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POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

ATTENTION!




Consult the operating instructions before using the equipment. Following these precautions is a must for an error-free operation and maintaining the eligibility for a warranty.

Therefore, please read this manual carefully before commissioning and using the RG3-12C/CS.

Precautions for Safe Use and Installation

- 1) Maintenance, installation and operation of RG3-12C/CS must be performed only by the qualified electricians.
- 2) Do not operate the device in undervoltage conditions.
- 3) Do not open the RG3-12C/CS's housing. There are no user servicable parts inside it.
- 4) RG3-12C/CS is connected to the network by means of a current transformer. Do not disconnect the current transformer terminals. If you disconnect them, be sure to short-circuit the terminals or connect them to another parallel load which has a low impedance. Otherwise, dangerously high voltage at the secondary side of current transformer may cause an electric shock.
- 5) Do not use this product for any other purpose than its original task.
- 6) When device is connected to the network, do not remove the front panel.
- 7) Do not clean the device with solvent or similar items. Only clean with a dried cloth.
- 8) Verify terminal connections before commissioning.
- 9) Electrical equipment should be serviced only by your competent seller.
- 10) Device is only suitable for panel mounting.

 No responsibility is assured by the manufacturer or any of its subsidiaries for any consequences rising out of disregarding these precautions while handling the RG3-12C/CS.

Important Note for System Connection.

- 1) First, connection type of auxiliary supply, voltage measurement and current measurement input must be 3 phase-neutral. The device will not operate properly if these connections are not done.
- 2) A 3-phase capacitor must always be connected to the first step. At least 3 single phase capacitors must be connected to the steps for RG3-15C/CS. Shunt reactors must be connected to R1, R2 and R3 steps for RG3-15CL/CLS.



Do not energise the device before verifying terminal connections.

Generator Input Connection

The connection to the generator input of the device must be done in a way that the energy comes to the system after the generator connection to the network has been established. Otherwise, the device will switch to generator mode when the generator is started for maintenance purposes.

If there is a voltage between 110-250 VAC present on the generator inputs of the device, the target "**Cos ϕ** " set on the device is deactivated and target "**Cos ϕ 2**" is activated. Then the device starts the compensation according to target Cos ϕ 2. This operation mode continues until the voltage on the generator input is disappeared.

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1. INTRODUCTION

1.1 General Information

In today's world, the reactive loads on a network continue to increase with the contracted power rise. The increase of the power on transformers, transmission lines and generators caused a rise in the reactive power levels just as much and maybe more than the active power levels. To prevent any overloads and under voltage conditions, the compensation of the reactive loads became a necessity in today's energy network.

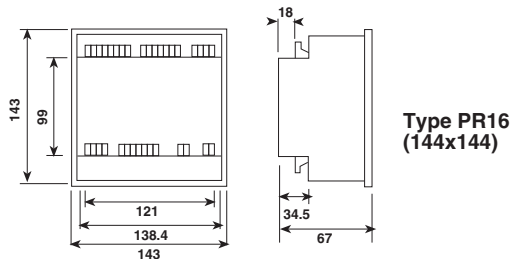
Power factor controllers monitor the reactive power of a plant and try to match the power factor value which is defined as the ratio of the active power(W) to the apparent power(VA) to a power factor value which is defined on the device by the user.

RG3-15C/CS/CL/CLS power factor controller is designed for reactive power compensation in single phase and 3-phase systems. RG3-15C/CS/CL/CLS compensates each phase separately and so, this makes RG3-15C/CS/CL/CLS series a unique solution for unbalanced load compensation. In order to achieve this feat, single phase and 3-phase capacitor steps must be connected to the device at the same time.

RG3-15C/CS/CL/CLS ile Yapılabilecek Ölçümler

- 1) Phase Voltage ($L_{1,2,3-N}$) Measurement
- 2) Phase Current ($L_{1,2,3-N}$) Measurement
- 3) $\cos\phi$ Value ($L_{1,2,3-N}$) Measurement
- 4) Average (Ind./Cap.) $\cos\phi$ Value Measurement
- 5) Active Power (W), Reactive Power (VAr), Apparent Power (VA) Measurement
- 6) Total Active Power (Ind./Cap.), Total Reactive Power (Ind./Cap.), Total Apparent Power (Ind./Cap.) Measurement
- 7) Active Energy (Wh-Import/Export), Reactive Energy (VArh-Import/Export) Measurement
- 8) Measuring up to 19th Harmonic (V, I, W, VAr, VA) THD, 1, 3, 5, ..., 19

DIMENSIONS

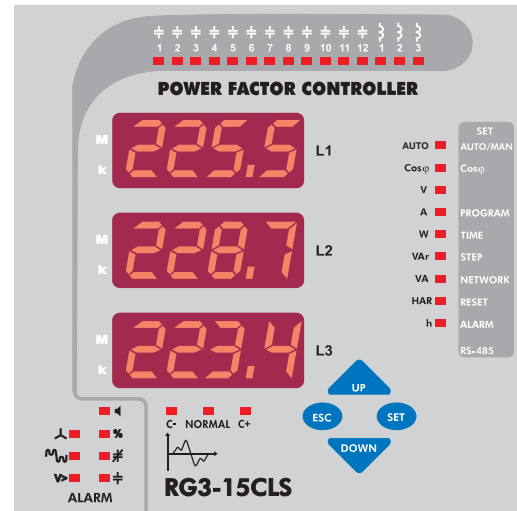


- 1) Panel cut-out dimension must be 139 mm x 139 mm (Type PR16).
- 2) Before installation, remove the mounting brackets.
- 3) Mount the device to the front panel.
- 4) Insert the mounting brackets.
- 5) Voltage and current terminals are designed for cables with a cross-section of 2,5 mm² but these terminals are suitable for cables with cross-sections up to 4 mm².
- 6) CAT5 cable is recommended for RS-485 input terminal.

Excessive force can damage the device.
Turn the screw into the terminals and tighten until the RG3-12C/CS is secured in place.

1.2 Front Panel

On the front panel; 3 display lines with four digits which consist of 7 segments, 4 buttons, alarm, capacitor step and display LEDs exist. Measured parameters are observed in the related displays. Displayed values for related parameters are selected via indicator leds. When an alarm occurs, related alarm LED blinks. 15 step LEDs indicate which step is switched on. Detailed information about buttons, display, alarm and capacitor step LEDs will be explained in the coming sections.



1.2.a Button Functions



In the observation mode, they are used for switching between observed parameters. In the programming mode, they are used for browsing the menu choices and changing the parameter values.



In the observation mode, it is used to switch between harmonic measurement mode and instant value measurement mode. In the programming mode, it is used to return to the previous menu or exit without saving any committed changes.

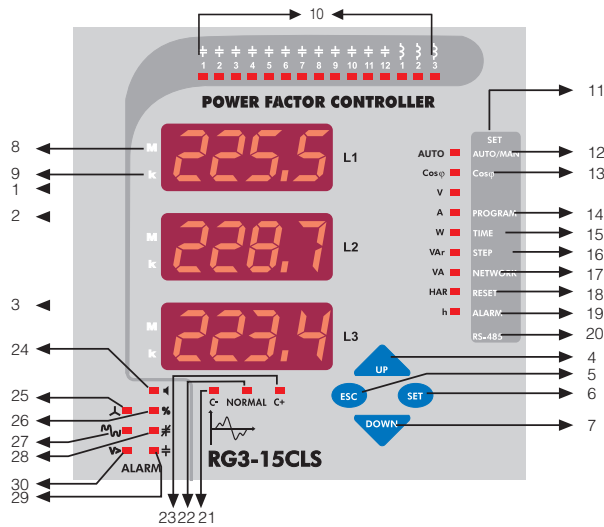



In the observation mode, it is used to show the harmonic value of the measured parameter. If it is pressed for 3 seconds, programming mode appears. In the programming mode, it is used to enter to a menu or confirm the data entry.

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




RG3-15C/CS/CL/CLS

1.2.b Front Panel Functions



 In order to enter to the menu, "SET" button must be pressed for 3 seconds. In the following sections, "enter the menu" means press the SET button for 3 seconds.

1. L1 : Display for phase 1.
2. L2 : Display for phase 2.
3. L3 : Display for phase 3.
4. Up Button : In the menu and measuring mode, is used to move upwards. In the setup mode, it is used to increase the adjusted value.
5. Esc Button : In the menu, it is used to return to the previous process or exit from a menu. In the measuring mode, it is used to leave the harmonic observation mode.
6. Set Button : It is used to enter to the menu, to access a sub-menu and save the committed changes. In the measurement mode, it is used to monitor the harmonic values of voltage, current and power parameters.
7. Down Button : In the menu and measuring mode, is used to move downwards. In the setup mode, it is used to decrease the adjusted value.
8. M LED : It indicates that the measured value is in mega units and the observed value is multiplied with 10^6 .
9. k LED : It indicates that the measured value is in kilo units and the observed value is multiplied with 10^3 .
10. 1,2,3,... Step LEDs : These LEDs indicate the state of corresponding capacitor steps of the device. If a capacitor step is activated, the corresponding step LED is lit. Reactor step LEDs start to light up after the 12th step LED on RG3-15CL/CLS models.
11. SET Menu : Programmable menus which are set by pressing SET button for 3 seconds.
12. OTO/MAN LED : This LED indicates if the operating mode is automatic or manual. If it is continuously on, the device is operating in Automatic Mode. If it blinks, the device is operating in Manual Mode. The color of this LED is green.
13. Cosφ LED : If Cosφ LED is on in the menu, target Cosφ value can be set between Inductive 0,8 and Capacitive 0,8. If Cosφ LED is on in the measuring mode, Cosφ values of related phases are displayed.

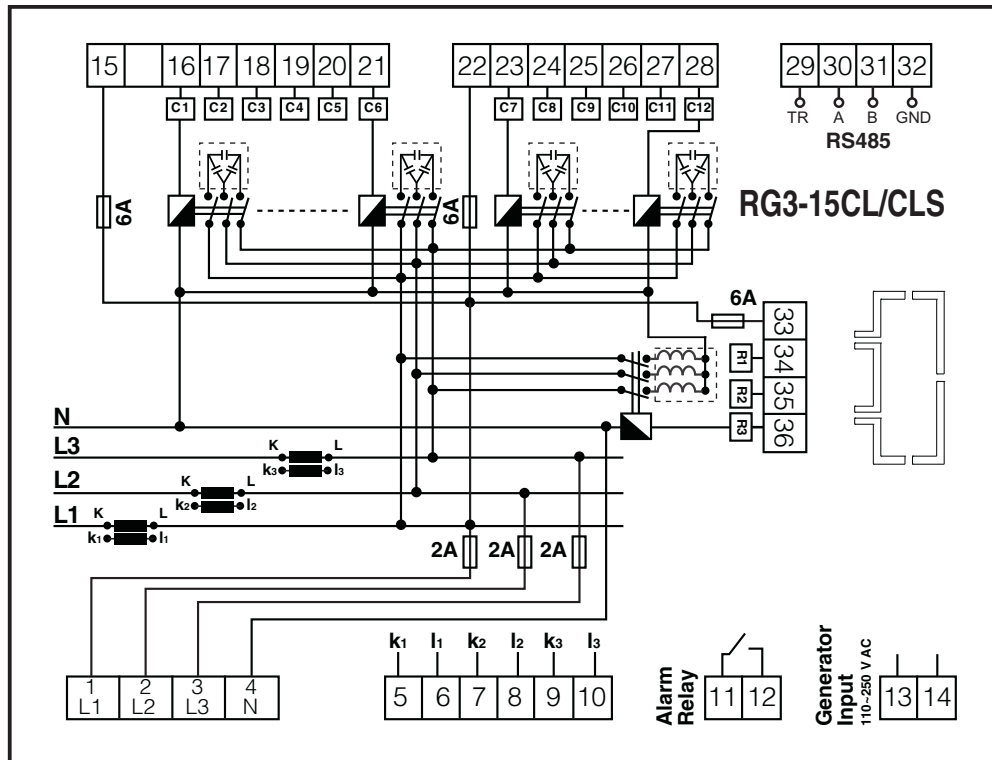
14. PROGRAM / I LED : If "PROGRAM/I" LED is on in the menu; the switching sequence can be set in the menu. If "PROGRAM/I" LED is on in the measuring mode, the phase currents appear on their corresponding phase displays.
15. TIME / W LED : If "TIME/W" LED is on in the menu; discharge time, switch on delay time and switch off delay time can be adjusted in the menu. If "TIME/W" LED is on in the measuring mode, active power and total active power (Imp./Exp.) values of the phases are displayed on the corresponding displays.
16. Capacitors/VAr LED : If "CAPACITORS/VAr" LED is on in the menu, the power values and connection types(R, S, T, RST) of the steps can be set. If "CAPACITORS/VAr" LED is on in the measuring mode, reactive power and total reactive power (Ind./Cap.) values of the phases are displayed on the corresponding displays.
17. NETWORK/VA LED : If "NETWORK/VA" LED is on in the menu; current transformer ratio (Ctr), voltage transformer ratio (Vtr) and calculation method (Calc) can be set. If "NETWORK/VA" LED is on in the measuring mode, apparent power and total apparent power values of the phases are displayed on the corresponding phase displays.
18. RESET / HAR LED : Press SET button for 3 seconds and enter the menu. Select the "RESET/HAR" LED to erase the energy values, reset the reactive energy ratios and alarms.
19. ALARM / h LED : Press SET button for 3 seconds and enter the menu. Select "ALARM/h" LED to set the boundary values for alarms(overvoltage, reactive/active ratio and harmonics).
20. RS-485 : In this menu; settings related to the RS-485 communication protocol(baudrate, address, parity) are set.
21. C- LED : This LED indicates that RG3-15C/CS/CL/CLS is waiting to switch off capacitor steps.
22. NORMAL LED : This LED indicates that RG3-15C/CS/CL/CLS will not switch any capacitor steps on or off.
23. C+ LED : This LED indicates that RG3-15C/CS/CL/CLS is waiting to switch on capacitor steps.
24.  : In case of a failure, alarm relay switches on and alarm LED lights up.
25.  : In case of a connection failure, this LED lights up.
26. % : If reactive energy ratios go beyond user-defined values, this LED lights up.
27.  : If voltage harmonic ratios go beyond user-defined values, this LED lights up.
28.  : When target Cosφ value is not reached even though all of the capacitor steps are switched on(insufficient step power for target compensation), this LED lights up.
29.  : If there isn't a capacitor connected to a step, capacitor step failure LED lights up.
30.  : If the voltage value exceeds the user-defined overvoltage, this LED lights up.

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1.3 Rear Panel

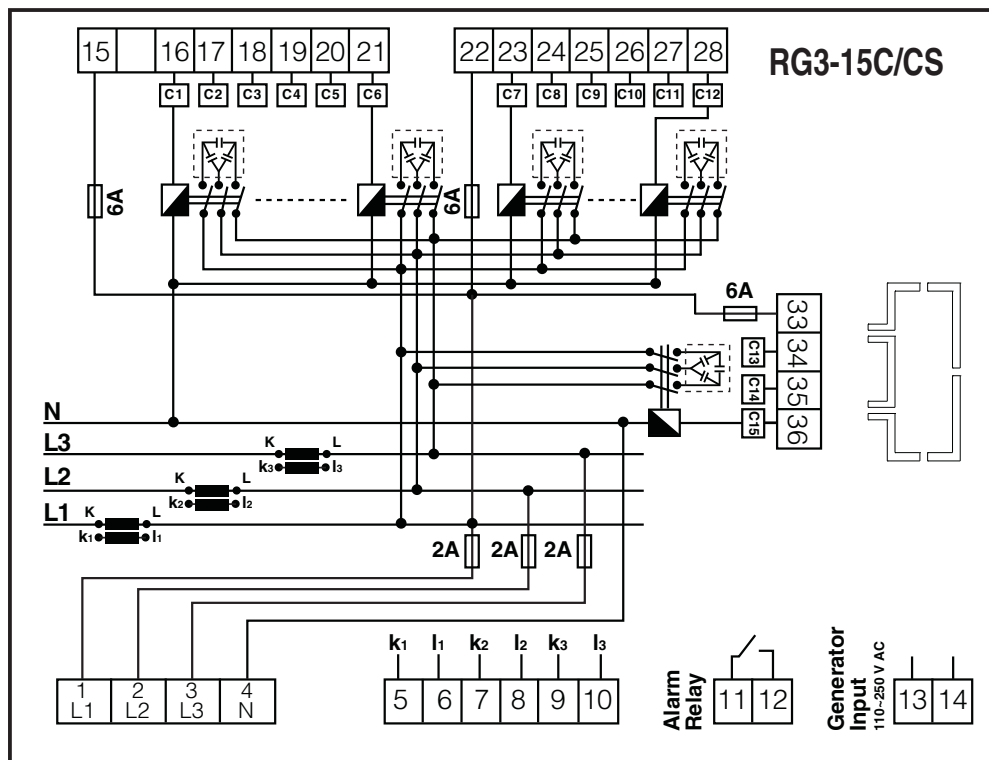
CONNECTION DIAGRAM



* Current value of 3-Phase fuses, which are connected to protect the capacitors, must be chosen according to the nominal current value of capacitors which are given by the manufacturer.



Don't energise the device without making sure that the connections are correct. A 3-phase capacitor must always be connected to the first step. Shunt reactors must be connected to R1, R2 and R3 steps for RG3-15CL/CLS.



* Current value of 3-Phase fuses, which are connected to protect the capacitors, must be chosen according to the nominal current value of capacitors which are given by the manufacturer.



Don't energise the device without making sure that the connections are correct. A 3-phase capacitor must always be connected to the first step. At least 3 single phase capacitors must be connected to the steps for RG3-15C/CS.

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

* Current value of 3-Phase fuses, which are connected to protect the capacitors, must be chosen according to the nominal current value of capacitors which are given by the manufacturer.

Warnings:

- a) First of all; connection type of auxiliary supply, voltage measurement and current measurement input must be 3 phase-neutral. The device will not operate if these connections are not done.
- b) After the device is energized, it finds connection errors and corrects automatically as the first operation. **Phase current should not be equal to zero in order to let the device to detect the connection error.** Device detects the connection error according to Active Power direction. Device switches "ON" and "OFF" the 1st step's 3-phase capacitor during the correction of connection errors (Phase sequence error and polarity error of Current Transformer). Device may not correct the connection errors if there are too many instant variations for loads and nonlinear loads (Such as Thyristor or triac controlled frequency inverter, UPS etc.). In this case, user should disconnect the device and restart it to make the same operation. This feature also can also be operated with "turning ON" the "Auto SET" function in "Auto" menu. In this case device corrects the errors and then calculates the capacitor values.
After connection errors are corrected; capacitor steps are calculated by turning the "Auto Setup" function "ON" in "Auto" menu (Refer to "Automatic Capacitor Recognition" menu). **A 3-phase capacitor has to be connected to 1st step of the device. At least 3 single phase capacitors must be connected to the steps for RG3-15C/CS. Shunt reactors must be connected to R1, R2 and R3 steps for RG3-15CL/CLS. Inductive reactor step powers can't be calculated automatically for RG3-15CL/CLS. Power values must be entered manually.** All steps are measured separately if the program-10 (PS-10) is selected in "Program" menu. In this program (PS-10); single or 3-Phase capacitors can be connected according to requirements of the system in any order. If you let the device calculate the step power values in the previous step, you can skip this part. If one of the other programs is chosen, device measures the 1st steps power value and then calculates the other steps values according to 1st steps value.
Device calculates the capacitor values which will be switched "ON" according to selected program and switches "ON" or "OFF" the necessary steps.
- d) Connection of a circuit breaker or an automatic fuse is highly recommended between the network and RG3-12C/CS. This circuit breaker must be marked in order to separate them from other breakers.
- e) All fuses which are used must be FF type and the current values of the fuses must be 2A or 3A and 6A (Refer to Connection Diagram).
- f) The connection to the generator input of the device must be done in a way that the energy comes to the system after the generator connection to the network has been established. Otherwise, the device will be switched to the generator operation for any generator starts including the ones for maintaining purposes.

2. INSTALLATION OF RG3-15C/CS/CL/CLS

● For proper operation of RG3-15C/CS/CL/CLS; 3-Phase, neutral, voltage and current terminals must be connected as shown in the connection diagram. Device will not be able to operate properly without 3-phase connection.

● After the connection of the current and voltage lines, connect the capacitors to the device. The most important point is connecting a 3-phase capacitor to the first step. At least 3 single phase capacitors must be connected to steps for RG3-15 C/CS. Shunt reactors must be connected to R1, R2 and R3 steps for RG3-15 CL/CLS.

Shunt reactors for RG3-15 CL/CLS must have power values equal to or less than capacitor power values.

- Finally, communication connection must be done.
- Do not energise the device before verifying the connections.
- Always connect a 3-phase capacitor to the 1st step.

2.1 Commissioning of RG3-15C/CS/CL/CLS

● When RG3-15C/CS/CL/CLS is energised for the first time, if the power value of any phase is negative, it switches the first capacitor step on&off automatically to recognize the connection error and records the connections.

● Later, automatic setup (Refer to page 6 - Automatic setup) is selected from the menu in order to recognise the connections and connected steps automatically. Inductive load steps can't be calculated automatically for RG3-15CL/CLS model. Power values have to be entered manually.

● After automatic recognition, RG3-15C/CS/CL/CLS checks all capacitor step values. If variable loads exist in the system, these variable loads must be disconnected first and then automatic setup process must be done. Otherwise, power factor controller may not measure capacitor step powers correctly. Capacitor step powers and connection types also can be entered to the power factor controller manually.
(Refer to page 10 - Setting of the capacitor's connection and power values)

● After recognising the capacitor step powers, target $\cos\phi$ value is set in order to start the compensation. Factory set value for target $\cos\phi$ is ind. 1.000 and $\cos\phi_2$ is ind. 0.900.

NOTE: PFC decreases the switching on&off time to 3 seconds in Automatic Setup mode but discharge time is not changed. After the automatic setup process, set values become valid.

2.2 Sequencing of Steps

After the device is energised, it finds connection errors and corrects them automatically. Power values of the capacitor steps are measured automatically according to program selection. If PS-10 program is selected, power values of all capacitor steps are measured (Refer to Program Section). If any other program is selected, device measures first capacitor step value and then calculates other capacitor steps according to the selected program. For this reason, a 3-phase capacitor must be connected to the first step. Shunt reactors must be connected to R1, R2 and R3 steps for RG3-15 CL/CLS. After the device calculates and saves the capacitor values, it will switch them on and off when needed.

When the capacitive steps are switched on, three-phase or single-phase inductive steps don't switch on.

When the single-phase inductive step is switched on, capacitive steps on other phases may be switched on. For example; when inductive load on T phase is switched on, capacitive loads on R or S phases may switch on.

3. SETTINGS

3.1 Manual Operation Mode, Automatic Capacitor Recognition Mode and Automatic Connection Control Mode

3.1.a Manual Operation Mode Setting

Device has two operating modes which are automatic and manual. The operation mode is chosen by selecting the "Auto Operati" option as **on**(automatic mode) or **off**(manual mode). Manual mode is used for test purposes. In this mode, capacitor steps are switched on&off to test relay outputs. In manual mode, capacitor steps are switched on with "**SET**" button and switched off with "**ESC**" button. The conditions of the steps can be monitored from the 15 step LEDs on the front panel. C+ LED lights up when a step is switching on and C- LED lights up when a step is switching off. Factory set values for switching on (t-on) and switching off (t-of) time are 10 sec. These values can be changed by the "dELy" menu (Refer to Switching on&off Time for Capacitor Steps and Discharge Time Settings). In manual mode; step numbers, which will be switched on&off, can be programmed in "StEP" menu (Refer to Step Number Setting). Even if manual mode is selected, device switches to automatic mode after 5 minutes continues to operate in this mode.

When automatic mode is selected, AUTO/MAN LED lights up continuously. When manual mode is selected, AUTO/MAN LED blinks.

Warning: Device warns user by blinking (short ON, long OFF) the LED of the capacitor steps which will be switched on. Also device warns user by blinking (long ON, short OFF) the LED of the capacitor steps which will be switched off.

