Network Analyzer with Digital Output User Manual

ADDRESS: Ikitelli OSB Mah. Cevre 14. Blok Sok. Telas Blok Dis Kapi No: 1 Kat: 1-2 Basaksehir/Istanbul

Phone: +90 212 438 80 24
Fax: +90 212 438 80 25

info@gruparge.com

V.25.1

CONTENTS

PROPER USE AND SAFETY REQUIREMENTS

Cut all the power when connecting and disconnecting the device to a panel.

Do not clean the device with a solvent or similar material. Only use a dry cloth.

Please do not intervene to the device when a technical problem is encountered and get in contact with a technical service within the shortest time.

If the warnings are not taken into account, our company or the authorized dealer shall not be held responsible for the negative consequences.

Do not dispose in the trash, the device must be delivered to the collection centers (electronic device recycling centers). It should be recycled or disposed of without harming human health and environment.

The installation, assembly, activation and operation of the device should be done and used by only expert professionals and in accordance with safety regulations and instructions.

The device operates with current transformers. Do not strictly leave current transformer tips unattached. Dangerous high voltage can occur.

1. INTRODUCTION

1.1. General Features

Network analyzer: 3 phase currents and neutral current, phase-neutral and phase-phase voltages, frequency, active and reactive powers, angle difference between current and voltage, power factor, current and voltage harmonics between 1-63 and current and voltage Total Harmonic Distortion values of each phase. In addition, it reads and records active and reactive energies.

Demand and peak values for these measured quantities can also be monitored on the analyzer.

Many necessary adjustments related to the device (Current Transformer, Voltage Transformer, etc.) can be made through the menu.

In the communicated versions, all read parameters can be monitored remotely via the standard MODBUS protocol and various adjustments can be made.

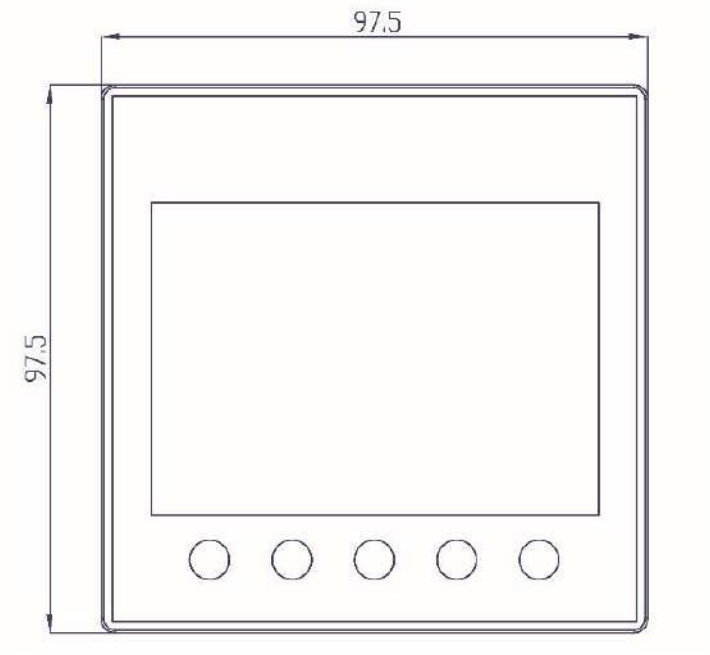
In the versions of our network analyzer product with SD card feature, the electrical quantities selected for recording can be periodically recorded on the SD card.

