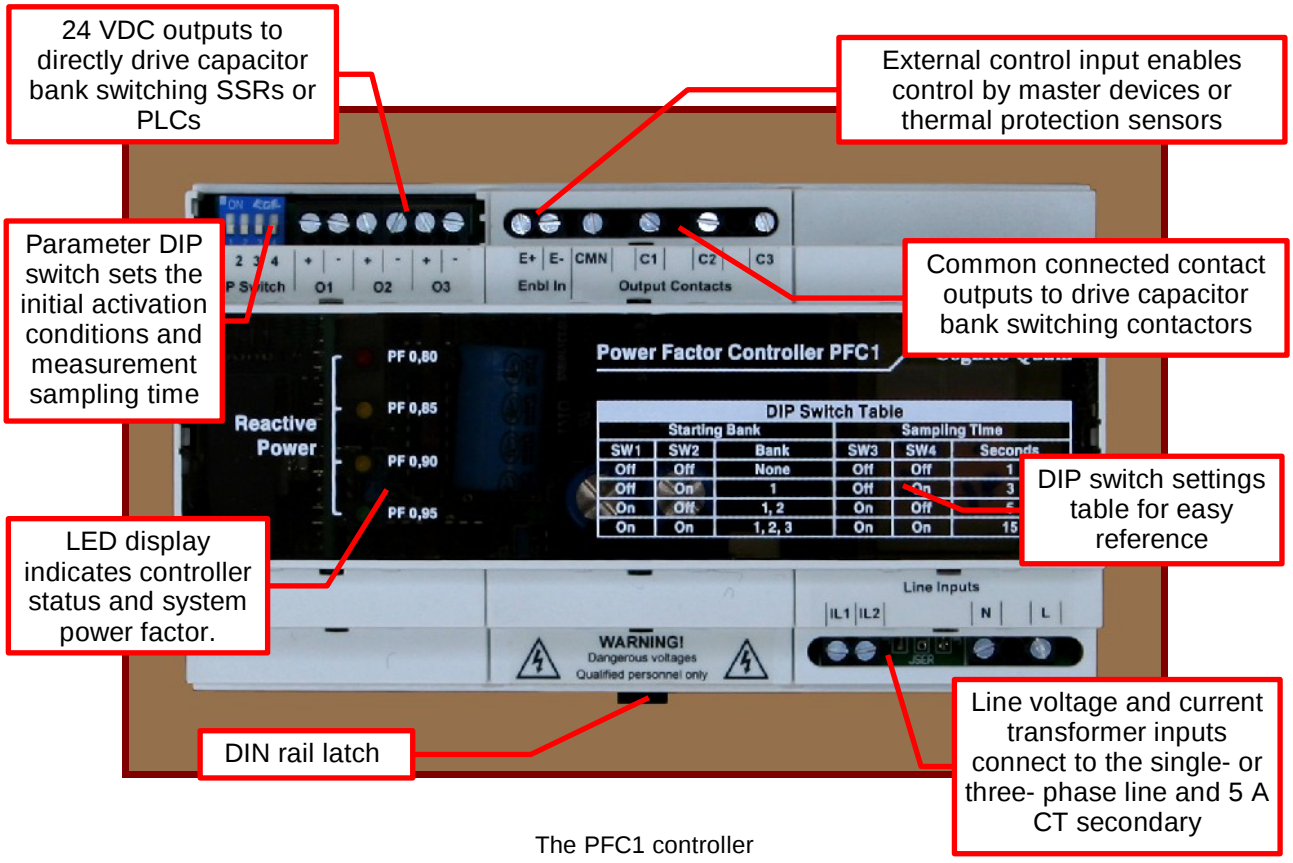
PFC1 Fast Power Factor Controller

The PFC1 controller measures the phase angle between the voltage and current vectors in a single- or three- phase line system and activates its three-step output to switch in and out of the line compensating capacitor banks. The current is detected with a standard current transformer (CT) in one of the line phases and measurement duration is selectable from 1 to 15 seconds.

The PFC1's fast response makes it particularly suitable for very fast dynamic compensation of frequently-started, low-duty or variable loads such as lifts, conveyors, pumps, fans and office lighting rows.



