



POWER FACTOR CONTROLLER **ZeroVAR-PLUS®**



USER GUIDE

INSIDE

1 General Specifications

2 Front panel description

3 Man Menu

* Manual mode is used for test purpose. In this mode, capacitor steps are switched on&off and so relay outputs of the device are tested

4 Auto Menu

Measurement

- * $\cos \varphi$
- * Q - (Reactive Power)
- * P - (Active Power)
- * % - Q/P (Reactive Power Rate)
- * I - (Current)
- * V - (Voltage)
- * Qc - (Steps Power Value)

5 Set Menu

Device Adjustment

- * $\cos \varphi$
- * k Current Transformer Ratio
- * t Time
 - * t on Delay ON time
 - * t off Delay OFF time
 - * t dC Discharge time
- * %Q/P - Reactive Power Rate
 - * Capacitive Power Rate
 - * Inductive Power Rate
- * Temperature Adjustment
- * Auto Set (Automatically Designation of Capacitor and Reactor)
- * Man Set (Manually Designation of Capacitor and Reactor)

6 Dimensions

7 Circuit Diagram

8 Technical specifications

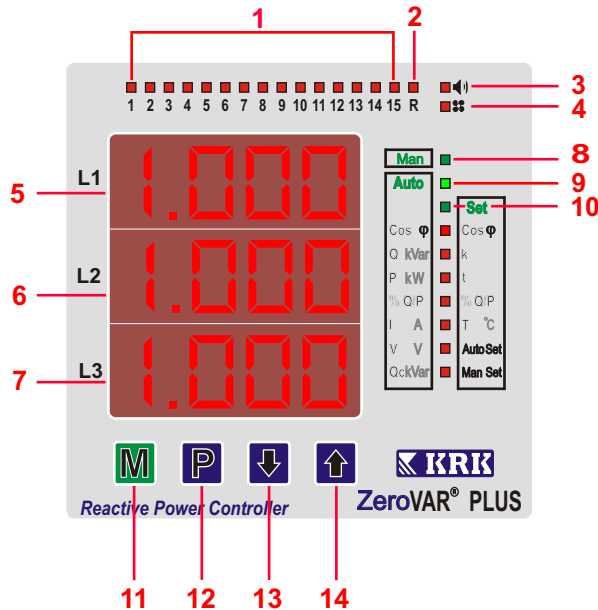
GENERAL SPECIFICATIONS

- * ZeroVAR-Plus compensates according to the reactive power of 3 phases by measuring voltage and current of 3 phases.
- * Monitors $\cos \varphi$, 3 phase reactive power need, apparent power, Active power, current, voltages at the same time
- * Compensate each phase separately.
- * You can connect monophase and threephase capacitors.
- * Sense current directions of phases.
- * Adjustable Delay On, Delay Off, discharge time.

- * Recognition of Capacitors Automatically and Manually

- * Adjustable inductive and capacitive reactive rates
- * Heat of panel is measured and automatically controlled by fan output.
- * 1 shunt reactor connection.
- * Manually step on, step off.
(to check the systems against Faulty output relay, Faulty contactors, Faulty capacitors)

FRONT PANEL DESCRIPTION



1 Capacitors Steps Power Output: If in the system Ractive power is inductive and shunt reactor is connected, first reactor is released. If system continue to stay in inductive region device calculates the needs and receive the necessary capacitors. 15 steps are for capacitors, 1 step is for reactor. Required outlets are received or released according to the needs

2 Shunt Reactor Power Output : If in the system reactive power is capacitive, device release capacitors and receive (R) shunt reactor.

3 Alarm Output : Alarm output is active for two conditions.

1. If Reactive power rates is over than acceptable rates , at the end of 60 second , Alarm is active.

2. Device can not reach target $\cos \phi$ inspite of receiving all the capacitors, so at the end of 60 second alarm output is active.

4 Fan Output : If ambient temperature over than adjusted limit , Fan output is active. Under 5°C of adjusted value fan output is passive.

5 L1 Phase Screen : When device is in auto mode if you press parameter button you can see $\text{Cos } \varphi$, Reactive powers,Active powers,Reactive power rates, Current, Voltages, Steps power values.

6 L2 Phase Screen :When device is in auto mode if you press parameter button you can see $\text{Cos } \varphi$, Reactive powers,Active powers,Reactive power rates, Current, Voltages, Steps power values.