1.2. Technical Features

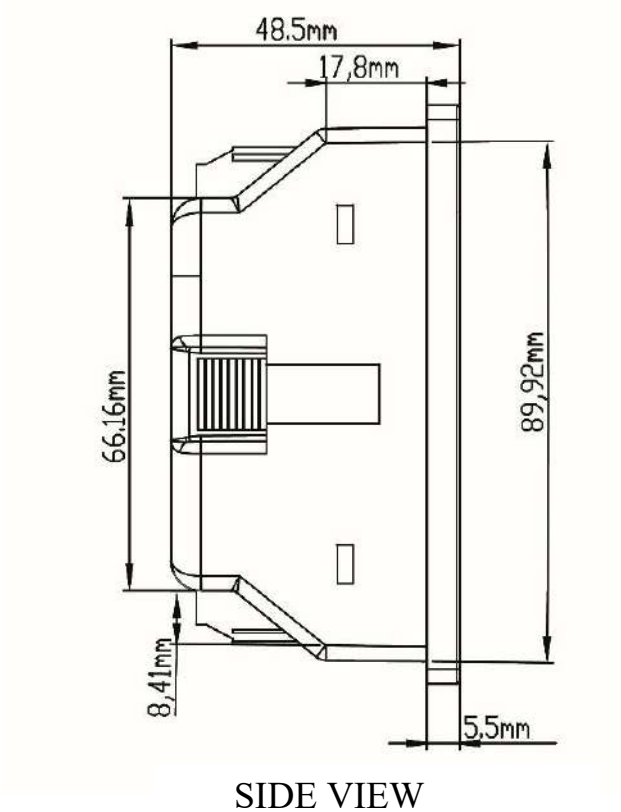
- RS-485 supports standard MODBUS RTU protocol communication channel.
- For Modbus RTU, the device supports 4800, 9600, 19200, 38400, 57600 and 115200 bps speeds.
- The operating ambient temperature of the device is between -10 °C and +55 °C.
- The power consumption of the measurement inputs is less than 1 VA.
- Line voltage can be adjusted in the range of (L-L) 90 V-46000 V
- Line voltage can be adjusted in the range of (L-N) 50 V- 26560 V
- Measuring voltage can be adjusted in the range of (L-L) 22 V-1000 V (45-65 Hz)
- Measuring voltage can be adjusted in the range of (L-N) 13 V-575 V (45-65 Hz)
- Current transformer ratio can be adjusted between 5/5 and 10000/5.
- Optionally, it can be compatible with CT30 type current transformer.
- Operating frequency is 45-65 Hz.
- Minimum measurement value is 1 mA / 2 V.
- Measurement accuracy is 1mA / 0.1 V.

● Periodically saves the peak values of energy, demand and all parameters in permanent memory. Even if the power is turned off, the device continues to record the corresponding values from where it left off when it is turned on again.
● Demand measurement time can be set between 1-60 minutes.
● All device parameters can be monitored remotely via RS-485 communication channel.
● The peak values of energy, demand and all line parameters should be reset from the device menu.
● Our Network Analyzer product has 1 digital output with optocoupler.
● Our Network Analyzer product has a 3.5-inch 320x480 resolution color TFT display.
● Network Analyzer device dimensions (Aspect-Length-Depth) are 97.5 x 97.5 x 50.5 mm.
● Our Network Analyzer product operates under 85-265 V AC voltage.
● Our Network Analyzer product has IP20 protection class.
● Measurement of Current and Voltage harmonics from 1 to 63
● Measurement of Current and Voltage Total Harmonic Distortions
● The device can save the measured magnitudes to the SD card for up to 250 hours in an adjustable period of 500 ms - 25 sec.