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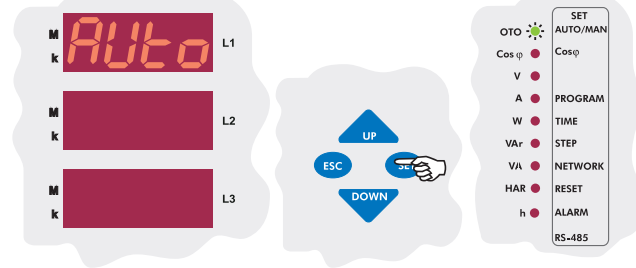
RG3-15C/CS/CL/CLS



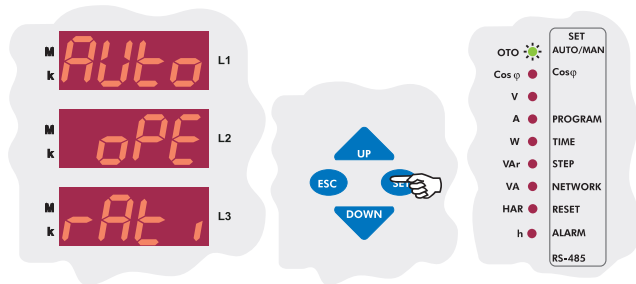
Numerical values of the parameters are set via buttons in the display. The blinking digit indicates which digit will be set. Numerical value of the related digit is increased or decreased via **“UP”** or **“DOWN”** button. To set the next digit, **“SET”** button is used. To go back to the previous digit, **“ESC”** button is used.



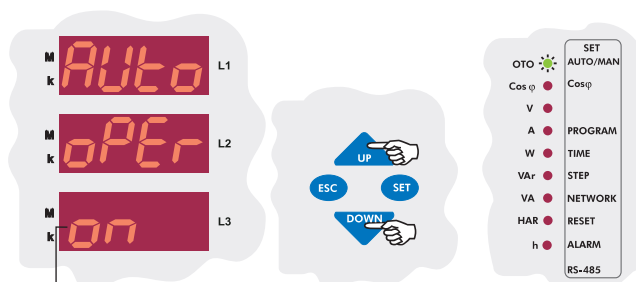
Press the **“SET”** button for 3 s in order to enter the menu.



Press **“SET”** button to set the parameters in **“Auto”** menu option.



The first setting in this menu is the operation mode(Operati). The operation mode of the device is selected according to this option's on or off selection. Press **“SET”** button to change this setting.



Press **“UP”** or **“DOWN”** button to select.

To select the automatic operating mode, choose **“on”** with **“UP”** or **“DOWN”** buttons and press **“SET”** button. To select the manual operating mode, choose **“oF”** with **“UP”** or **“DOWN”** buttons and press **“SET”** button.

3.1.b Automatic Capacitor Recognition Mode Setting

When the device is energised for the first time, it checks for connection errors. If there is a faulty connection, it corrects this fault in itself. In order for the device to correct a connection fault, 3-phase voltage and current connections of the device must be done.

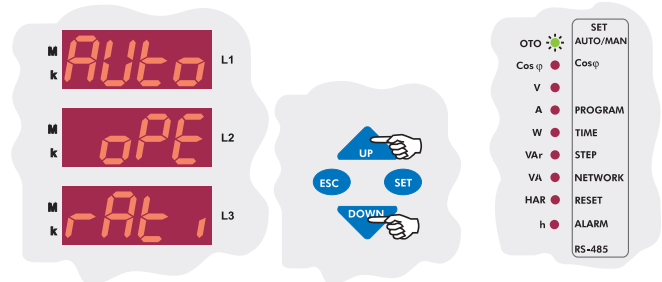
NOTE: If there are other loads than compensation connected to the system, the device may not find the connection at the first try and may need several tries. However, if the device is unable to complete the automatic connection process step calculation process shouldn't be done.

In order for the calculated capacitor powers to be accurate, the current and voltage transformer ratios have to be entered correctly before the automatic capacitor recognition process. If these ratios are not entered by the user, they will be set as **“1”** by the device and the capacitor step powers will be calculated according to these values(Refer to page 12-CT and VT Ratio Settings).

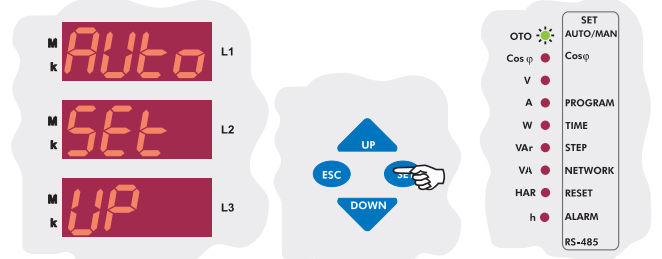
After any connection faults are corrected by the device; if **“Auto Setup”** option is set as **“on”**, the device calculates the capacitor step powers according to the selected program. If 10th program(P-10) is selected, all of the capacitor step powers are measured separately. If any other program is selected, the device measures only the first capacitor step power and then calculates the other step powers according to the selected program(Refer to page 7-Step Number Setting).

NOTE: If the option **“on”** is selected in the automatic setup menu, the automatic capacitor recognition will start without exiting the menu. The step powers which are calculated after this process must always be checked.

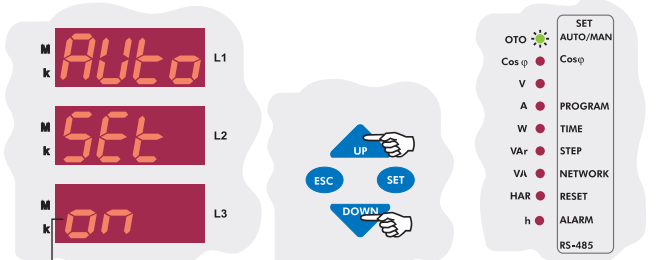
Inductive load step powers can't be calculated automatically for RG3-15CL/CLS. Power values have to be entered manually.



In Auto Operati menu, choose **“Auto Setup”** menu by pressing the **“UP”** button.



The 2nd setting in this menu is the Auto Setup setting. The automatic setup will or will not start according to the options **“on”** or **“off”** selection. To change this setting, press the SET button.



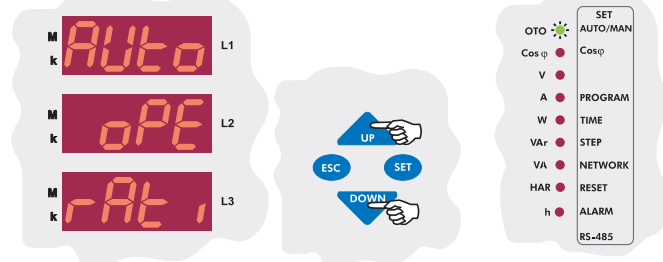
Select **“on”** or **“oF”** using the **“UP”** and **“DOWN”** buttons(Select **“on”** for automatic capacitor recognition).

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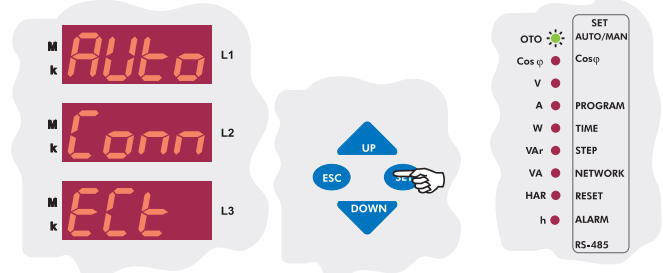
RG3-15C/CS/CL/CLS

3.1.c Automatic Connection Recognition Mode Setting

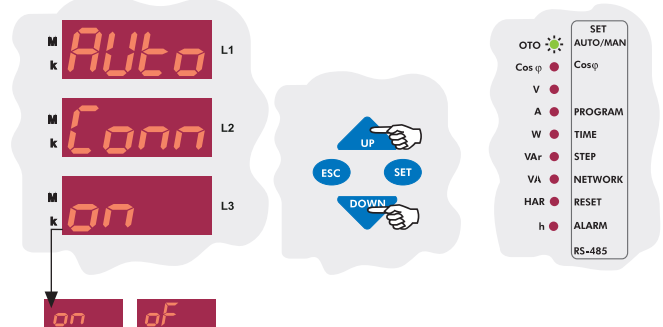
This option is used for activating or deactivating the connection recognition mode when the device is energised. It is activated as factory default. In applications with a generator, the voltage and current information may not arrive to the device properly depending on the transfer panels design and delay when the system is switched from generator to the network power. When this transition occurs, the device may find a connection fault. Therefore, it is recommended to turn this option off after the setup is completed.



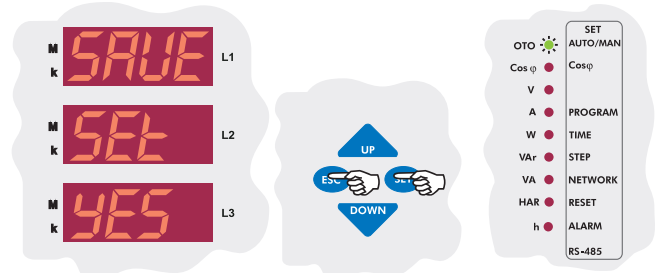
Select the Auto Setup option in the Auto Operati menu with “DOWN” button.



Connection correction is activated or deactivated depending on the “on” or “off” position of the Auto connection option. To change this setting press the “SET” button.



When Auto connection is “on”, the device controls its connection automatically at start-up and corrects any existing measurement input errors. If this option is “of”, automatic connection correction is deactivated. Using “UP” or “DOWN” buttons, select “on” or “of”.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.2 Target Cosφ and Target Cosφ2 Value Settings

The device has two target Cosφ values as Cosφ ve Cosφ2.

⚠ If there is a voltage between 110-250 VAC present on the generator inputs of the device, the target “Cosφ” set on the device is deactivated and target “Cosφ2” is activated. Then the device starts the compensation according to target Cosφ2. This operation mode continues until the voltage on the generator input is disappeared.

Target Cosφ ve Cosφ2 values may be adjusted between “0,800 ... -0,800” by the user. Negative values represent **Capacitive** region and positive values represent **Inductive** region. RG3-15C/CS/CL/CLS tries to match the systems Cosφ to the user defined value. If the need for compensation of a phase is lower than 0,625 times of the capacitor which is connected to that phase, the device doesn't activate or deactivate any steps and stays at NORMAL status. If there aren't any connected capacitors on that phase, the device operates according to one-third (the power for that phase) of the 3-phase capacitor with the lowest power value.

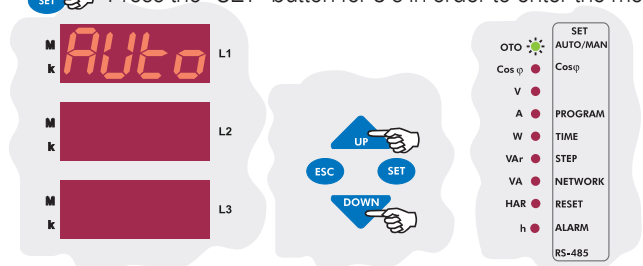
3.2.a Inductive / Capacitive Cosφ and Cosφ2 Setting

Target Cosφ and Cosφ2 values may be entered between “0,800 ... -0,800”.

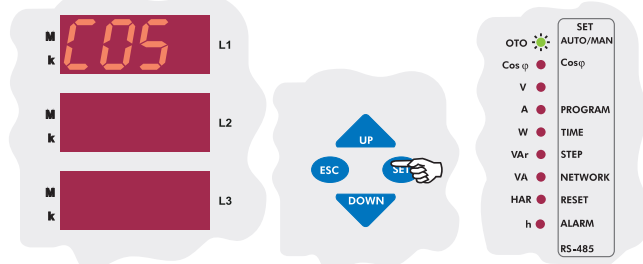
Negative value represents **Capacitive**, positive value represents **Inductive** region.

NOTE : Cosφ2 value can be set the same way from Cosφ2 menu.

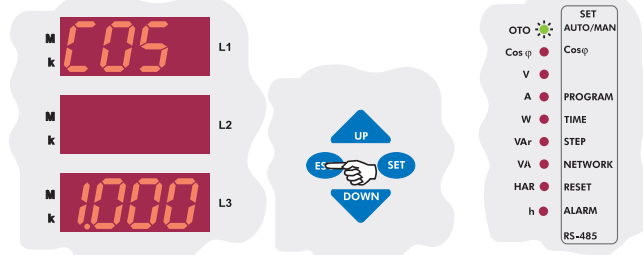
3 sn. Press the “SET” button for 3 s in order to enter the menu.



Using the “DOWN / UP” buttons, find the Target Cosφ (COS or COS2) menu option.

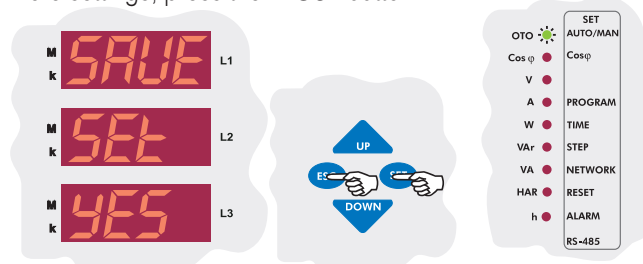


Press “SET” button to enter Target Cosφ setting.



Using the “UP/DOWN” buttons, enter a Cosφ value between -0,800 ... 0,800 and press the “SET” button.

Using the “UP/DOWN” buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the “ESC” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

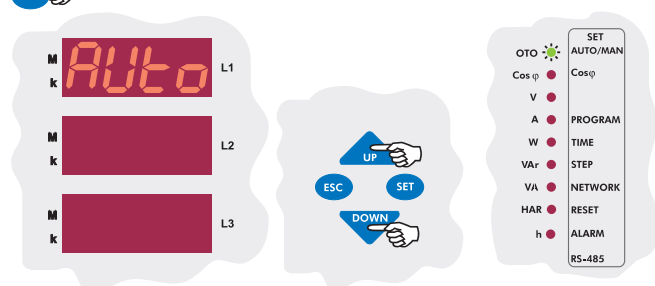
3.3 Selection of Proper Switching Sequence

There are 10 different program modes which determines the power ratio sequence of the capacitor steps. The switching programs are given in the table. If the step sequence is selected as in program 02(PS-02), many identical connection components must be used. When a step sequence between the 3rd and the 8th one is selected, less identical connection components will be used. By selecting the 9th connection sequence, different group powers can be achieved. In this sequence connection, the rating of each capacitor step value may exceed that of the first by a maximum amount equal to the preceding capacitor steps value. By using this setting, less capacitors will be used. When the 10th connection sequence is selected, RG3-15C/CS/CL/CLS will calculate the capacitor step power values automatically. RG3-12C/CS/CL/CLS counts switching on/off times of all capacitor steps and so only the most necessary step is switched on. Thus, maximum service life time of the system is ensured.

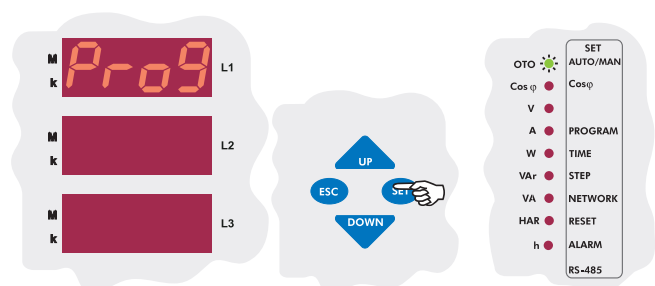
NOTE: In the 10th program(PS-10), power values and connection types(except the first step) of the single phase capacitor steps(r, s, t, rst, off) can be set by user. In Auto setup mode power values of all capacitor steps are measured and connection types of the capacitor steps are detected by the device. In all the connection sequences except the 10th one, only the 1st capacitor step power can be set. All the other capacitor step values are calculated according to the 1st capacitor steps power value.

Set the program option suitable for your system in this menu.

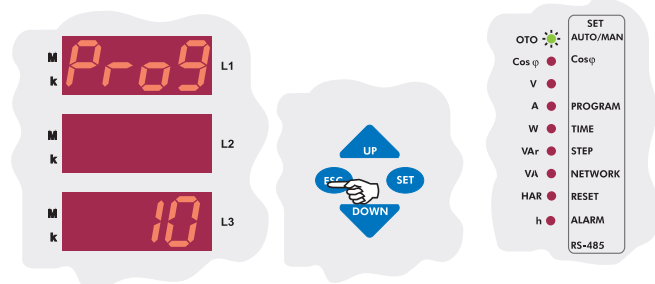
3 sn. Press the "SET" button for 3 s in order to enter the menu.



Using the "UP/DOWN" buttons, select the Program (Prog) menu. When program menu is displayed, program LED turns on.

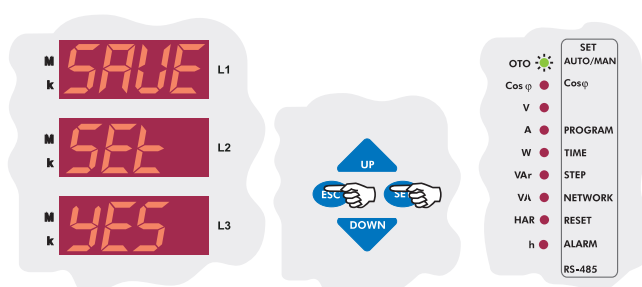


Press the "SET" button to select the switching program.



Enter the desired program number between 01-10 and press the "SET" button.

Using the "UP/DOWN" buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the "ESC" button.



If you want to leave the setup menu without making any other changes, press the "ESC" button until "SAVE Set YES" shows on the screen. If you want to save the changes, press the "SET" button. If not, press the "ESC" button.

PROGRAM	SEQUENCE
01	linear
02	1.1.1.1.....
03	1.1.2.2.....
04	1.2.2.2.....
05	1.2.3.3.....
06	1.2.4.4.....
07	1.1.2.4.....
08	1.2.3.4.....
09	1.2.4.8.....
*10	Capacitor step values are calculated automatically.

* Recommended switching program.

3.4 Switching On&Off and Discharge Time Settings

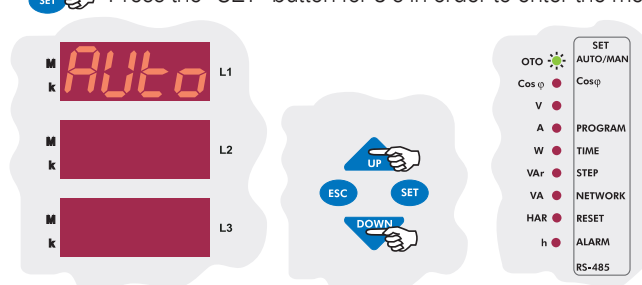
In order to decrease harmful effects of instant reactive power loads to the relays and capacitors, delay time (in terms of seconds) for capacitor steps is entered in this menu.

NOTE: t-on and t-of time periods must be set according to your systems requirements. If t-on time is set very long, relay can not switch on until the end of this time period and so target compensation ratios may not be achieved. If t-on time is set too short, capacitor steps switch on&off frequently in case of fast load variations and this will shorten the life time of contactors and capacitors. For this reason, it is very important to set these time periods according to your system's requirement.

3.4.a Switch-On Delay Time Setting

Switch-on delay time must be set according to system requirement in order to achieve compensation targets and also to provide long life time for contactors and capacitors.

3 sn. Press the "SET" button for 3 s in order to enter the menu.

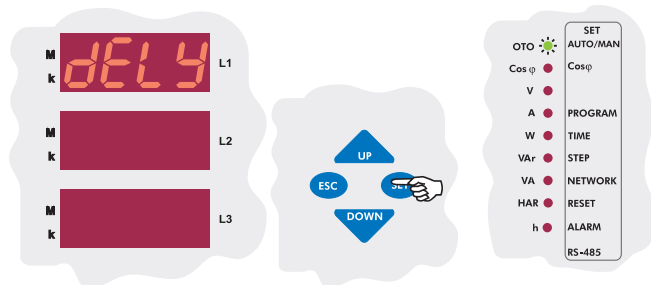


Using the "UP/DOWN" buttons, select the delay time menu (dELy).

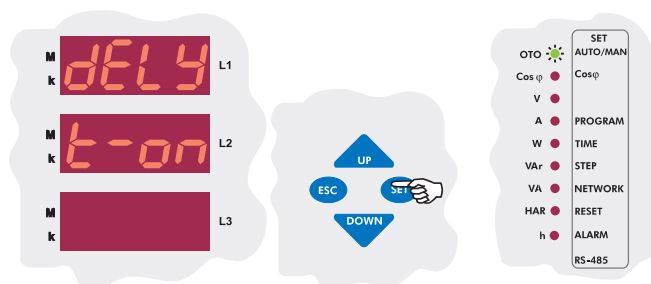
When delay time menu is displayed, time LED turns on.

POWER FACTOR CONTROLLER

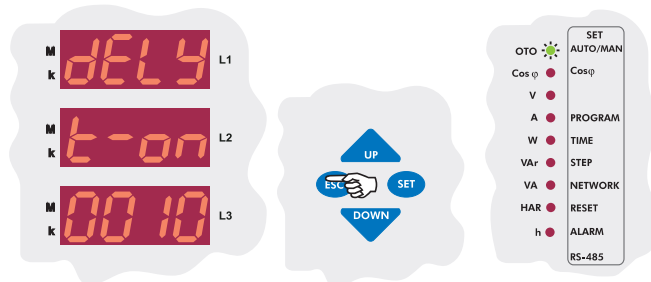
RG3-15C/CS/CL/CLS



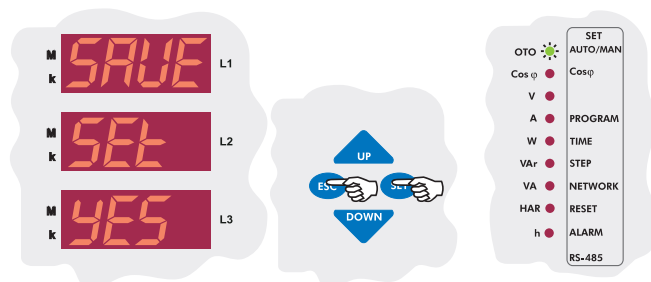
Press the **“SET”** button to enter delay time settings menu(dELy).



The first setting in this menu is the switch on delay time setting(t-on). Press the **“SET”** button to change this time value.



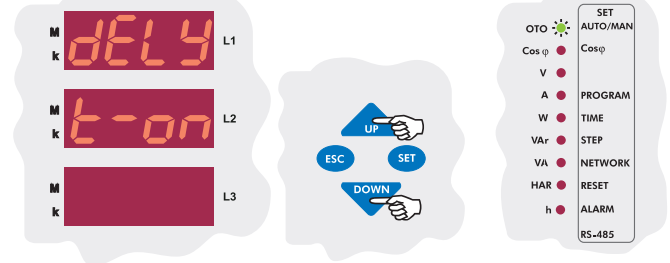
Enter a value between 1-1800 seconds and then press **“SET”** button. Using the **“UP/DOWN”** buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the **“ESC”** button.



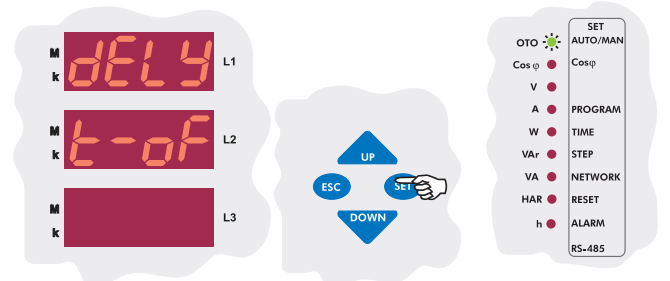
If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE SET YES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.

3.4.b Switch-Off Delay Time Setting

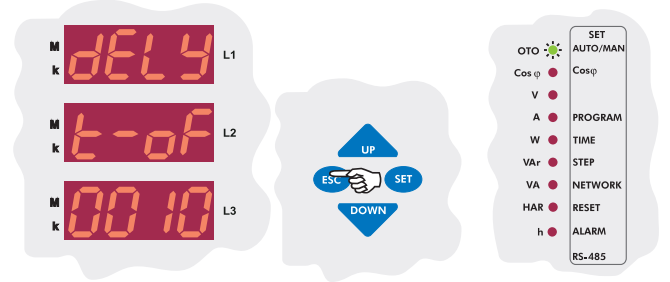
Switch-off delay time must be set according to system requirement in order to achieve compensation targets and also to provide long life time for contactors and capacitors.



