RGA / RGSR Series

3 Phase Power Factor Controllers

www.entes.com.tr

Index

1. General Information

RGA Series is the new 3-phase reactive power factor controller ENTES. It controls each of the 3 phases individually with its 15 and 20 steps and converges the Cos Φ value of each phase into 1 to prevent businesses from being fined.

It cannot be used for other purposes (energy analyser).

The device has 4-phase 1-neutral voltage input, separate current inputs for network and load steps, and RS-485 communication port.

It has up to 20** and 15** step outputs and 1 alarm output. Connection diagram is at the back of the device.

The device has replaceable batteries. The box comes with CR2032 battery. If you operate the device without inserting the battery, some information such as the time information may be deleted in case of power failure.

The device has a Graphic Display and 5 buttons. Functions of the buttons are written on them and functions are updated on each window.

** The module with the SVAR driver has up to 16 steps, and an additional SVAR driver.

2. Safety and Warnings

2.1. Caution

Failure to comply with the following instructions may cause situations which might result in death or serious injury. In such cases, the manufacturer cannot be held responsible under any circumstances.

1. Only authorised persons should commission, maintain and operate the device.
2. Before attaching the device to the panel, insert the battery you've taken out of the box to the battery holder.
3. Disconnect all power sources before attaching the device to the panel.
4. Your device is suitable only for terminal connection.
5. First of all, connect the supply, voltage and current measuring inputs so that they are 3-phase-neutral. The device will not operate properly without a 3-phase connection.
6. It is a must to connect a 3-phase capacity to the Reference Step.
7. Make sure that all terminal connections are correct before operating your device. After performing all the connections, apply supply voltage to the device.
8. Do not remove the front panel or any connection while the device is connected to the network.
9. When the battery is dead, de-energise the device to replace the battery.
10. Do not dismantle the device. There are no user-serviceable parts. The warranty will be void if the device is dismantled.
11. The device is connected to the network through current transformers. Do not deactivate the current transformer if you are not sure whether the terminals are shorted or connected to another parallel load with a sufficiently low impedance. Otherwise, hazardously high voltages may be formed on the secondary terminals of the current transformer.
12. Do not use this device for purposes other than its intended purpose.
13. Wipe the device only with a dry cloth. Water and substances such as solvents may damage the device.
14. Please contact your dealer for all service operations of your device.
15. If a fuse will be used, it must be F-type and its current value limit must be 1 A.
16. Install the device so that its ventilation holes are not covered for the device to operate with the stated values.

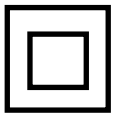
2.2. Safety

1. Please strictly follow the instructions above.
2. Read the user instructions thoroughly before operating the device.
3. Install a button or a circuit breaker between the network and the supply inputs of the device.
4. The button or the circuit breaker must be close to the device.
5. The button or the circuit breaker must be marked so as to indicate that it will be used to disconnect the device from the network.

2.3. Warranty

- Warranty period of the device is 2 (two) years.
- In case of a failure, the device must be repaired only by the manufacturer. Otherwise, the warranty of the device will be void.
- Never dismantle the device. The warranty will be void if the device is dismantled.

2.4. Symbols-Labels



Double insulation: The user will not be shocked by electricity even if they touch the low-voltage parts while the device is energised. (Display, Buttons, Communication, Battery) No ground connection required.

CAT III : Category 3, the electronic circuit that can be used in measuring and testing systems. It can
be used for indoor measurements.

Caution: pay attention to the safety rules.
CURRENT INPUTS: Network current inputs
CUR2: Power factor correction current input
AUX SUPPLY: Auxiliary supply (voltage must be applied at this point to operate the device)
SVC: SVC driver output
VN.1.2.3.4 Voltage inputs
ALARM: Alarm output
NC: No connection
THRM SW: Thermal input
C1,C2,...C20: Relay steps
COM1,2,3: Common terminal output of relay steps (COM1,COM2,COM3 are insulated on the board)
GEN.INPUT: Generator input
GND,A,B,TR RS-485 connection terminals
OPEN: Battery replacing housing

3. Operating Conditions

Operating Conditions	Value Range
Operating voltage	100-270(-15%+10%) VAC/VDC
Operating frequency	47~63 Hz
Power Consumption	<25 VA <20W
Maximum Measurable Current	6A AC
Maximum Measurable Voltage	400 VAC L-N
Maximum number of steps	20
Communication Speed	2400-256000 bps
Storage Temperature	-30~+80 °C
Operating Temperature	-20~+70 °C
Maximum Humidity	% 95 (noncondensing)
Battery	3 V CR2032

4.Introduction

4.1. General Specifications

The RGA-15S/RGSR-15S/RGA-20S/RGSR-20S reactive power factor controller has been designed for automatic reactive power power factor correction in single and 3-phase systems. RGA-15S / RGSR-15S / RGA-20S / RGSR-20S draws current and voltage information of each phase to compensate each phase individually.

Thus it makes it possible to reach the correct power factor correction level even in unstable systems. Both single and 3-phase steps are required to be connected to RGA-15S / RGSR-15S / RGA-20S / RGSR-20S to do this.

4.2. RG Product Family

RG Product Family	Grafik LCD Ekran	8Step	12 Step	15 Step	20 Steps	24 Steps	12 + SVC	16 + SVC	20 + SVC	SVC	Log	RS-485
RGA-8S	●	●									●	●
RGA-12S	●		●								●	●
RGA-15S	●			●			●				●	●
RGSR-15S	●									●	●	●
RGA-20S	●				●			●			●	●
RGSR-20S	●									●	●	●
RGA-24S	●					●					●	●
RGSR-24S	●								●	●	●	●
RGA-24S-OG	●					●					●	●
RGSR-24OG	●								●	●	●	●

Product codes and specifications are given in the table

4.3. Appearance

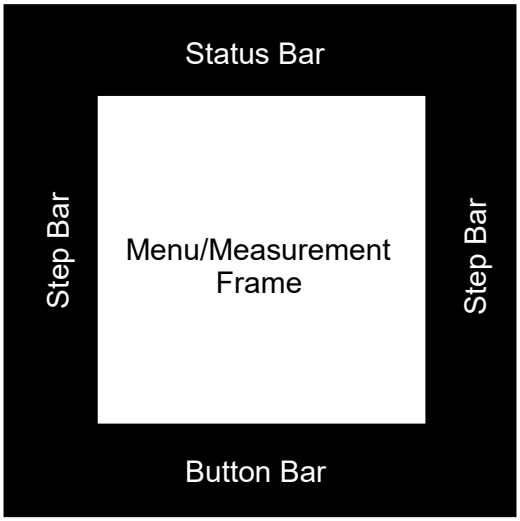
4.3.1. Front Panel

A LCD, 5 buttons and a LED showing the alarm status are found at the front panel of the device. A step status bar, a status bar, a button bar and menu/measurement frame areas are found on the LCD. Specifications of the display areas are given below.

Step Status Bar: Step Statuses are located at the right and left hand sides of the display as a band. This area shows what is connected (Capacitor, Reactor, Off) at which step and if it is enabled or not.

Status Bar: The Status Bar is located at the top of the graphic LCD. The Status Bar contains the display name, current date and time information, alarm symbol (is there is an active alarm in the system), and warning symbol (if there is an active warning in the system).

Button Bar: The Button Bar is located at the lower part of the graphic LCD. Functions of the five buttons are displayed here. Button functions vary according to the current menu.
Menu/Measurement Frame: As indicated above, the area which is at the centre of the bars located at the right-hand, left-hand upper and lower parts of the graphic display is the Menu and Measurement Frame. This frame is used to view the measurements carried out and enter the menu to perform settings.



Representative display areas are as in the figure.

4.3.2. Key Functions

Key functions vary depending on the menu on the display, while there are permanent functions assigned to them. These functions become enabled when you press and hold the keys for a certain period. Permanent functions assigned to the keys are:

1. Entering the Settings Menu (Menu)

Press and hold the “MENU” button for 3 seconds to enter the settings menu. If the user has activated the password, they will be prompted to enter the password when making a change.

a. Network Settings: Settings related to the network are grouped under two headings, namely Connection Settings and Transformer Settings.

Connection Settings: The settings where values such as the Connection type (3F4T, 3F3T, ARON, 3F4TD, 3F3TD), System frequency (50Hz-60Hz), Current input2, Energy calculating method, Current demand duration, and Power demand duration are set.

Transformer Settings: The settings where the Voltage Transformer, AT Primary, AT Secondary, AT Primary, AT Secondary, AT2 Primary and AT2 Secondary values are set.

b. Power factor correction Settings: Settings related to the power factor correction are grouped under the headings: Step settings, Program settings, Target settings, Power factor correction Alarm setting and SVC settings (for RGSR models only).

Step settings: The user will see the step list on this screen which includes the step number, step value and the connection type. They will select the step to be set from this list. They can adjust the type, connection type, step value, discharge duration and the contactor life of the selected step.

Program settings: On this screen, the user sets the power factor correction program, operating mode, the traction delay and release delay values of single-phase and three-phase steps, the delay time between steps, and values such as the maximum switching rate.

Target settings: The user can perform operations such as entering the cos value, activating/ deactivating the target cos2 and entering value, determining time interval for the target cos2, setting the generator input, entering the value for the generator target cos, activating/deactivating the stable group, and entering the value for the stable group.

Power factor correction alarm settings: The settings where the power factor correction alarms of the device are set. Rate Calculation Duration, Excessive Power factor correction, Low Power factor correction, Step Alarm, and Step Warning values are entered in %.