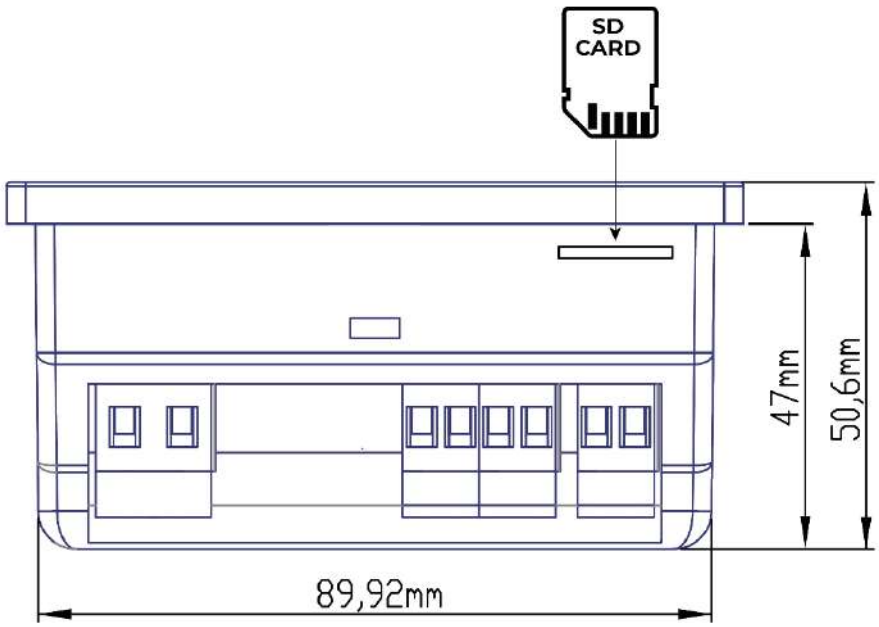
1.3. Network Analyzer Technical Drawing



FRONT VIEW

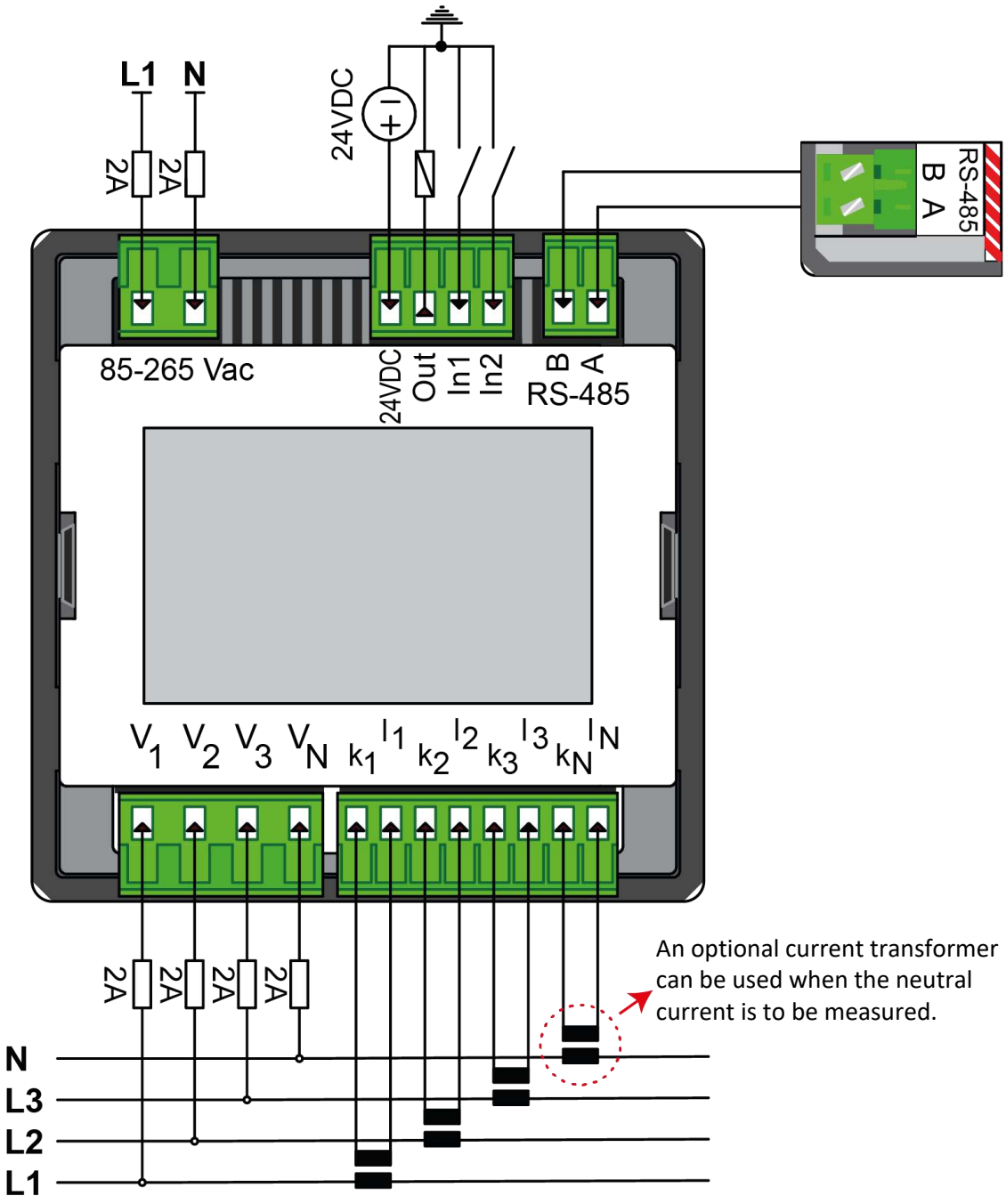


SIDE VIEW



TOP VIEW

1.4. Connection Diagram



1.5. Measurable Line Parameters

- Phase-Neutral Voltages (V11, V12, V13)
- Phase-to-phase voltages (V12, V23, V13)
- Phase Currents (I1, I2, I3, ΣI)
- Neutral Current (In)
- Frequency
- Active Power (P1, P2, P3, ΣP)
- Reactive Power
- Capacitive Reactive Power (ΣQ(cap), Q1(cap), Q2(cap), Q3(cap))
- Inductive Reactive Power
- Visible Power (ΣS, S1, S2, S3)
- Power Factors (PF1, PF2, PF3)
- Active Energy (Import / Export, ΣWh)
- Reactive Energy (Import / Export, ΣVARh)
- Min/Max Values (Import / Export)
- Demand Values (Import / Export)
- Voltage and Current Harmonics of Each Phase (between 1- 63)
- Total Harmonic Values of Current and Voltage (THVD and THID)
- CosØ and tanØ values of each phase
- % Current and % Voltage Imbalances
- Current and Voltage Phase Angles
- Power Triangle
- Phasor Diagram

1.6. Buttons and Functions

There are 5 buttons on the device and their functions change according to the current screen. When navigating between screens, the yellow buttons shown in the picture below allow you to switch between the main screens and the white buttons on the left allow you to switch between the sub-screens of the selected main screen. The nomenclature of the buttons changes according to the main screen and sub-screens to be navigated when the relevant button is pressed.