7 L3 Phase Screen :When device is in auto mode if you press parameter button you can see $\text{Cos } \varphi$, Reactive powers,Active powers,Reactive power rates, Current, Voltages, Steps power values.

8 Manuel Menu :When device is in manual menu, steps are received or released.At this way steps are tested. (See page 8)

9 Auto Menu : When device is in Auto menu,to reach target $\text{cos } \varphi$,receive or release the steps.You can see the measured values by pressing parameter values.(See page 9..15)

10 Set Menu :System parameters adjustment is made in this menu.In this menu you can enter target $\text{cos } \varphi$ value , Current transformer ratio,time (Delay on time, Delay off time, discharge time), Temperature, Automatic steps recognition, Manuel steps recognition. (see 16 - 26)

11 Menu Button : It is used to select Automatic, Set and Manual modes

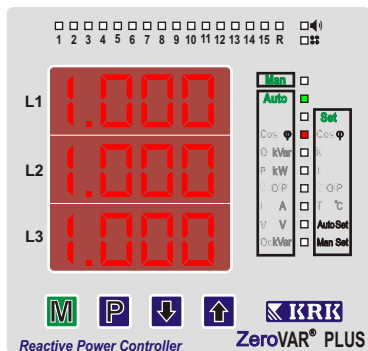
12 Parameter Button : It is used to select a parameter on Automatic or Set mode

13 Down button :It is used to relase the steps on Man menu. It is used on Auto menu for down process and on SET menu to decrease the values.

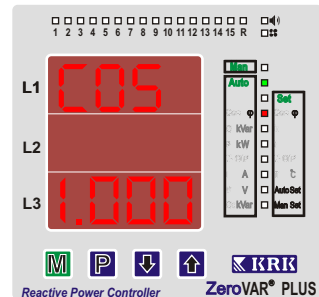
14 Up button :It is used to receive the steps on Man Menu It is used on Auto menu for up process and on SET menu to increase the values.

MEASUREMENT

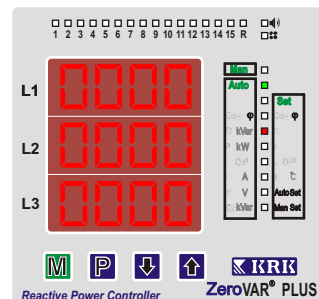
To see the measured values in Auto menu first choose Auto. Press **M** button to choose Auto. When Auto led is on you can see the measured values pressing parameter **P** button.



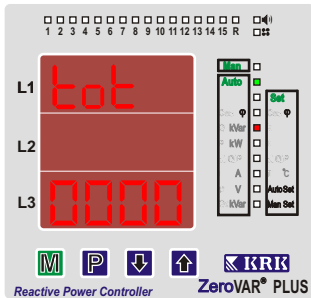
COS φ : You can see L1,L2,L3 cos φ values. If device receives all the steps and can't reach to target values ,at the end of 60 sec. alarm light(🔊) is on.



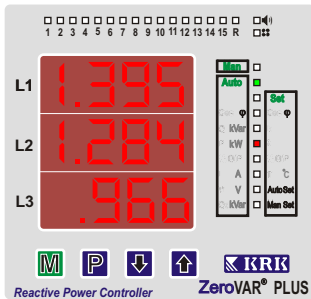
To see average cos φ value press Parameter **P** button. On the screen you can see average L1,L2,L3 cos φ values.



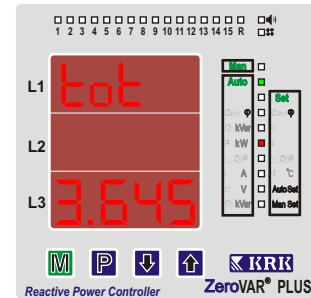
Q kVar :You can see inductive , capacitive reactive loads of L1, L2, L3 Lines. If load is capacitive we see "c", inductive load we see "i"



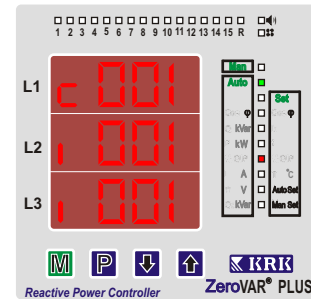
To see total reactive power press **P** Parameter button one time.