SVC settings: The settings where the reactor values related to the driver are set manually. It is recommended to use the SC recognition function instead of entering the values manually.

c. Alarm Settings: The settings where the Alarm Log Deletion, Voltage, Current, THD, User Alarm settings are performed.

d. Log Settings: It consists of Periodic Log Settings, Periodic Log Deletion, and Min. Max. Demand Deletion. Under the periodic log settings, the user can select the parameters they want to record periodically (Load Profile, Voltage Log, Current Log, Power Log, THD Log) and set their periods. On the periodic log deletion screen, the user can select and delete all the logs, and logs related to the parameters. Min. Max. Also on the Demand Deletion screen, the user can select and delete all the logs, and logs related to the parameters.

d.Adjusting energy meters: The settings used to Import Energy Meters, Export Energy Meters and Deleting Energy Meters.

e.Communication: The user performs the Modbus settings under the Communication settings.
f. System: It consists of Region and Language Settings, Screen Settings, Daylight Saving Time Settings, Date and Time Settings, Password Settings, and Back-up and Restore.

Region and Language Settings: These settings consist of screens where the user sets the Language Selection, Time Zone and Daylight Saving Time values.

Screen Settings: Screens where the user adjusts the contrast and backlight of the display.
Date and Time Settings: The user sets the current date and time on these screens. The set time will be displayed at the top-right corner of the screen.

Password Settings: The user determines the password for accessing the device. The default password of the device is “0000”.
Back-up and Restore: The menu that allows you to restore factory settings of the device.

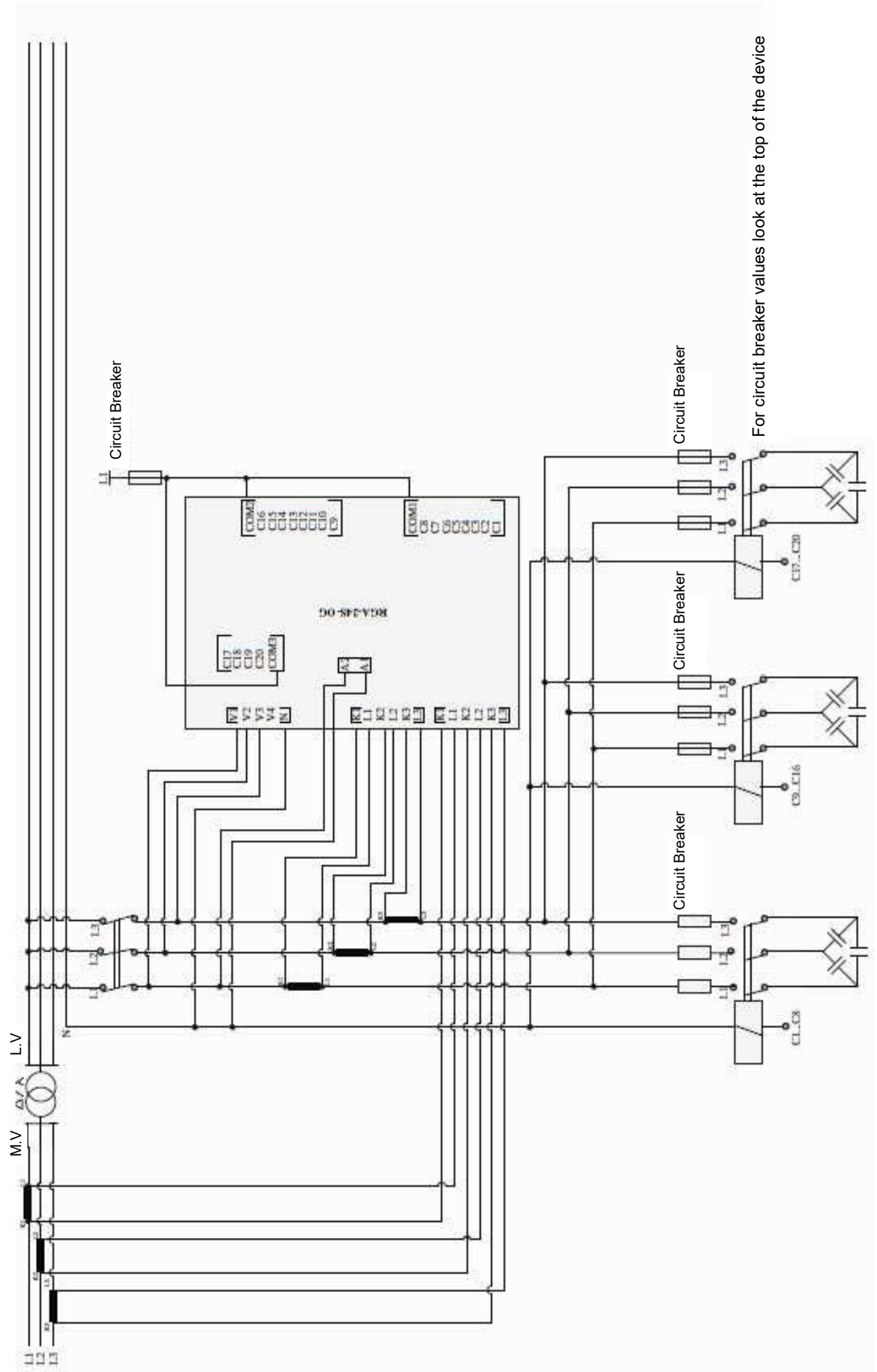
2. Auto Setup
Press and hold the “AUTO SETUP” button for 3 seconds to enter the “Auto Setup” screen. On this screen, the following functions are performed depending on the user’s preference.
a. Automatic Connection Detection
b. Automatic Step Recognition
c. Automatic SC Recognition (for RGSR models only)

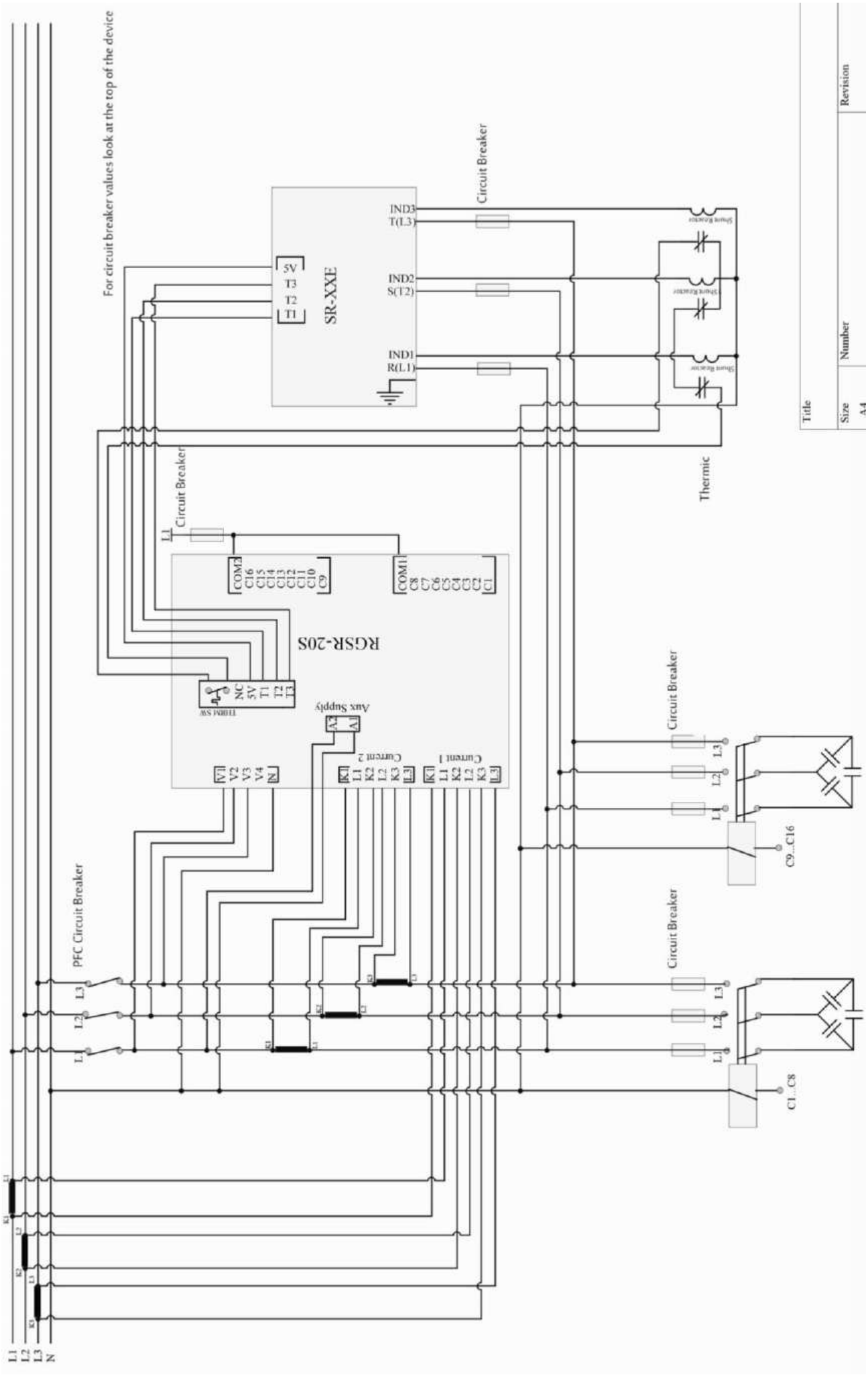
3. Logs
Press and hold the “LOG” button for 3 seconds to enter the “Active Alarms and Logs” screen. Setting changes, energising and automatic testing logs will also be seen in the system logs.