The green button on the far right has 2 functions. Pressing this button opens the menu of the device. When this button is pressed and held, the main measurement screen of the device opens. In this way, the user can access the main screen in a very short time by long pressing this button.
Each time the buttons are pressed, arrow keys will appear on the screen to help the user with the direction of progress.

When the menu button is entered, the buttons have the functions shown in the picture below. Exit button is used to exit the menu directly. The back button is used to exit back from the current menu screen.

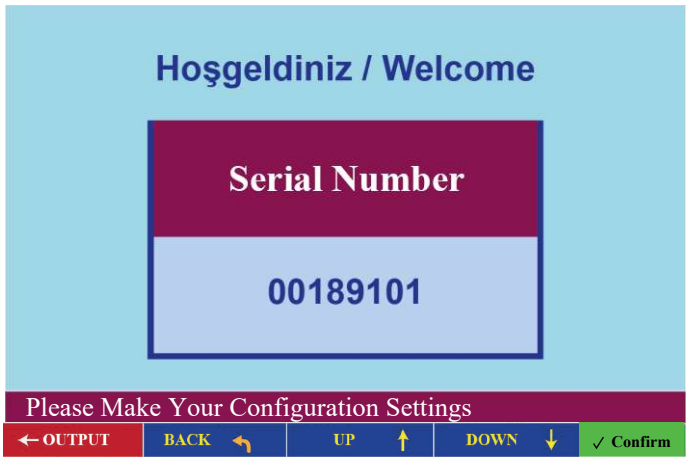
2. INSTALLATION

2.1. Device Installation

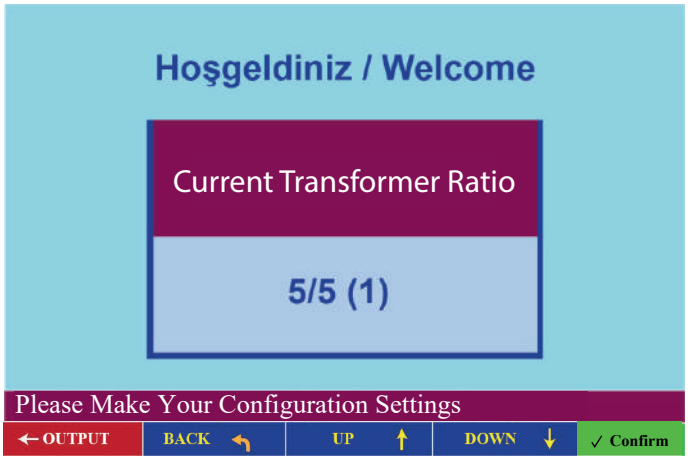
Make the current and voltage input connections of your device according to the diagrams on **Page 8** and **Page 9**. When connecting your device, make sure that the current and voltage inputs are correctly matched. After checking the connections and making sure that they are correct, give energy to your device.

NOT: Menu > Settings > Expert Settings in the "Device Reset" section, "Device Reset" is confirmed and the device returns to the initial setup settings.