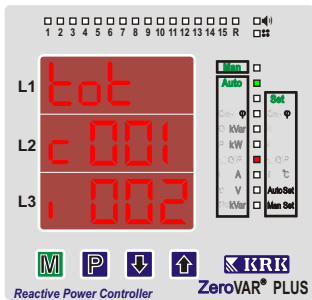
P kW : It shows instant active power on L1,L2,L3



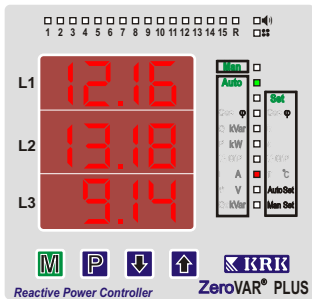
To see total active power press **P** parameter button one time.



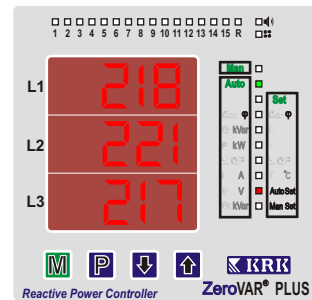
% Q/P : It shows inductive/capacitive reactive power rates on L1, L2, L3 lines.



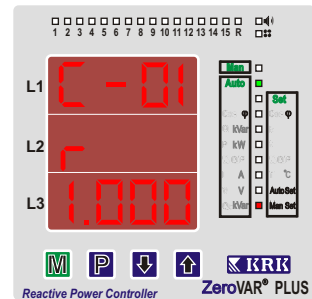
To see inductive/capacitive reactive power rates press **P** parameter button one time.



I (A) :It shows the currents of L1, L2, L3.



V (V) :It shows voltages of L1, L2, L3.



Qc (kVar) : You can see the values of steps which has been recognized in auto set or man set menu ,using **↑** , **↓** buttons.

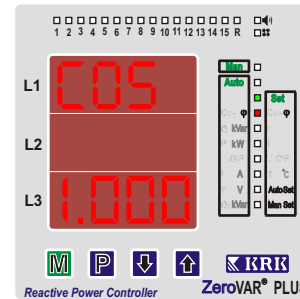
SET MENU SETTING ADJUSTMENT

To set device first select **Set mode**.

To select **Set mode** press **M** button. When Set light is on (green) you can choose parameters with **P**. You can change values of parameters using **↑**, **↓** button. To save the values wait for 10 seconds. If you don't wait for 10 seconds, and press any key the values is not saved.

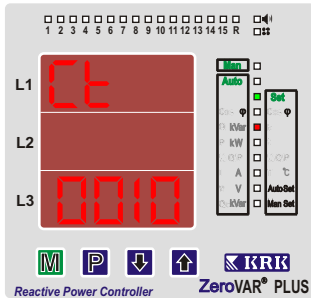
You can adjust **Cos ϕ** between capacitive 0.95 and inductive 0.95. You can adjust also current transformer ratio (**k**), step on delay time (**ton**), step off delay time (**toff**), step discharge time (**t dC**), reactive power rates (% **Q/P**), temperature (**T**), Auto Set automatic recognition of steps, Man Set, manually recognition of steps.

COS ϕ (Target Cos ϕ)



Cos ϕ : To adjust **Cos ϕ** Set led should be green. To active Led press Menu **M** button. When the Set light is on Cos ϕ led is on. Adjust value of **Cos ϕ** using **↑**, **↓** button. Wait for 10 seconds to record. Before 10 seconds if you press any button device doesn't record the value. This condition causes wrong measurement. You can adjust **Cos ϕ** value between capacitive 0,95 and inductive 0,95.

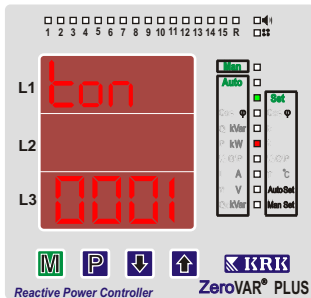
k (Current transformer ratio)



k (Current transformer ratio): Pressing parameter **P** button. Make active **k** led (red). Using **↑**, **↓** button to enter **k** value. And wait for 10 seconds to save. If you enter wrong current transformer ratio Device will not compensate right.