4. Info
Press and hold the “INFO” button for 3 seconds to enter the “Info” screen. The user can display the following information on this screen.
Device Model, HW Version, SW Version, Boot Version, Modbus Version, Date of Manufacture, Calibration Date.

5. Test Screen (Manual Mode)
Press and hold the “MANUAL” button for 3 seconds to enter the “Manual Mode” screen. The user can enable/disable the desired step on this screen.

4.4. Connection Diagram




For circuit breaker values look at the top of the device
Circuit Breaker
SR-XXE
IND3
T(L3)
IND2
S(T2)
IND1
R(L1)
5V
T3
T2
T1
Thermic
RGSR-20S
COM2
COM1
Aux Supply
Current 2
Current 1
PFC Circuit Breaker
C9...C16
C1...C8
L1
L2
L3
N
Title
Size
Number
Revision

Warnings:

First of all, connect the supply voltage, voltage and current measuring inputs so that they are 3-phase-neutral. The device will not operate without a 3-phase connection.

To disconnect the device from the network, you must install an automatic fuse or a circuit breaker between the network and the voltage inputs of the device, and mark it so as not to confuse it with other fuse.

The fuses used must be F-type and have a value of 1 A and 6 A. (See Connection Diagram)

The connection to the generator input of the device must definitely be performed so that power is supplied after the generator is connected to the network line of the plant. Otherwise, the device will switch to the generator position when the generator is operated for maintenance.

4.5. Connection

1. 3 phases, neutral and the current belonging to these three phases need to be supplied to the device for it to operate properly.
2. Step connections must be made as shown in the connection diagram. The most important point to be considered here is that a 3-phase capacity must be definitely connected to the reference step.
3. Shunt reactors can be connected to all steps except for the reference step.
4. Communication connection must be established.
5. Alarm output connections must be established.
6. Battery must be inserted.
7. Never energise the device before verifying the connections mentioned above.

4.6. Commissioning

1. After the device is energised, the automatic setup menu will be displayed and the user will be prompted to set the relevant parameters.
2. The device will operate the automatic connection detection function. Phase currents must have a value other than zero for the device to detect connection errors automatically. The device will enable/disable the 3-phase capacitor in the reference step while correcting the connection error (phase sequence error and polarity error of current transformers). If there are too much non-linear load (Thyristor Triac Controlled, Frequency Converter, UPS etc.) and too many sudden changes in the loads, it may not be able to correct the connection automatically. In this case, you must disable such loads temporarily, de-energise the device again and repeat the process.
3. Once the connection has been corrected, the device will activate the automatic step recognition function. It enables and disables the steps one-by-one to detect their power and connection types.
4. Once the Step Recognition has been performed, the device will activate the automatic sc recognition function. (for RGSR models only)
5. The device will start to operate with the factory settings.

5. Using the Device

5.1. Settings

In the first operation, the device will turn on with the language selection menu on the screen. Once the language has been selected, the Date and Time Setting, parameters under the heading of Network Settings: Voltage Transformer, Connection Type (3P4W etc.), AT rate, 2nd Current Transformer, System Frequency, Program Setting, Target Cosϕ, Generator Setting, Reference Step etc. values must be set. If the device is de-energised before the settings are performed, these setting selections will be displayed on the screen the next time the device is switched on.
When the user wants to set parameters on the settings screen, they will be prompted to enter the password if they are setting for the first time; they can set parameters once the correct password has been entered. Otherwise, an invalid password warning will be displayed on the screen.

5.1.1. Network Settings

5.1.1.1. Connection Settings

The settings for the device's connection method to the network, energy calculation method, whether the 2nd Current input is active/passive, system frequency, current and power demand durations are performed.
Parameter headings to be set on the screen are listed below.

5.1.1.1.1. Connection

The connection method of the device to the network is determined through this parameter. Values to be received are as follows: 3F4T.

3F4T (Three-Phase Four-Wire) Connection

In this connection method, four voltage and three current connections are established, including the neutral line.

5.1.1.1.2. System Frequency

Values to be received by the operating frequency of the device are selected as 50Hz, 60Hz.

5.1.1.1.3. Current input 2

2. Active/passive selection for the current input.

5.1.1.1.4. Energy Calculation

Energy calculation method is selected either vectorial or arithmetical.

5.1.1.1.5. Current Demand Duration

Current demand period is set. Values that can be assigned are 1 min., 2 min., 5 min., 10 min., 15 min., 20 min., 30 min., 60 min. respectively.

5.1.1.1.6. Power Demand Duration

Period demand period is set. Values that can be assigned are 1 min., 2 min., 5 min., 10 min., 15 min., 20 min., 30 min., 60 min. respectively.

5.1.1.2. Transformer Settings

It is the menu where current and voltage transformers' primary and secondary values are entered. Current and voltage transformer values must be set correctly for the power, which is calculated when the device enters the mode for measuring the step powers, to be correct. If these values are incorrect, the step powers calculated will be incorrect, too. If the current and voltage transformer rates have not been entered previously, these rates are considered 1 and then the capacitor powers are calculated.

5.1.1.2.1. Voltage Transformer

Active/passive selection. Passive must be selected if there is no voltage transformer in the system.

5.1.1.2.2. GT Primary

The user can enter a voltage transformer Primary value between (VT Secondary - 1MV).

5.1.1.2.3. GT Secondary

The user can enter a GT Secondary value between 50 -300.

5.1.1.2.4. AT Primary

It is the menu where the current transformer's Primary circuit values are entered.
AT primary value range can be selected (AT Secondary- 10kA).

5.1.1.2.5. AT Secondary

It is the menu where the current transformer's Secondary circuit values are entered.
It can get AT secondary 1A or 5A values.

5.1.1.2.6. AT2 Primary

AT2 primary value range can be selected (AT Secondary- 10kA).

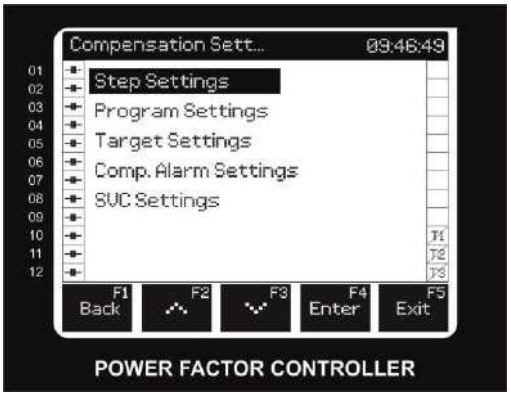
5.1.1.2.7. AT2 Secondary

It can get AT2 secondary 1A or 5A values.

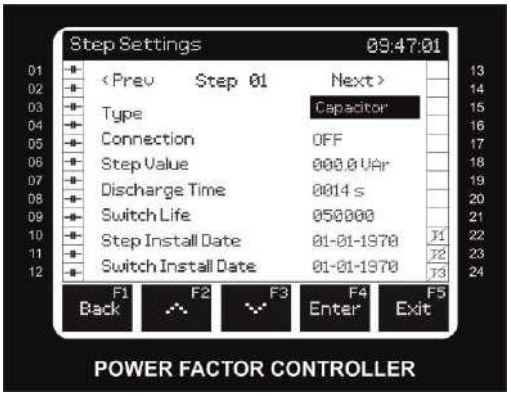
5.1.1.2.8. Step value

5.1.2 Power factor correction Settings

It is the section where the total power of the step is entered.



5.1.2.1 StepSettings



Parameter headings to be set on the screen are listed below

5.1.2.1.1. Discharging duration

It is the area where the discharging duration of the step is entered. If the step type is selected as Kondansatör (Capacitor), the discharging duration indicates the earliest time (in seconds) after which the step will be enabled again after being released. The discharging duration must be set in the range determined by the capacitor manufacturer. If a discharge coil or contactors with discharge coils are used, this duration can be shortened in compliance with the criteria determined by the manufacturer. A value between 1 - 1800 (in seconds) is entered. The factory setting is 14 seconds.

5.1.2.1.2. Step Type

It is the section where the step type used is selected. The appropriate option amongst (Off), (Capacitor), (Reactor), Tristör (Thyristor Capacitor) and (Entes Static Capacitor) is selected. (Off) must be selected if the step is empty or is not going to be used.

5.1.2.1.3 Connection

It is the section where the connection type of the step used is selected. The appropriate option amongst OFF, R, S, T, RST, RS, ST, RT and ON is selected. ON means the step will be continuously enabled, while OFF means the step will be continuously disabled. Other options indicate the phases to which the step is connected.

5.1.2.1.4. Contactor life

It is the area where the switching life of the step's contactor is entered.

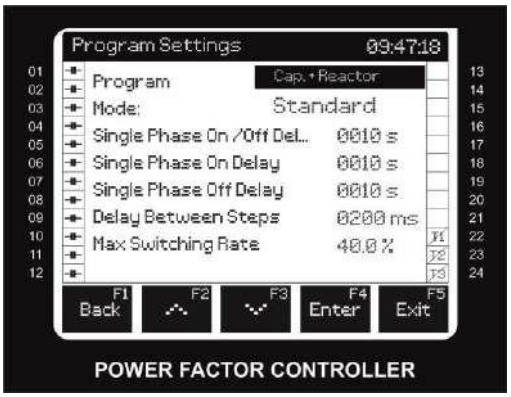
5.1.2.1.5.Step date

It is the value that is given automatically by the device during setup and that indicates the date on which the step has begun to be used.

5.1.2.1.6.Contactor date

It is the value that is given automatically by the device during setup and that indicates the date on which the step contactor has begun to be used.

5.1.2.2. Program Settings



Parameter headings to be set on the screen are listed below.