2.2. Installation Menu

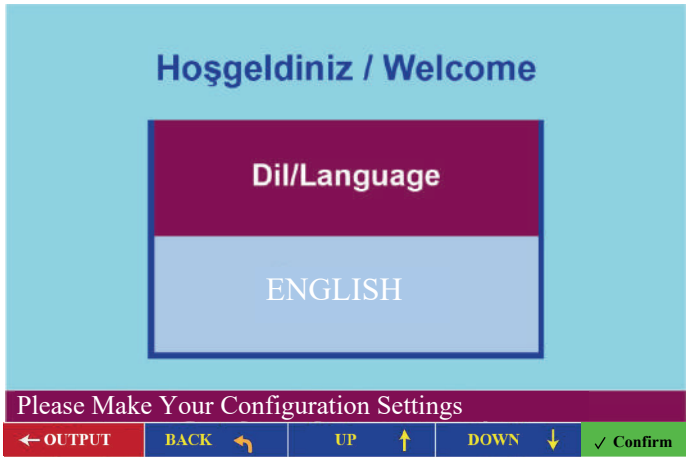


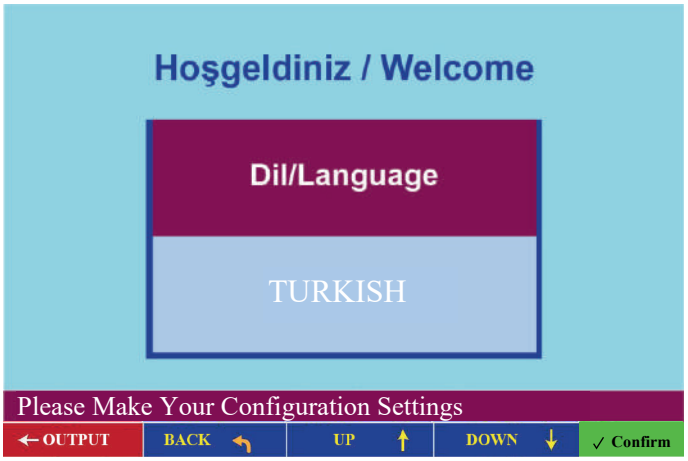
After your device is energised, you will first see the serial number screen on the left. This screen gives information about the serial number of your device. Confirm after confirming with the button, the current transformer ratio menu appears on the screen as follows.



In this screen, the current transformer ratio is set with the direction buttons and confirmed by pressing the Confirm button.
Then, the language selection screen appears as below. After selecting the required language option

✓ Confirm by pressing the confirm button.



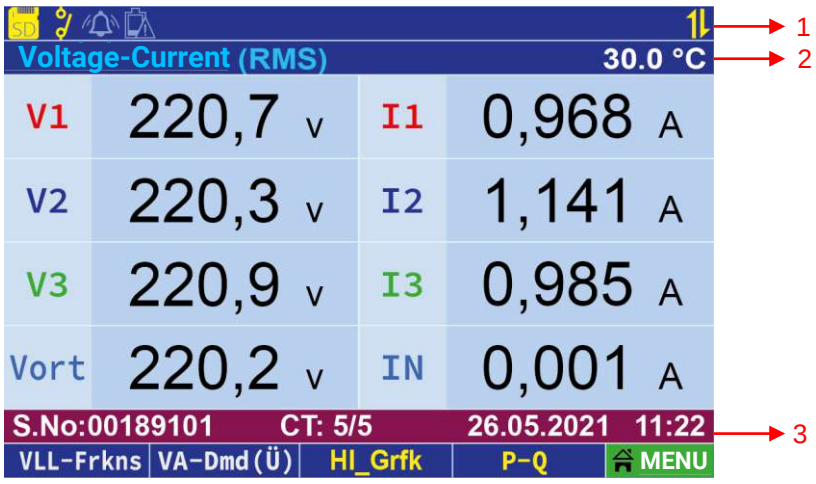


3. MAIN SCREEN AND SUB SCREENS

The device has a total of 9 main screen titles. The image below shows the default main screen after installation.

NOT : If you want to return to the main screen while navigating between other main screens and sub-screens, press and hold the button under "Menu".

3.1. Main Screen General Overview



(1) Information Bar: SD card is the part where various symbols such as relay on/off, alarm, communication, RTC battery status are located.

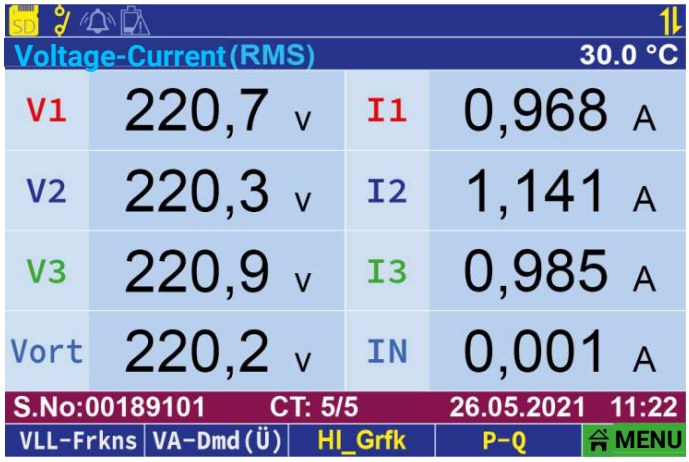
(2) Title Bar: This section shows the screen titles navigated on the device. The temperature value is also shown in this section.

(3) Bottom Status Bar: Date and time information, current transformer ratio and device serial number are available in this section. At the same time, various warnings are given to the user via this bar. If the bottom warning bar is colored blue, it means that the device has not been quality tested and a quality control test should be performed by going to the quality control section from the expert settings in the menu. If the color of the bar is burgundy, the Quality Control test has been performed and the device is working properly. If the company name is written via modbus, the company name is shown in this status bar at intervals.

		The SD card symbol is colored yellow when the SD card is inserted. When the SD card is ejected, it is colored pale gray. If there is an error during recording, this symbol is colored red. During formatting this symbol is colored white.
		Digital output position is indicated by this symbol which flashes yellow during recording. If the digital output on-off time is available, this symbol is colored green-yellow during counting and the counted time information is notified to the user.
		If an alarm occurs, the alarm symbol is colored red.
		The symbol indicating the RTC battery status will be colored red when the RTC battery is low.
		This symbol indicates that the device has modbus communication feature. When the device exchanges data with modbus, the arrows in the sending and receiving direction are painted in different colors.

