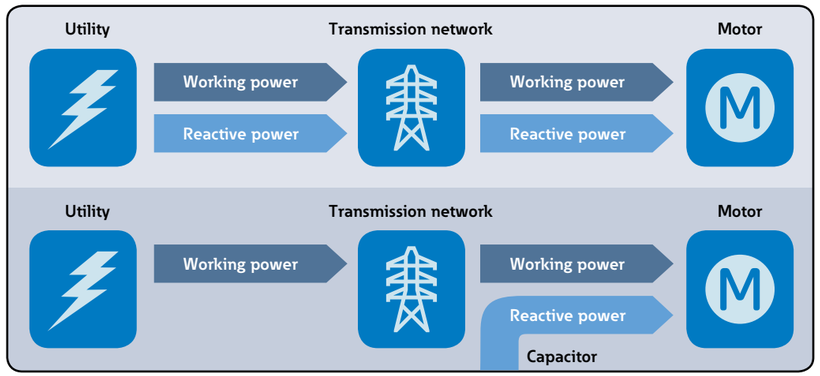

Oil and gas


Industrial

Powering Business Worldwide

Eaton's power factor correction solutions

Power factor is one of the power quality issues that any facility should know. Power factor (PF) is the ratio of working power (kW) to apparent power (kVA) and it measures how efficient power is being used. A high power factor indicates a highly efficient electrical system and a low power factor indicates a poor utilization of electrical power. Many loads in modern electrical distribution systems are inductive, which requires working power to perform the actual work and reactive power (kvar) to sustain the magnetic field to operate the equipment. Working power and reactive power together make up the apparent power measured in volt-amperes.



When the apparent power is greater than the working power, the utility must supply the working power plus the excess reactive power. Capacitor banks can reduce or eliminate utility reactive power and improve power factor.

Did You Know?

Eaton can help calculate your utility bill savings. Consumers can send utility bills to their local sales representative or pfc@eaton.com for a free evaluation.

Low power factor could be costing the consumer. Consumers can eliminate costly penalties by adding power factor correction capacitors to their plant distribution system.

Consumers with a power factor below 1.0 or unity require the utility to generate more than the minimum kVA to provide kW. This increases costs for the utility.

These increased costs are typically billed to the consumer as charges for power utilization. Increasing the power factor to meet the utility's minimum power factor requirements can eliminate these costly charges.

How could low power factor be costing the consumer?

Top three ways for consumers to incur extra power factor charges on their utility bill:

- kW Demand Adjustment
- kVA Demand Billing
- kvar Demand Charges

The utility tariff model may vary from utility to utility and the consumer can obtain tariff details from the utility to better understand these extra charges.

Eaton has a comprehensive line of power factor correction solutions designed for any industry and application. Fixed or automatic switching power factor correction technology for a variety of voltage applications can be coupled with options for filtering or additional features to meet consumer specifications. These robust solutions offer advanced power factor technology to ensure specific consumer and utility requirements can be met, and costly charges can be eliminated.

Eaton's power factor correction family overview

Medium voltage (2.3–14.4 kV)

- Fixed MV
  - Filtered/detuned → AutoVAR MV fixed filter
  - Unfiltered
    - ≥900 kvar → AutoVAR MV fixed
    - <900 kvar → UniVAR
- Automatic switched MV
  - Unfiltered → AutoVAR MV
  - Filtered/detuned → AutoVAR MV filter

AutoVAR MV fixed filter

AutoVAR MV fixed

UniVAR

AutoVAR MV

AutoVAR MV filter

Low voltage (208–690 V)

- Automatic switched LV
  - Filtered/detuned
    - <1 s reaction time → Variable and/or correction for leading PF → EVI2
    - ≥60 s reaction time → AutoVAR LV filter
  - Unfiltered
    - Wall mount → AutoVAR 300
    - Floor mount → AutoVAR 600
- Fixed LV
  - Filtered/detuned → Unipak filter
  - Unfiltered
    - General industrial applications → Unipak
    - Specialized pumping applications → Unipump

EVI2

AutoVAR LV filter

AutoVAR 300

AutoVAR 600

Unipak filter

Unipak

Unipump

AutoVAR detuned filters

Eaton's AutoVAR detuned filter provides power factor correction in harmonic-rich environments for low-voltage applications. This is an ideal solution for consumers that have three-phase or single-phase nonlinear loads (such as 6-pulse alternating current variable frequency drives and direct current drives or switch-mode power supplies) causing voltage and current contaminations on the pure sinusoidal wave received by the utility. Harmonics are caused by an increased use of nonlinear loads.