5.1.2.2.1. Program

It is the area where the applied power factor correction program is selected.
The off program option must be used in cases where the user will deactivate the automatic power factor correction and perform manual power factor correction.
The linear program must be used when the user wants the device to start receiving from the lowest step and release from the lowest step.

Capacitor and Reactor program is the program where power factor correction is performed automatically by using the defined capacitors and reactors. A capacitor and a reactor cannot be taken for the same phase in this program.

This protection prevents the following step combinations. A 3-phase capacitor and a single-phase reactor enabled simultaneously, a 3-phase capacitor and a 3-phase reactor enabled simultaneously, a 3-phase reactor and a single-phase capacitor enabled simultaneously.

If some of the phases have capacitive load and some have inductive load in this program, the device uses the single-phase steps to compensate the phases individually. For example, in a scenario where the first and second phases have inductive load and the third phase has capacitive load, only single-phase capacitors are received for the first and second phases while only sin-glephase reactors are received for the third phase for power factor correction.

Capacitor+Reactor program is the program where power factor correction is performed automatically by using the defined capacitors and reactors. A capacitor and a reactor can be taken for the same phase in this program. The type of the step received is selected by the device in the most appropriate way regardless of the types of the steps enabled. The following step combinations are not prevented. A 3-phase capacitor and a single-phase reactor enabled simultaneously, a 3-phase capacitor and a 3-phase reactor enabled simultaneously, a 3-phase reactor and a single-phase capacitor enabled simultaneously.

If some of the phases have capacitive load and some have inductive load in this program, the device can use 3-steps as well. For example, in a scenario where the first and second phases have inductive load and the third phase has capacitive load, power factor correction is performed using one of the 3 combinations below: 3-phase capacitor + single-phase reactor to the third phase, 3-phase reactor + single-phase capacitors to the first and second phases

Single-phase capacitors to the first and second phases, single-phase reactor to the third phase.
Capacitor, Reactor and SC program is selected when an additional reactor driver is going to be used in addition to the Capacitor+Reactor program in RGSR models. In this program, the aim is zero distance to the target reactive power.

5.1.2.2.2. Mode

It is the area where the applied power factor correction operation is selected.
Eco mode is the mode that aims at the least contactor switching and the least step usage by remaining within the alarm limits determined by the user.
Precise mode offers the closest solution to the target cos ϕ with available steps.
Standard mode is the most appropriate mode for the standard use where the eco mode and the precise mode are balanced.

5.1.2.2.3. Single-phase traction delay

Indicates the device’s response time to the load changes occurred in single phases. A value between 1 - 1800 (in seconds) is entered. The factory setting is 10 seconds.

5.1.2.2.4. Three-phase traction delay

Indicates the period that needs to elapse for the three-phase capacitor receiving and three-phase reactor releasing operation. A value between 1 - 1800 (in seconds) is entered. The factory setting is 10 seconds.

5.1.2.2.5. Three-phase release delay

Indicates the period that needs to elapse for the three-phase capacitor releasing and three-phase reactor receiving operation. A value between 1 - 1800 (in seconds) is entered. The factory setting is 10 seconds.

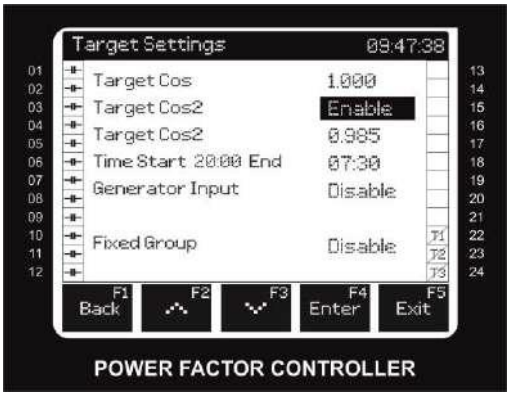
5.1.2.2.6. Delay between steps

Indicates the period to elapse between two receiving or releasing processes in cases where more than one steps are received or released. Factory setting is 200 milliseconds.

5.1.2.2.7. Maximum switching rate

Indicates the ratio of the power change -that will occur in the receiving/releasing process after the delay time has elapsed- to the total power of all capacitors. For example, if this value is 100%, power factor correction change amounting to the total power of all capacitors at once is impossible.

5.1.2.3. Target Settings



Parameter headings to be set on the screen are listed below.

5.1.2.3.1.Target Cos ϕ

Indicates the targeted cos ϕ value. A value between -1,000 and +1,000 is entered. The factory setting is +1,000.

5.1.2.3.2.Target Cosϕ2 -Active/Passive

Indicates if the secondary cos ϕ value is going to be used or not.

5.1.2.3.3. Target Cosϕ2 Value

Indicates the targeted secondary ϕ value.

5.1.2.3.4. Target Cosϕ2 Time start-end values

Indicates the period during which the targeted secondary ϕ value will be valid.

5.1.2.3.5. Generator Input:

Indicates the function to be applied while the generator is enabled.
(Passive): Generator input is ignored.
(Generator Target): Power factor correction is performed according to the determined Generator Target Cos.
(Comp. Off): Automatic power factor correction is disabled, so are all steps.

5.1.2.3.6. Generator Target Cosϕ value

It indicates the target cos ϕ value to be used while the generator is enabled if the generator input is active.

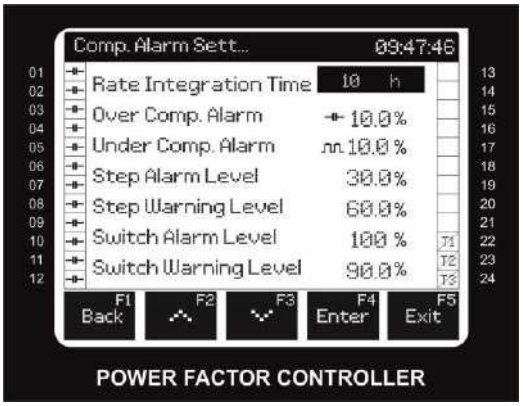
5.1.2.3.7. Stable Group - active/passive

Indicates if the stable group is going to be used or not.

5.1.2.3.8. Stable Group value

Indicates the power of the stable group if it is going to be used. A positive value must be entered if the stable group is inductive, or a negative value if the stable group is capacitive. A value between 30GVAr and -30GVAr can be entered. The factory setting is 0.

5.1.2.4. Power factor correction Alarm Setting



5.1.2.4.1 Rate Calculation Period

The period used when calculating the power factor correction rates.

5.1.2.4.2.Excessive Power factor correction Alarm

Excessive power factor correction alarm is given when the rate of the reactive power to the active power drops below the value entered here. For example, if the value entered for the excessive power factor correction is -5% and an active power of 100KW is present in the system, the limit for excessive power factor correction will be -5 KVAr. When the reactive power drops below this value (e.g. -7KVar), an excessive power factor correction alarm will be given.

5.1.2.4.3.Low Power factor correction Alarm

Excessive power factor correction alarm is given when the rate of the reactive power to the active power exceeds the value entered here. For example, if the value entered for the excessive power factor correction is 5% and an active power of 100KW is present in the system, the limit for low power factor correction will be 5 KVAr. When the reactive power exceeds this value (e.g. 7KVar), a low power factor correction alarm will be given.

5.1.2.4.4.Kademe Alarmi Step Alarm

A step alarm will be given when the rate of the step's actual power to the value entered during setup drops below the value entered here. For example, on a device whose step alarm value is 40%, an alarm will be given if the value of a capacitor which has been introduced as -100kVAr to the system during setup drops below -40kVAr.

5.1.2.4.5.Step Warning

A step warning will be given when the rate of the step's actual power to the value entered during setup drops below the value entered here. For example, on a device whose step warning value is 75%, a warning will be given if the value of a capacitor which has been introduced as -100kVAr to the system during setup drops below -75kVAr.

5.1.2.4.6. Contactor Alarm

A contactor alarm will be given when the contactor switching number exceeds the value entered here.

5.1.2.4.7.Contactor Warning

A contactor warning will be given when the contactor switching number exceeds the value entered here.

5.1.3. Alarm Settings

In this menu, you can set different values for Alarm Log Deletion, Voltage, Current, THD and User Alarms. Plus, you can define a user alarm parameter under the user alarm
settings and determine alarm features for the defined parameter.
The device has 1 alarm relay output other than the step relays.
When any of the alarm-triggering factors above occurs, the error symbol for the related error will be displayed.

5.1.3.1. Alarm Log Deletion

a. Select all: All logs, rates and alarms will be deleted.
b. Delete alarm:It is used to delete alarms which are continuing actively and has been given once (alarms which are not corrected automatically when the alarm status has disappeared).
c.Delete rates: It is used to delete power factor correction rates.
d. Delete alarm log: It is used to delete alarm logs.

5.1.3.2. Voltage Alarm Settings

If any of the phase voltages measured by the device goes out of the upper or lower limit set by the user, this alarm will be given in consequence of the set delay time. The device will disable all steps to protect them if the Step Protection is "Active" when this alarm is given. This alarm will be reset when its status is eliminated. The following values can be selected between the ranges given below.
Voltage Upper Limit: 0 - VT Primary,
Voltage Lower Limit 0 - VT Primary,
Hysteresis : 0%-100%
Voltage Alarm Delay Time 0-300.0 seconds,
Step Protection Active/Passive.

5.1.3.3. Current Alarm Settings

If any of the phase currents measured by the device goes out of the upper or lower limit set by the user, this alarm will be given in consequence of the set delay time. The device will disable all steps to protect them if the Step Protection is “Active” when this alarm is given. This alarm will be reset when its status is eliminated. The following values can be selected between the ranges given below.

Current Upper Limit: 0 - AT Primary,
Current Lower Limit 0 - AT Primer,
Hysteresis : 0%-100%
Current Alarm Traction Delay Time 0-300.0S,
Step Protection Active/Passive.