3.2. Voltage-Current Display

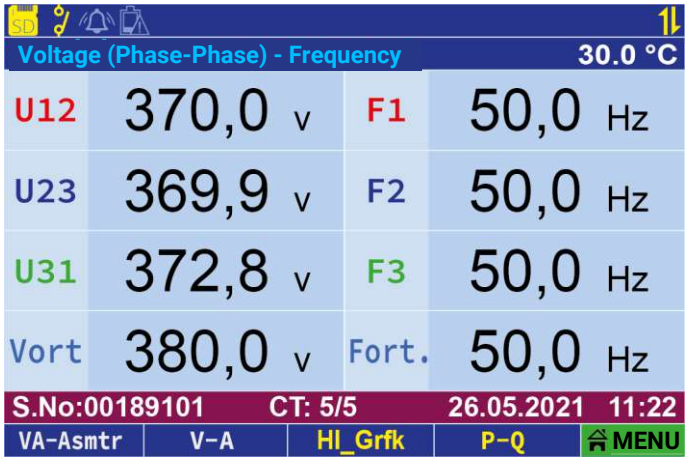
The next screen is the main screen of the device. The device starts with this screen when it is first turned on. Phase-Neutral voltages and average voltage are shown on the left side of the screen, while current values of each phase and neutral current are shown on the right side of the screen. This main screen has many sub screens. You can switch to the sub-screens with the white buttons on the left side.



By pressing the "VLL-Frkns" button while on this screen, you can switch to the Voltage (Phase-Phase) - Frequency sub-screen.

3.2.1. Voltage (Phase-Phase) - Frequency

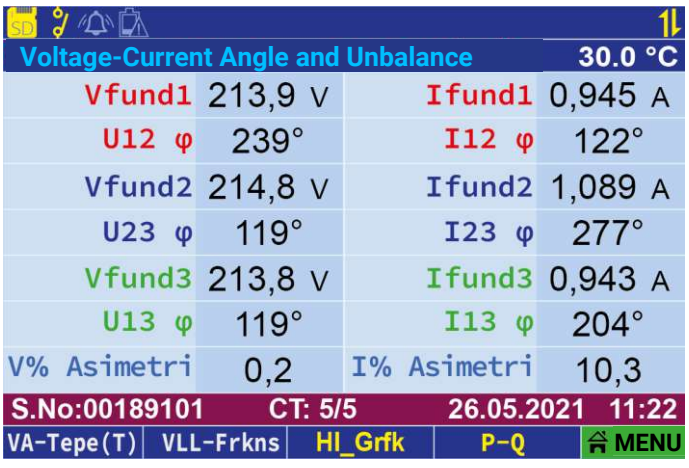
The screen on the side shows the phase-phase values of the voltage and the frequency values of each phase. The average voltage of the phases and the average frequency of the phases can also be seen on this screen.



While on this screen, VA-Asmtr By pressing the bottom button, you can switch to the **Voltage-Current Angle** and Imbalance screen.

3.2.2. Voltage-Current Angle and Unbalance

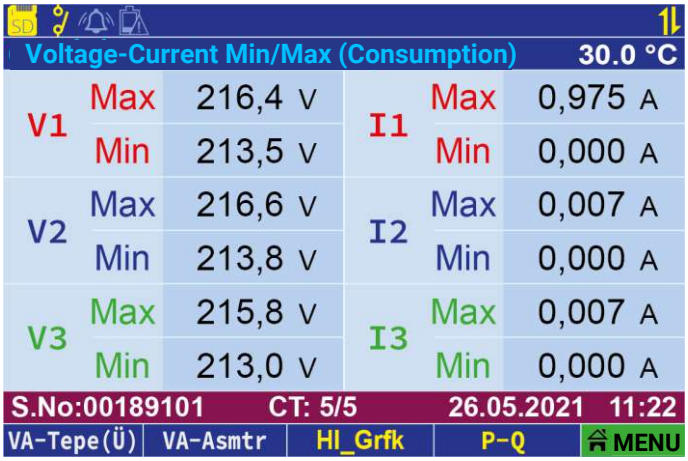
The left side of the screen shows the fund value of the voltage for each phase, the angle differences between the phase voltages and the % voltage asymmetry value. The right part of the screen shows the fund value of the current for each phase, the angle differences between the phase currents and the % current asymmetry value.



When the VA-Tepe(T) button is pressed while on this screen, it is possible to switch to the **Voltage Current Min Max** (Consumption) sub-screen.

