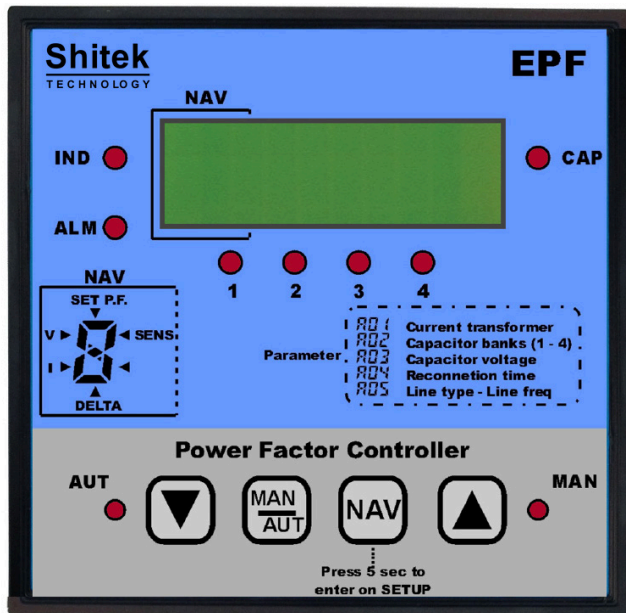


EPF Series USER MANUAL

Power Factor Controller



The power factor controller was designed with signal processing technology to ensure accurate control of all the electrical systems of the plant such as: VOLTAGE, CURRENT, $\cos\phi$, THDI% and through a sofisticate algorithm, optimal use of capacitors bank and contactors, taking into account the distortion phenomena of industrial plants.

Using digital signal filtering techniques, it is able to separate only the components from the other harmonic components basic sinusoidal voltage and current, on which the phase shift is measured.

The device consecutively displays all the measurements on the 4 digit 7 segment display in order to ensure easy reading of the data in any environmental condition.

The user can access the adjustment using four user keys of the instrument, manually insertion banks, displaying measurements and alarms.

INSTALLATION

The power factor controller must be installed on a three-phase or single-phase line with a 50-60 Hz mains frequency and quadrature insertion. EPF need to be connected to a CT to measure the line current (L1) and to the AC voltage (L2-L3) to measure the voltage of the network.

The power supply inputs and the other connections of the device must be protected by fuses suitably sized according to the regulations in force and to the expected power consumption.

The control outputs must be suitably connected to the respective intervention devices.

SET UP

EPF allows the setup of the parameters of the POWER FACTOR and SENSITIVITY by pressing the NAV button until the LED corresponding to the parameter to be changed lights up.

NOTE: The sensitivity is the time interval that the EPF regulator have to wait between 2 consecutive insertions.

To access the SETUP menu it is necessary to set the device to manual operation, switch off all the outputs and press the NAV button for 3sec until the display shows PAR.

To select the parameter to modify press shortly the NAV button and to change the value, press the buttons UP ▲ o DOWN ▼.

The regulations to be made in this menu are:

- A01 -> Current transformer ratio
- A02 -> Power of each capacitor bank
- A03 -> Capacitors nominal voltage
- A04 -> RC time minimum time to wait between the disconnection of a capacitor bank and a subsequent reconnection.
- A05 -> Select three-phase or single-phase and 2 or 4 quadrant.
- A06 -> Line Frequency (50-60Hz)
- A07 -> High THDI% threshold
- A08 -> Over THDI% threshold
- A09 -> Over Temp threshold

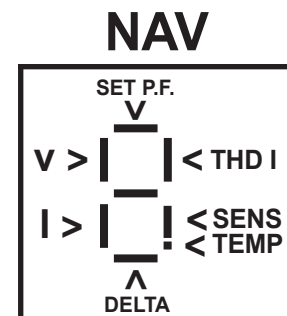
NORMAL OPERATIONS

When the SETUP operations have been completed, the display shows the value of the Power Factor currently calculated in the plant, the voltage of line, current measured on the TA (true RMS) and the Δ kVar missing reactive power to reach the Set $\cos\phi$ setpoint.

Note: if the measured power factor is not stable, reverse the connections in terminals T1 and T2 of the input amperometric.

Press the NAV button to scroll through the various pages of the main menu in the sequence:

Power Factor - Voltage - Current - Delta Power - SENS - SET $\cos\phi$ - THD I% - TEMP.



The segment of the NAV display shows the type of measure displayed. Switching on the segment therefore indicates respectively whether the display on the right corresponds to: Voltage, Current, Delta Power, Sensitivity, THD I%, Set Power Factor, Temperature (the temperature value is showed with the DOT led on).

After 30 seconds of displaying the selected parameter, if is no pressed any button, EPF returns to the main page view (Power factor). To switch from automatic mode to manual mode and vice versa, it is necessary to press the MAN/AUT button and consequently, the corresponding signal LED lights up.