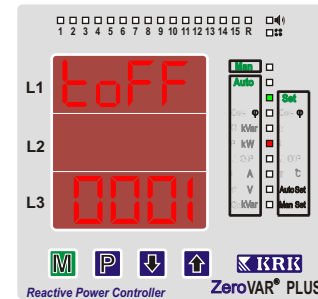
t (Time)

t on
t off
t dC



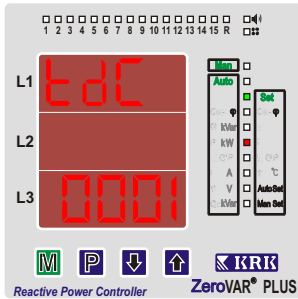
t on (Step on delay)

When Set led is on (green) press Parameter **P** button to make active **t** led. There are **t on**, **t off** and **tdC** times in **t**. You can see these times pressing parameter button and change the values. Using **↑** and **↓** buttons you can adjust **t on** time. Then wait for 10 seconds to save.



t off (Step off delay)

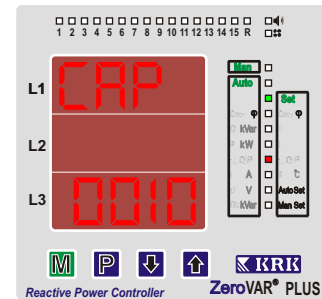
Press Parameter **P** button to make active **t** led. Again press Parameter **P** button choose **t off**. Using **↑** and **↓** button adjust **t off** time. Wait for 10 seconds to save.



T dC (Discharge time)

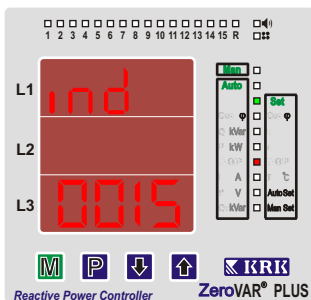
Pressing Parameter **P** button to make active **t** led. Again press parameter and see **tdC** screen. Using **↑** and **↓** button you can enter **tdC** value. To save wait for 10 seconds.

Reactive Power Rates Adjustment



Capacitive power rates

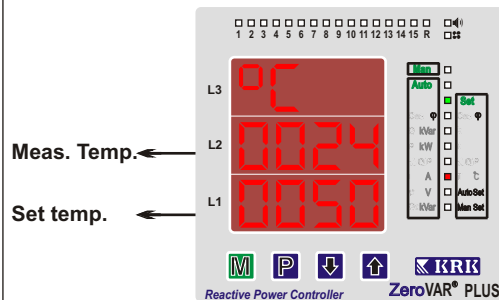
P Press parameter button to make active **%Q/P** led. Using **↑** and **↓** button enter capacitive limit. If system over this limit and it continuous over than 60 seconds , device makes active alarm output. And **🔊** led is on.



Inductive power rates

Press Parameter **P** button to make active %Q/P led. Using **↑** and **↓** button enter **ind** limit. If compensation over this limit and this condition continuous over than 60 seconds, device make active alarm output and **!** led is on.

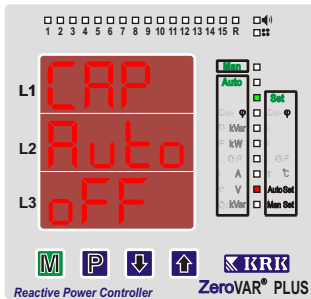
Temperature adjustment



To make active **T** led press parameter **P** button. On the screen you will see ambient temperature and temperature adjustment.

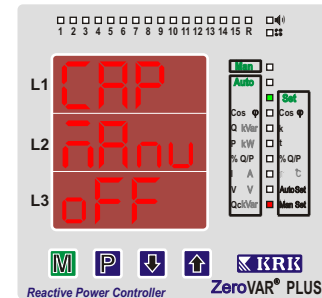
You can adjust temperature limit by using **↑** and **↓** button. To save adjusted value wait for 10 seconds. You can adjust temperature limits between +30 °C - +60 °C. If ambient temperature over than adjusted temperature value device gives alarm without delay. **!** Led is on and Fan stats to work. When ambient temperature is under 5 °C of adjusted temperature limit device turnn off fan alarm. **!** led is off.

Automatic Recognition of Steps

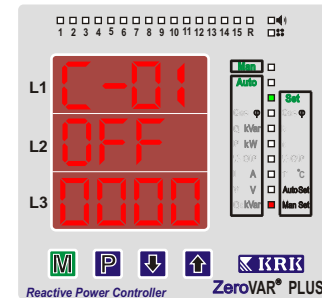


Make active **Auto set** led by using parameter **P** button. On the **Cap Auto OFF** screen by using **↓** button change **oFF** to **on**. Device will start automatic recognition process 5 seconds later. Device receive steps more than 1 time to reach best result. Device can not recognize the steps for 1 time. To recognize the steps in system all the loads should be off. After **Auto set** process, device will return **Auto cosφ** screen and start compensation.