5.1.3.4. THD Alarm Settings

1. If any of the Total Harmonic Voltage Distortion (THDV) values of the phases measured by the device exceeds the upper limit determined by the user, this alarm will be given in consequence of the set delay time. The device will disable all steps to protect them if the THDV Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset when its status is eliminated.

2. If any of the Total Harmonic Current Distortion (THDI) values of the phases measured by the device exceeds the upper limit determined by the user, this alarm will be given in consequence of the set delay time. The device will disable all steps to protect them if the THDI Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset when its status is eliminated. The following values can be selected between the ranges given below.

THDV Limit value 0% - 100%,
THDV Alarm Delay Time 0-300.0S,
THDV Alarm Hysteresis Value 0% - 100%
THDV Alarm Step Protection Active/Passive.
THDI Limit value 0% - 100%,
THDI Alarm Delay Time 0-300.0S,
THDI Alarm Hysteresis value 0% - 100%
THDI Alarm Step Protection Active/Passive.

5.1.3.5. User Alarm Settings

The user can create 8 alarms. Alarms can be activated/deactivated using the checkbox as they are dependent on selection.

Values can be selected as follows: Parameter value can be selected from the parameters defined in the parameter list: VL-N, VL-L, VE, İL, IL2, İN, İL Demand, IN Demand, P, Q, S, ΣS, EQ, EP, P2, Q2, S2, ES2, EQ2, EP2, P Demand, Q Demand, S Demand, Cos, ECos, Hz, THD-V, THD-U, THD-I

Comparison value: Big, Small, In-Window, Out-of-Window
Big: Alarm will be given if it is bigger than the upper limit.
Small: Alarm will be given if it is smaller than the lower limit.
In-Window: The range between the upper and lower limits are considered normal. Alarm will be given when the value is out of the window.

Out-of-Window: The range out of the upper and lower limits are considered normal. Alarm will be given when the window is entered.
Upper Limit: The upper limit at which the user wants an alarm to be given.
Lower Limit: The lower limit at which the user wants an alarm to be given.
Hysteresis: The parameter used when exiting the alarm. The values can be selected between:
Alarm Delay Time 0-300S
Alarm Reset Time 0-300S

5.1.4. Log Settings

Settings for the parameters to be recorded by the device are performed in this menu. The “Log Settings” menu has 3 submenus.

5.1.4.1. Periodic Log Settings

The relevant log can be activated, or the log period for that log can be set in this menu.
Parameters that can be recorded on the device:
1. Load Profile
2. Voltage
3. Current
4. Power
5. THD

The log period can be set one of the following values: 1, 2, 5, 10, 15, 20, 30, 60 minutes.

5.1.4.2. Periodic Log Deletion

This menu is used to delete the recorded parameters. Parameters can be deleted all at once or individually through this menu. You need to select the checkbox for the parameter to be deleted.

5.1.4.3. Min. Max. Demand Deletion

This menu is used to delete the recorded parameters. Parameters can be deleted all at once or individually through this menu. You need to select the checkbox for the parameter to be deleted.

5.1.5. Adjusting Energy Meters

It is the menu where the meters are deleted and index values are entered.
In consists of the following headings: Setting the export energy meters, Deleting energy meters.
Parameters under the Setting Import Energy Meters menu:
1. Active Energy Index (Ea)
2. Reactive Inductive Index (Eri)
3. Reactive Capacitive Index (Ere)
4. Apparent Energy Index (Es)
5. Generator Active Energy Index (Eag)

Parameters under the Setting Export Energy Meters menu:
1. Active Energy Index (Ea)
2. Reactive Inductive Index (Eri)
3. Reactive Capacitive Index (Ere)
4. Apparent Energy Index (Es)
5. Generator Active Energy Index (Eag)

Under the Deleting Energy Meters screen, the checkbox is selected for Select All, Active Energy,

Reactive Energy, Apparent Energy, Generator Active Energy parameters selection.

5.1.6. Communication Settings

Communication settings of the device are performed through this menu. The “Communication Settings” menu has a submenu. This is the “Modbus Settings” menu.

5.1.6.1. Modbus Settings

Modbus RTU settings of the device are performed through this menu. Modbus address, bit rate and parity bit settings of the device are performed through this menu.
Modbus: Can be set as slave or master.
Modbus Address: This parameter can be set to a value between 1 and 247. The set value must be unique on the line where the device is present. Otherwise, communication of the line to which the device is connected will be distorted.
Bit Rate: This parameters can be set to one of the following values: 2400, 4800, 9600, 19200, 38400, 57600, 115200 or 256000 bps. The value of this parameter and the value of the software you use to communicate with the device must be the same. Otherwise, you cannot communicate with the device.
Parity Bit: Parity bit can be set as none, single or dual. The value of this parameter and the value of the software you use to communicate with the device must be the same. Otherwise, you cannot communicate with the device.

5.1.7. System Settings

5.1.7.1. Region and Language Setting

The screen where the user sets the Language, Time Zone and Daylight Saving Time.

5.1.7.1.1. Dil (Language)

İngilizce (English)
Türkçe (Turkish)
German (Deutsch)
or Fransızca (French) can be selected.

5.1.7.1.2.Time Zone

Can be set between 12:00 and 14:00 with half-hour intervals.

5.1.7.1.3. Daylight Saving Time

Off
Europe
or USA
can be selected.

5.1.7.2. Display Settings

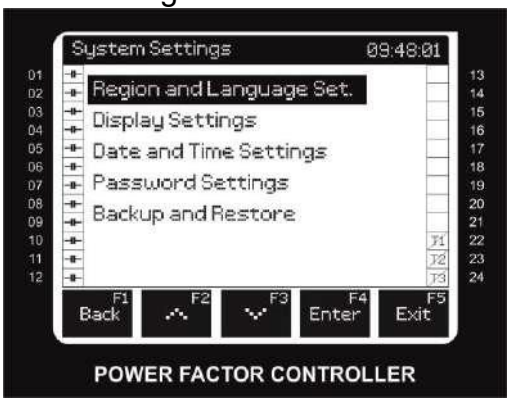
It is the screen where the user adjusts the contrast and light of the screen.

5.1.7.2.1.Contrast

The user can adjust the contrast of the screen.

5.1.7.2.2.Screen Light

Screen light off, Screen light on, or Screen light automatic can be selected.



5.1.7.3. Date and Time Setting

Date: can be set between 01.01.2000-31.12.2099 as day/month/year.

Time: can be set between 00:00:00-23:59:59 as hour/minute/second.

5.1.7.4. Password Settings

1. Password Prompt:

The user can activate/deactivate the password using the following options after entering the password.

1. Active
2. Pasif

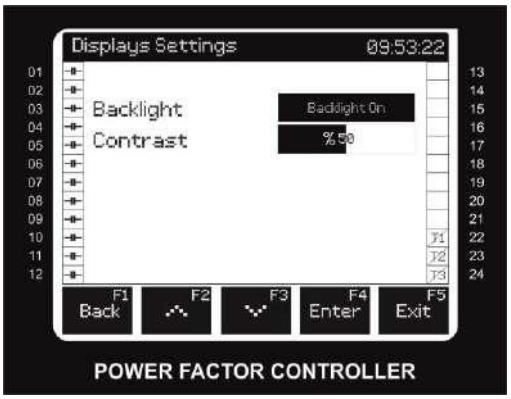
1. Password Changing

The user can change the password by entering the old password first, and then the new one.

1. Current Password
2. New Password
3. Repeat New Password

5.1.7.5. Back-up and Restore

Restore factory settings: Under this menu, select “Restore factory settings” checkbox and press F5

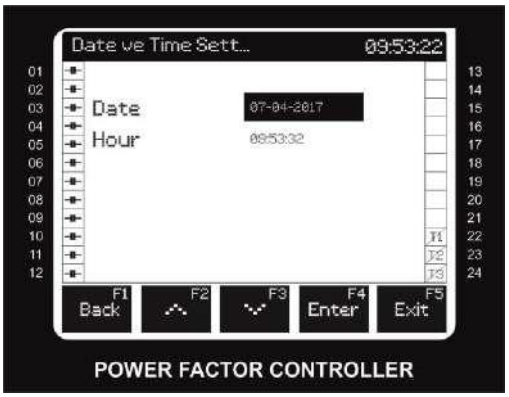


to save and exit. The device will restore factory settings.

5.2. Instantaneous Values Screen

Information about the measurements performed by the device and screen options is given below.

