

Power Factor Correction (NEMA)

Reduce Utility Bill by Avoiding Power Factor Penalties

EcoStruxure Power Digital Application

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12/2023

EcoStruxure™ Power



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Overview

Context of Application

For large electricity consumers, utilities often charge penalties on the energy bill for reactive power consumption or lagging power factor. Reactive power and lagging power factor are primarily caused by inductive motor loads, and can be compensated using power factor correction equipment. Power Factor Correction is a common way of achieving fast return on investment.

Problem to Solve

The facility manager needs to:

- Gain visibility into the facility's reactive power and power factor.
- Reduce or avoid power factor penalties on the energy bill.

Purpose of the Application

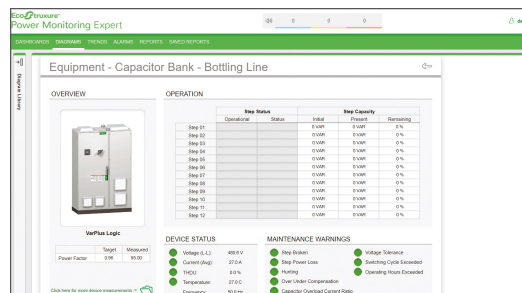
Reduce financial impact of power factor on energy bill by:

- Improving power factor to lower utility bills
- Reducing total process power consumption
- Optimizing capacitor bank maintenance with useful alarming and diagnostics data

Application Outcomes

Live Data Display

- Real-time values of power factor or reactive power
- Real-time monitoring and diagnostics of power factor correction equipment
- Power Factor Correction Equipment diagrams



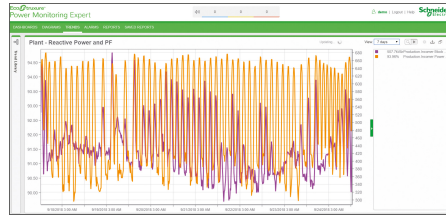
Power Factor Equipment Diagram

Events and Alarms

- Chronological display of events and alarms with sorting and filtering capabilities
- Intelligent alarm grouping into summary incidents

Trends

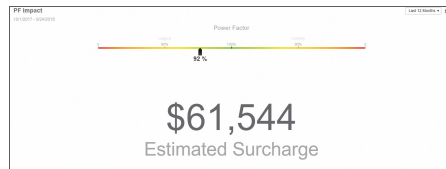
All analog values stored as historical data can be displayed as trends to monitor their evolution over time.