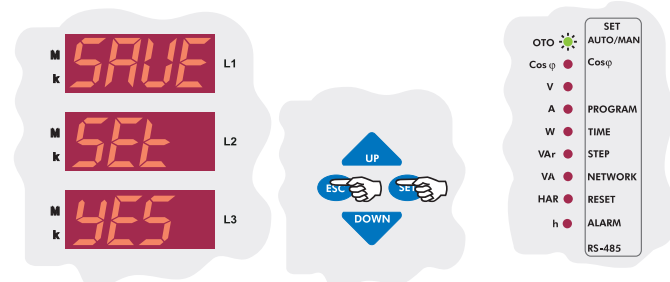
Using the **“UP/DOWN”** buttons, select the switch-off delay time (dELy t-of) menu.



The second setting in this menu is the switch off delay time setting (t-of). Press the **“SET”** button to change this time value.



Enter a value between 1-1800 seconds and then press **“SET”** button. Using the **“UP/DOWN”** buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the **“ESC”** button.



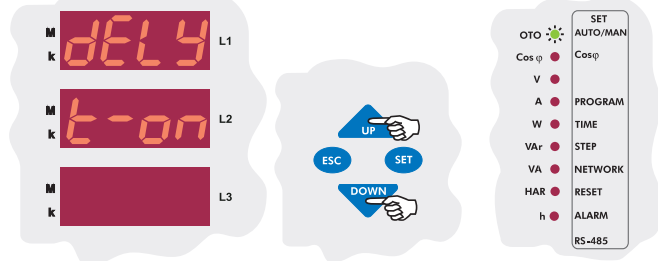
If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE SET YES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.

POWER FACTOR CONTROLLER

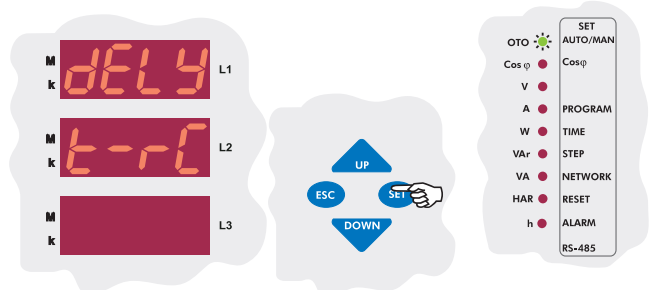
RG3-15C/CS/CL/CLS

3.4.c Discharge Time Setting

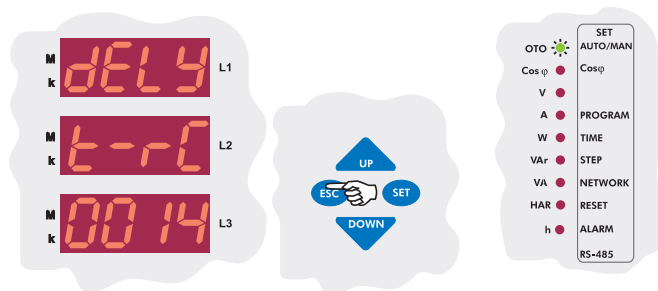
Discharge time must be set according to determined time periods by the capacitor suppliers. If discharge coil or contactors, which have discharge coils, are used, discharge time can be shortened according to do instructions defined by the suppliers.



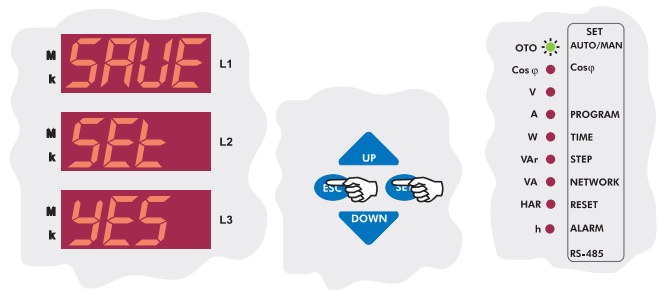
Using the “UP/DOWN” buttons, select the discharge time menu (dELy t-rC).



The third setting in this menu is the switch off delay time setting (t-rC). Press the “SET” button to change this time value.



Enter a value between 1-1800 seconds and then press “SET” button. Using the “UP/DOWN” buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the “ESC” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set YES” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.5 Power Value and Connection Type Settings for Capacitors

In this menu, power values and connection types of all capacitor steps can be set.

There are 5 different connection types for capacitors which are “R, S, T, RST and off”. Also capacitor step measurement for power values can be set between 0,020-2,000 kVar. If a capacitor step is set as “off”, there is no need to set any power value.

Note : For the first capacitor step. There isn't a connection type setting. “RST” connection type always must be selected because first capacitor step is used to detect correct connection.

Note : If the 10th program is selected, capacitor powers can be set separately for each capacitor step. However; if any program except PS-10 is selected, only first capacitor steps power value (C-01) can be set manually. Capacitor powers for other steps are calculated in 3-phase according to the selected program.

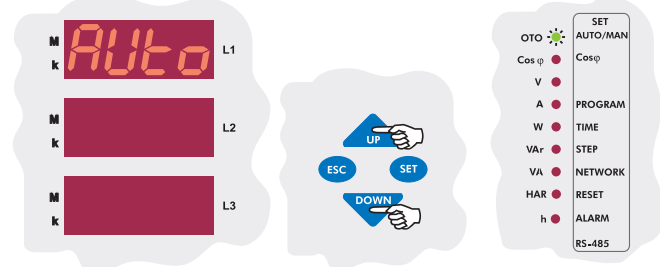
3.5.a First Capacitor Step Setting

First capacitor step is used to find connection. Therefore, a 3-phase capacitor must be connected to the first step. For this reason, it isn't possible to set the connection setting for first capacitor step and it is always selected “RST” type.

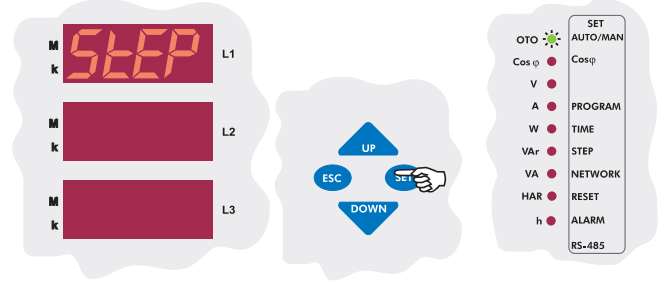
When setup parameter is selected as “on” in Auto menu, if any program except PS-10 is selected, power value of the first capacitor step is measured and other steps power values are calculated according to selected program.

Note : When setup parameter is selected as “on” in Auto menu, after completing the measurement of capacitor powers according to the selected program, RG3-12C/CS continues to work in “setup:of” mode.

3 sn. Press the “SET” button for 3 s in order to enter the menu.



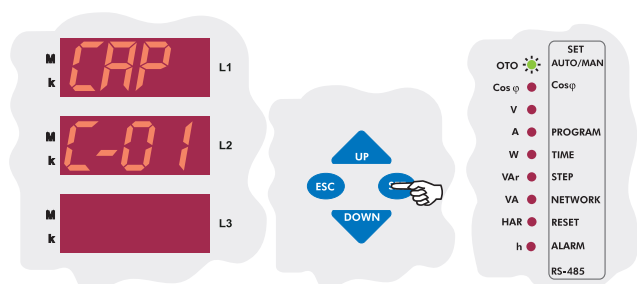
Using the “UP/DOWN” buttons, select Step menu where capacitor connection and power values will be entered. When Step menu is displayed, step (VAr/STEP) LED turns on.



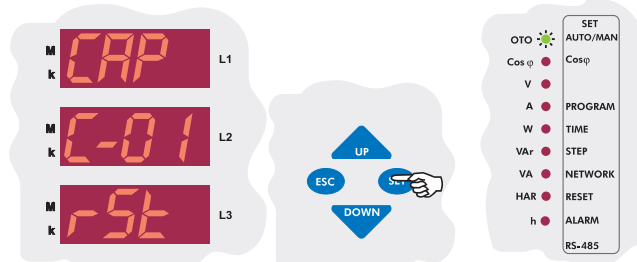
Press the “SET” button to enter capacitor (CAP) settings menu.

POWER FACTOR CONTROLLER

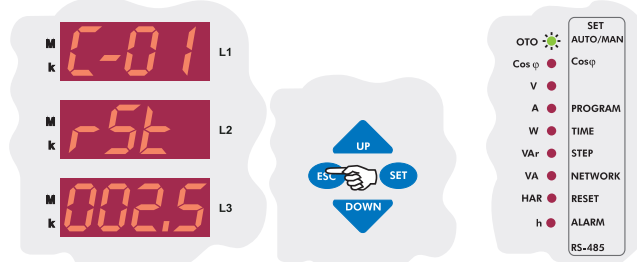
RG3-15C/CS/CL/CLS



Press the “**SET**” button to enter to the first capacitor step setting menu(C-01) which is the first menu under the capacitor menu option.

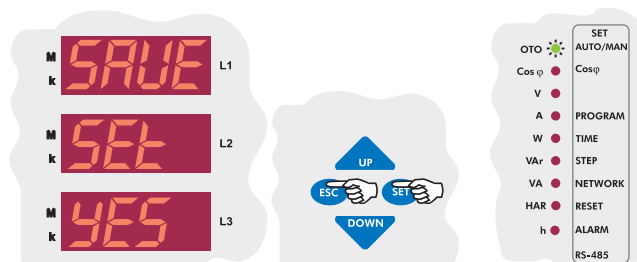


First capacitor step is used to find connection. Therefore, a 3-phase capacitor must be connected to the first step. For this reason, it isn't possible to set the connection setting for first capacitor step and it is always selected “**RST**” type and it can not be changed. Press the “**SET**” button to set power value of the first capacitor step.



Enter the power value of the first capacitor step and then press the “**SET**” button. If you are going to change another setting, enter the desired menu option by using “**UP/DOWN**” buttons. If you do not want to set another parameter, press the “**ESC**” button.

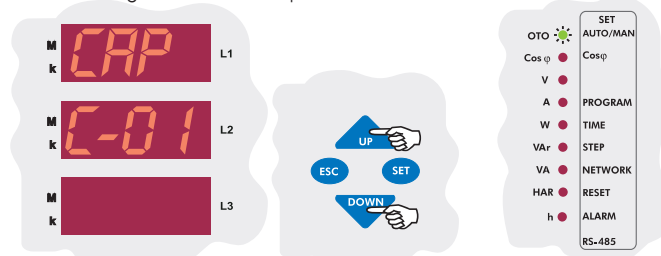
NOTE: If the 10th program is selected, capacitor powers can be set separately for each capacitor step. However; if any program except PS-10 is selected, only first capacitor steps power value (C-01) can be set manually. Capacitor powers for other steps are calculated in 3-phase according to the selected program..



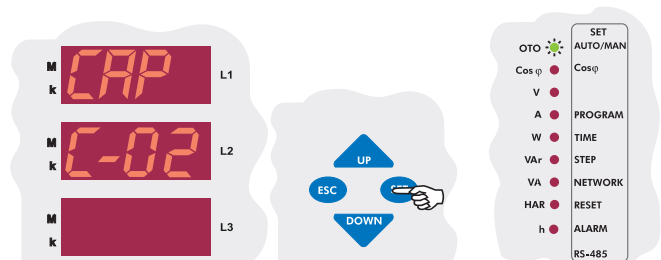
If you want to leave the setup menu without making any other changes, press the “**ESC**” button until “**SAVE Set YES**” shows on the screen. If you want to save the changes, press the “**SET**” button. If not, press the “**ESC**” button.

3.5.b Second Step Capacitor Setting

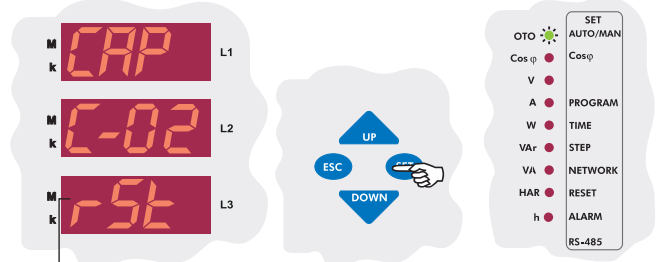
When PS-10 (Program 10) is selected, connection type and capacitor power value settings of all capacitor steps from the 2nd to the 15th can be set. When a program except PS-10 is selected, only first capacitor steps setting can be changed and other steps can not be set.



Using the “**UP/DOWN**” buttons, find the second capacitor step setting menu(C-02).



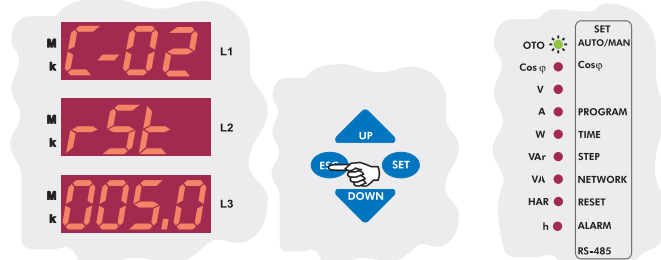
The first setting in this menu is the connection type. Press the “**SET**” button to set the connection type.



Using the “**UP/DOWN**” buttons, second capacitor steps connection type can be set manually as connected to the “**r**”, “**S**”, “**t**” or “**rSt**” phase/phases. If this parameter is selected as “**oFF**”, capacitor step which is connected to the second step will be disabled.

Note: After automatic calculation of the capacitors, if “**oFF**” is displayed in any step, it means that related capacitor could not be calculated, is defected or there is no connected capacitors in the related step

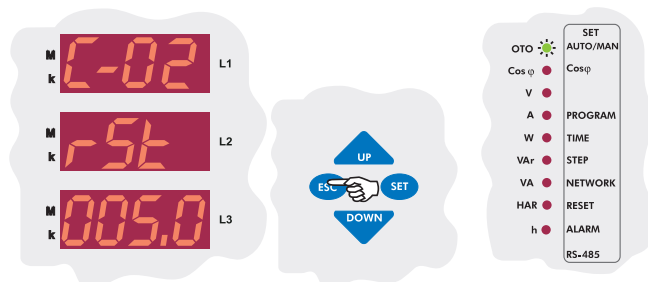
Press the “**SET**” button to set second capacitor steps power value.



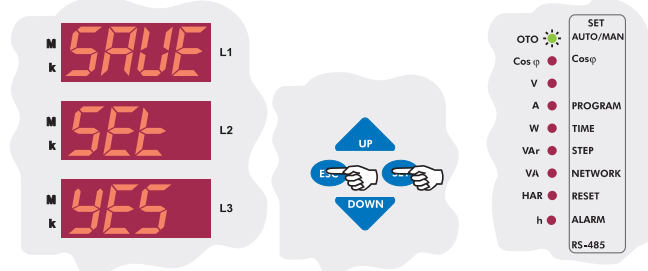
Enter the power value of the second capacitor step and then press the “**SET**” button. If you are going to change another setting, enter the desired menu option by using “**UP/DOWN**” buttons. If you do not want to set another parameter, press the “**ESC**” button.

POWER FACTOR CONTROLLER

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Enter the power value of the second capacitor step and then press the “SET” button. If you are going to change another setting, enter the desired menu option by using “UP/DOWN” buttons. If you do not want to set another parameter, press the “ESC” button.

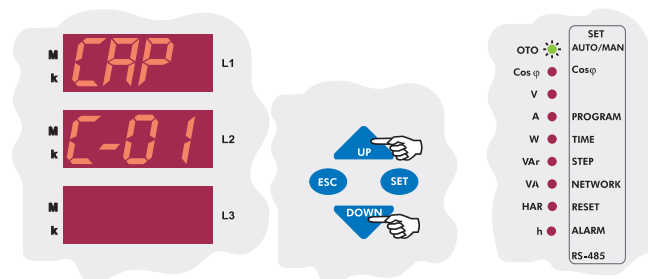


If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

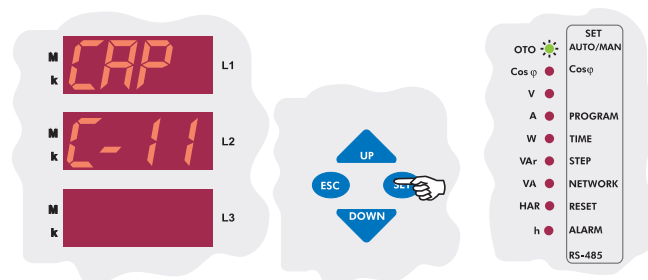
3.5.c Step Number Setting

Steps which will not be used can be deactivated by selecting “off” in the step menu. After these settings are done, the device must deenergised and reenergised. If the device is not reset, unselected steps may stay activated and they may not be deactivated in case they are activated.

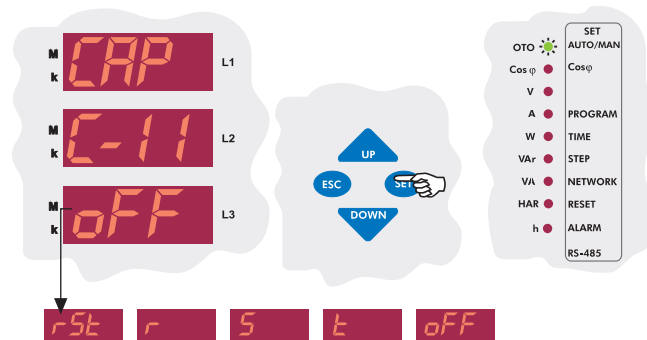
NOTE: Since connection type of the free capacitor steps (without a capacitor bank connected to them) can be set as “off” when Program 10 is selected, their activation or deactivation don’t come into question. This setting must be used for power sequencing options other than Program 10.



Find C-11 menu option where connection type and step power value will be set by using “UP / DOWN” buttons.



The first setting in this menu is the connection type. Press the “SET” button to set the connection type.



When you set the 11th capacitor step “oFF” by using “UP/DOWN” buttons, the capacitor group which is connected to the 11th step will be deactivated.

Note: After automatic calculation of the capacitors, if “oFF” is displayed in any step, it means that related capacitor could not be calculated, is defected or there is no connected capacitors in the related step.



CAP C-03

In this menu, capacitor setting for 3rd step are done.

CAP C-04

In this menu, capacitor setting for 4th step are done.

.....

.....

.....

CAP C-13

In this menu, capacitor setting for 13th step are done.

CAP C-14

In this menu, capacitor setting for 14th step are done.

CAP C-15

In this menu, capacitor setting for 15th step are done.

* IND R-1

In this menu, settings for shunt reactor which is connected to R1 step are done.

* IND R-2

In this menu, settings for shunt reactor which is connected to R2 step are done.

* IND R-3

In this menu, settings for shunt reactor which is connected to R3 step are done.

*Valid for RG3-15CL/CLS.

●Above step settings for connection type and power value can be done just like second capacitor step setting (C-02).

3.6 Current and Voltage Transformer Ratio Settings

To obtain accurate power when calculating the capacitor step powers, current and voltage transformer ratios must be entered correctly. If these ratios are entered incorrectly, the calculated capacitor step powers will be incorrect. When these ratios aren't entered, the device will set these ratios as “1” and capacitor step powers will be calculated according to this setting.

Current and voltage transformer ratios can be set separately.

3.6.a Current Transformer Ratio Setting

In this menu, current transformer ratio can be set between 1-2000.

For Example: For a 150/5 current transformer, CT ratio must be set as 30.

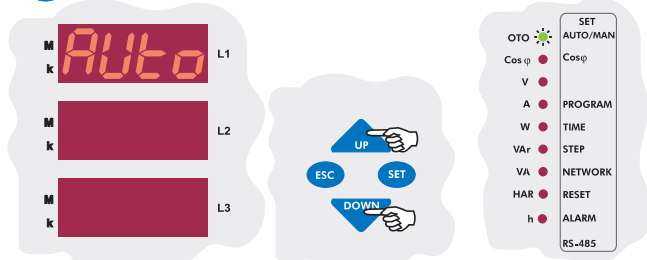
NOTE: Be aware that this value is entered as a ratio, not CT primary or secondary value.

POWER FACTOR CONTROLLER

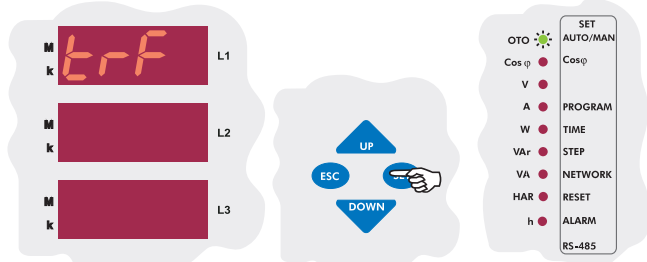
RG3-15C/CS/CL/CLS

3 sn.

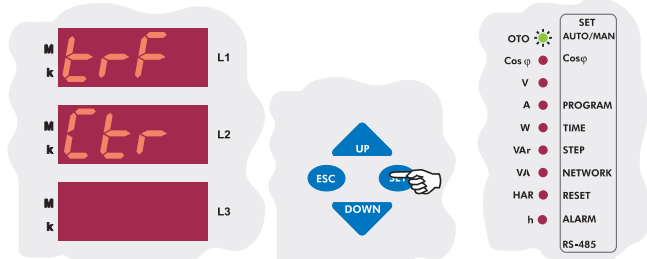
Press the “SET” button for 3 s in order to enter the menu.



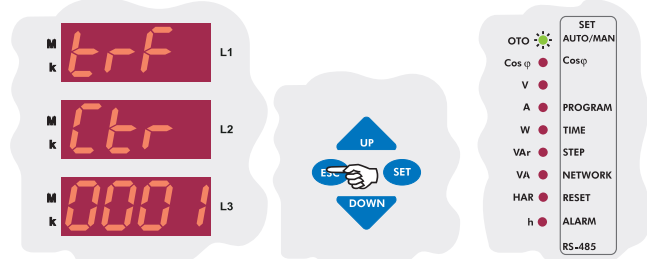
Using the “UP/DOWN” buttons, find current and voltage transformer ratio menu (trF). When this menu is selected, Transformer (VA/TRF) LED turns on.



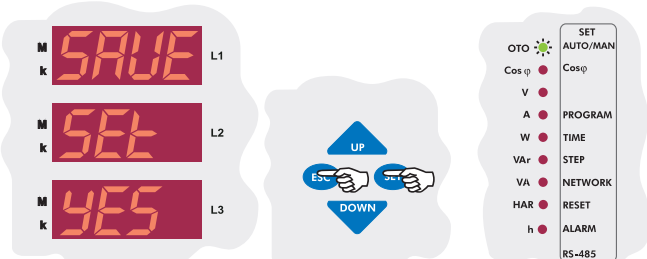
Press the “SET” button to enter to the CT and VT ratio setting menu.



The first setting in the CT and VT ratio menu is the CT ratio menu. Press the “SET” button to set CT ratio.



Enter CT ratio between 1-2000 and press the “SET” button. If you do not want to set another parameter, press the “ESC” button. If you are going to change another setting, enter the desired menu option by using “UP/DOWN” buttons. If you do not want to set another parameter, press the “ESC” button.



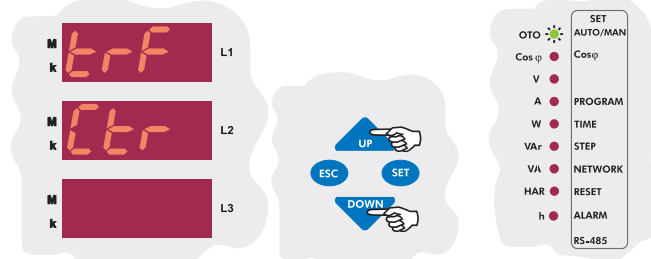
If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.6.b Voltage Transformer Ratio Setting

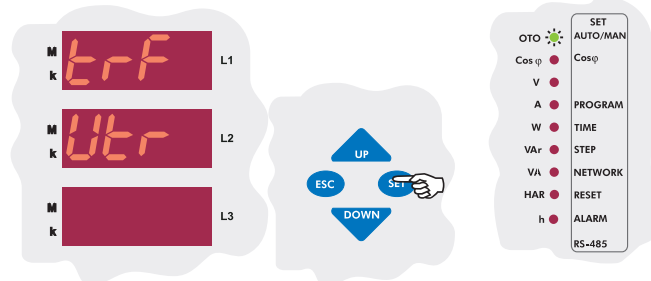
In this menu, voltage transformer ratio can be set between 1-2000.