The PFC1 controller

The controller is active while the CT secondary current is above 0.5 A (10 % of range) and enabled at the external control input. On activation the outputs are initialized as selected at the DIP switch until the first measurement is completed. If the measured power factor is above 0.95 the outputs remain unchanged until the next measurement is completed. The outputs are incremented (the next step output is activated) for inductive power factors below 0.95 and the activated output protection time-out has elapsed. Correspondingly, the outputs are decremented (the highest step output is deactivated) for capacitive power factors below 0.95.

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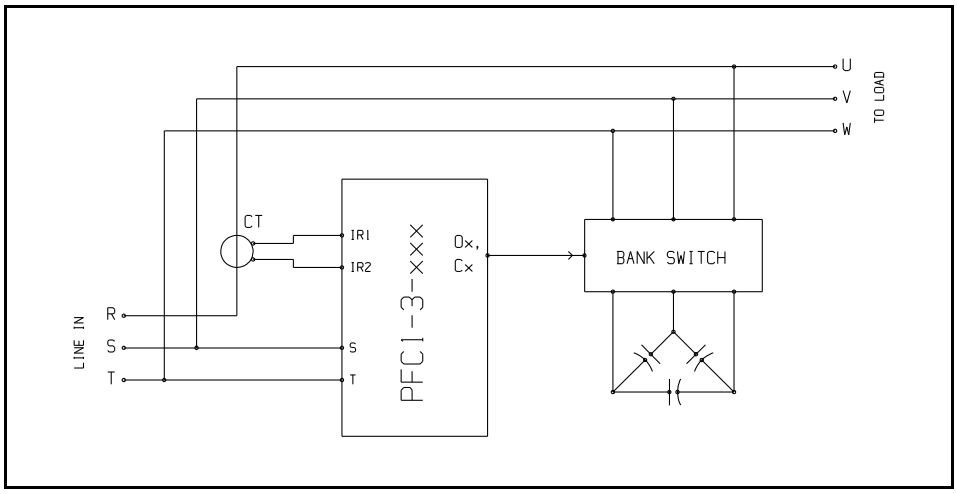
PFC1 Feature Summary	
Line connection	No connection to the neutral is required for three-phase models
Current detection	By standard 5 A secondary current transformer (CT)
Controller activation limit	0.5 A in the CT secondary (10 % of CT range) ensures reliable, robust and noise-free controller operation
Three-step output system	Switches the compensating capacitor banks progressively in and out of the line at every measured sample
Dual type galvanically isolated outputs	Directly drive solid state relays (SSR) and/or higher voltage loads such as contactors. The SSRs can be driven directly by the 24 VDC outputs while contactors are controlled via the PFC1 isolated contact outputs.
External control input	Control input to interface to external master devices or thermal protection sensors.
Measurement time	DIP switch selectable averaging/sampling time of 1, 3, 5 and 15 seconds
Initial output state	DIP switch selectable at controller activation until the first measurement is ready to immediately compensate known loads
DIP switch changes	Immediately effective at the next controller activation
Four LED display	Simple and intuitive display indicates the measured power factor and controller status
Comprehensive error handling	Handles reverse current transformer connection, out-of-range line frequency (valid range is 45 - 66 Hz) and line faults. Outputs are deactivated during a fault and the error clears after its cause is removed.
CT phase error compensation	The phase error introduced by the current transformer is compensated by a programmable amount.
Capacitor bank time-out protection	Time-out after deactivation allows proper capacitor discharging before next switch-in.
Protection	Line inputs are protected against line overvoltages and faults. 24 VDC outputs are protected against over-voltages and are current-limited.
Enclosure	DIN rail mountable plastic enclosure, 157x90x58 mm.



Typical three-phase power factor correction PFC1 system. Only one capacitor bank is shown for clarity. The bank switch can either be a set of solid state switches or a relay contactor.