1. Phase-Neutral RMS Voltage (V1 ,V2,V3,V4) Measurement
2. Phase-Phase RMS Voltage (U1, U2, U3)
3. Frequency (Hz)
4. Total Harmonic Voltage Distortion (%)
5. Phase-Neutral Voltage Harmonics Amplitude (V) (up to the 51st harmonic)



6. Phase-Neutral Voltage Harmonics Rating (up to the 51st harmonic)
7. Phase-Phase Voltage Harmonics Amplitude (U) (up to the 51st harmonic)

8. Phase-Phase Voltage Harmonics Rating (up to the 51st harmonic)
9. Phase Current (I1, I2, I3) (A) Measurement
10. Power factor correction Current (IC1, IC2, IC3) (A) Measurement
11. Total Harmonic Current Distortion THDI (%)
12. Current Harmonics Amplitude (A) (up to the 51st harmonic)
13. Current Harmonics Rating (up to the 51st harmonic)
14. Power factor correction Phase Current (IC1, IC2, IC3) (A)
15. Total Power factor correction Current Harmonic Distortion THDIC (%)
16. Power factor correction Current Harmonics Amplitude (A) (up to the 51st harmonic)
17. Power factor correction Current Harmonics Rating (up to the 51st harmonic)
18. Cos O Value (L1,2,3-N) Measurement
19. Ambient (Ind./Cap.) Cos O Value Measurement
20. Active Power (W), Reactive Power (VAr), Apparent Power (VA) Measurement
21. Total Active Power (Imp./Exp.), Total Reactive Power (Ind./Cap.), Total Apparent Power Measurement
22. Active Energy (Wh-Import/Export), Reactive Energy (VArh-import/Export) Measurement
23. Phase Current Demand (I1, I2, I3) (A)
24. Phase Active Power Demand (P1, P2, P3) (W)
25. Phase Reactive (Ind. / Cap.) Power Demand (Q1, Q2, Q3) (VAr)
26. Phase Apparent Power Demand (S1, S2, S3) (VA)

The Main Screen of the device displays difference reactive power value and power factor correction rates in % to reach the instantaneous Cos Φ, Total Powers and Target Cos Φ. Other measurement values will be reached through buttons on this screen. The measurement screens will be as follows respectively:

1. Step: This screen will display the steps' type, connection, power, remaining capacity percent, period during which they remain enabled, switching number, step date and contactor date.
2. Power factor correction: This screen will display the graph of daily power factor correction rates as capacitive and inductive. The user will also be able to see the daily, weekly, monthly and quarterly graphs.
3. Load: The user will be able to see the weekly, monthly and quarterly load profile graphs as active, reactive and apparent energy.
4. Energy: This screen will display the Permanent Energy meters and Removable Energy meters.
5. Power: This screen will display total powers and their distribution by phases, demands and maximum demands.
6. Voltage: This screen will display phase-phase and phase-neutral voltages and frequencies. The user will also be able to view the Max., Min Voltage, Frequency Values, Phasor Diagram, THDV values, harmonic amplitude and angle values.
7. Current: This screen will display phase, neutral and power factor correction current values. The user will view the Mix., Max. values on the same screen. The user will also be able to view the Max., Min Current, Demand, Maximum Demand, THDI Values, Harmonic Amplitude and Angle Values.

5.2.1. Step screen

This screen displays the summery of the type, value and connection of each step. To view the details of a step, hover over the step and press “Select”. Step details will be displayed upon pressing this option.

5.2.1.1. Step Details

Type: Contains step type information
Connection: Contains step connection information.
Step Value: Contains total instantaneous step power. The section given in percent indicates the remaining step capacity. For example, if the percentage value of a capacitor with a value of -100kVAr is 80% during the initial setup, this indicates that the step has lost value amounting to 20% and decreased to -80kVAr. Step value displayed on the screen indicates the remaining power.
Step Life: Indicates for how many hours the step has been enabled.
Contactor Life: Indicates how many times the contactor has been switched.
The adjacent percentage is the total contactor life of the switching number.
Step Date: It is the area indicating the date on which the step has begun to be used.
Kontaktor Tarihi Contactor Date: It is the area indicating the date on which the step contactor has begun to be used.

5.2.2. Power factor correction Screen

This screen displays daily, weekly, monthly and quarterly power factor correction graphs.

5.2.3. Load Screen

This screen displays daily, weekly, monthly and quarterly load profiles.

5.2.4. Energy Screen

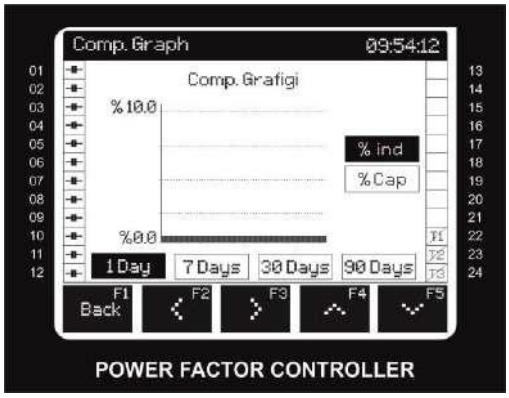
The user can use this screen to track permanent energies (Energy2) and removable energies (Energy).

Energy
This screen displays the import and export values of the following energy parameters:
Ea: Active Energy
Es: Apparent Energy

Ere: Capacitive Reactive Energy
Eri: Inductive Reactive Energy
Eag: Active Generator Energy

Energy 2

This screen displays the import and export values of the following energy parameters:
Ea: Resettable Active Energy
Es: Resettable Apparent Energy
Ere: Resettable Capacitive Reactive Energy
Eri: Resettable Inductive Reactive Energy
Eag: Resettable Active Generator Energy

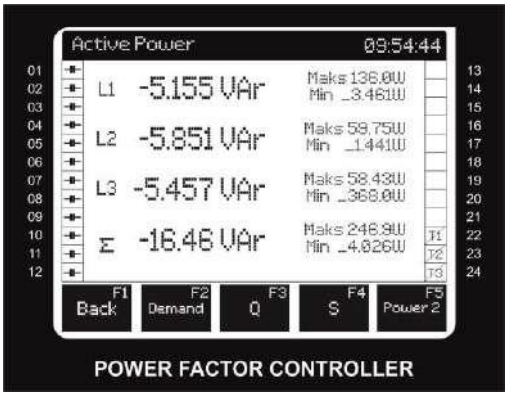


5.2.5. Power Screen

5.2.5.1. Total Power Screen

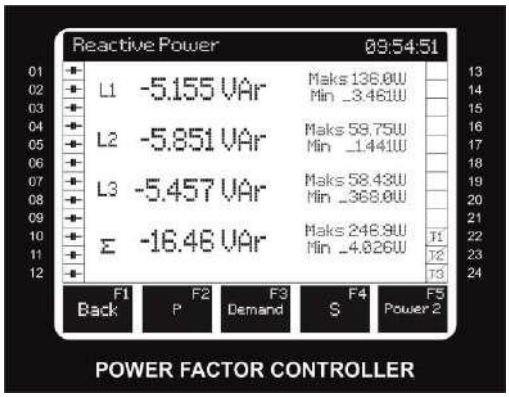
This screen displays total active, total reactive and total apparent powers, and minimum and maximum values of these powers.

5.2.5.2. Active Power Screen



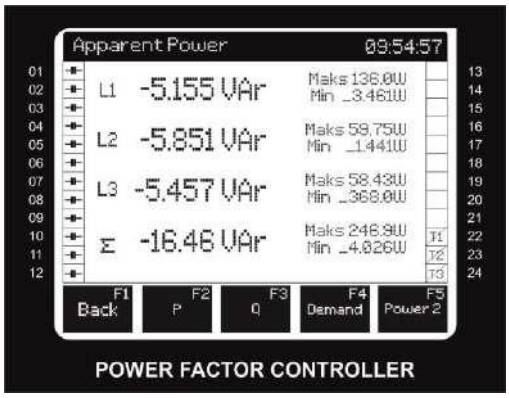
This screen displays active powers in phases, minimum and maximum values of these values, total active power, and minimum and maximum value of this value. If you press “Talep” (Demand) on this screen, the active power demand table will be displayed.

5.2.5.3. Reactive Power Screen



This screen displays reactive powers in phases, minimum and maximum values of these values, total reactive power, and minimum and maximum value of this value. If you press “Talep” (Demand) on this screen, the reactive power demand table will be displayed.

5.2.5.4. Apparent Power Screen



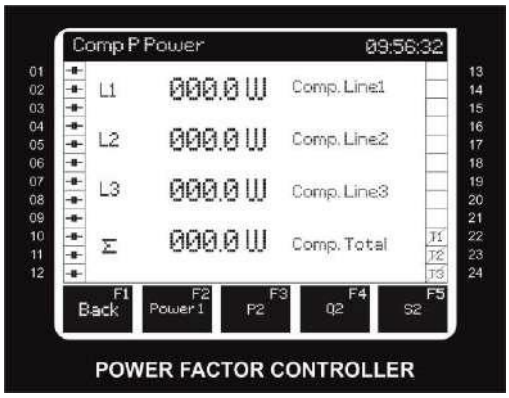
This screen displays apparent powers in phases, minimum and maximum values of these values, total apparent power, and minimum and maximum value of this value. If you press “Talep” (Demand) on this screen, the apparent power demand table will be displayed.

5.2.5.5. Total Power factor correction Power Screen

This screen displays total active power factor correction power, total reactive power factor correction power and total apparent power factor correction power, and minimum and maximum values of these powers.

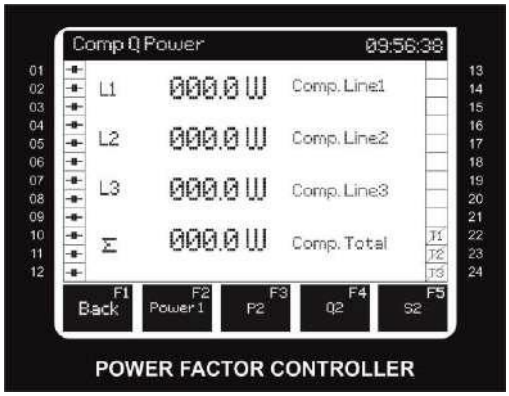
5.2.5.6. Active Power factor correction Power Screen

This screen displays active power factor correction powers in phases and minimum and maximum values of these values, and total active power factor correction power and minimum and maximum values of these value.



5.2.5.7. Reactive Power factor correction Power Screen

This screen displays reactive power factor correction powers in phases and minimum and maximum values of these values, and total reactive power factor correction power and minimum and maximum values of these value.



5.2.5.8. Apparent Power factor correction Power Screen

This screen displays apparent power factor correction powers in phases and minimum and maximum values of these values, and total apparent power factor correction power and minimum and maximum values of these value.