For Example: For a 34,5 kV / 100 V transformer, VT ratio must be set as 345.

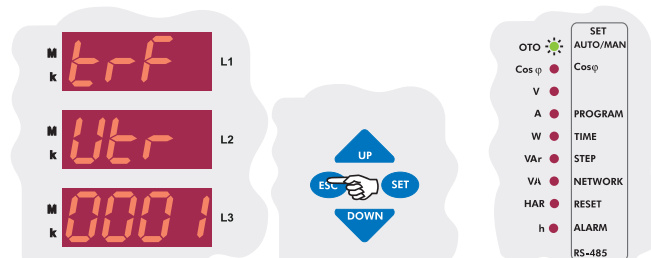
NOTE: Be aware that this value is entered as a ratio, not VT primary or secondary value.



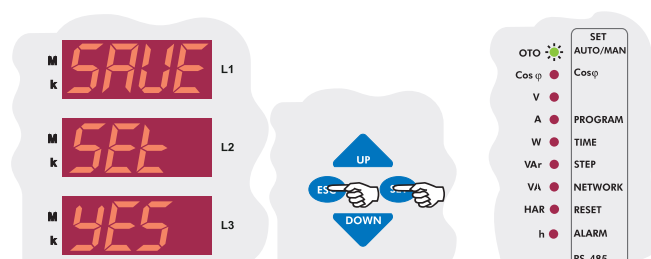
Using the “UP/DOWN” buttons, enter the voltage transformer ratio (Vtr) menu which is the second menu in CT and VT ratio settings.



Press the “SET” button to set VT ratio.



Enter VT ratio between 1-2000 and press the “SET” button. If you do not want to set another parameter, press the “ESC” button. If you are going to change another setting, enter the desired menu option by using “UP/DOWN” buttons. If you do not want to set another parameter, press the “ESC” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

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3.7 Reset Operation Settings

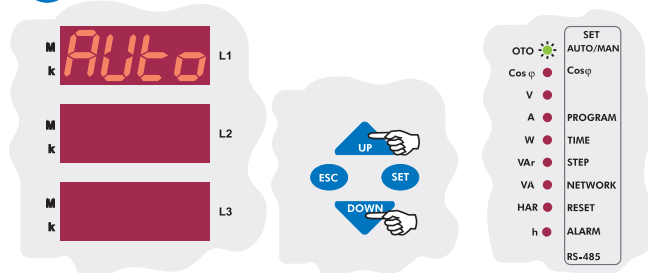
In this menu; alarms and ratios(reactive/active ratios) are reset.

3.7.a Alarm Reset Operation Setting

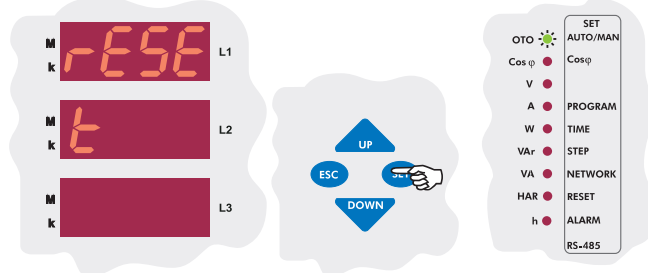
The alarms which occur when the device operates are reset in this menu. To reset the alarms, “yES” option must be selected.

NOTE: When an alarm occurs, the alarm relay switches on and the related alarms LED turns on and the alarm code is displayed. Even if alarm conditions disappear, the alarm relay will stay switched on. By using the reset menu, alarms are reset and alarm relay is switched off. If alarm conditions still exist, even if alarms are reset in the “reset” menu, alarm relay switches on again. If alarm conditions disappeared, alarm relay continues to its normal operation.

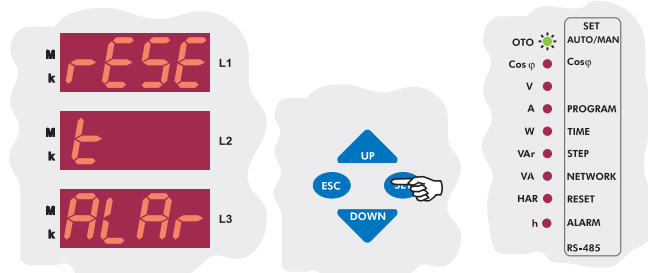
3 sn. Press the “SET” button for 3 s in order to enter the menu.



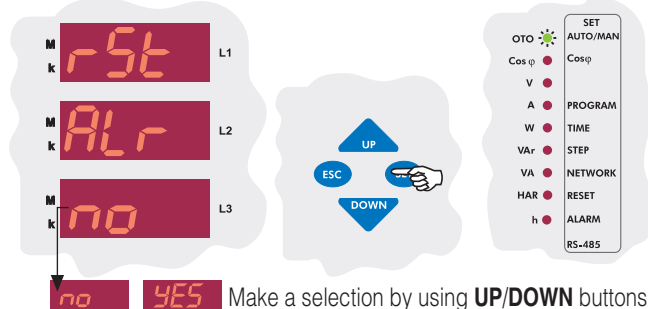
Using the “UP/DOWN” buttons, find the reset menu option(rESet). When reset menu is selected, Reset LED turns on.



Press the “SET” button to enter reset (rESet) setting options.



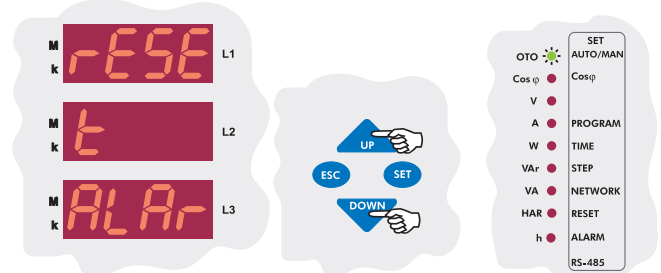
Press the “SET” button to set the alarm (ALAR) setting which is the first setting in the reset (rESet) menu.



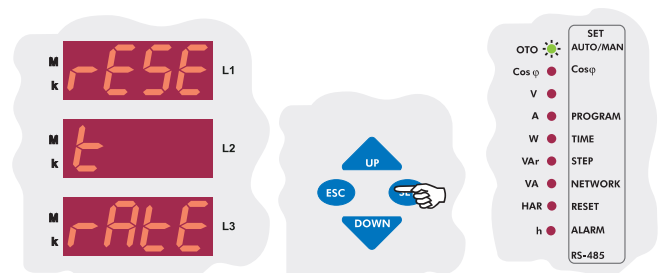
Select “yES” with “AŞAĞI/YUKARI” buttons to delete alarm values, select “no” to cancel deleting operation and press “SET” button.

3.7.b Reactive/Active Ratio Reset Setting

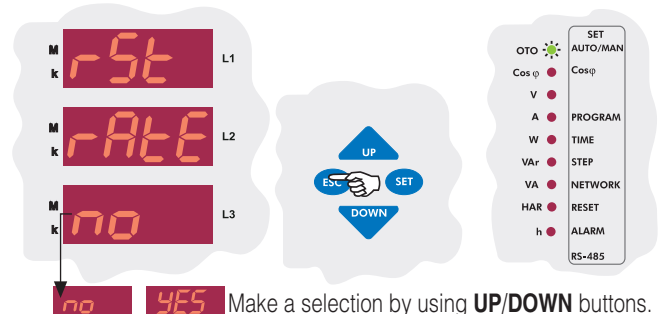
Reactive/active ratio, which is calculated by the device, is reset in this menu.



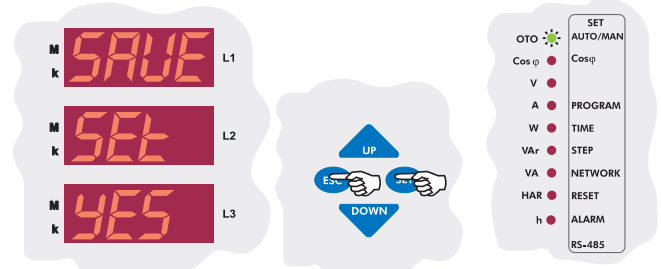
Using the “UP/DOWN” buttons, find “reactive/active ratio reset” menu(rAtE) which is the second setting in the reset(rESet) menu.



Press the “SET” button to enter the reactive/active ratio reset settings.



Using the “UP/DOWN” buttons, select “yES” to delete reactive/active ratio or “no” to cancel the delete process and then press “SET” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yES” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

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3.8 Alarm Settings

In this menu, alarm values for **overvoltage**, **reactive/active ratio** and **THD** can be set separately.

Device has 2 relay outputs in addition to capacitor step relays which are alarm relay and *fan relay.

If any of the above mentioned alarm conditions occurs, alarm relay switches on and the related error LED and alarm LED (AL) light (Refer to "errors" section for details).

Also, related error code is displayed on the display (Refer to page 31 for alarm codes).

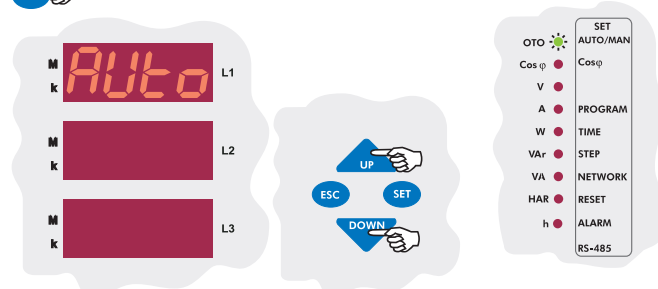
3.8.a Overvoltage Alarm Setting

In this menu, the limit value for the overvoltage alarm is set. This value is used for all three phases. If any phase value exceeds the set value and the alarm condition still exists even after the entered delay time is over, alarm relay switches on and the overvoltage LED (V>) turns on.

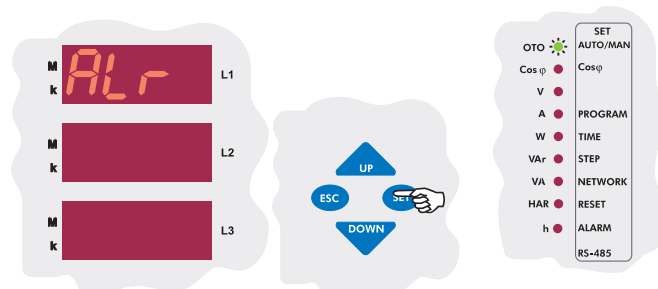
3.8.a.a Overvoltage Setting

In this menu, overvoltage value is set between 0-300 V (for $V_{tr}=1$). If this value is set as "0", this function is disabled.

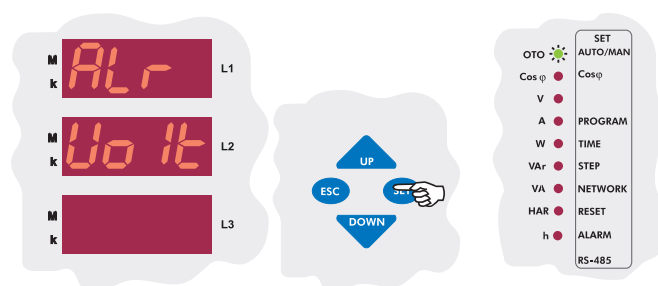
3 sn. Press the "SET" button for 3 s in order to enter the menu.



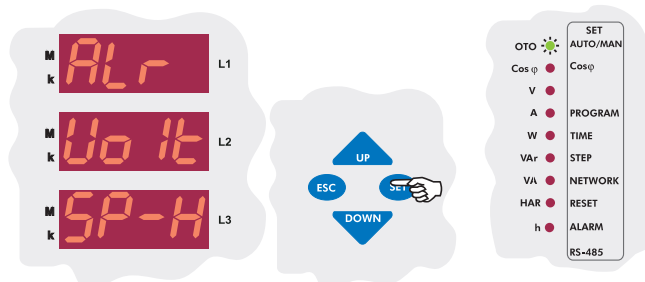
Using the "UP/DOWN" buttons, find Alarm(ALr) menu. When Alarm menu is selected, alarm LED turns on.



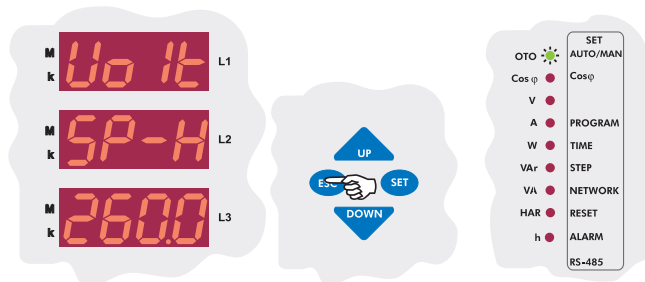
The first setting in the alarm menu (ALr) is the voltage (UoLt). Press the "SET" button to enter the overvoltage settings menu.



Overvoltage value (SP-H), delay time (dELy) and overvoltage step (StEP) parameters can be set in this menu. In order to set these parameters, press the "SET" button.

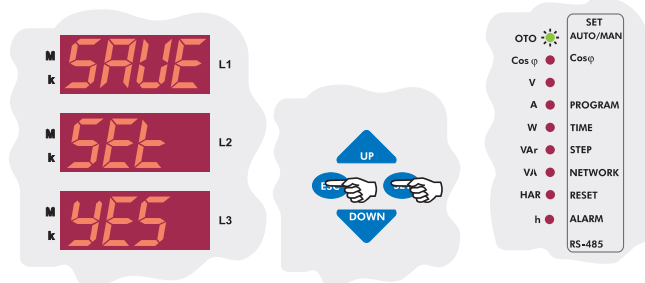


Press the "SET" button to set the overvoltage value (SP-H).



Enter the overvoltage value between 0-300 V. If you are going to change another setting, return to the menu by pressing the "SET" button. If you do not want to set another parameter, press the "ESC" button.

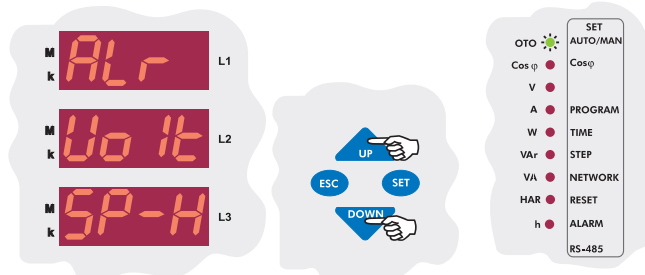
NOTE: If over voltage value is set as "0", this function is disabled.



If you want to leave the setup menu without making any other changes, press the "ESC" button until "SAVE Set yes" shows on the screen. If you want to save the changes, press the "SET" button. If not, press the "ESC" button.

3.8.a.b Overvoltage Delay Time Setting

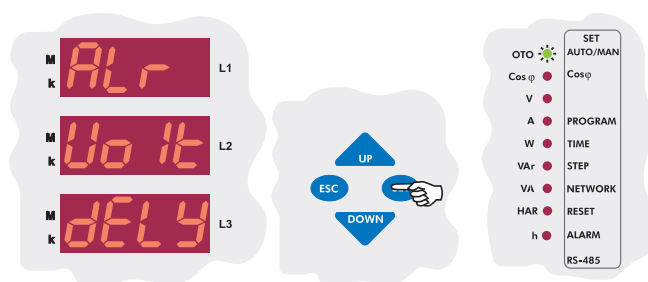
If one or more of measured phase voltage values exceed preset voltage value, an alarm occurs at the end of the adjusted delay time. Delay time can be set between 0-999.9 seconds.



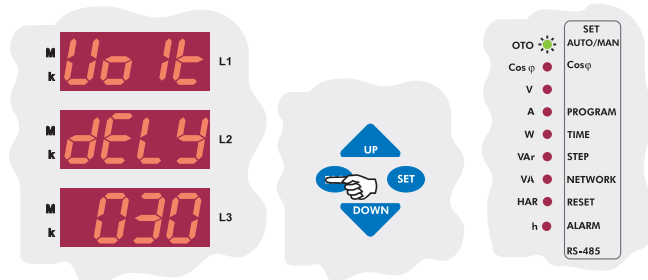
Press the "DOWN" button to select the over voltage delay time (dELy) menu.

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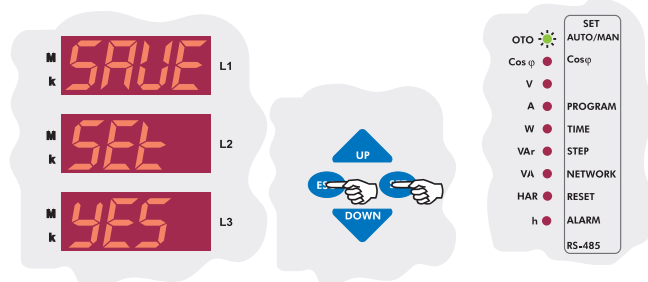
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The second setting in the voltage menu(UoLt) is the overvoltage delay time(dELy). Press the “**SET**” button to enter the overvoltage delay time setting menu.



Enter the over voltage delay time between 0-999.9 seconds. If you are going to change another setting, return to the menu by pressing the “**SET**” button. If you do not want to set another parameter, press the “**ESC**” button.



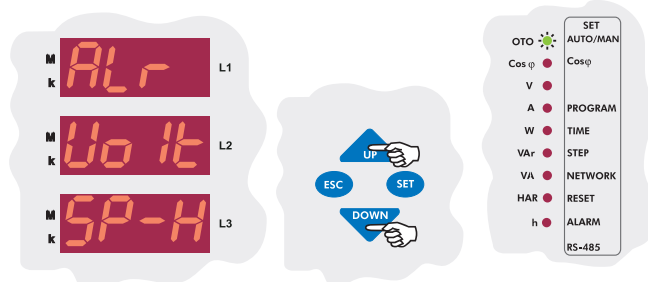
If you want to leave the setup menu without making any other changes, press the “**ESC**” button until “**SAVE Set yES**” shows on the screen. If you want to save the changes, press the “**SET**” button. If not, press the “**ESC**” button.

3.8.a.c Switch On or Switch Off Setting of Capacitor Steps for Overvoltage Alarm Setting

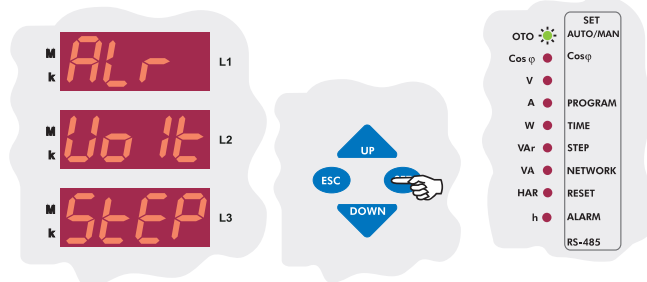
In order to protect the capacitors from overvoltage, when an overvoltage alarm occurs, capacitor steps' switch on or switch off settings are done in this menu.

If “on” is selected: When overvoltage error occurs, capacitor steps stay switched on.

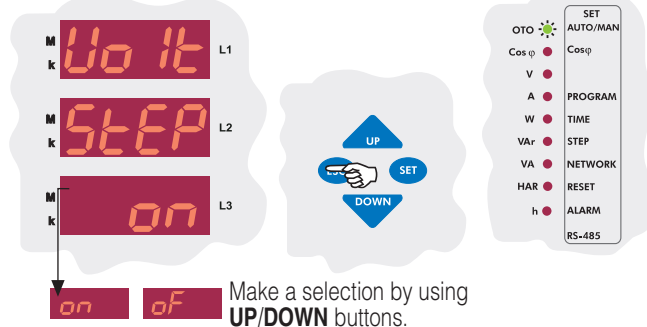
If “off” is selected: When overvoltage error occurs, capacitor steps stay switched off.



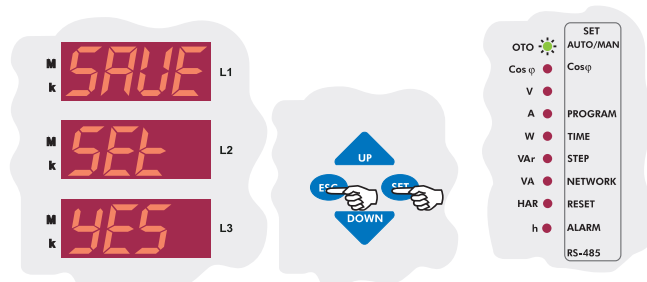
Press the “**DOWN**” button in order to switch from overvoltage menu to the overvoltage step menu(StEP).



The third setting in the voltage menu(UoLt) is the overvoltage step setting(StEP). Press the “**SET**” button to enter the overvoltage step setting menu.



Using the “**UP/DOWN**” buttons, select “**on**” or “**of**” option and press the “**SET**” button. Using the “**UP/DOWN**” buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the “**ESC**” button.



If you want to leave the setup menu without making any other changes, press the “**ESC**” button until “**SAVE Set yES**” shows on the screen. If you want to save the changes, press the “**SET**” button. If not, press the “**ESC**” button.

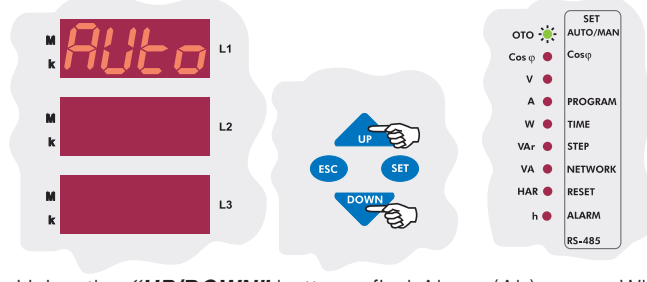
3.8.b Reactive / Active Ratio Setting

If reactive/active energy ratio exceeds the preset value, an alarm occurs. This ratio can be set for inductive/active and capacitive/active separately between 0-99.9 %. If this value is set as “0”, this function is disabled.

3.8.b.a Capacitive Ratio Setting

In order to provide accurate compensation, the upper limit value of capacitive/active ratio is entered in this menu. This value can be set between 0-99.9 %. If the capacitive/active ratio of the network exceeds the preset value, an alarm occurs. If this value is set as “0”, this function is disabled.

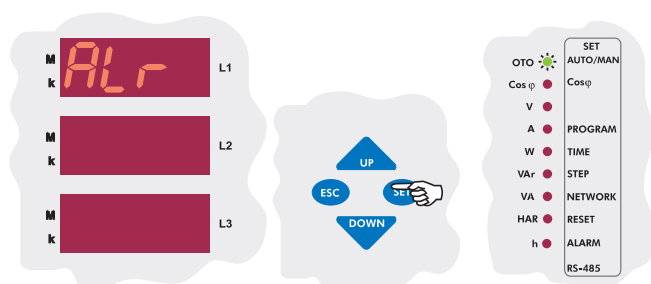
3 sn. Press the “**SET**” button for 3 sec. in order to enter the menu.



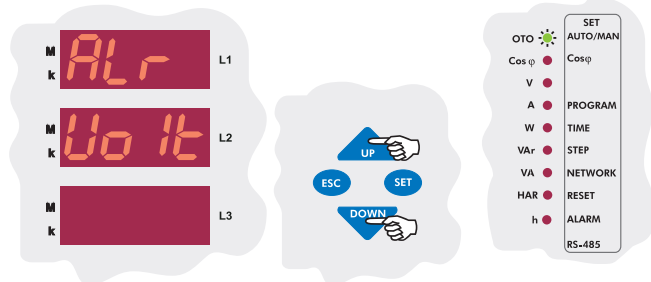
Using the “**UP/DOWN**” buttons, find Alarm (ALr) menu. When “**Alarm**” menu is selected, Alarm LED turns on.