Power Factor - Reactive Power Trending

Dashboards

- Power Factor Estimated Cost gadgets
- Power Factor Impact gadgets



Power Factor Surcharges

Cloud-Based Analytics and Services

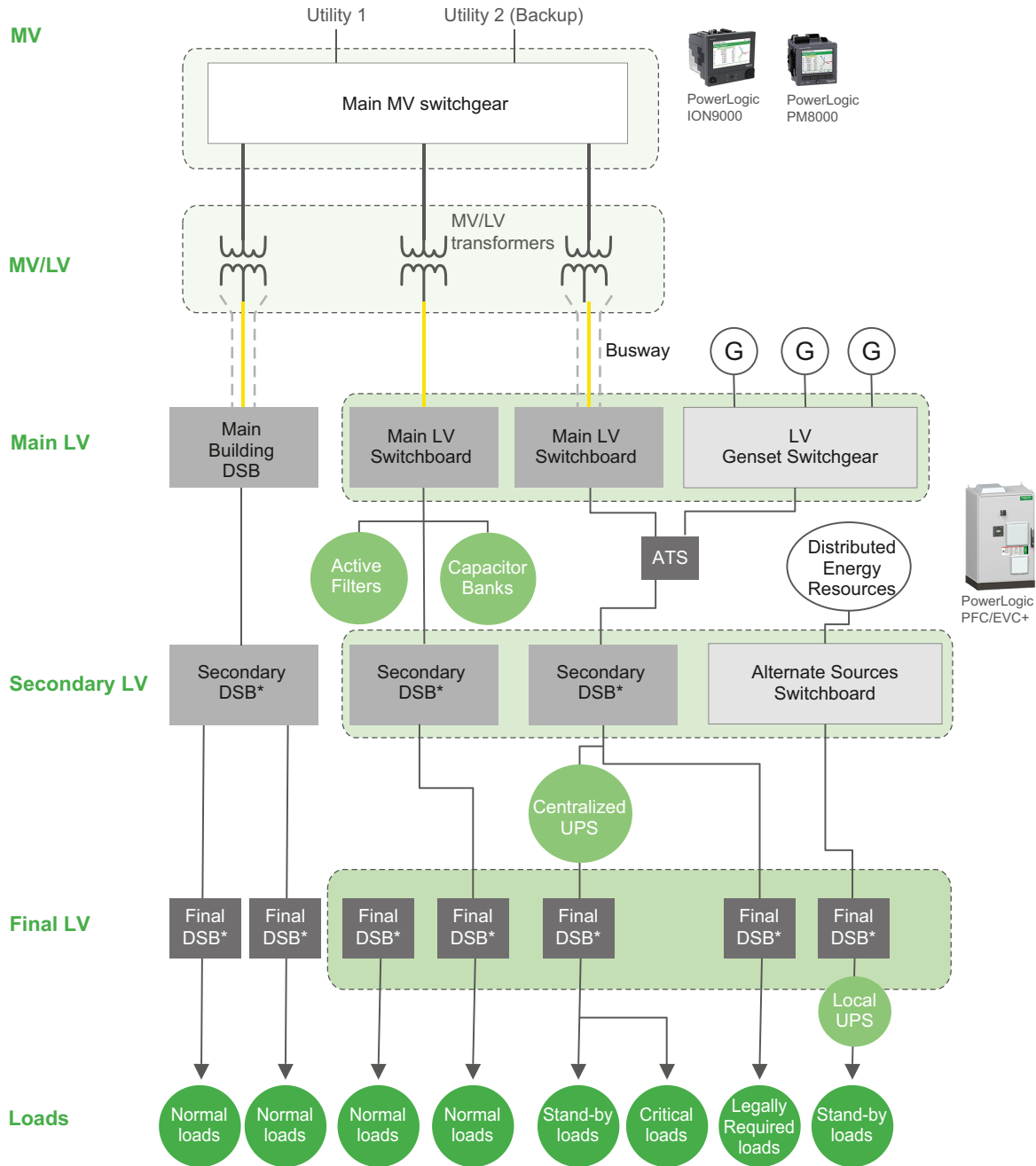
As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.



EcoStruxure Power Advisor Data Quality Report

Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Power Factor Correction application:



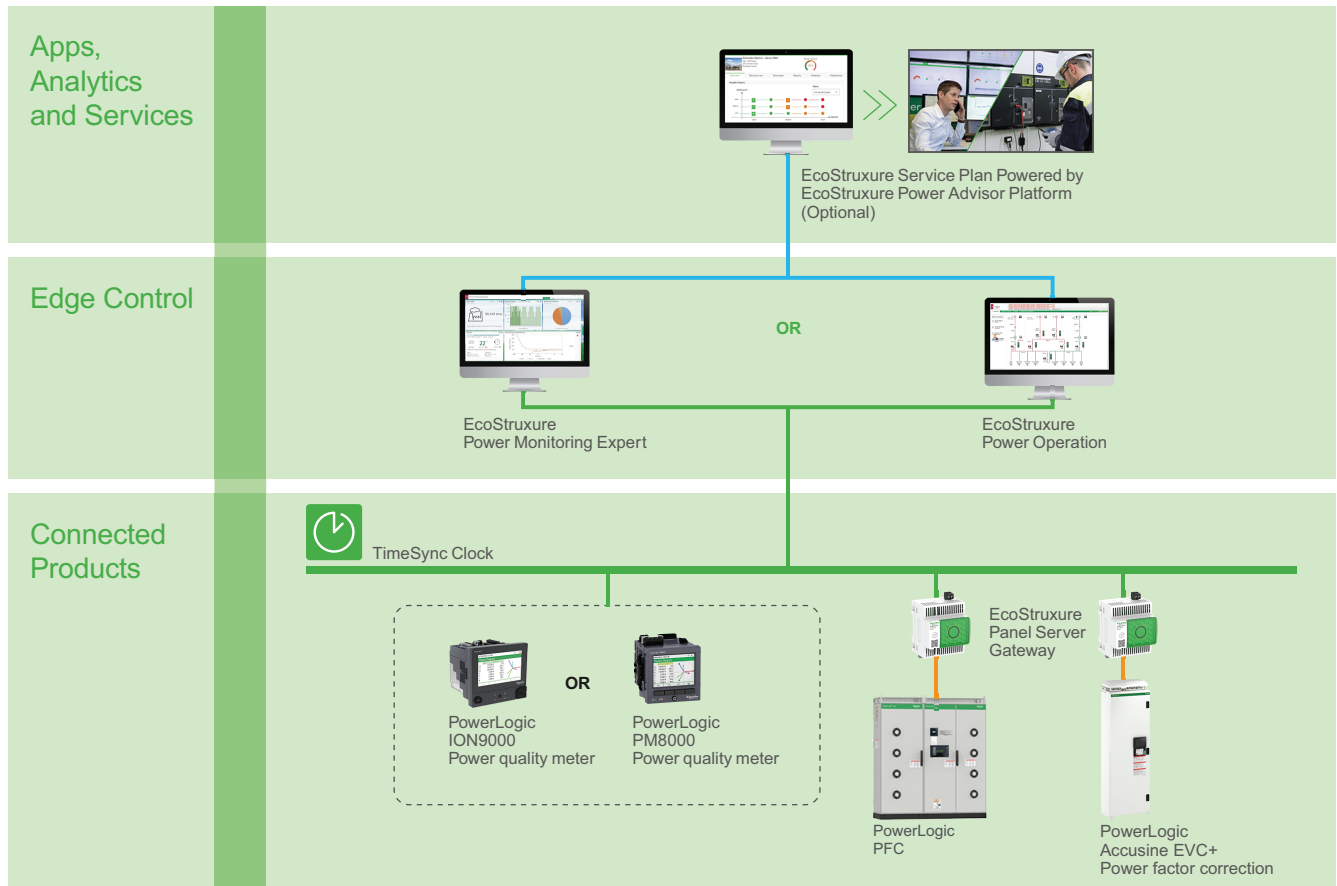
* DSB = Distribution Switchboard

Digital Architecture

In this architecture, the combined power factor measured at utility entrance is collected from connected products (PowerLogic ION9000 or PM8000) directly over Ethernet and then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization, analysis, and reporting. Communications are performed directly over Ethernet for PowerLogic AccuSine EVC+ and through a Modbus Serial connection for PowerLogic PFC. EcoStruxure Panel Server gateway converts the Modbus communications to Ethernet for real-time data acquisition by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation).

As an option, data from EcoStruxure Power Monitoring Expert or Power Operation can be passed on to the EcoStruxure Power Advisor platform and analyzed by experts as part of the EcoStruxure Service Plan.

The recommended digital architecture for the application is shown below:

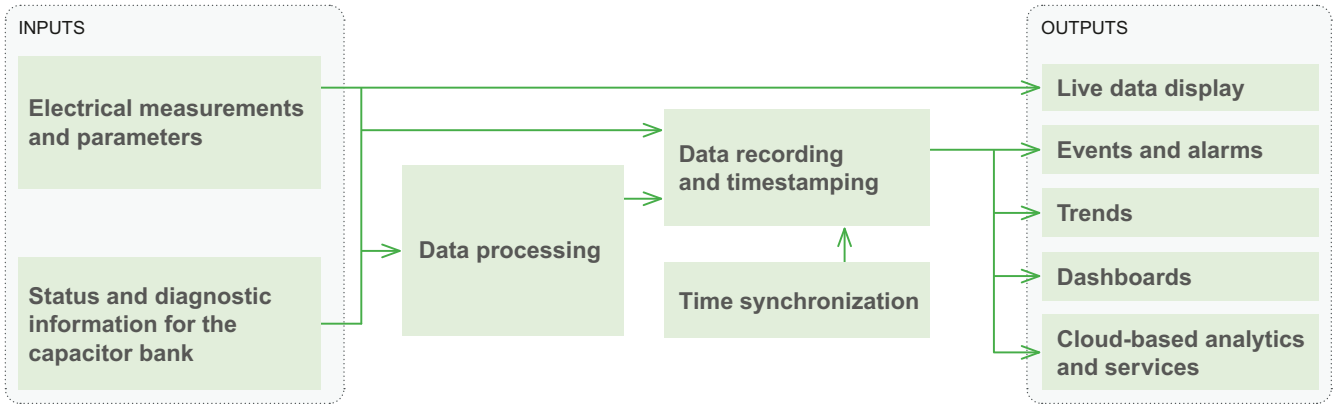


- Ethernet - public LAN/WAN
- Ethernet - technical LAN
- Serial

System Description

Data Flow

The Power Factor Correction application can be broken down as follows:



Inputs

The following data is required:

Electrical Measurements and Parameters

- Power Factor (measured and targeted)
- Other electrical measurements: voltage, current, frequency, power (kW, kVAR, kVA), harmonics

A power meter (PowerLogic ION9000 or PM8000) at the utility entrance is used to check that the combined power factor, as seen by the utility, is within allowable thresholds to avoid power factor penalties.