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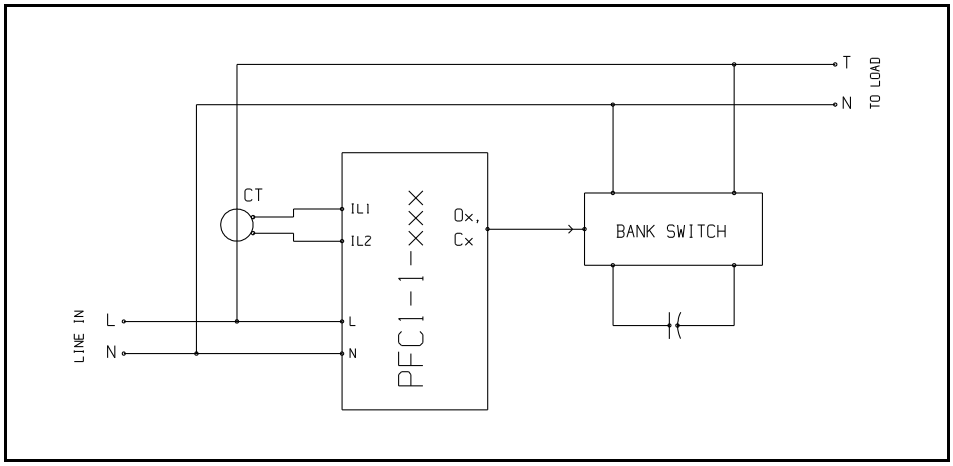
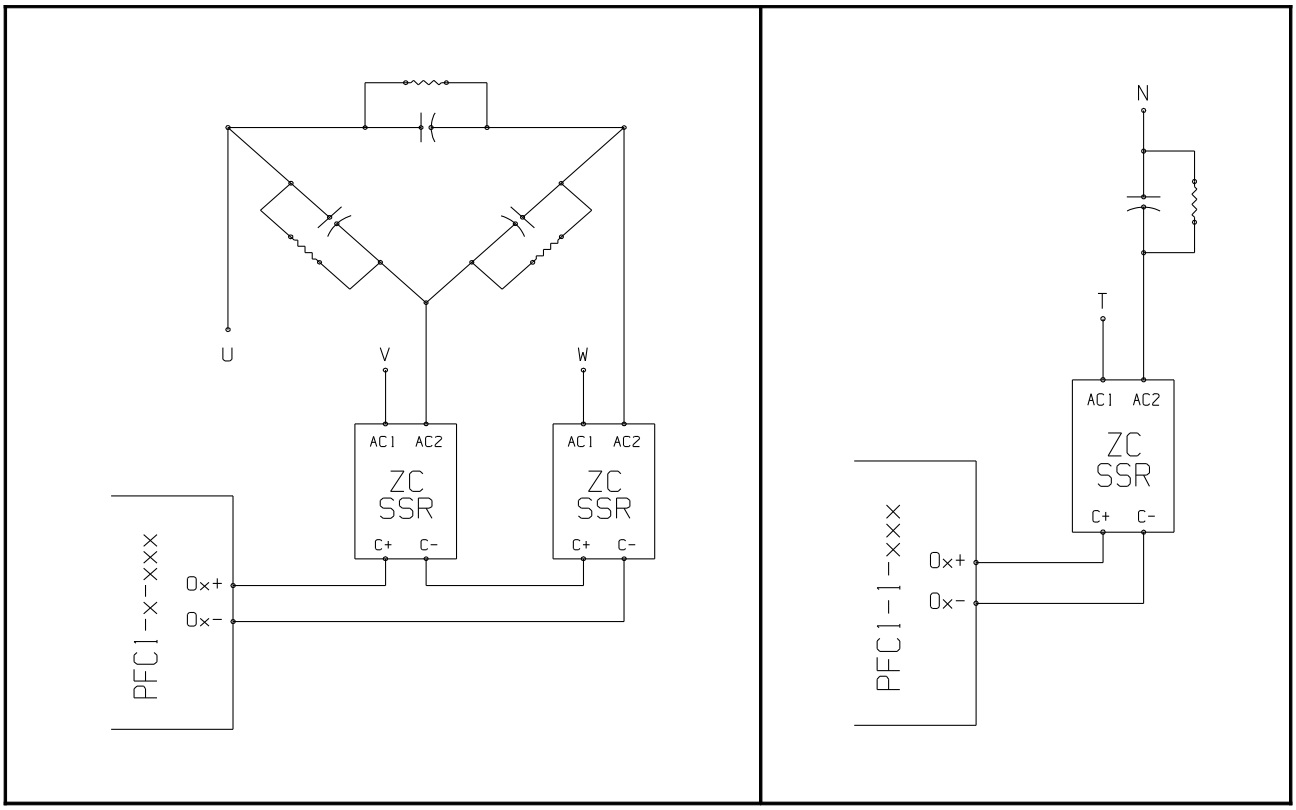


Typical single-phase power factor correction PFC1 system. Only one capacitor bank is shown for clarity. The bank switch can either be a set of solid state switches or a relay contactor. A single-phase model can also be used in a three-phase system with neutral by connecting to the detected current line and the neutral.