Designation of Steps Manually



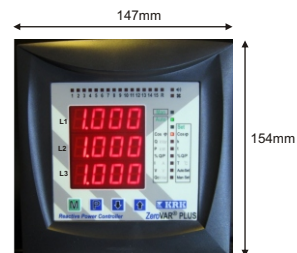
Make active **Man Set** led by using parameter **P** button. On **Cap Menu oFF** screen press **↓** key to change **off** to **on**. You will see manual screen 5 second later.



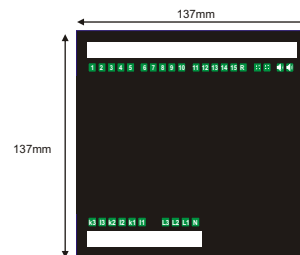
Using **↑** and **↓** button you can designate the steps. You can designate the steps for capacitor between 1 and 15. 16. Steps is for reactor.

Press Parameter **P** button and using **↑** and **↓** key you can choose lines and power of capacitors. Press parameter **P** button and choose the lines (**r,s,t,rst,OFF**). After line has been choosed press parameter to enter capasitor power. Using **↑** and **↓** button enter capasitor power.To save wait for 10 seconds. If you don't wait 10 seconds device will not save changes.

DIMENSIONS



Front

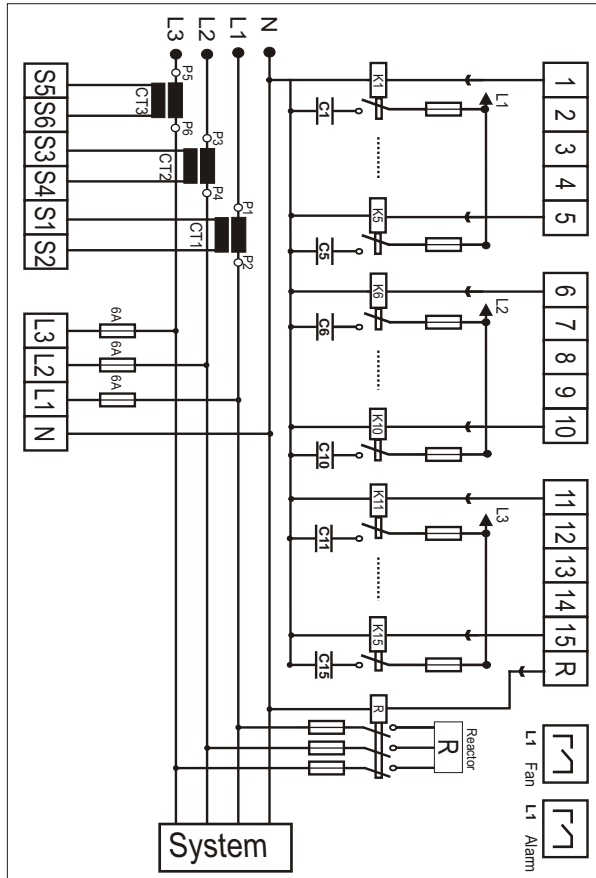


Back



Side

Connection Diagram



Technical Specifications

Supply Voltage	: 220Vac±%20(L1-N), 50/60Hz
Power Consumption	: <5VA
Current Transformer	: .../5A
Current Measuring Range	: 10mA...7A
Control Output	: Relay, 5A/250Vac (Omron)
Cosφ Adjustment	: Inductive 0,95...1,00 Capacitive 0,95...1,00
Cosφ Adjustment Steps	: 0,05
Step Delays	:
Step On	: 1... 99 sec. adjustable.
Step Off	: 1... 99 sec. adjustable.
Discharge time	: 1... 99 sec. adjustable.
Alarm Delay	: 60sec.
Temperature Control Range	: 30..60 °C
Factory Set Values	: Cosφ=1,00; Current Transformer Rate (k) : 10 ton=1 sn; toff=1 sn; t discharge= 1 sn Inductive Reactive Rate : % 15 Capacitive Reactive Rate : % 10 Temperature : 50°C
Operation Temperature	: -5...+55 °C
Display	: 3 x 4 digit display
Protection Class	: Front: IP54 Connecting Terminals: IP20
Weight	: 1 kg