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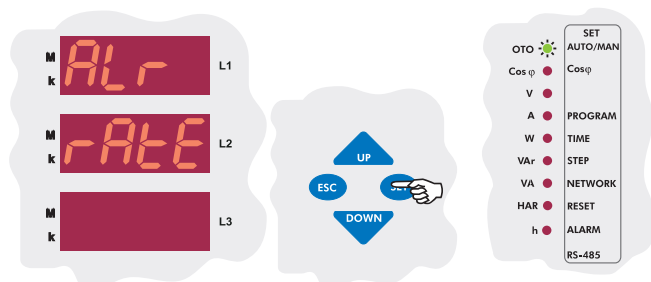
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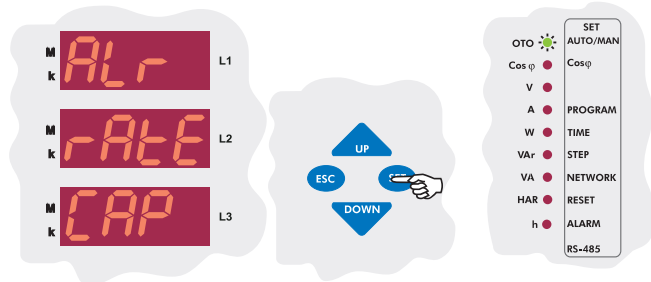
Press the **"SET"** button to enter the alarm(ALr) settings menu.



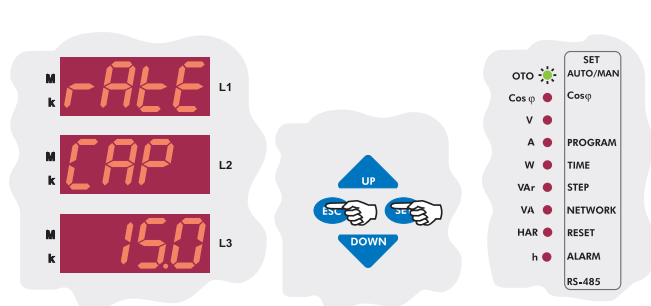
Using the **"UP/DOWN"** buttons, find reactive/active ratio (rAtE) menu.



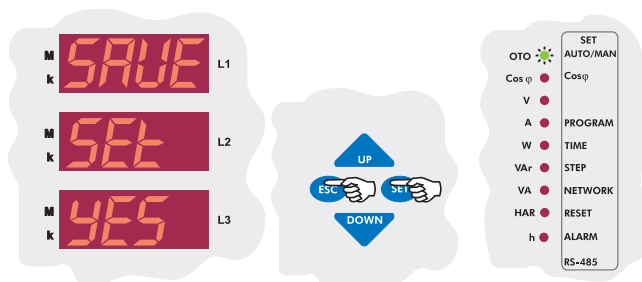
The second setting in the alarm menu(ALr) is the reactive/active energy ratio menu(rAtE). From this menu, the upper limit value of the capacitive/active and inductive/active ratios can be set. Press the **"SET"** button to set these values.



Press **"SET"** button to enter Capacitive/Active ratio.



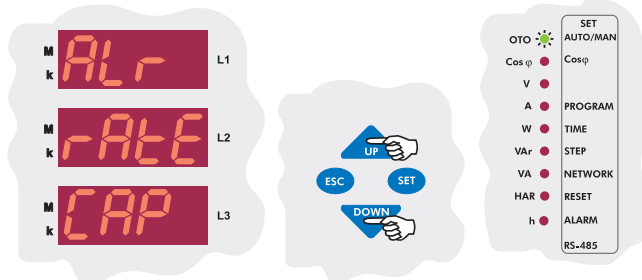
Enter the capacitive/active ratio between 0-99.9 % and press the **"SET"** button. Using the **"UP/DOWN"** buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the **"ESC"** button.



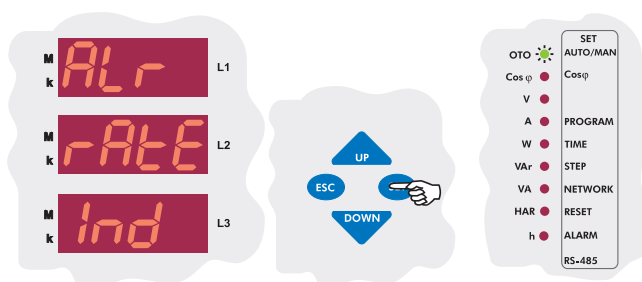
If you want to leave the setup menu without making any other changes, press the **"ESC"** button until **"SAVE Set YES"** shows on the screen. If you want to save the changes, press the **"SET"** button. If not, press the **"ESC"** button.

3.8.b.b Inductive Ratio Setting

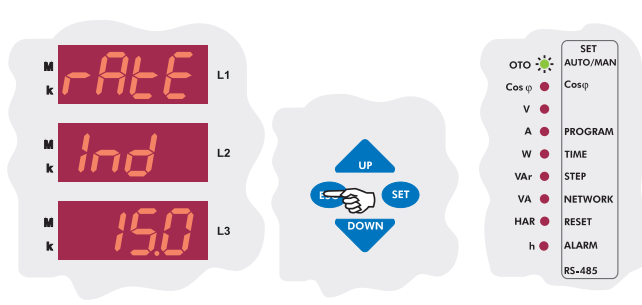
In order to provide accurate compensation, the upper limit value of inductive/active ratio is entered in this menu. This value can be set between 0-99.9 %. If the inductive/active ratio of the network exceeds the preset value, an alarm occurs. If this value is set as "0", this function is disabled.



When **"Alr rAtE CAP"** is displayed on the display, find **"rAtE Ind"** menu by using **"UP/DOWN"** buttons.



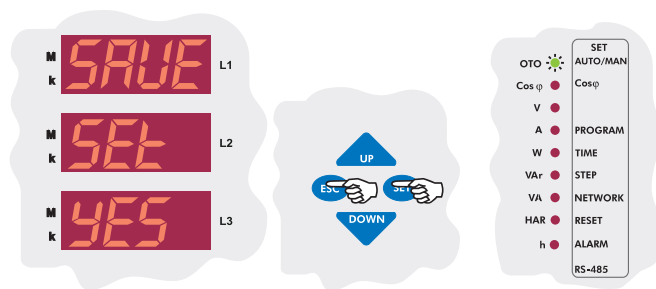
Press the **"SET"** button to set the inductive/active ratio.



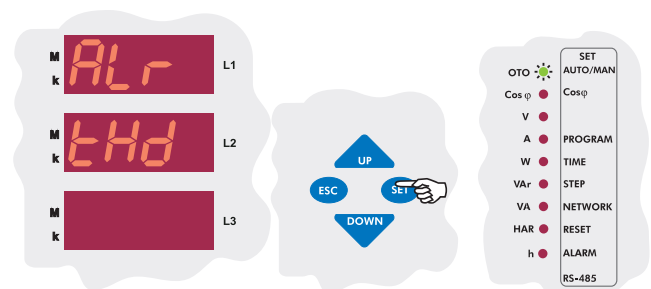
Enter the inductive/active ratio between 0-99.9 % and press the **"SET"** button. If you are going to change another setting, return to the menu by pressing the **"SET"** button. If you do not want to set another parameter, press the **"ESC"** button.

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If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE Set YES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.



In this menu, over voltage harmonic value(thdV), delay time(dELy) and switching off of the capacitor steps(StEP) parameters are set. In order to set these parameters, press the **“SET”** button.

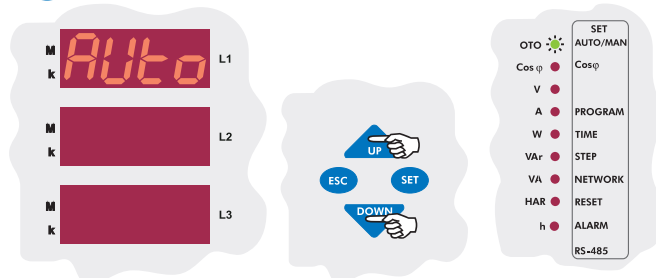
3.8.d Harmonic Setting

If total harmonic value of measured voltages exceeds the value which is entered from this menu and does not return to normal level during the entered delay time(dELy), alarm relay switches on and harmonic LED(**M_w**) turns on.

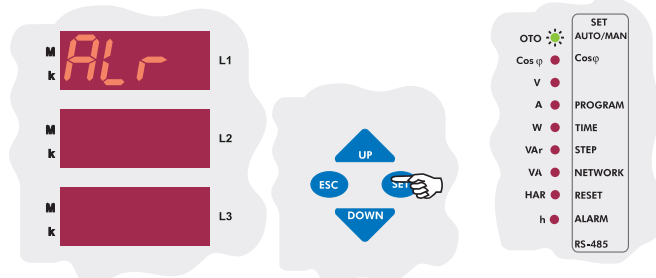
3.8.d.a Overvoltage Harmonic Setting

The upper limit for the overvoltage harmonic value to set the harmonic alarm is set in this menu.

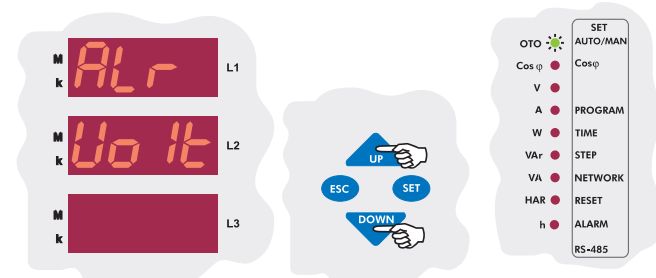
3 sn. Press the **“SET”** button for 3 sec. in order to enter the menu.



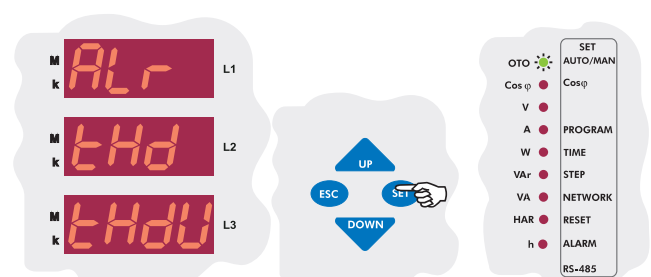
Using the **“UP/DOWN”** buttons, find the alarm menu(ALr). When alarm menu is selected, alarm LED turns on.



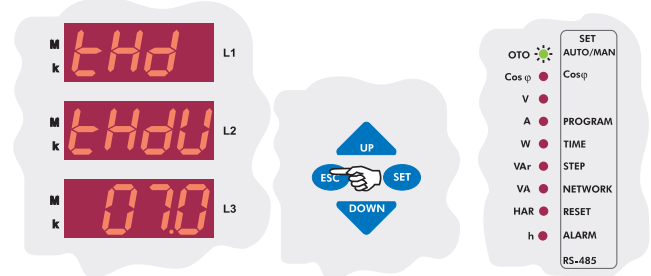
Press the **“SET”** button to enter the alarm(ALr) settings.



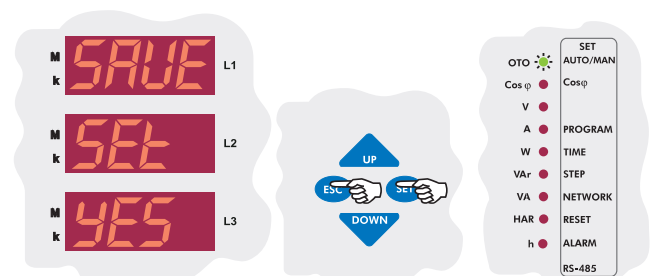
Using the **“UP/DOWN”** buttons, find over voltage harmonic menu(thd) which is the fourth setting in the alarm menu.



The first setting in this menu is the overvoltage harmonic (thdV) value. Press the **“SET”** button to enter the overvoltage settings menu.



Enter the overvoltage harmonic value between 0-99 % and press the **“SET”** button.



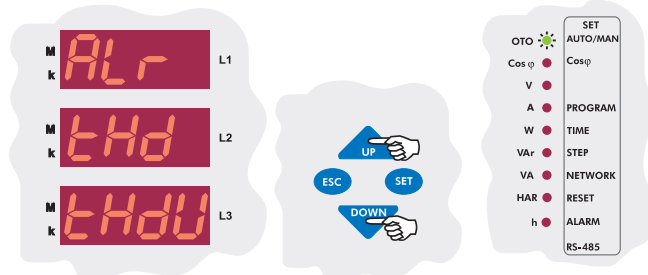
If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE Set YES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.

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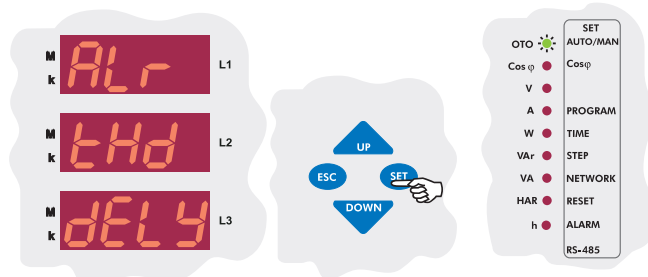
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3.8.d.b Harmonic Alarm Delay Time Setting

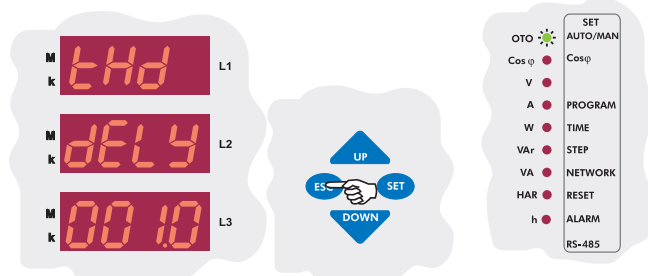
If total voltage harmonic value exceeds preset value and does not turn to normal level during the delay time(dELy) which is entered in this menu, an alarm occurs.



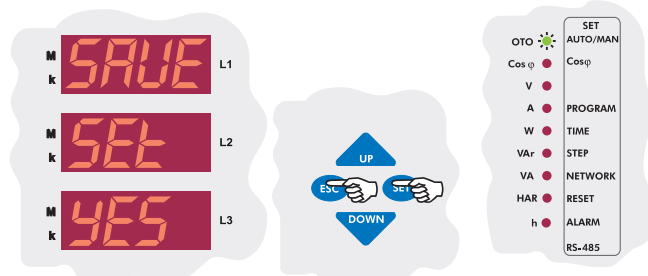
Using the “UP/DOWN” buttons, find the delay time(dELy) menu.



Press the “SET” button for delay time menu(dELy) which is the second setting in the harmonic menu.



Enter the delay time for overvoltage harmonic between 0-999,9 seconds and press “SET” button.



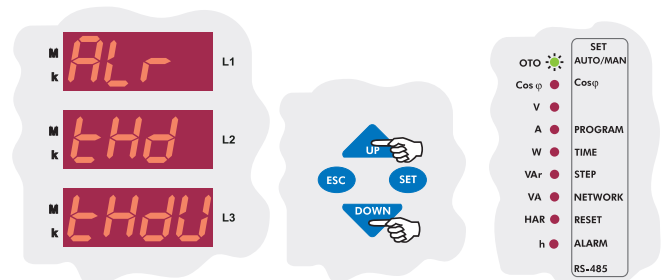
If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set YES” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.8.d.c Programming the Switching Off of the Capacitor Steps in Case of Harmonic Alarm

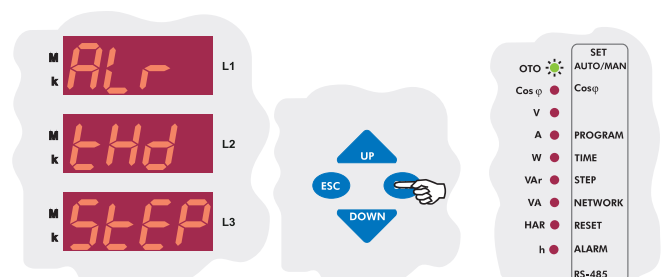
In order to protect the capacitors from overvoltage harmonic, they can be set to switch off in case of a harmonic alarm in this menu.

If “on” option is selected: When overvoltage harmonic error occurs, capacitor steps stay switched on.

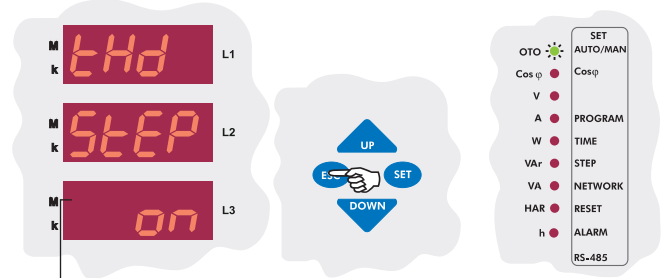
If “of” option is selected: When overvoltage harmonic error occurs, capacitor steps switch off.



Using the “UP/DOWN” buttons, find capacitor step(StEP) menu.

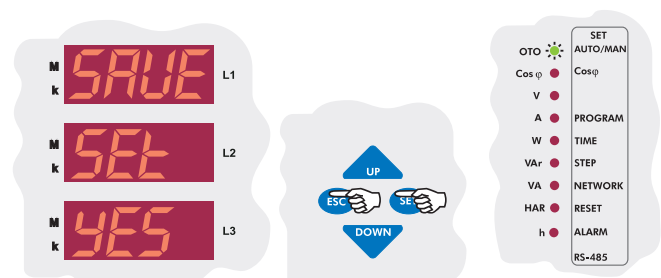


Press the “SET” button for capacitor step menu which is the third setting in the harmonic menu.



Make a selection by using UP/DOWN buttons.

Using the “UP/DOWN” buttons, select “on” or “of” option and press the “SET” button. Using the “UP/DOWN” buttons, enter to another menu option which you wish to change. If you are not going to change any more settings, press the “ESC” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set YES” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

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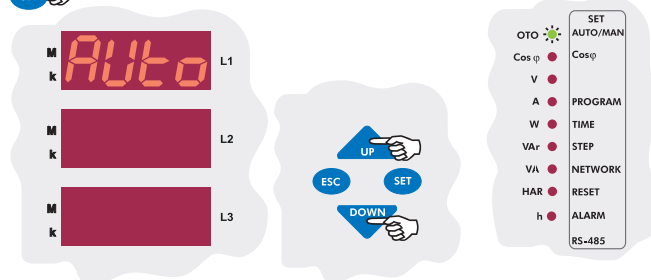
3.9 Resetting the Energy Counters and Entering the Energy Values

The Device has 2 energy counters. "Energy Counter 1" is the energy counter which can be read from the measurement parameters. "Energy Counter 2" can only be read from the devices registers. For "Energy Counter 1"; the energy value can be entered with "0,1 kWh/kVarh" precision for Active Import(A-I), Active Export(A-E), Reactive Inductive(r-L) and Reactive Capacitive(r-C) energy types. For "Energy Counter 2"; entering a value from the menu is not possible. If communication for the device exists, the energy values can be entered with "0,1 kWh/kVarh" precision for both counters. Resetting the energy counters can be done from this menu. Energy counters can also be conditioned to work with the generator input.

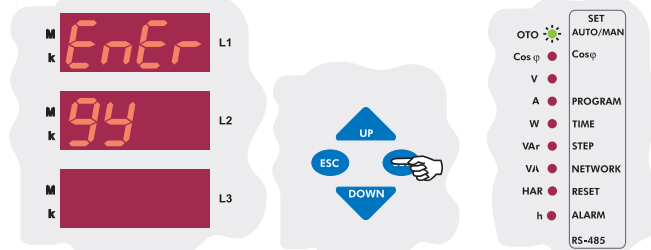
3.9.a Entering the Energy Values

Note: This process is done the same way for Active Import(A-I), Active Export(A-E), Reactive Inductive(r-L) and Reactive Capacitive(r-C) energy types.

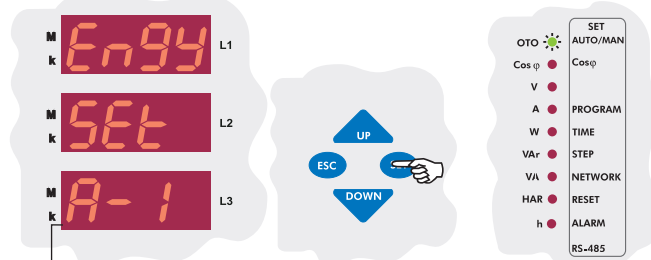
3 sn. Press **"SET"** button for 3 s in order to enter the menu.



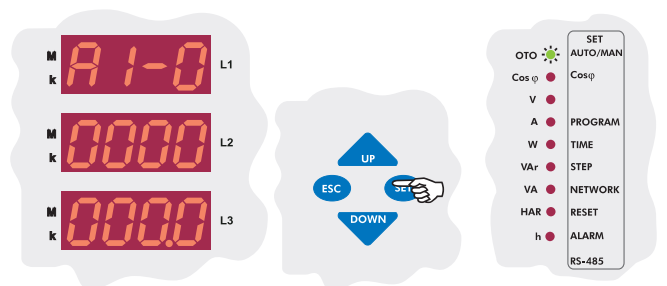
Using the **"UP/DOWN"** buttons, find the energy menu(EnErgy).



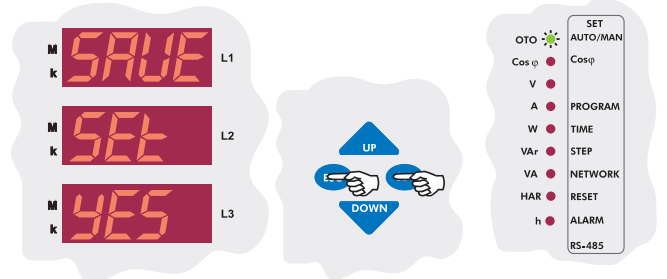
Press the **"SET"** to enter the energy menu. The first option in the energy menu is the Active Import Export(A-I) value.



To enter the **"A-I"** value, press the **"SET"** button (For the other energy types, press the **"UP"** button and find the energy type value you want to enter and press the **"SET"** button to change that energy value).



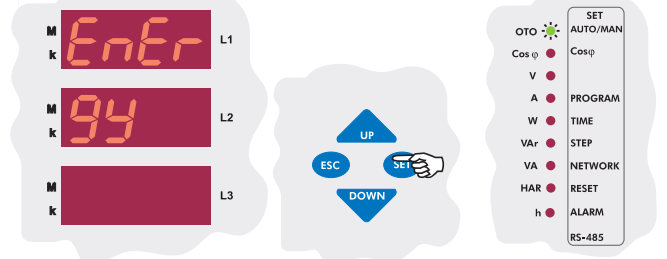
Active import energy value can be entered between "00000000.1 - 99999999.9". Enter the desired value and press the **"SET"** button.



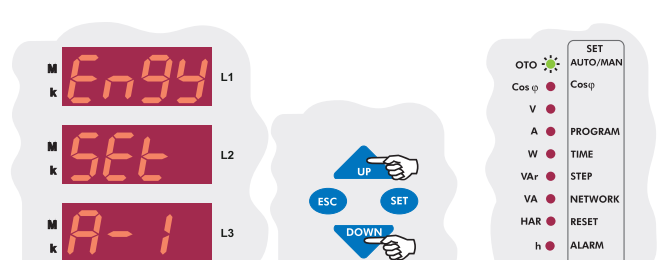
If you want to leave the setup menu without making any other changes, press the **"ESC"** button until **"SAVE SET YES"** shows on the screen. If you want to save the changes, press the **"SET"** button. If not, press the **"ESC"** button.

3.9.b Resetting the Energy Values

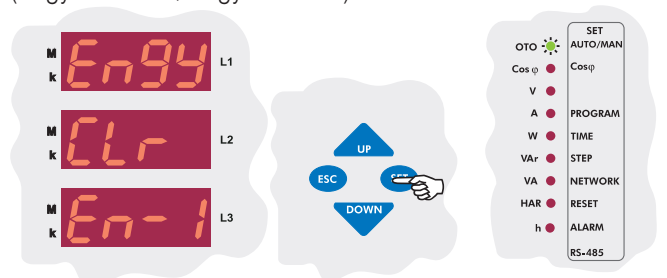
The device has 2 energy counters. These counters can be reset independently. Resetting is done the same way for both of the counters.



Press the **"SET"** to enter the energy menu. The first option in the energy menu is the Active Import Export(A-I) value.