3.2.3. Voltage-Current Min/Max (Consumption)

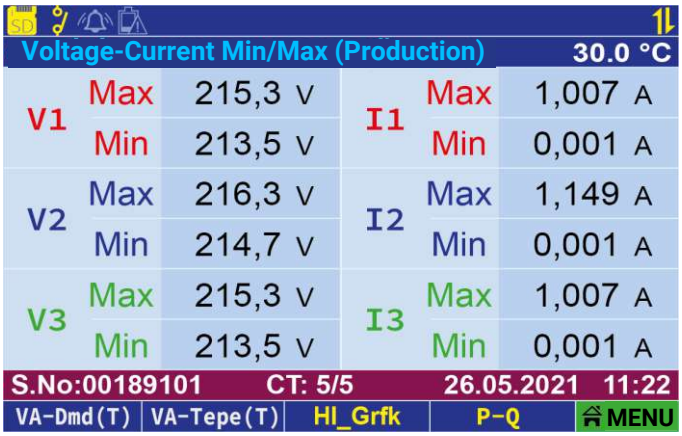
The screen on the left shows the minimum and maximum consumption values of the current and voltage values of each phase separately.



By pressing the VA-Tepe(Ü) button on this screen, you can switch to the Voltage Current Max (Production) sub-screen.

3.2.4. Voltage-Current Min/Max (Production)

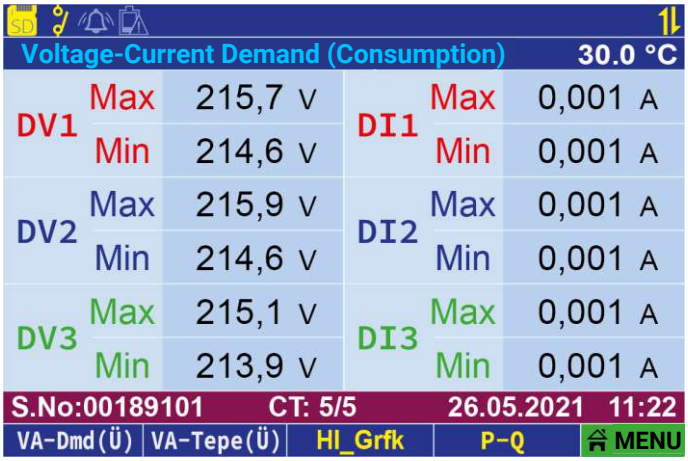
The screen on the left shows the minimum and maximum production values of the current and voltage values of each phase separately.



By pressing the VA-Dmd(T) button on this screen, you can switch to the **Voltage Current Demand** (Derivation) sub-screen.

3.2.5. Voltage-Current Demand (Consumption)

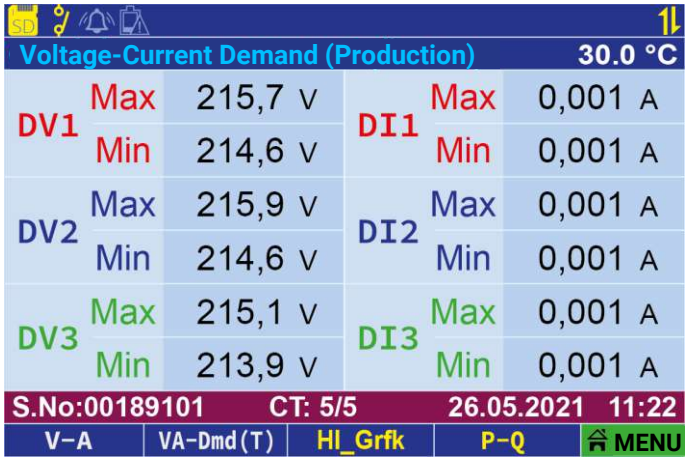
On the next screen, the minimum and maximum consumption values of current and voltage demands are shown separately for each phase.



By pressing the VA-Dmd(Ü) button on this screen, you can switch to the Voltage-Current Demand (Production) sub-screen.

3.2.6. Voltage-Current Demand (Production)

The screen on the left shows the minimum and maximum values of current and voltage demands for each phase for production values.



3.3. Active - Reactive Powers Main Screen

The left side of the screen shows active powers for each phase and total imported and exported active powers separately. On the right side of the screen, reactive powers, total import and export reactive powers are shown separately for each phase. The inductive - capacitive status of the powers is expressed by the coil and capacitor drawn next to the values. This main screen has many sub screens. You can switch to the sub screens with the white buttons on the left side.