5.2.5.9. Demand Screens

This screen displays individual and total demand values of the relevant power type for each phase, the maximum demand, and the date on which this maximum demand has occurred. Demand settings can be set in Settings/Network Settings/Connection Settings menu.

5.2.6. Voltage Screen

Voltage L-N Screen:

This screen displays Phase-Neutral voltage values and maximum-minimum values for each phase.

Voltage L-L Screen:

If you press F2 on Voltage L-N screen, you will enter this screen. This screen displays PhasePhase voltage values and maximum-minimum values for each phase.

THD Voltage L-N Screen:

If you press F3 on Voltage L-N screen, you will enter this screen. This screen displays PhaseNeutral THD values for each phase.

THD Voltage L-L Screen:

If you press F3 on Voltage L-L screen, you will enter this screen. This screen displays PhasePhase THD values.

Phasor diagram will be displayed if you press F5 (Phasor) on voltage screen.

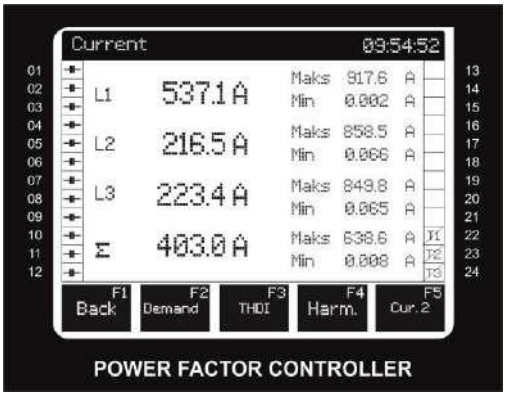
Harmonics will be shown in bars if you press Harmonic (F4) key on voltage or current screen. You can switch between harmonics using F4 and F5 keys.

In the harmonics screen, each press on the table (F2) key will display the amplitude and angle of harmonic in tables.

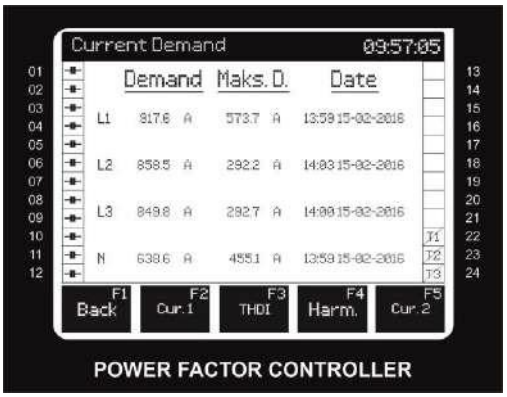
All harmonics of the related phase can be tracked with F2 and F3 keys.

You can switch between phases using F4 and F5 keys.

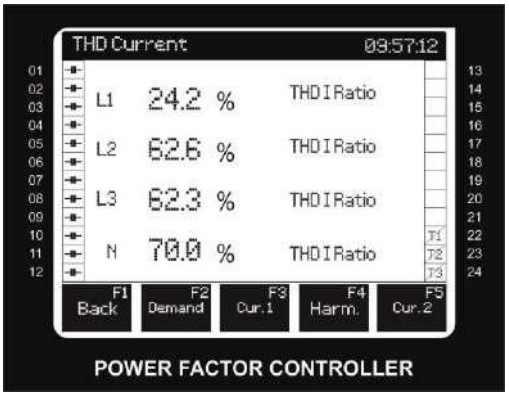
5.2.7. Current Screen



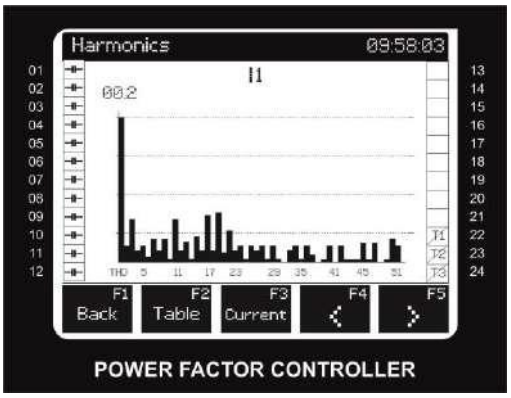
This screen displays the current values measured instantaneously for each Phase, and Maximum and Minimum current values.



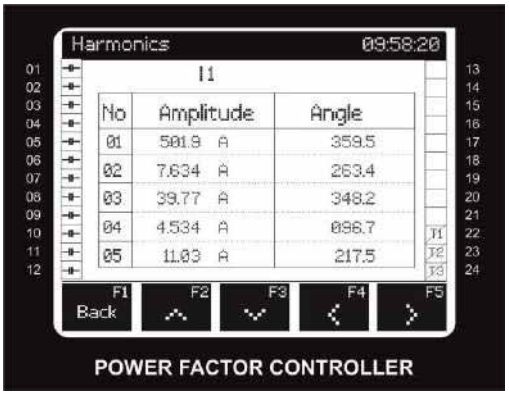
If you press the Demand (Talep) screen when you are on the Current screen, you can view the Demand for each phase, the Maximum Demand and the date on which that demand was created.



If you press THD on the current screen, you can view the THD rate for each phase in %.



If you press the Harmonik (Harmonics) button on the Current Screen, all harmonics up to the 51st harmonic for I1 will be shown in bars. You can switch between currents using F4 and F5 keys.



In the harmonics screen, each press on the table key will display the amplitude and angle of harmonic in tables.
Using F2 and F3, you can track all harmonics by moving up and down.
You can switch between phases using F4 and F5.

5.2.8. Current2 Screen

If you press Current2 screen, you can view the related power factor correction current for each phase.
Just like on the Current screen, you can view the phases in detail by switching to THD and Harmonics screen.

5.3. Manual Mode Screen

Press and hold F5 for 3 seconds to enter the manual mode screen. Change the selected steps with right and left arrow keys. Press Pull to pull the selected step, and press Release to release it.
1. Pulling the step manually is not allowed in the following situations:
    a. If the step type is set to Off
    b. If the step has entered into error mode
2. If you want to manually pull a capacitor whose discharge period has not elapsed yet, the device will wait for the discharge period to end and then fulfill the request.

5.4. Alarm screen

Available alarms can be listed on the screen by pressing and holding F3. Each row of the list includes the alarm created and the date/time when the alarm was created. All warnings and alarms are transferred to the event log. These logs can be accessed via communication.
Descriptions for alarms and warnings that may be seen on the device are given below:

5.4.1. Excessive Power factor correction Alarm

Alarm is given when the capacitive power factor correction rate exceeds the rate set by the user. This alarm continues until its conditions are eliminated or the rates are reset by the user.

5.4.2. Excessive Power factor correction Warning

Warning is given when the capacitive power factor correction rate exceeds the rate set by the user. This warning continues until its conditions are eliminated or the rates are reset by the user.

5.4.3. Insufficient Power factor correction Alarm

Alarm is given when the inductive power factor correction rate exceeds the rate set by the user. This alarm continues until its conditions are eliminated or the rates are reset by the user.

5.4.4. Insufficient Power factor correction Warning

Warning is given when the inductive power factor correction rate exceeds the rate set by the user. This warning continues until its conditions are eliminated or the rates are reset by the user.

5.4.5. Insufficient Capacitor Power Alarm

This alarm will be given if the targeted Cosϕ value cannot be reached event though the device has commissioned all capacitor steps.

5.4.6. Insufficient Reactor Power Alarm

This alarm will be given if the targeted Cosϕ value cannot be reached event though the device has commissioned all reactor steps.

5.4.7. Step Array Error Alarm

This alarm will be given if the inductive and capacitive power factor correction rates cannot remain below the alarm levels with the existing steps (if it exceeds insufficient power factor correction limits when it has received the smallest step, when it has released excessive power factor correction).

5.4.8. Capacitor Value Decrease Alarm

Alarm will be given if the percentage rate of the up-to-date capacitor power to the set capacitor power drops below the Capacitor Power Decrease Alarm Level set by the user. This alarm continues until a new step power value is set.

5.4.9. Capacitor Value Decrease Warning

Warning will be given if the rate of the up-to-date capacitor power to the set capacitor power drops below the Capacitor Power Decrease Warning Level set by the user. This warning continues it is reset by the user.

5.4.10. Contactor Switching Number Alarm

Alarm will be given if the up-to-date step switching number exceeds the Contactor Switching Number Alarm Level set by the user. This alarm continues until the Contactor Switching Number is reset by the user.

5.4.11. Contactor Switching Number Warning

Warning will be given if the up-to-date step switching number exceeds the Contactor Switching Number Warning Level set by the user. This warning continues it is reset by the user.

5.4.12. Contactor Sticking Alarm

This alarm will be given if the device measures that the load amounting to the related step power has not been released from the system even though the device has released the relevant step. This alarm continues it is reset by the user.

5.4.13. Contactor not Pulling Alarm

This alarm will be given if the device measures that the load amounting to the related step power has not entered the system even though the device has pulled the relevant step. This alarm continues it is reset by the user.

5.4.14. Phase Sequence Alarm:

It is the alarm given when the voltage phase sequence is reverse. This alarm will be reset at the end of the set resetting duration when the alarm condition is eliminated.

5.4.15. Voltage Alarm:

If any of the phase voltages measured by the device goes out of the upper or lower limit set by the user, this alarm will be given in consequence of the set traction delay time. The device will disable all steps to protect them if the Voltage Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset at the end of the set resetting duration when the alarm condition is eliminated.

5.4.16. THDV Alarm:

If any of the Total Harmonic Distortion Voltage values of the phases measured by the device exceeds the upper limit determined by the user, this alarm will be given in consequence of the set traction delay time. The device will disable all steps to protect them if the THDV Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset at the end of the set resetting duration when the alarm condition is eliminated.