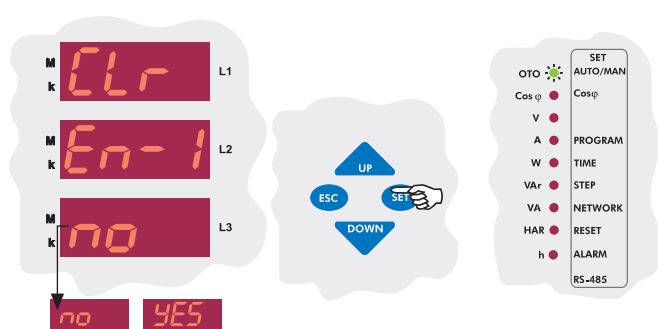
Using the **"UP/DOWN"** buttons, find the energy reset menu (Engy CLr En-1 / Engy CLr En-2).



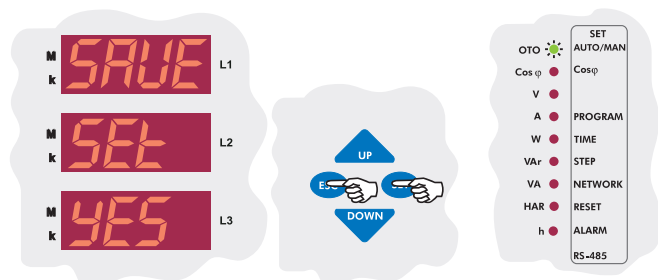
To reset the energy counter 1, press the **"SET"** button.

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS



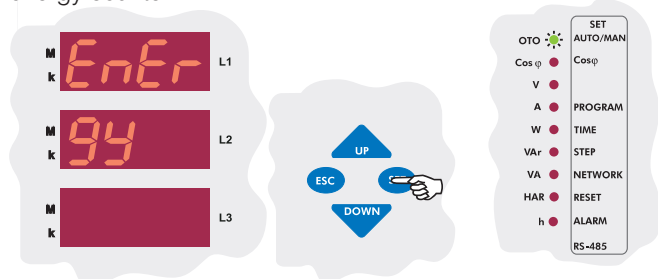
Using the “UP/DOWN” buttons, select “yes” to reset the energy counters or select “no” to cancel the resetting and press the “SET” button.



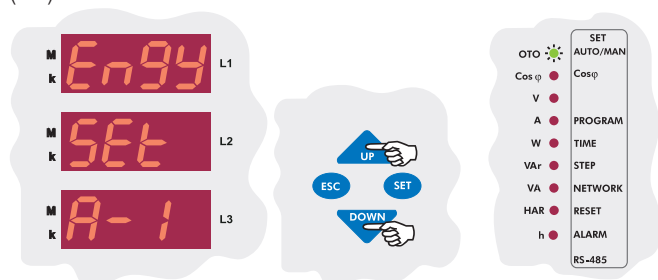
If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.9.c Conditioning the Energy Counters to Work with the Generator Input

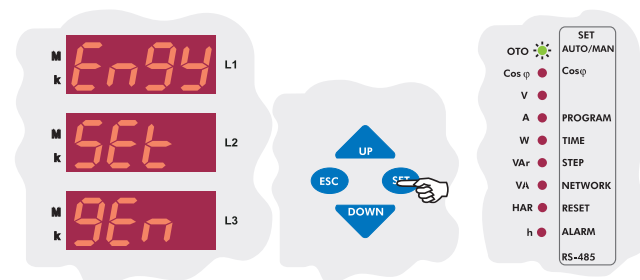
The conditioning of the energy counters is done in this menu. There are 2 parameters. If the “gEn ACt no” parameter is selected, Energy Counter 1 and Energy Counter 2 will count simultaneously. If the “gEn ACt yes” parameter is selected; when a signal on the generator input exists, Energy Counter 1 stops counting and Energy Counter 2 starts to count. When the signal disappears, Energy Counter 2 stops counting and Energy Counter 1 starts to count. This way, Energy Counter 2 can be set as a generator energy counter.



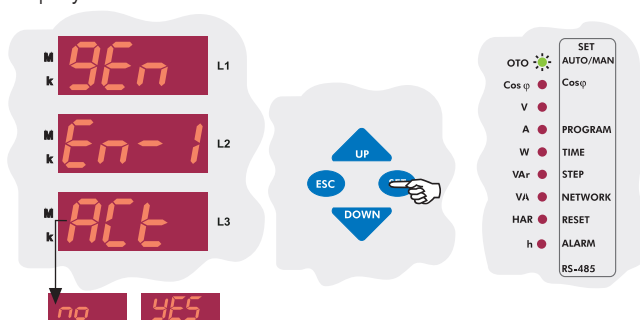
To enter to the Energy menu, press the “SET” button. The first option in the Energy menu is the Active Import Energy Value (A-I).



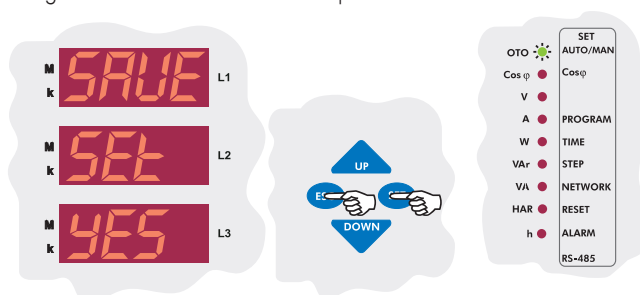
Using the “UP/DOWN” buttons, find the menu for conditioning the energy counters (Engy SET gEn).



Press the “SET” button to enter this menu. “gEn ACt no” will be displayed.



In order for the energy counter 1 to stop counting and energy counter 2 to start counting when there is a signal on the generator input, select “yes” or in order for the energy counters to count simultaneously, select “no” using the “UP/DOWN” buttons and press the “SET” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set yes” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.10 PC Communication Settings (RS-485)

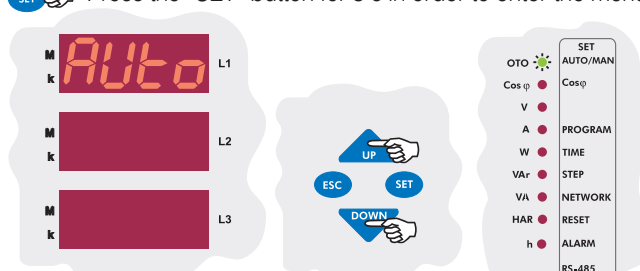
RG3-15CS/CLS models have MODBUS-RTU communication protocol. All measured parameters can be saved into computer's memory via appropriate software. Additionally, all necessary configurations also can be set via a computer with the software installed on it.

NOTE: Computer communication feature is only available for RG3-15CS/CLS models.

3.10.a Device Address Setting (485 Adr)

By changing the device address setting, communication up to 247 devices can be achieved.

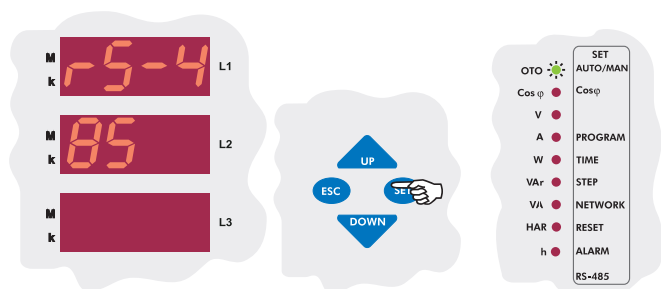
3 sn. Press the “SET” button for 3 s in order to enter the menu.



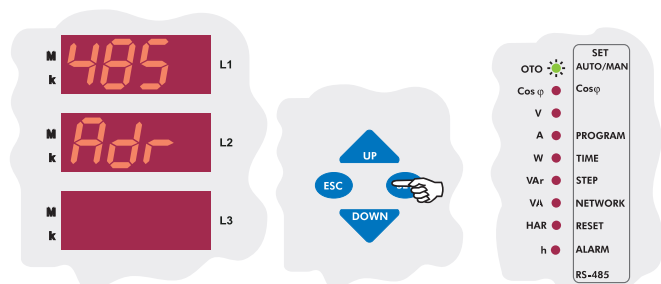
Using the “UP/DOWN” buttons, find computer communication menu (RS-485).

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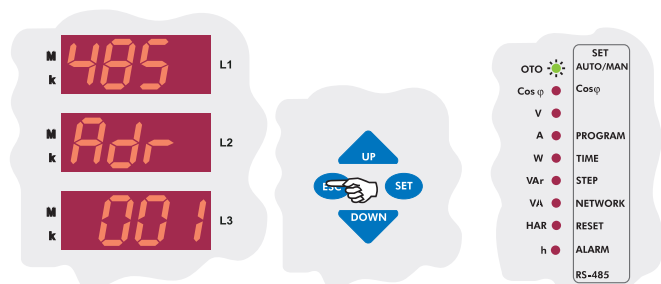
RG3-15C/CS/CL/CLS



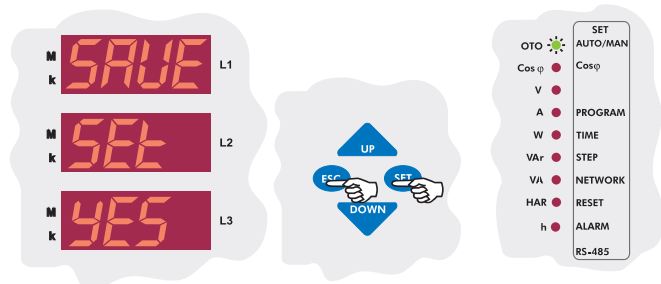
The first parameter in the RS-485 menu is the address setting(Adr). Press the **"SET"** button for address setting.



Press the **"SET"** button to set the address value.



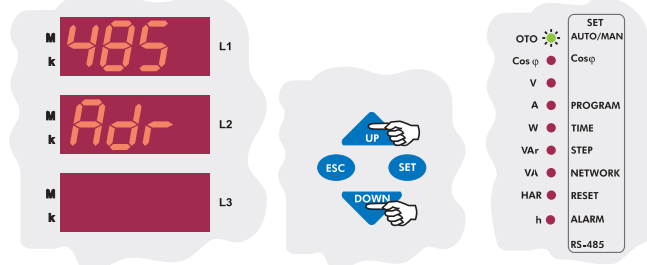
Enter the communication address between 1-247 and press the **"SET"** button. If you are going to change another setting, return to the menu by pressing the **"SET"** button. If you do not want to set another parameter, press the **"ESC"** button.



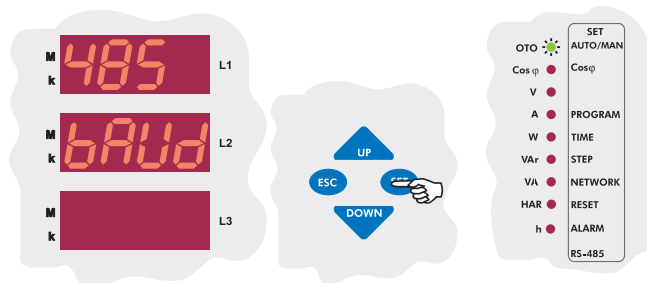
If you want to leave the setup menu without making any other changes, press the **"ESC"** button until **"SAVE SET YES"** shows on the screen. If you want to save the changes, press the **"SET"** button. If not, press the **"ESC"** button.

3.10.b Baud Rate Setting

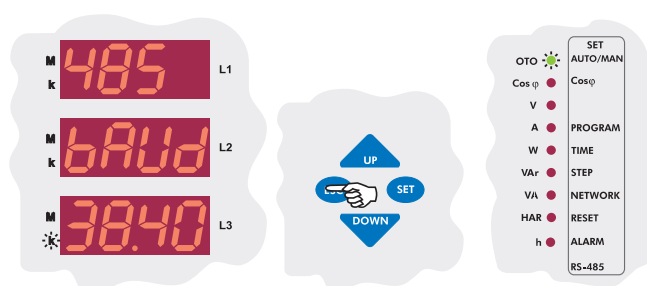
In this menu, baud rate value can be set as 1.200 Kbps, 2.400 Kbps, 4.800 Kbps, 9.600 Kbps, 19.200 Kbps or 38.400 Kbps as defined in the communication software.



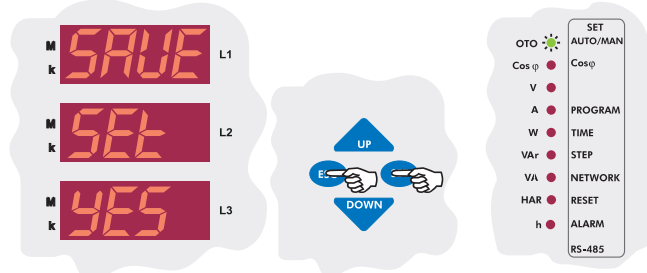
Using the **"UP/DOWN"** buttons, find baud rate menu(bAud) which is the second parameter in the RS-485 menu.



Press the **"SET"** button to enter the baud rate menu(bAud).



Using the **"UP/DOWN"** buttons, enter baud rate value (1.200 - 2.400 - 4.800 - 9.600 - 19.200 - 38.400) and press the **"SET"** button. If you are going to change another setting, return to the menu by pressing the **"SET"** button. If you do not want to set another parameter, press the **"ESC"** button.



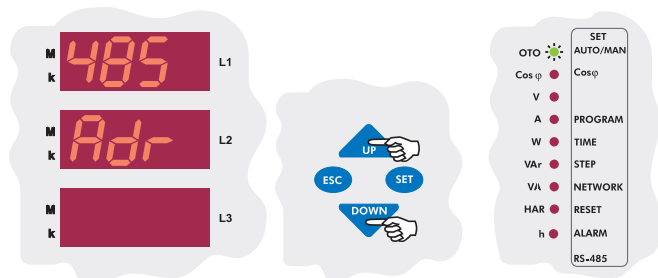
If you want to leave the setup menu without making any other changes, press the **"ESC"** button until **"SAVE SET YES"** shows on the screen. If you want to save the changes, press the **"SET"** button. If not, press the **"ESC"** button.

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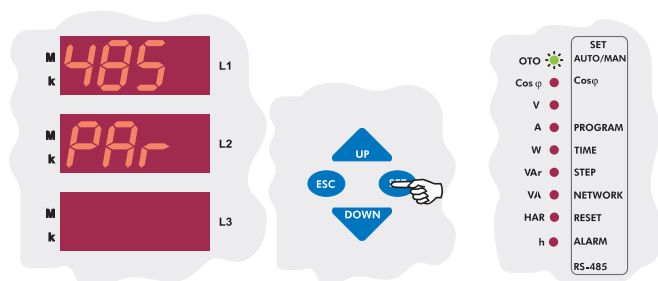
RG3-15C/CS/CL/CLS

3.10.c Parity Setting

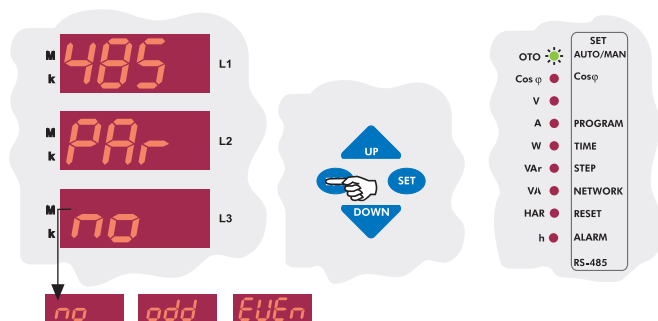
In this menu, Parity value can be set as “no”, “odd” or “EVEN”.



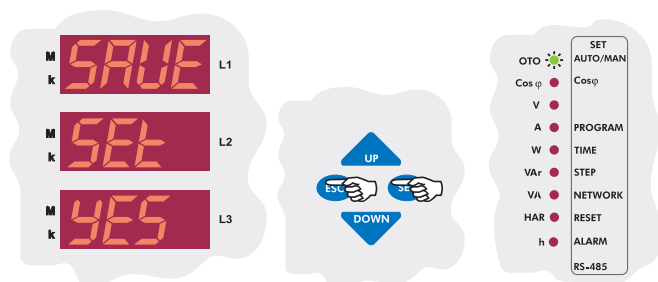
Using the “UP/DOWN” buttons, find the parity menu(PAR) menu which is the third parameter in the RS-485 menu.



Press the “SET” button to enter the parity menu(PAR).



Using the “UP/DOWN” buttons, select a parity option and press the “SET” button. If you are going to change another setting, return to the menu by pressing the “SET” button. If you do not want to set another parameter, press the “ESC” button.



If you want to leave the setup menu without making any other changes, press the “ESC” button until “SAVE Set YES” shows on the screen. If you want to save the changes, press the “SET” button. If not, press the “ESC” button.

3.11 Password Activation and Change Settings

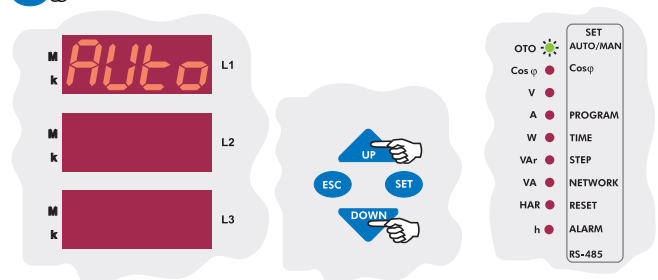
User password can be changed and activated in this menu. When the password is activated, a pin code is always required before entering the menu. Thus, user password prevents any change to the settings of the device by unauthorized people. For this reason, a pin code with 4 digits must be set and then it must be activated.

Note: Factory default value for pin code is “1234” and it is not activated.

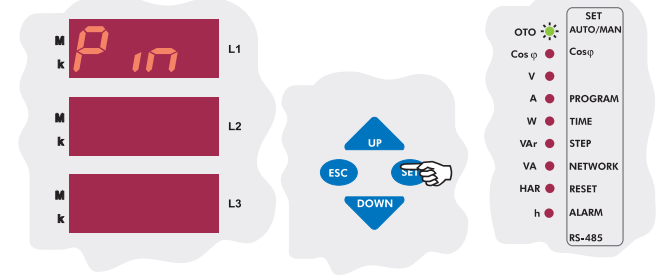
3.11.a Pin Activation

In this menu, user password is activated. When the password is activated, a pin code is always required before entering to the menu.

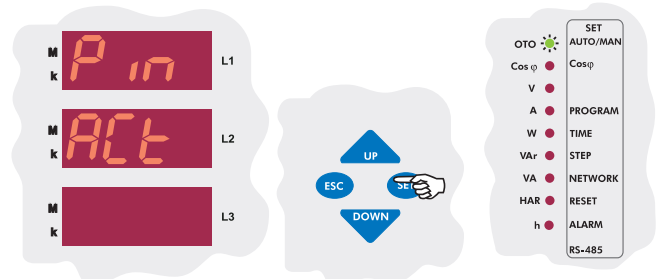
3 sn. Press the “SET” button for 3 s in order to enter the menu.



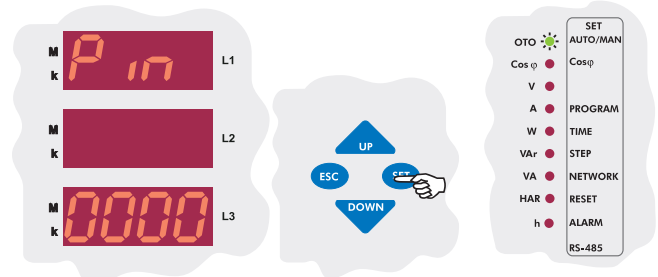
Using the “UP/DOWN” buttons, find “Pin” menu.



Press “SET” button to enter the password menu.



The first parameter in the password menu is the parameter activation menu(Pin Act). According to this setting, password for the device menu can be set “inactive” or “active”. Press the “SET” button to enter this menu.

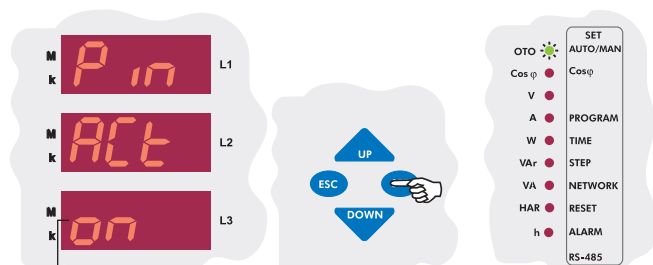


If you did not activate the password before, enter the pin code as “1234”. If you changed the password before, enter that password. Press “SET” button to change the password activation setting.

POWER FACTOR CONTROLLER

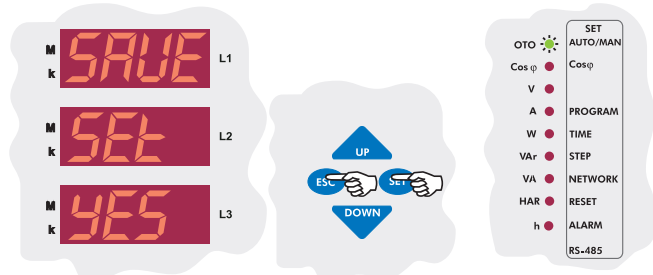
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NOTE: While entering the pin code, the blinking digit represents the digit which will be set. Press the **“UP/DOWN”** buttons to increase/decrease the value of the related digit. Press **“SET”** button to set the next digit or press **“ESC”** button to set previous digit.



on: Ask password for menu entry (Password active)
of: Don't ask password for menu entry.

Using the **“UP/DOWN”** buttons, select the “Pin ACT” as **“on”** or **“of”** and then press the **“SET”** button. If you are going to change another setting, return to the menu by pressing the **“SET”** button. If you do not want to set another parameter, press the **“ESC”** button.



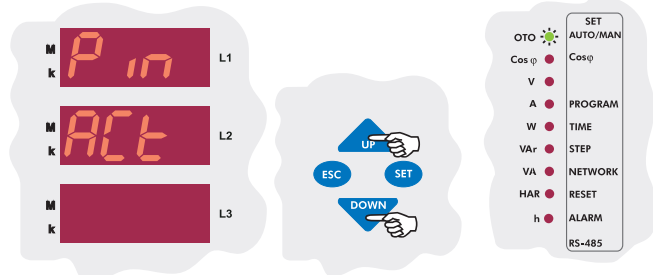
If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE Set yES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.

NOTE: If you do not save your changes, they will not be valid.

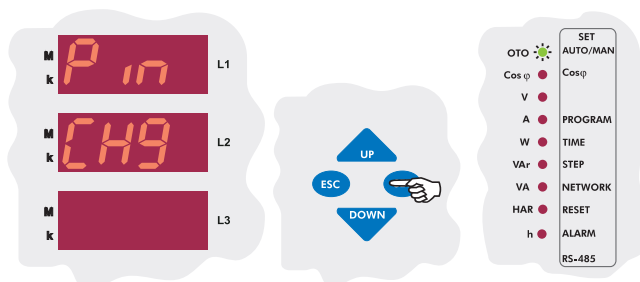
NOTE: After the settings in the menu are done, the changed settings are selected and the menu can be shown by pressing the **“SET”** button. If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE Set yES”** shows on the screen. If you press the **“SET”** button, the new settings will be saved and the device will start to operate with the new settings. If you press the **“ESC”** button, the changed settings will be discarded and the device will continue to operate with the old settings.

3.11.b Pin Change

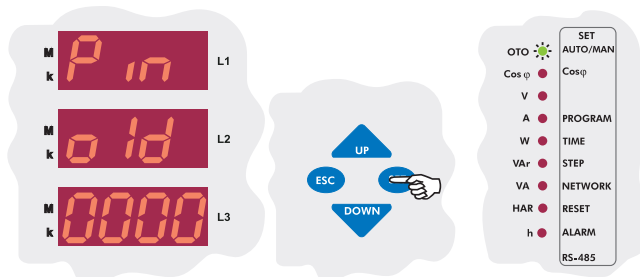
In this menu, user password is changed. In order to change the password, old password and new password (x2 times) must be entered.



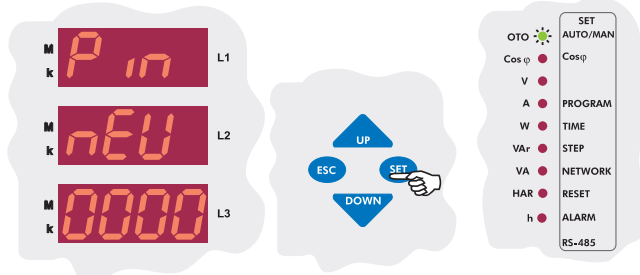
In “Pin ACT” menu, press the **“DOWN”** button to find “Pin CHg” menu.