Units are available up to 1100 kvar at 600 V.

AutoVAR detuned filter in a KK enclosure with optional integrated main breaker.

AutoVAR filter in an L enclosure with optional communicating controller and standard cooling fans.

Features	AutoVAR detuned filter	
	Standard	Available option
Automatically switched power factor correction for fluctuating power factor demand	■	
Harmonic detuned filter designs for protection against harmonic distortion	■	
Easy-to-understand LCD controller with alarms for servicing	■	
Controller with supervisory monitoring plus RS-485 Modbus communication capabilities with distribution equipment		■
Indoor or outdoor enclosures for a variety of applications		■
Integrated main breaker when no available space for a feeder breaker		■
Ease of unit expandability for future plant load add-ons		■
Heavy-duty capacitor cells rated for 125% nominal system voltage	■	
Integrated surge protection to increase unit longevity		■
IQ 250 electronic meter		■

Did You Know?

Low power factor results when inactive motors are operated at less than full load. This often occurs in cycle processes—such as those using circular saws, ball mills, conveyors, compressors, grinders, punch presses, and the like—where motors are sized for the heaviest load.

Did You Know?

Including power capacitors in a new construction and expansion plans can reduce the size of transformers, bus, switches, and the like, and bring the project in at lower cost.

AutoVAR 300 and 600 automatic power factor correction capacitor systems

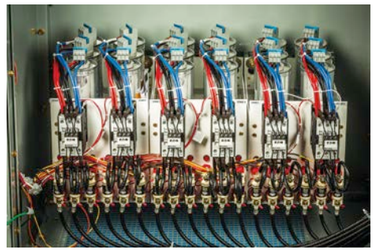
Eaton's AutoVAR 300 provides automatically switched power factor correction for low-voltage applications. The compact, wall-mount design provides an ideal solution for consumers with a requirement for minimized footprint.

Units are available in a variety of configurations up to 250 kvar at 600 V.

Eaton's AutoVAR 600 provides automatically switched power factor correction for applications requiring precise maintenance of the target power factor. This design provides an ideal solution for consumers with larger capacitance requirements and/or future plans to expand plant loads.

Units are available in a variety of configurations up to 1200 kvar at 600 V.

AutoVAR 300 in a compact, wall-mount J1 enclosure.



AutoVAR capacitor cell nests are vertically oriented to increase cooling airflow and power density.

AutoVAR 600 in an L enclosure with optional IQ Meter.

Features	AutoVAR 300		AutoVAR 600	
	Standard	Available option	Standard	Available option
Automatically switched power factor correction for fluctuating power factor demand	■		■	
Easy-to-understand LCD controller with alarms for servicing	■		■	
Controller with supervisory monitoring plus RS-485 Modbus® communication capabilities with distribution equipment		■		■
Indoor or outdoor enclosures for a variety of applications		■		■
Compact wall-mountable design to minimize footprint	■			
Integrated main breaker when no available space for a feeder breaker		■		■
Ease of unit expandability for future plant load add-ons				■
Heavy-duty capacitor cells rated for 125% nominal voltage				■
Integrated surge protection to increase unit longevity				■
IQ 250 electronic meter				■

Note: Other options are available, contact Eaton for details.

Unipak and Unipump power factor correction capacitors

Eaton's Unipak provides fixed power factor correction for low-voltage indoor and outdoor service applications. The design provides the consumer a solution with a slim profile to conserve valuable floor space and a removable top cover for ease of installation and service. A two-enclosure, detuned filter design is also available for consumers with a high amount of nonlinear loads. Units are available in a variety of configurations up to 400 kvar at 600 V for unfiltered and up to 250 kvar at 600 V for detuned filters.

Eaton's Unipump power factor correction capacitors are designed specifically for low-voltage outdoor pumping applications. The units are small, lightweight and can be pole-mounted or wall-mounted for ease of installation.

Units are available in configurations up to 25 kvar at 600 V.