To open or close the output relays it is necessary to select the manual mode, press the UP or DOWN button to select the output bank indicated by the flashing led, and finally press the NAV button to confirm your selection. In manual mode the automatic power factor regulation function is turned off, but EPF continue to check the measurements and alarms. The status of the output is stored in the non volatile memory, after a power up the regulator restore the last output status before to restart the automatic regulation function. The same capacitor banks are inserted as soon as the power supply is restored. In automatic mode, EPF manages the output relays state to connect or disconnect the capacitive loads to reach the threshold set $\cos\phi$. The algorithm that manage the output relays state takes into account of all the measures and other parameters like the power and the number of operation of each step and the reconnection time. EPF manages the following alarms:

HIGH VOLTAGE:	Line voltage higher than 110% of the capacitors nominal voltage for 15 min; disconnection of the inserted capacitor banks.
LOW VOLTAGE:	Line voltage of less than 85% of the nominal for 5 sec; disconnection of the inserted capacitor banks.
HIGH CURRENT:	Current higher than 110% of the rated current for 2 min.
LOW CURRENT:	Current lower than 5% of the nominal current for 5sec (no battery insertion and disconnection of the inserted batteries if the alarm remains for more than 2 minutes)
UNDER COMPENS:	Power factor lower than the $\cos\phi$ setpoint for more than 15 min
HIGH THD%:	Higher than the HIGH THD I% threshold for 2 min; disconnection of the inserted capacitor banks.
OVER THD%:	THDI% higher than the OVER THD I% threshold; disconnection of the inserted capacitor banks.
OVER TEMP:	Measured temperature higher than the OVER TEMP threshold; disconnection of the inserted capacitor banks.

When an alarm is displayed, the LED ALM blinks with the measure and the correspondent NAV segment.

For example, in the case of an HIGH VOLTAGE alarm, the LED ALM and the segment V of the NAV display will blink and the voltage measure is displayed. The system to be protected and controlled must be suitably dimensioned on the basis of the harmonic content present in the network, keeping in account of the resonances that can be generated at insertion of capacitive loads. Then check the technical characteristics of the capacitors and filters considering of the harmonic pollution of the network.

MAIN FEATURES

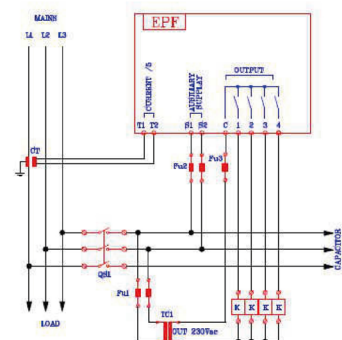
- Current input on TA standard /5
- Setting primary current from 5A to 10000A
- Measure the true RMS current and voltage
- $\cos\phi$ measure of Fundamental Voltage - Current
- Setting kVAr for each battery from 0.1 to 6000
- Setting the reconnection time (5 to 240s)

- Setting the nominal voltage of the capacitor (from 80 to 1000V standard pitch)
- Setting sensitivity of delayed trip
- $\cos\phi$ display between voltage and current of fundamental
- Display line voltage true RMS
- Display line current true RMS
- Display Reactive Power in excess or deficiency of the set value (Delta Power)
- Filter anti-sway
- Management wear uniform batteries

Power supply	110Vac -20% +10% (PF.010.102) 230Vac -20% +10% (PF.010.101) 440Vac -20% +10% (PF.010.100)
Consumption	3.3VA
Mains frequency	50 o 60Hz $\pm 5\%$
Current input	2.5 - 110% Ie
Operation	2 or 4 settable quadrants
Power Factor setting	0.85 Ind to 0.95 Cap
Measures	Voltage, Current, Power Factor, Delta Power Temperature, THDI%
Display	4 characters 7 segments – red
Relay outputs for batteries	4
Contact range	5A 250V (AC1), max switching 400V
Led	Relay Output status; MAN/AUT; Ind-Cap; Alarm
Terminal board	Standard, extractable
Operating temperature	-20°C + 55°C
Frontal protection degree	IP41 (IP54 with optional cover)
Box	Self-extinguishing ABS
Dimensions and Weight	96x96x575 / 300 gr

SINGLE PHASE CONNECTION:

Optional, communication and module



WARRANTY

For a continuous development of its products, Shitek technology Srl reserves the right to make changes to the technical data and the functions without notice. The consumer is guaranteed against the product conformity defects according to the European Directive 1999/44/c and the document on the guarantee policy of the manufacturer.

Compliance to:

- 2014/35/EU (Low Voltage)
- 2014/30/EU (Elect. compatibility)
- 2011/65/CE (RoHS directive)
- 2015/863/CE
- 2017/2102/CE
- 2012/19/CE (RAEE directive)

Reference standards:

- EN 61010-1:2010+A1:2019
- EN 61326-1:2013
- EN 61000-6-2:2019
- EN 61000-6-3:2007+A1:2011

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