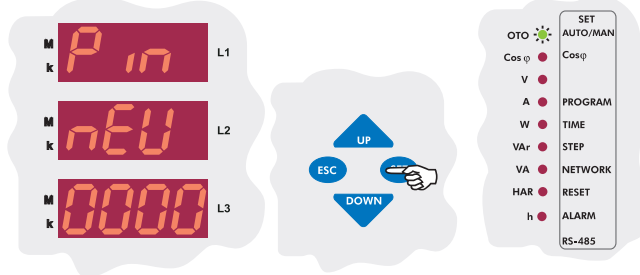
Press the **“SET”** button to enter the password change menu (Pin CHg) which is the second menu under the password menu (Pin). Press the **“SET”** button to change the password.



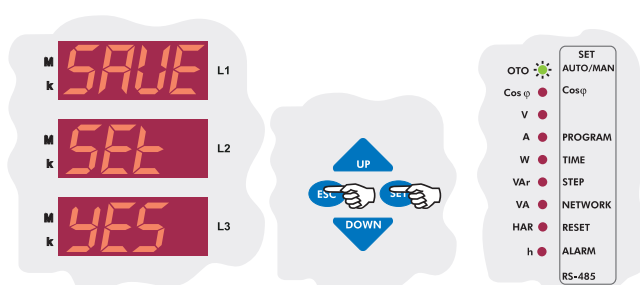
In order to define a new password, the old password must be entered first. After entering the old password, press the **“SET”** button.



After entering new password, press the **“SET”** button.



Enter the new password again and press the **“SET”** button. If you are going to change another setting, return to the menu by pressing the **“SET”** button. If you do not want to set another parameter, press the **“ESC”** button.



If you want to leave the setup menu without making any other changes, press the **“ESC”** button until **“SAVE Set yES”** shows on the screen. If you want to save the changes, press the **“SET”** button. If not, press the **“ESC”** button.

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

4. DISPLAYING OF INSTANTANEOUS VALUES

In the "Instantaneous Values" menu, below network parameters can be observed by using the "UP", "DOWN" and "SET" buttons.

Voltage_N - Currents - Cos ϕ - Σ Cos ϕ - Active (W) - Reactive (VAr)
Apparent (VA) - Σ Powers - Energies - THDV% - THDI%

By pressing the "ESC" button repeatedly in any menu, "Instantaneous Values" menu can be displayed.

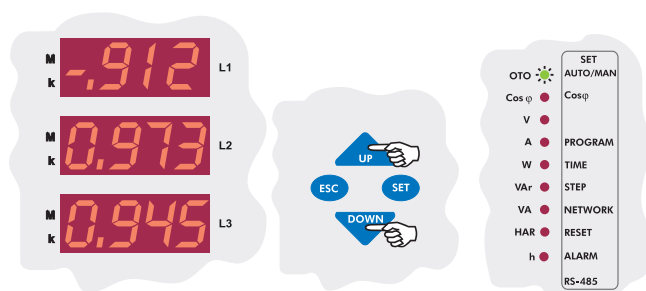
This is the main menu of RG3-15C/CS/CL/CLS. If you wait without pressing the buttons in any menu, "Instantaneous Values" menu is displayed automatically.

When RG3-15C/CS/CL/CLS is energised for the first time, "Instantaneous Values" menu is displayed.

Cos ϕ

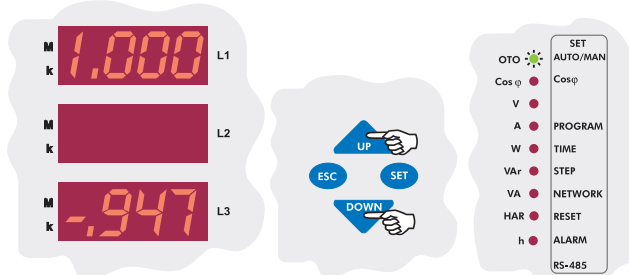
When the device is energised, Cos ϕ values of the 3-phases are displayed. A negative (-) sign indicates that the phase is capacitive and a positive (+) sign indicates that the phase is inductive. As you can see in the example below; Cos ϕ value of the first phase is capacitive, Cos ϕ value of the second and third phases are inductive.

While observing cos ϕ values, if "SET" button is pressed (HAR LED lights), harmonic values can be observed up to 19th (odd-numbered) harmonics.



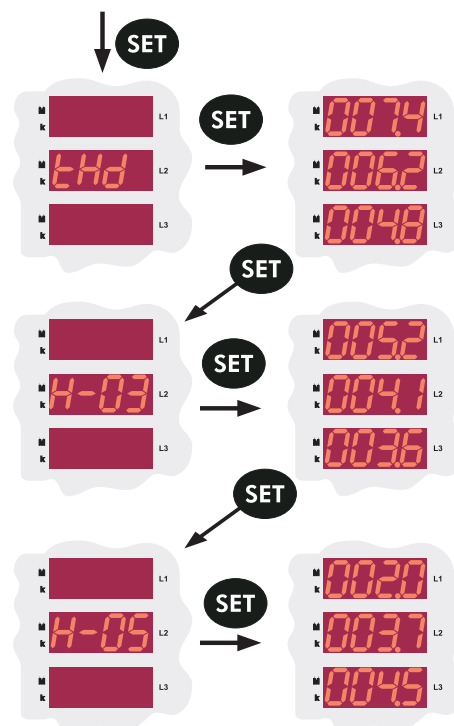
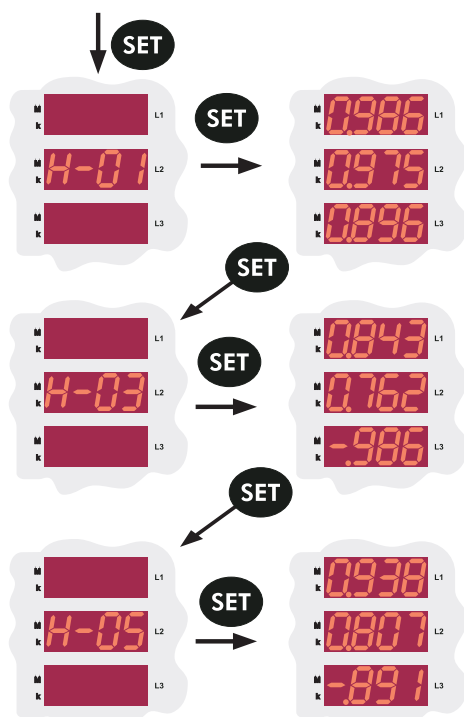
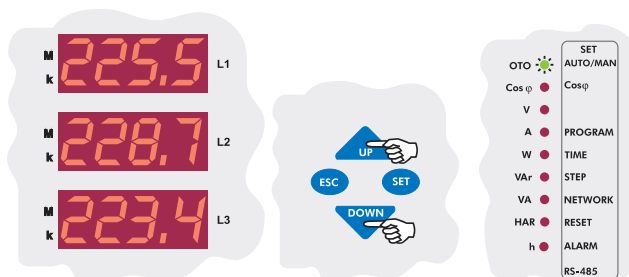
Total Cos ϕ

When Cos ϕ values are displayed, if "DOWN" button is pressed, Total Inductive Cos ϕ and Total Capacitive Cos ϕ values are observed. As you can see in the example below, total inductive Cos ϕ value is displayed on the first display and total capacitive cos ϕ value is displayed on the third display.



Voltages

In the measurement mode, phase-neutral voltages can be displayed when V LED is activated by using "UP/DOWN" buttons. When phase voltages are displayed, if "SET" button is pressed (HAR LED lights), harmonic values up to 19th harmonic (odd-numbered) can be observed.



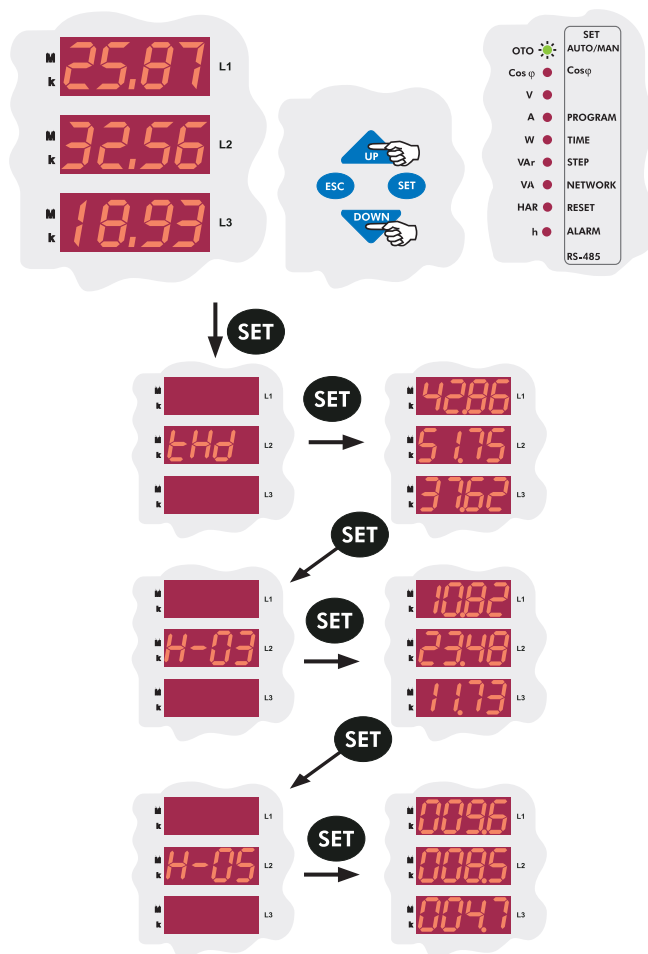
Cos ϕ and HAR LEDs on the display indicate that the displayed values are harmonic values of the related cos ϕ . By pressing the "SET" button repeatedly, odd-numbered harmonic values up to 19th harmonic can be observed.

V and HAR LEDs on the display indicate that displayed values are voltage harmonic values. By pressing the "SET" button repeatedly, THD and odd-numbered harmonic values up to 19th harmonic can be observed as %.

RG3-15C/CS/CL/CLS

Currents

In the measurement mode, phase-phase current values can be displayed by using **“UP/DOWN”** buttons when I LED lights. When phase current values are displayed, if **“SET”** button is pressed (HAR LED lights), odd-numbered harmonic values up to 19th harmonic can be observed.

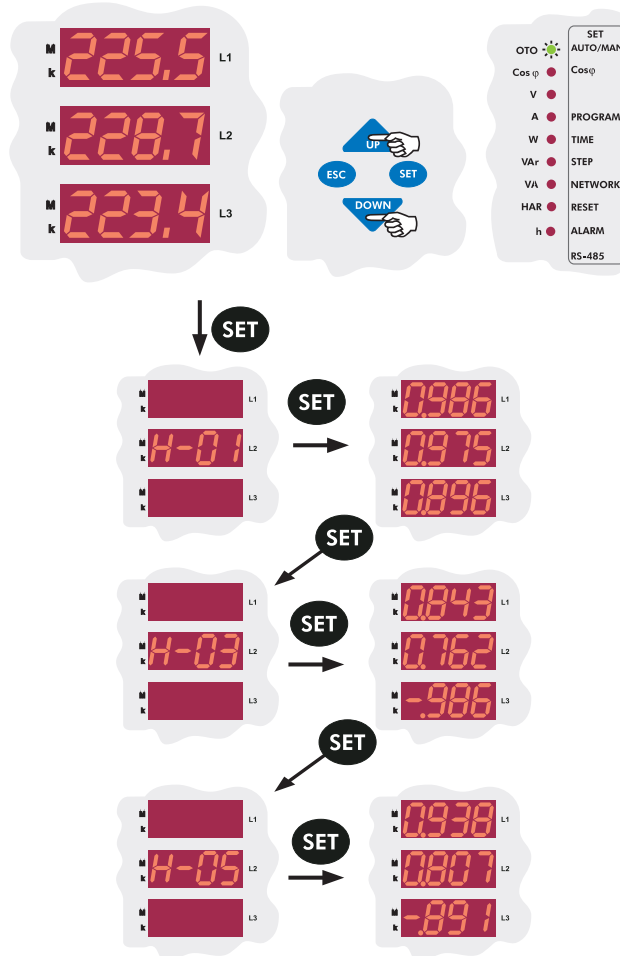


I and **HAR** LEDs on the display indicate that displayed values indicate current harmonic values. By pressing the **"SET"** button repeatedly, THD and odd-numbered harmonic values up to 19th harmonic can be observed as %.

Active Powers

In the measurement mode, active power values can be displayed by using **“UP/DOWN”** buttons when W LED lights. When active power values are displayed, if **“SET”** button is pressed (HAR LED lights), odd-numbered harmonic values up to 19th harmonic can be observed.

Active power values of the phases are displayed on the display. If the dot at the most right of the value blinks, the active power on this phase is export active power.

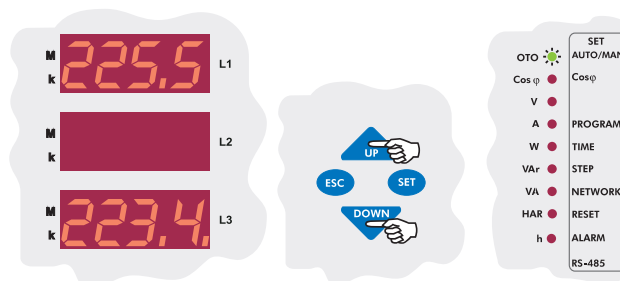


W and **HAR** LEDs on the display indicate that displayed values are active power harmonic values. By pressing the **"SET"** button repeatedly, odd-numbered harmonic values up to 19th harmonic can be observed.

Total Active Powers

When active power values are displayed, if the **“DOWN”** button is pressed, import active and export active power values are displayed. As seen in the example below, total active import power value is displayed on the first display and total active export value is displayed on the third display.

Note: The dot at the most right digit of the third display indicates that the displayed value is export value.

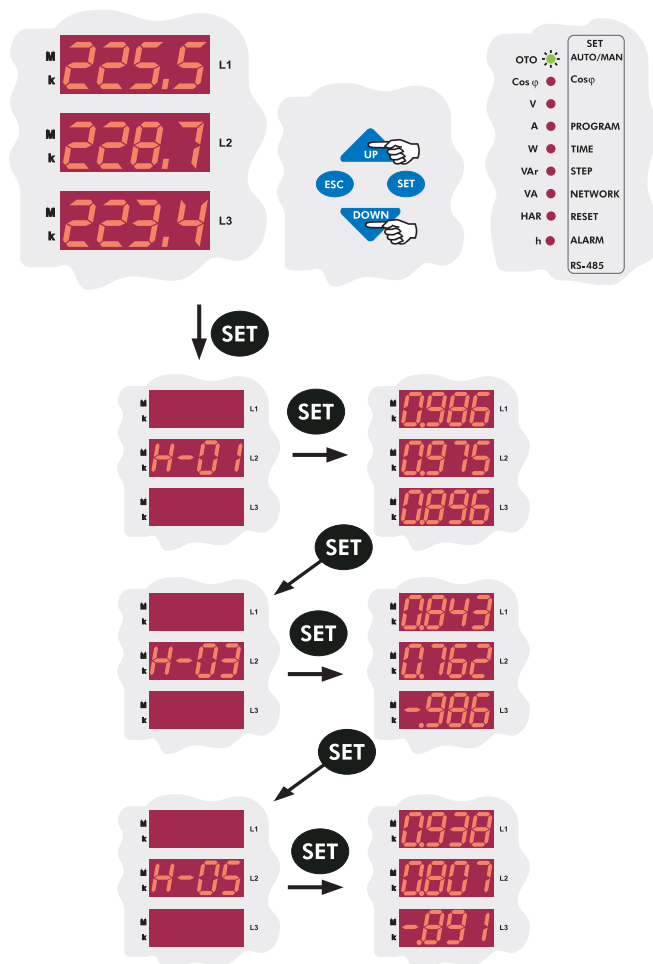


POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

Reactive Powers

In the measurement mode, reactive power values are displayed by using “UP/DOWN” buttons when VAr LED lights. When reactive power values are displayed, if “SET” button is pressed (HAR LED lights), odd-numbered harmonic values up to 19th harmonic can be observed.

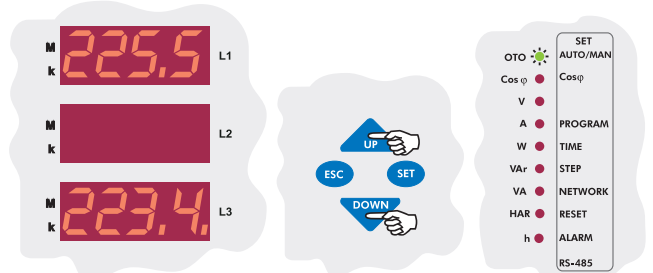


VAr and HAR LEDs on the display represent that displayed values indicate harmonic values of the reactive powers. By pressing the “SET” button repeatedly, odd-numbered harmonic values up to 19th harmonic can be observed.

Total Reactive Powers

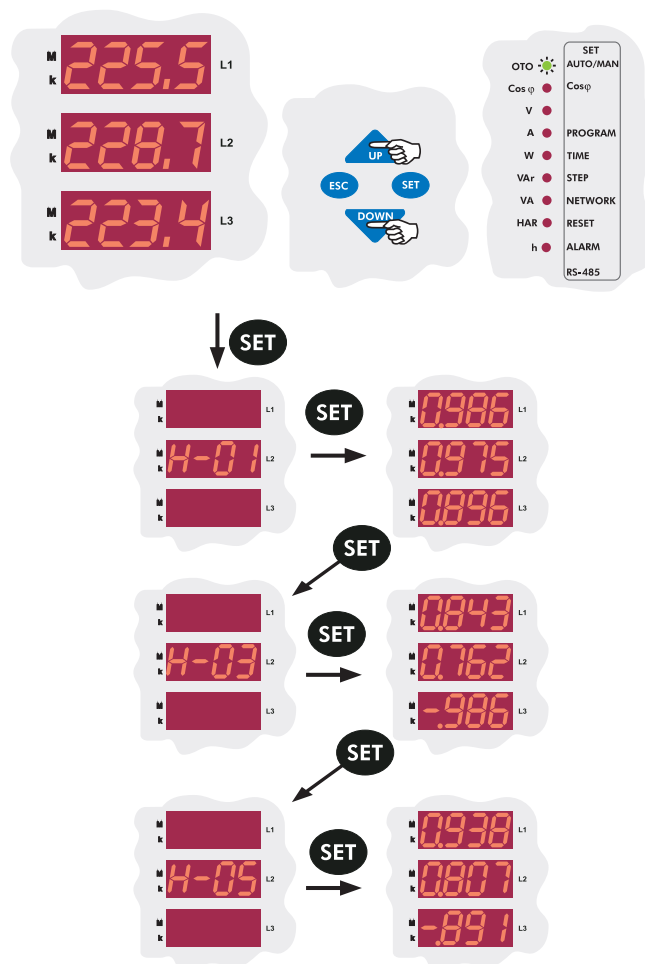
When active power values are displayed, if the “DOWN” button is pressed, inductive reactive and capacitive reactive power values are observed. As seen in the example below, total reactive inductive power value is displayed on the first display and total reactive capacitive power value is displayed on the third display.

Note : The dot at the most right digit of the third display indicates that the displayed value is capacitive reactive power.



Apparent Powers

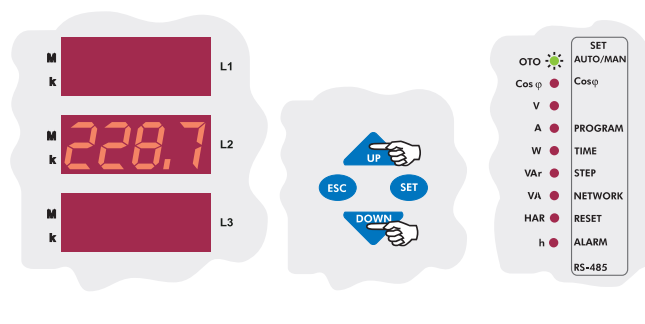
In the measurement mode, apparent power values are displayed by using the “UP/DOWN” buttons when VA LED lights. When apparent power values are displayed, if the “SET” button is pressed (HAR led lights), odd-numbered harmonic values up to 19th harmonic can be observed.



VA and HAR LEDs on the display indicate that displayed values are harmonic values of the apparent powers. By pressing “SET” button repeatedly, odd-numbered harmonic values up to 19th harmonic can be observed.

Total Apparent Power

When apparent power values are displayed, if the “DOWN” button is pressed, total apparent power is displayed on the second display.



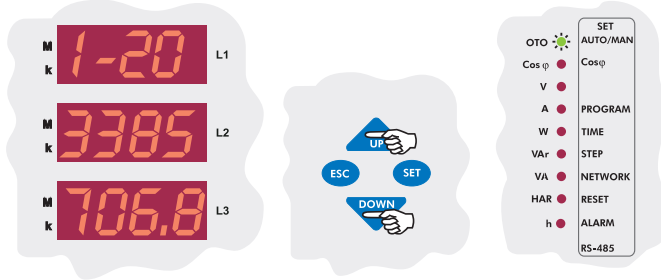
POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

Active Import Energy

In the measurement mode, active import and active export energy values can be observed by using “UP/DOWN” buttons, when W and h LEDs light.

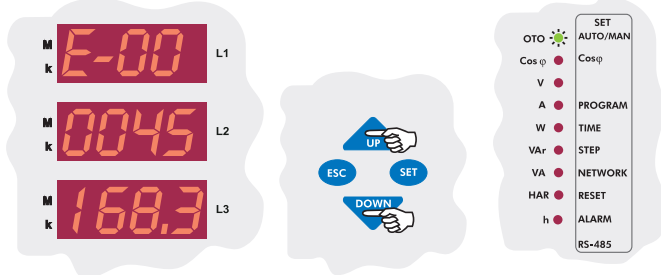
In the example below, “I” indicates that the displayed parameter is import energy and the remaining numbers show the energy value (such as 203385706,8 kWh).



Active Export Energy

While active import energy is displayed, if the “DOWN” button is pressed, active export energy is displayed.

In the example below, “E” indicates that the displayed parameter is export energy and the remaining numbers show the energy value (such as 45168,3 kWh).

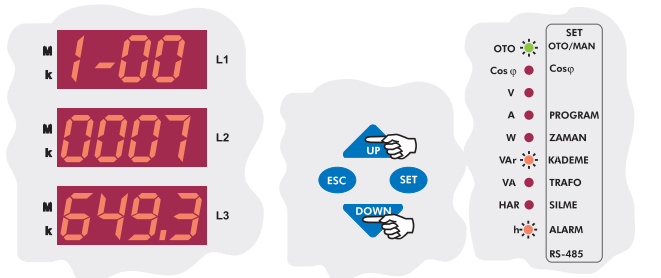


Note : When you reset the energies using the energy counter reset menu, active and reactive energy values are both reset (Refer to Page 14 - Reactive / Active ratio reset settings).

Inductive Reactive Energy

In the measurement mode, inductive reactive and capacitive reactive energy values can be observed by using the “UP/DOWN” buttons when VAr and h LEDs light.

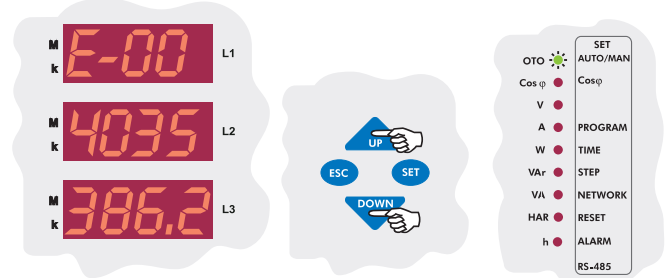
In the example below, “I” indicates that the displayed parameter is import energy (inductive) and the remaining numbers show the energy value (such as 7649,3 kVarh).



On the first display, the measured **Inductive/Active ratio** is displayed and on the third display, the entered **Inductive/Active ratio** is displayed. (Refer to page 18 - Inductive ratio setting)

Capacitive Reactive Energy

In the example below, “E” indicates that the displayed parameter is export (capacitive) energy and the remaining numbers show the energy value (such as 4035386,2 kVarh).