5.4.17. THDI Alarm:

If any of the Total Harmonic Distortion Current values of the phases measured by the device exceeds the upper limit determined by the user, this alarm will be given in consequence of the set traction delay time. The device will disable all steps to protect them if the THDI Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset at the end of the set resetting duration when the alarm condition is eliminated.

5.4.18. Current Alarm:

If any of the phase currents measured by the device goes out of the upper or lower limit set by the user, this alarm will be given in consequence of the set traction delay time. The device will disable all steps to protect them if the Current Alarm Step Protection is “Active” when this alarm is given. This alarm will be reset at the end of the set resetting duration when the alarm condition is eliminated.

6. Technical Specifications and Appendices

6.1. Technical Specifications

6.1.1. Electrical

Connection	Range	Terminal Type
Auxiliary Supply	100-270 VAC 47-63 Hz 25VA	with 2x10.16 mm socket
		2.5 mm2 CD, 4 mm2 TD
		with fixing screw
Voltage Measuring Input	4 x 10-690VAC47-63 Hz	with 5 x 7.62 mm socket
		2.5 mm2 CD, 4 mm2 TD
Current Measuring Input	6x0.005-6 A AC 47-63HZ	with 2x6 x5.08 mm socket
		2.5 mm2 CD, 4 mm2 TD
		with fixing screw
Relay Output	20 x 250 VAC 3A 750 VA	with 4 x 6 x5.08 mm socket
		2.5 mm2 CD, 4 mm2 TD
Generator Input	100-270 VAC/DC	with 2x10.16 mm socket
		2.5 mm2 CD, 4 mm2 TD
Alarm/Fan Relay Output	2 x 250 VAC 5 A AC 1250 VA	with 4x5.08 mm socket
		2.5 mm2 CD, 4 mm2 TD
RS 485 Port	Max+12 V	with 4 x 3.84 mm socket
		1.5 mm2 ÇD 2.5 mm2 TD
Battery	3 V CR2032	CR2032 Battery Holder

6.1.2. Mechanical and Ambient Conditions

Dimensions	144 x 144 mm	
Max Depth (In-Panel)	60 mm	
Panel Segment Size	138 x 138 mm	
Installation	Vertical Panel Installation	
Box Protection	IP 54 (Front Panel)	
	IP 20 (From the Back)	
Display	FSTN Monochrome Graphic LCD	
	Visible Area	82 x 62 mm
	Active Area	77 x 58 mm
	Colour	White/Grey Positive
	Resolution	240 x 160 pixels
Button	5x Rubbers on Tag Switch	
Ambient	Operating Temperature	-20 - +70 °C
	Storage Temperature	-30 - +80 °C
	Maximum Relative Humidity	95%, non-condensing
	Vibration	0.3 mm (2-9 Hz) 1 m/sn^2 (9-200 Hz)

6.1.3. Measurement

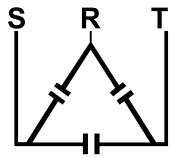
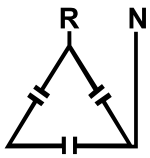
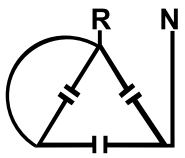
Parameter	Unit	Description	Range	Precision	Max. Value
Voltage					
V1 ,V2,V3,V4	V	Phase-Neutral Rms Voltage	10-400 Vac	±0.5%	1MV
U1,U2,U3	V	Phase-Phase Rms Voltage	10-690 Vac	±0.5%	1.71MV
Frequency	Hz	Basic Voltage Frequency	47-63 Hz	±0.02Hz	63Hz
THDV	%	Total Harm. Voltage Dist	0 - 200%	±1%	1000%
V Harmonic	V	V Harmonic L-N Voltage Amplitude	2.-51.	±1%	1MV
	Rating	g Harmonic L-N Phase Voltage	2.-51.	±3%	0-360.0
U Harmonic	V	Harmonic L-L Voltage Amplitude	2.-51.	±1%	1.71MV
	Rating	Harmonic L-L Phase Voltage	2.-51.	±3%	0-360.0
Phase Current					
I1, I2, I3	A	Phase Current	0.005 - 6A	±0.5%	10kA
THDI	%	Total Harm. Current Dist.	0 - 200%	±1%	1000%
I Harmonic	A	Harmonic Current Amplitude	2.-51.	±1%	10kA
	Rating	Harmonic Current Amplitude	2.-51	±3%	0-360.0

POWER (1)					
Cosϕ		Shift Factor	-1,000 - +1,000		-1,000-+1,000
PF		Power Factor	-1,000 - +1,000		-1,000-+1,000
P1,P2,P3	W	Phase Active Power	-2400 - 2400W	±1 %	-10GW-10GW
ΣP	W	Total Active Power	7200 - 7200W	±1 %	-30GW - 30GW
Q1,Q2,Q3	VAr	Phase Reactive Power	7200 - 7200W	±1 %	10GVAr -10GVAr
ΣQ Ind.	VAr	Total Inductive Reactive Power	0.1 -7200 VAr	±1 %	30GVAr
ΣQ Cap.	VAr	Total Reactive Capacitive Power	-0.1 -7200 VAr	±1 %	-30GVAr
ΣQ	VAr	Total Reactive Power	-7200 - 7200 VAr	±1 %	-30GVAr - 30GVAr
S1,S2,S3	W	Phase Apparent Power	-2400 - 2400W	±1 %	-10GW-10GW
ΣS	W	Total Apparent Power	-7200 - 7200W	±1 %	-30GW - 30GW
Energy (2)					
+Ea	Wh	Imp. Active Energy	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh
+Er	VAr	Imp. Reactive Energy	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh
-Er	VAr	Exp. Reactive Energy	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh
Es	VAh	Apparent Power	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh
+Eag	Wh	Generator Imp. Active Energy	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh
Esg	VAh	Generator Apparent Energy	0 - 2 ∧ 64	±1 %	2 ∧ 64 Wh

Talep					
11, 12, 13	A	Phase Current Demand	0.005 - 6A	±0.5%	10kA
P1,P2,P3	W	Phase Active Energy Demand	-2400 - 2400W	±1%	-10GW-10GW
ΣP	W	Total Active Energy Demand	-7200 -7200W	±1%	-30GW - 30GW
Q1,Q2,Q3 Ind.	VAr	Phase Reactive Energy Demand	0.1 -2400 VAr	±1%	10GVAr
Q1,Q2,Q3 Cap.	VAr	Phase Reactive Energy Demand	-0.1 -2400 VAr	±1%	-10GVAr
ΣQ Ind.	VAr	Total Inductive Reactive Energy Demand	0.1 -7200 VAr	±1%	30GVAr
£Q Cap.	VAr	Total Capacitive Reactive Energy Demand	-0.1 -7200 VAr	±1%	30GVAr
S1,S2,S3	W	Phase Apparent Energy Demand	-2400 - 2400W	±1%	-10GW-10GW
ΣS	W	Apparent Energy Demand	-7200 - 7200W	±1%	-30GW - 30GW
Min/Max Values					
V1 ,V2,V3,V4	V	Phase-Neutral Rms Voltage	10-400 Vac	±0.5%	1MV
U1,U2,U3	V	Phase-Phase Rms Voltage	10-690 Vac	±0.5%	1.71MV
Frequency	hZ	Basic Voltage Frequency	45 - 65 Hz	±0.02Hz	70Hz
I1, I2, I3	A	Phase Current	0.005 - 6A	±0.5%	10kA
P1,P2,P3	W	Phase Active Power	2400-2400W	±1%	10GW-10GW
ΣP	W	Total Active Power	-7200 -7200W	±1%	-30GW - 30GW
Q1,Q2,Q3	VAr	Phase Reactive Power	-2400 - 2400 VAr	±1%	10GVAr -10GVAr

ΣQ Ind.	A	Total Inductive Reactiv Power	0.1 -7200 VAr	±1%	30GVAr
ΣQ Cap	VAr	Total Capacitive Reaktif Guc	0.1 - -7200 VAr	±1%	-10GW-10GW
ΣQ	VAr	Total Reactive Power	-7200 - 7200 VAr	±1%	-30GW - 30GW
S1,S2,S3	W	Phase Apparent Power	-2400 - 2400W	±1%	10GVAr
ΣS	W	Total Apparent Power	-7200 - 7200W	±1%	-10GVAr
Step					
Qs1 ... Qs20	VAr	Power of Steps	-4800 - 4800 VAr	±3%	30GW - 30GW
Ts1 ... Ts20	-	Step Changing Meter	0 - 2 ∧ 32		2 ∧ 32
Hs1 ... Hs20	h	Step Operating Time	0 - 2 ∧ 32	±0.1 %	2 ∧ 32
Time					
Hour		DD.MM.YYYY hh:mm:ss		1 second / day	

6.2 APPENDICES
6.2.2 Capacitor Account Table

			
KONDANSATÖR GÜÇLERİ	3 PHASE CONNECTION (Q/3)	PHASE-NEUTRAL CONNECTION (Q/6)	PHASE-NEUTRAL BRIDGED 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

Entes Elektronik Cihazlar İmalat ve Ticaret A.Ş.

Adres: Dudullu OSB 1. Cadde No:23 34776 Ümraniye, İstanbul / TR.

Telefon: +90 (216) 313 0110

Faks: +90 (216) 314 1615

Satış Faks: +90 (216) 365 7171

E-mail: satis@entes.com.tr

Web: www.entes.com.tr

E-bülten üyeliği için: ebulten@entes.com.tr

Koordinatlar: 40,995852 N, 29,178398 E