PowerLogic ION9000



PowerLogic PM8000

Status and Diagnostic Information for the Capacitor Bank

- Active compensation steps
- Broken steps
- Step power loss
- Hunting
- Over/under compensation
- Temperature
- THD voltage, voltage tolerance, overcurrent
- Switching cycles
- Operating hours
- Ambient and max temperature

- Capacitor overload
- Fan status

This information is acquired by Power Factor Correction equipment such as PowerLogic PFC/AccuSine EVC+.



PowerLogic PFC



PowerLogic AccuSine EVC+

Data Processing

Data processing is done through the Edge Control’s data acquisition engine to create events and alarms from status and diagnostic information (with EcoStruxure Power Monitoring Expert or Power Operation).



EcoStruxure Power Monitoring Expert



EcoStruxure Power Operation

Data Recording and Timestamping

For power factor correction equipment, data recording is performed by EcoStruxure Power Monitoring Expert or Power Operation, based on real-time values acquired by the driver. For the power quality meters located at the service entrance, data recording is performed on board the device(s). For these device(s), a time accuracy of 1 second or better is recommended.

For a comprehensive overview of device recording and timestamping capabilities, refer to Data Recording and Time Synchronization Capabilities of EcoStruxure Power Connected Products.



EcoStruxure Power Monitoring Expert



EcoStruxure Power Operation

Time Synchronization

For consistent timestamping of all the data, the date and time should be accurately distributed to connected products and data loggers.

Time synchronization can be performed through various technologies (PTP, NTP, SNTP, etc.). An external master clock may be required and can be connected to a GPS antenna to reach the expected time precision.



TimeSync Clock

Outputs

Live data, alarms, events, and dashboards are available by default in EcoStruxure Power Monitoring Expert and Power Operation.



EcoStruxure Power Monitoring Expert

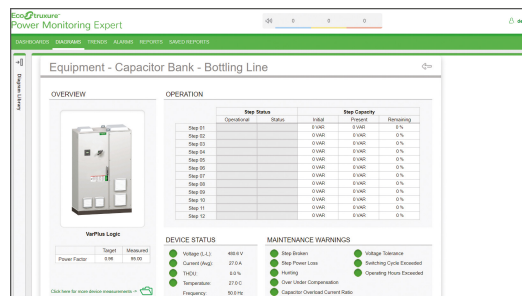


EcoStruxure Power Operation

Live Data Display

Live data acquired by the software driver can be displayed in Power Monitoring Expert or Power Operation through equipment diagrams.

The real-time data displayed include electrical measurements, operating modes, statuses, and maintenance indicators.



Default Diagram for Capacitor Banks

Events and Alarms

Events and alarms are generated by the Edge Control software upon change of the statuses. The events are timestamped by the PC, recorded, and displayed in the software's default alarms interface as diagnostic alarms.

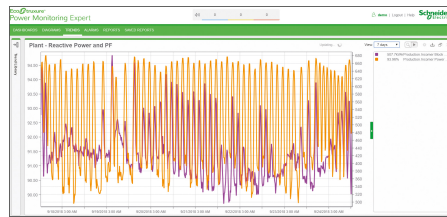
Trends

All analog values stored as historical data can be displayed as trends to monitor their evolution over time.

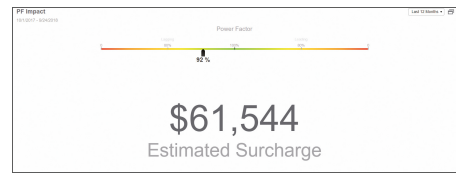
Dashboards 1

Electrical parameters acquired and recorded natively by power factor correction equipment (PowerLogic PFC and PowerLogic AccuSine EVC+) can be displayed as historical data in dashboards. Some examples of these dashboards include:

- PF Impact
- PF Impact Trend



Power Factor Impact Trend Dashboard



Power Factor Impact Dashboard

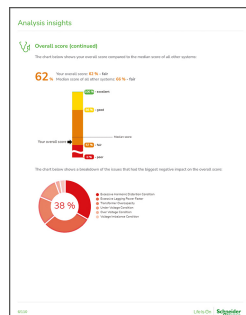
Cloud-Based Analytics and Services

As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides data quality analytics with recommendations from our Schneider Electric service experts.

For further information, refer to Data Quality Management.



EcoStruxure Service Plan Powered by EcoStruxure Power Advisor Platform



EcoStruxure Power Advisor Data Quality Report - Overall Score



EcoStruxure Power Advisor Data Quality Report - Device Details by Issue

1. The Power Quality Performance Module of EcoStruxure Power Monitoring Expert must be deployed to benefit from these features.

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