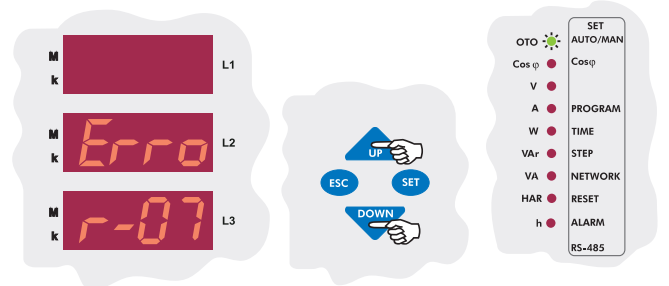


On the first display, the measured **Capacitive/Active ratio** is displayed and on the third display, the entered **Capacitive/Active ratio** is displayed.

(Refer to page 17 - Inductive ratio setting)

Note: When you reset the reactive/active ratio, the value in the first display will be reset and updated continuously. (Refer to page 14 - Reactive/Active ratio setting)

Hata Kodları



































If any failure occurs for any reason, related Alarm LED is turned on. If the related error code needs to be displayed by the user, the “UP/DOWN” buttons are pressed until “Error-xx” is displayed on the displays. This option is not displayed if there is no error. All the error codes are displayed respectively by pressing the “SET” button (such as Error-05, 07, 12).

Note : The descriptions of the error codes are given in the alarm codes table (Refer to Page 32 - Alarm Codes).

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

5. APPENDIX

ALARM CODES			
NO	DESCRIPTION	LED 	REASON
00	Angle degree between phase voltages doesn't equal to 120°		Neutral and Voltage terminal connections are incorrect.
01	Reverse phase sequence		Voltage terminal connections are in counter-clockwise direction
02	One or more phase voltages don't exist		Voltage terminal connections are wrong
03	Phase 1 Current		Current transformer connections for phase 1 are wrong or first capacitor step is defected
04	Phase 2 Current		Current transformer connections for phase 2 are wrong or first capacitor step is defected
05	Phase 3 Current		Current transformer connections for phase 3 are wrong or first capacitor step is defected
06	THD for voltage exceeds the preset value		Excessive harmonic exists in the system
07	Voltage value of any phase exceeds the preset value		Voltage value of the system is increased
08	Reactive capacitive ratio exceeds the preset value		Compensation Error
09	Reactive inductive ratio exceeds the preset value		Compensation Error
10			
11	Automatic connection could not be found		Defected 1st capacitor step or loads are too variable.
12	Over compensation		Target $\cos\phi$ is capacitive even when all capacitor steps are switched off
13	Insufficient compensation		Capacitor powers are not sufficient for target $\cos\phi$
14	RST step sequence is incorrect		3-phase capacitor powers were not selected properly
15	Capacitor power for phase 1 is not suitable		Capacitor step powers for phase 1 were not selected properly
16	Capacitor power for phase 2 is not suitable		Capacitor step powers for phase 2 were not selected properly
17	Capacitor power for phase 3 is not suitable		Capacitor step powers for phase 3 were not selected properly
18	Capacitor step 1 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
19	Capacitor step 2 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
20	Capacitor step 3 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
21	Capacitor step 4 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
22	Capacitor step 5 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
23	Capacitor step 6 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
24	Capacitor step 7 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
25	Capacitor step 8 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
26	Capacitor step 9 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
27	Capacitor step 10 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
28	Capacitor step 11 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
29	Capacitor step 12 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
30	Capacitor step 13 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown
31	Capacitor step 14 is defected		In the capacitor step measurement, 3-phase capacitor step is unbalanced or the fuse of any phases is blown

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

REGISTER TABLE

REGISTER TABLE						
NO	ADDRESS (HEX)	PARAMETER	FORMAT	MULTIPLIER	UNIT	FUNCTION
0 1	0000	PHASE 1 VOLTAGE	unsigned long int	0.1	VOLT	READ
2 3	0002	PHASE 2 VOLTAGE	unsigned long int	0.1	VOLT	READ
4 5	0004	PHASE 3 VOLTAGE	unsigned long int	0.1	VOLT	READ
6 7	0006	PHASE 1 CURRENT	unsigned long int	0.001	AMPERE	READ
8 9	0008	PHASE 2 CURRENT	unsigned long int	0.001	AMPERE	READ
10 11	000A	PHASE 3 CURRENT	unsigned long int	0.001	AMPERE	READ
12 13	000C	PHASE 1 ACTIVE POWER	long int	0.1	WATT	READ
14 15	000E	PHASE 2 ACTIVE POWER	long int	0.1	WATT	READ
16 17	0010	PHASE 3 ACTIVE POWER	long int	0.1	WATT	READ
18 19	0012	PHASE 1 REACTIVE POWER	long int	0.1	VAr	READ
20 21	0014	PHASE 2 REACTIVE POWER	long int	0.1	VAr	READ
22 23	0016	PHASE 3 REACTIVE POWER	long int	0.1	VAr	READ
24 25	0018	PHASE 1 APPARENT POWER	unsigned long int	0.1	VA	READ
26 27	001A	PHASE 2 APPARENT POWER	unsigned long int	0.1	VA	READ
28 29	001C	PHASE 3 APPARENT POWER	unsigned long int	0.1	VA	READ
30 31	001E	PHASE 1 COS ϕ	long int	0.001	-	READ
32 33	0020	PHASE 2 COS ϕ	long int	0.001	-	READ
34 35	0022	PHASE 3 COS ϕ	long int	0.001	-	READ
36 37	0024	TOTAL ACTIVE POWER (IMPORT)	long int	0.1	WATT	READ
38 39	0026	TOTAL ACTIVE POWER (EXPORT)	long int	0.1	WATT	READ
40 41	0028	TOTAL REACTIVE POWER (IMPORT)	long int	0.1	VAr	READ
42 43	002A	TOTAL REACTIVE POWER (EXPORT)	long int	0.1	VAr	READ
44 45	002C	TOTAL APPARENT POWER	unsigned long int	0.1	VA	READ
46 47	002E	COS ϕ TOTAL IMPORT	long int	0.001	-	READ
48 49	0030	COS ϕ TOTAL EXPORT	long int	0.001	-	READ
50 51	0032	FREQUENCY	long int	0.01	HZ	READ
52 53	0034	PHASE 1 VOLTAGE VECTORIAL ANGLE	unsigned long int	1	DEGREES	READ
54 55	0036	PHASE 2 VOLTAGE VECTORIAL ANGLE	long int	1	DEGREES	READ

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

REGISTER TABLE

NO	ADDRESS (HEX)	PARAMETER	FORMAT	MULTIPLIER	UNIT	FUNCTION
56	0038	PHASE 3 VOLTAGE VECTORIAL ANGLE	long int	1	DEGREES	READ
57						
58	003A	PHASE 1 CURRENT VECTORIAL ANGLE	long int	1	DEGREES	READ
59						
60	003C	PHASE 2 CURRENT VECTORIAL ANGLE	long int	1	DEGREES	READ
61						
62	003E	PHASE 3 CURRENT VECTORIAL ANGLE	long int	1	DEGREES	READ
63						
64	-	-	-	-	-	-
65						
66	0042	CAPACITOR STEP STATUS	long int	-	-	READ
67						
68	0044	ALARM STATUS	long int	-	-	READ/CLEAR
69						
70	0046	INDUCTIVE REACTIVE ENERGY RATIO	long int	0.1	%	READ
71						
72	0048	CAPACITIVE REACTIVE ENERGY RATIO	long int	0.1	%	READ
73						
74	004A	IMPORT ACTIVE ENERGY COUNTER	64 BIT HEX	1	Wh	READ/CLEAR
75						
76						
77						
78	004E	EXPORT ACTIVE ENERGY COUNTER	64 BIT HEX	1	Wh	READ/CLEAR
79						
80						
81						
82	0052	IMPORT REACTIVE ENERGY COUNTER	64 BIT HEX	1	VArh	READ/CLEAR
83						
84						
85						
86	0056	EXPORT REACTIVE ENERGY COUNTER	64 BIT HEX	1	VArh	READ/CLEAR
87						
88						
89						
90	005A	IMPORT ACTIVE ENERGY COUNTER (RATIO)	64 BIT HEX	1	Wh	READ/CLEAR
91						
92						
93						
94	005E	EXPORT ACTIVE ENERGY COUNTER (RATIO)	64 BIT HEX	1	Wh	READ/CLEAR
95						
96						
97						
98	0062	IMPORT REACTIVE ENERGY COUNTER (RATIO)	64 BIT HEX	1	VArh	READ/CLEAR
99						
100						
101						
102	0066	EXPORT REACTIVE ENERGY COUNTER (RATIO)	64 BIT HEX	1	VArh	READ/CLEAR
103						
104						
105						
106	006A	PHASE 1 VOLTAGE THD	unsigned int	0.1	%	READ
107	006B	PHASE 1 VOLTAGE 3RD HARMONIC	unsigned int	0.1	%	READ
108	006C	PHASE 1 VOLTAGE 5TH HARMONIC	unsigned int	0.1	%	READ
109	006D	PHASE 1 VOLTAGE 7TH HARMONIC	unsigned int	0.1	%	READ
110	006E	PHASE 1 VOLTAGE 9TH HARMONIC	unsigned int	0.1	%	READ
111	006F	PHASE 1 VOLTAGE 11TH HARMONIC	unsigned int	0.1	%	READ

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

REGISTER TABLE

NO	ADDRESS (HEX)	PARAMETER	FORMAT	MULTIPLIER	UNIT	FUNCTION
112	0070	PHASE 1 VOLTAGE 13TH HARMONIC	unsigned int	0.1	%	READ
113	0071	PHASE 1 VOLTAGE 15TH HARMONIC	unsigned int	0.1	%	READ
114	0072	PHASE 1 VOLTAGE 17TH HARMONIC	unsigned int	0.1	%	READ
115	0073	PHASE 1 VOLTAGE 19TH HARMONIC	unsigned int	0.1	%	READ
116	0074	PHASE 1 CURRENT THD	unsigned int	0.1	%	READ
117	0075	PHASE 1 CURRENT 3RD HARMONIC	unsigned int	0.1	%	READ
118	0076	PHASE 1 CURRENT 5TH HARMONIC	unsigned int	0.1	%	READ
119	0077	PHASE 1 CURRENT 7TH HARMONIC	unsigned int	0.1	%	READ
120	0078	PHASE 1 CURRENT 9TH HARMONIC	unsigned int	0.1	%	READ
121	0079	PHASE 1 CURRENT 11TH HARMONIC	unsigned int	0.1	%	READ
122	007A	PHASE 1 CURRENT 13TH HARMONIC	unsigned int	0.1	%	READ
123	007B	PHASE 1 CURRENT 15TH HARMONIC	unsigned int	0.1	%	READ
124	007C	PHASE 1 CURRENT 17TH HARMONIC	unsigned int	0.1	%	READ
125	007D	PHASE 1 CURRENT 19TH HARMONIC	unsigned int	0.1	%	READ
126	007E	PHASE 2 VOLTAGE THD	unsigned int	0.1	%	READ
127	007F	PHASE 2 VOLTAGE 3RD HARMONIC	unsigned int	0.1	%	READ
128	0080	PHASE 2 VOLTAGE 5TH HARMONIC	unsigned int	0.1	%	READ
129	0081	PHASE 2 VOLTAGE 7TH HARMONIC	unsigned int	0.1	%	READ
130	0082	PHASE 2 VOLTAGE 9TH HARMONIC	unsigned int	0.1	%	READ
131	0083	PHASE 2 VOLTAGE 11TH HARMONIC	unsigned int	0.1	%	READ
132	0084	PHASE 2 VOLTAGE 13TH HARMONIC	unsigned int	0.1	%	READ
133	0085	PHASE 2 VOLTAGE 15TH HARMONIC	unsigned int	0.1	%	READ
134	0086	PHASE 2 VOLTAGE 17TH HARMONIC	unsigned int	0.1	%	READ
135	0087	PHASE 2 VOLTAGE 19TH HARMONIC	unsigned int	0.1	%	READ
136	0088	PHASE 2 CURRENT THD	unsigned int	0.1	%	READ
137	0089	PHASE 2 CURRENT 3RD HARMONIC	unsigned int	0.1	%	READ
138	008A	PHASE 2 CURRENT 5TH HARMONIC	unsigned int	0.1	%	READ
139	008B	PHASE 2 CURRENT 7TH HARMONIC	unsigned int	0.1	%	READ
140	008C	PHASE 2 CURRENT 9TH HARMONIC	unsigned int	0.1	%	READ
141	008D	PHASE 2 CURRENT 11TH HARMONIC	unsigned int	0.1	%	READ
142	008E	PHASE 2 CURRENT 13TH HARMONIC	unsigned int	0.1	%	READ
143	008F	PHASE 2 CURRENT 15TH HARMONIC	unsigned int	0.1	%	READ
144	0090	PHASE 2 CURRENT 17TH HARMONIC	unsigned int	0.1	%	READ
145	0091	PHASE 2 CURRENT 19TH HARMONIC	unsigned int	0.1	%	READ
146	0092	PHASE 3 VOLTAGE THD	unsigned int	0.1	%	READ
147	0093	PHASE 3 VOLTAGE 3RD HARMONIC	unsigned int	0.1	%	READ
148	0094	PHASE 3 VOLTAGE 5TH HARMONIC	unsigned int	0.1	%	READ
149	0095	PHASE 3 VOLTAGE 7TH HARMONIC	unsigned int	0.1	%	READ
150	0096	PHASE 3 VOLTAGE 9TH HARMONIC	unsigned int	0.1	%	READ
151	0097	PHASE 3 VOLTAGE 11TH HARMONIC	unsigned int	0.1	%	READ
152	0098	PHASE 3 VOLTAGE 13TH HARMONIC	unsigned int	0.1	%	READ
153	0099	PHASE 3 VOLTAGE 15TH HARMONIC	unsigned int	0.1	%	READ
154	009A	PHASE 3 VOLTAGE 17TH HARMONIC	unsigned int	0.1	%	READ
155	009B	PHASE 3 VOLTAGE 19TH HARMONIC	unsigned int	0.1	%	READ
156	009C	PHASE 3 CURRENT THD	unsigned int	0.1	%	READ
157	009D	PHASE 3 CURRENT 3RD HARMONIC	unsigned int	0.1	%	READ
158	009E	PHASE 3 CURRENT 5TH HARMONIC	unsigned int	0.1	%	READ
159	009F	PHASE 3 CURRENT 7TH HARMONIC	unsigned int	0.1	%	READ
160	00A0	PHASE 3 CURRENT 9TH HARMONIC	unsigned int	0.1	%	READ
161	00A1	PHASE 3 CURRENT 11TH HARMONIC	unsigned int	0.1	%	READ
162	00A2	PHASE 3 CURRENT 13TH HARMONIC	unsigned int	0.1	%	READ
163	00A3	PHASE 3 CURRENT 15TH HARMONIC	unsigned int	0.1	%	READ
164	00A4	PHASE 3 CURRENT 17TH HARMONIC	unsigned int	0.1	%	READ
165	00A5	PHASE 3 CURRENT 19TH HARMONIC	unsigned int	0.1	%	READ

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REGISTER TABLE

NO	ADDRESS (HEX)	PARAMETER	FORMAT	MULTIPLIER	UNIT	FUNCTION
32768	8000	VOLTAGE TRANSFORMER RATIO	unsigned int	1	-	READ/WRITE
32769	8001	CURRENT TRANSFORMER RATIO	unsigned int	1	-	READ/WRITE
32770	8002	REACTIVE POWER CALCULATION METHOD	unsigned int	-	-	READ/WRITE
32771	8003	TARGET COS ϕ	int	0.001	-	READ/WRITE
32772	8004	TARGET COS ϕ 2	int	0.001	-	READ/WRITE
32773	8005	CAPACITOR STEP NUMBER	unsigned int	-	-	READ/WRITE
32774	8006	PROGRAM	unsigned int	-	-	READ/WRITE
32775	8007	SWITCH-ON TIME	unsigned int	0.1	SANIYE	READ/WRITE
32776	8008	SWITCH-OFF TIME	unsigned int	0.1	SANIYE	READ/WRITE
32777	8009	CAPACITOR STEP DISCHARGE TIME	unsigned int	0.1	SANIYE	READ/WRITE
32778	800A	OVER VOLTAGE SET VALUE	unsigned int	0.1	VOLT	READ/WRITE
32779	800B	OVER VOLTAGE DELAY	unsigned int	0.1	SANIYE	READ/WRITE
32780	800C	OVER VOLTAGE CAPACITOR STEP	unsigned int	-	-	READ/WRITE
32781	800D	CAPACITIVE RATIO SET VALUE	unsigned int	0.1	%	READ/WRITE
32782	800E	INDUCTIVE RATIO SET VALUE	unsigned int	0.1	%	READ/WRITE
32783	-	-	-	-	-	-
32784	-	-	-	-	-	-
32785	-	-	-	-	-	-
32786	8012	OVER THDV SET VALUE	unsigned int	0.1	-	READ/WRITE
32787	8013	OVER THDV DELAY	unsigned int	0.1	SANIYE	READ/WRITE
32788	8014	OVER THDV CAPACITOR STEP SITUATION	unsigned int	-	-	READ/WRITE
32789	8015	MODBUS ADDRESS	unsigned int	-	-	READ/WRITE
32790	8016	RS-485 BAUD RATE	unsigned int	-	-	READ/WRITE
32791	8017	RS-485 PARITY	unsigned int	-	-	READ/WRITE
32792	8018	PASSWORD ACTIVATION	unsigned int	-	-	READ/WRITE
32793	8019	PASSWORD	hex	-	-	READ/WRITE
32794	801A	RATIO READ TIME	unsigned int	-	SAAT	READ/WRITE
32795	-	-	-	-	-	-
32796	-	-	-	-	-	-
32797	-	-	-	-	-	-
32798	801E	ENERGY COUNTER CONDITIONING	unsigned int	-	-	READ/WRITE
32799	801F	AUTOMATIC CONNECTION SEARCH	unsigned int	-	-	READ/WRITE
32896	8080	1ST CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32897	8081	2ND CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32898	8082	3RD CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32899	8083	4TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32900	8084	5TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32901	8085	6TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32902	8086	7TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32903	8087	8TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32904	8088	9TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32905	8089	10TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32906	808A	11TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32907	808B	12TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32908	808C	13TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32909	808D	14TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32910	808E	15TH CAPACITOR STEP POWER	unsigned int	0.1	VAR	READ/WRITE
32911	808F	1ST CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32912	8090	2ND CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32913	8091	3RD CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32914	8092	4TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32915	8093	5TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32916	8094	6TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32917	8095	7TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32918	8096	8TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32919	8097	9TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32920	8098	10TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32921	8099	11TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE

POWER FACTOR CONTROLLER

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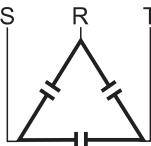
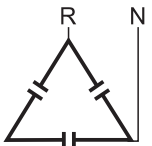
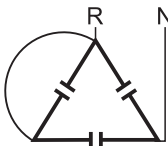
REGISTER TABLE

NO	ADDRESS(HEX)	PARAMETER	FORMAT	MULTIPLIER	UNIT	FUNCTION
32922	809A	12TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32923	809B	13TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32924	809C	14TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
32925	809D	15TH CAPACITOR STEP CONNECTION	unsigned int	-	-	READ/WRITE
36864	9000	1ST CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36865	9001	2ND CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36866	9002	3RD CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36867	9003	4TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36868	9004	5TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36869	9005	6TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36870	9006	7TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36871	9007	8TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36872	9008	9TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36873	9009	10TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36874	900A	11TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36875	900B	12TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36876	900C	13TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36877	900D	14TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36878	900E	15TH CAPACITOR STEP SWITCH ON&OFF	-	-	-	WRITE
36879	900F	AUTOMATIC SETUP	-	-	-	WRITE
36880	9010	ALARM DELETE	-	-	-	WRITE
36881	9011	ENERGY COUNTER DELETE	-	-	-	WRITE
36882	9012	ENERGY COUNTER 2 DELETE(GENERATOR)	-	-	-	WRITE
36883	9013	RATIO DELETE	-	-	-	WRITE
36884	9014	AUTOMATIC / MANUAL MODE SELECTION	-	-	-	WRITE

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

CAPACITOR CALCULATION TABLE

			
CAPACITOR POWERS	3-PHASE CONNECTION (Q/3)	PHASE-NEUTRAL CONNECTION (Q/6)	PHASE-NEUTRAL BRIDGE CONNECTION (2xQ/9)
0,5 KVAR	0,16 KVAR	0,08 KVAR	0,11 KVAR
1 KVAR	0,33 KVAR	0,16 KVAR	0,22 KVAR
1,5 KVAR	0,5 KVAR	0,25 KVAR	0,33 KVAR
2,5 KVAR	0,83 KVAR	0,41 KVAR	0,55 KVAR
5 KVAR	1,66 KVAR	0,83 KVAR	1,11 KVAR
7,5 KVAR	2,5 KVAR	1,25 KVAR	1,66 KVAR
10 KVAR	3,33 KVAR	1,66 KVAR	2,22 KVAR
15 KVAR	5 KVAR	2,5 KVAR	3,33 KVAR
20 KVAR	6,66 KVAR	3,33 KVAR	4,44 KVAR
25 KVAR	8,3 KVAR	4,1 KVAR	5,5 KVAR
30 KVAR	10 KVAR	5 KVAR	6,66 KVAR

In the first column, total reactive power values of 3-phase capacitors and in second & third columns, reactive power values of the capacitors in single phase system are shown.

POWER FACTOR CONTROLLER

RG3-15C/CS/CL/CLS

Technical Features

Operating Voltage (Un)	: Please look at the rear label of the device.
Operating Voltage Range ΔU	: (0.9-1.1) x Un
Operating Current Range ΔI	: 50 mA-5.5 A
Frequency	: 50 Hz / 60 Hz
Measurement Class	: 1% ± 1 digit (V, I, Cos ϕ), 2% ± 1 digit (W, VAr, VA, Wh) (100mA-5.5A)
Power Consumption	: <2 VA (Current) 3 VA - 10 VA (Voltage)
Output Contact	: 5 A, 250 V AC, 1250 VA
Generator Input	: 110 V AC ~ 250 V AC
No-Volt Feature	: In case of a power failure (for phase 1) longer than 20 ms, all capacitor steps are disconnected automatically
Setting Range	
Cos ϕ Setting	: -0,800 ... 0,800
Cos ϕ 2 Setting	: -0,800 ... 0,800
CT Ratio	: 1 - 2000
VT Ratio	: 1 - 2000
Switching on&off and Discharge	
Time Setting for Capacitor Steps	: Switching on & off and discharge times can be set between 1 - 1800 seconds.
Step Number	: 15
Over Voltage Setting	: Selectable
Ambient Temperature Range	: -5° C ... 55° C
Display	: Red LED Display with 4 digits
Equipment Protection Class	: Double Insulation (<input type="checkbox"/>)
Wires Crossection (for terminals)	: 2.5 mm ²
Box Protection Class	: IP 00 (Terminal) IP 40 (Front panel)
Installation	: Flush mounting with rear terminals
Dimension	: Type PR16
Panel Cut-out	: 139 x 139 mm
Weight	: 0.85 kg.
RS-485 Communication *	
Address	: 1 - 247
Baud Rate	: 1.200 Kbps, 2.400 Kbps, 4.800 Kbps, 9.600 Kbps, 19.20 Kbps, 38.40 Kbps
Parity	: no, odd, even

Factory Set Values

Automatic Connection Correction	: On
Target Cos ϕ	: 1,000 (inductive)
Target Cos ϕ 2	: 0,900 (inductive)
Program	: PS10
t-on (switch-on delay)	: 10 s.
t-off (switch-off delay)	: 10 s
Discharge time	: 14 s
Overvoltage	: 260.0 V AC
Delay	: 3.0 s
Step protection	: Off
Over Harmonic	: 7.0%
Delay	: 1.0 s
Step protection	: Off
Inductive Ratio Range	: 25
Capacitive Ratio Range	: 15
Ratio Read Period	: 96 hours
CT Ratio	: 1
VT Ratio	: 1
RS-485 Communication	
Address	: 1
Baud Rate	: 9.600 Kbps
Parity	: no

* Only available for RG3-15CS/CLS