Each PFC1 24 VDC output is current-limited by 210 Ohms of resistance and protected against overvoltages and reverse inductive current. It can typically drive two or three SSRs (one at each controlled arm) connected in series with 20 mA control current.



Typical solid state relay bank switch connection in three-phase (left) and single-phase (right) line systems. The SSRs must be of the zero-crossing (or line synchronized) type to ensure that the capacitors are switched in when the line voltage equals the capacitor voltage thus eliminating capacitor inrush current and extending capacitor service life. The capacitor discharging resistors are for safety only and can be any suitable value giving minimum heat dissipation while connected to the line.

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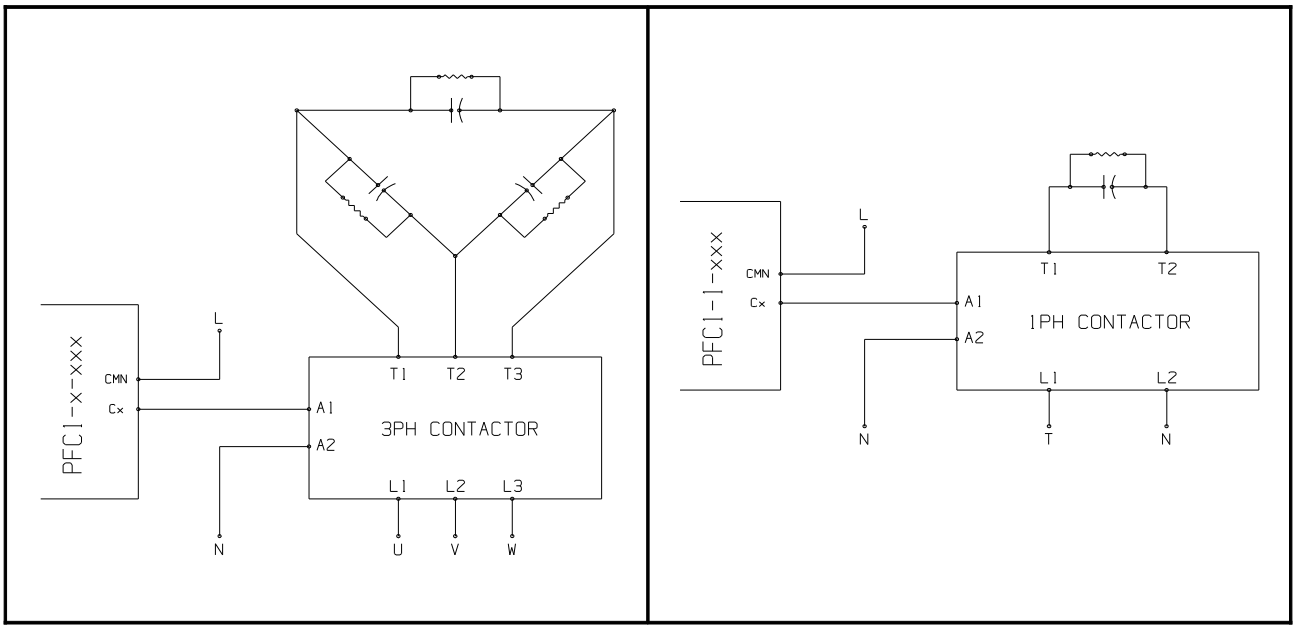
The PFC1 contact outputs are common-connected, normally-open, potential-free types and can switch up to 4 A loads at 240 VAC.



Typical contactor bank switch connection in three-phase (left) and single-phase (right) systems. The control voltage live (typically 230 VAC) is switched to activate the contactor coil.

The contactor must be of special two stage design limiting capacitor inrush current at bank switch in.

The capacitor discharge resistors should be sized to optimally bring down the capacitor voltage before a possible bank switch-in (within the DIP selectable capacitor protection time-out) minimizing average capacitor inrush current.

Ready-to-install, completely assembled systems in wall mountable cabinets are available on a custom order basis.

Ordering Information by Line System				
Description	**110-120 V**	**220-240 V**	**400 V**	**480 V**
Single-phase PFC1 fast power factor controller	PFC1-1-120	PFC1-1-240		
Three-phase PFC1 fast power factor controller	PFC1-3-120	PFC1-3-240	PFC1-3-400	PFC1-3-480

Supplied by