Electronic VAR Injector active filters

Electronic VAR Injectors (EVI2) are static power electronic products that correct for continuously variable displacement power factor. EVI2 can correct for either leading (capacitive) or lagging (inductive) loads that cause poor displacement power factor.

EVI2 active filters also have the ability to monitor the network voltage on which they are connected and determine the proper amount of vars to either raise the network voltage or lower it. EVI2 active filters will inject leading vars to raise the voltage and lagging vars to lower the voltage.

Units are available up to 300 A and up to 600 V.

Did You Know?

Low voltage from excessive current draw causes motors to be sluggish and overheated. As power factor decreases, total line current increases, causing further voltage drop. By adding capacitors to the system and improving voltage, you get more efficient motor performance and longer motor life.

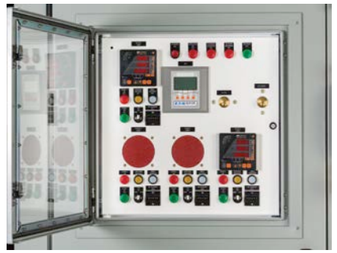
Eaton's AutoVAR MV and UniVAR XV provide medium-voltage power factor correction systems for 5 kV and 15 kV voltage classes. These designs provide consumers a solution for commercial, industrial and utility power systems requiring power factor correction, motor start support, and can also increase system capacity.

Units are available with a host of options and accessories to fit requirements and desired configurations of virtually any installation.

Medium-voltage AutoVAR and UniVAR

Medium-voltage AutoVAR with three vertical sections shown with the incoming section on the right hand side.

Single-phase, two-bushing capacitor unit rated for 95 kV BIL.



Medium-voltage AutoVAR control panel with standard communicating controller plus meter/relays for unbalance and overcurrent detection.

Features	UniVAR XV		MV AutoVAR	
	Standard	Available option	Standard	Available option
5 kV class equipment	■		■	
15 kV class equipment			■	
Easy-to-understand LCD controller with alarms for servicing			■	
Systems completely factory assembled	■		■	
Suitable indoor or outdoor installation	■		■	
Robust NEMA® 12 dust-resistant enclosure	■			
Fixed amount of kvar in a compact footprint	■			
Automatically switched power factor correction for fluctuating power factor demand			■	
Standard designs available to expedite project approvals	■			■
Modular design for ease of unit expandability for future sections				■
Harmonic detuned filter or multi-tuned filter designs for protection against harmonic distortion				■

Why choose Eaton's power factor correction?

Eaton has been in the power capacitor business for 70 years. In the 1980s, Eaton incorporated detuned filtering into both fixed and automatic capacitor banks.

The success of these installations has made Eaton the leader in the field of power factor corrections.

Save money

Eaton's power factor correction units can eliminate the consumer's utility bill penalties by effectively reducing the utility kvar demand.

Installation support

From pre-sale to post-sale, your power factor correction project is supported by Eaton through knowledgeable sales representatives, hands-on engineering services and a capable Technical Resource Center team of application engineers.

Designed for your project goals

Standard low-voltage and medium-voltage factory designs are available for projects with tight deadlines. Custom-engineered solutions are also available for low-voltage and medium-voltage applications to meet the consumer's exact specifications. For a detailed review, send capacitor bank specifications to PFC@eaton.com

DESIGN IT RIGHT

Eaton also offers a Design It Right guide to assist plant engineers with topics such as where to install power factor correction, sizing capacitors, and what to do about harmonics in your facility. Find the Design It Right guide at Eaton.com/PFC

Did You Know?

The Technical Resource Center application engineers are trained to answer commissioning and troubleshooting questions to assist with Eaton power factor correction equipment.

Eaton's comprehensive line of power factor correction solutions are designed for any industry and application. These robust solutions offer advanced power factor technology to ensure specific consumer and utility requirements can be met, and costly charges can be eliminated.

Our focus is on delivering the right solution for the application. Eaton's engineers and network of sales representatives are committed to providing best-in-class customer service and ensuring customer success.

See what the utility bill savings could be by sending last 6 to 12 months in utility bills to a local sales representative. To learn more, visit
Eaton.com/PFC or contact PFC@eaton.com

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Printed in USA
Publication No. BR157001EN / Z19074
January 2017

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