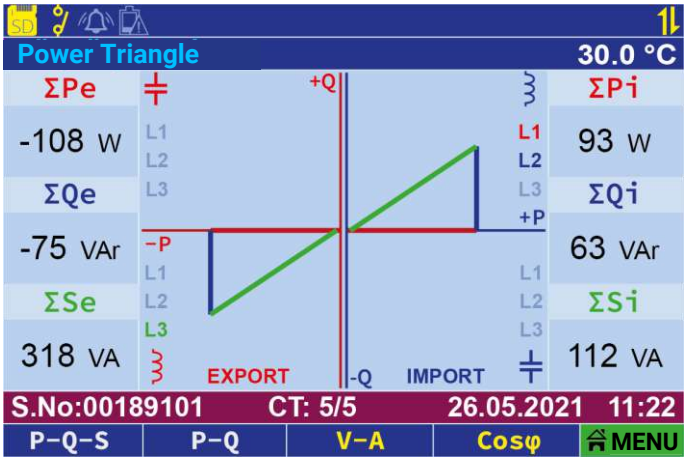
While on this screen, you can switch to the **Power Triangle** sub-screen by pressing the Power Grfk. button.

3.3.1. Power Triangle

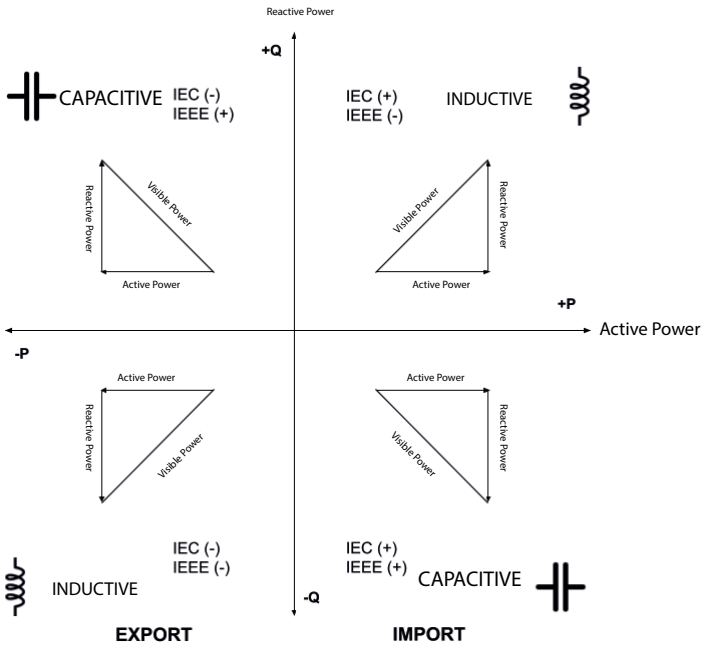
The power triangle graph is shown in the center of the next screen. In the power triangle, red thick lines are active, blue thick lines are reactive and green thick lines are visible power.

The graph is divided into two parts by the export and import axes and consists of four regions. The left side of the graph shows the export and the right side the import values. The export part with the red line is the part where the export power triangle will be drawn for inductive and capacitive values. The import section with the blue line is where the import power triangle will be drawn for inductive and capacitive values.

In the four regions in the graph, there are "L1", "L2", "L3" expressions indicating the state of the phases in each region. For example, while L1-L2 phases are operating in the inductive import region, L3 phase is operating in the capacitive export region.



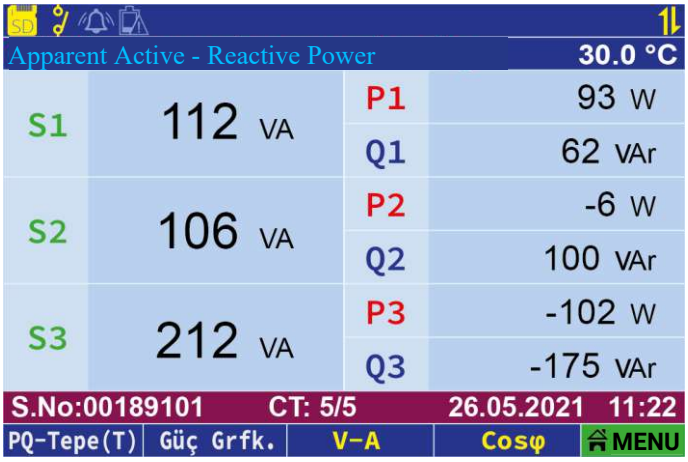
In places outside the graph, total active, reactive and apparent powers are shown for export values on the left side of the screen. On the right side of the screen, total active, reactive and apparent powers are shown for import values.



When the P-Q-S button is pressed on this screen, it will shoe the Apparent Active - Reactive Power sub screen.

3.3.2. Apparent Active - Reactive Power

Apparent Active -The left side of the screen shows the apparent powers for each phase. The right side of the screen shows the active and reactive powers for each phase.



While on this screen, pressing the PQ-Tepe (T) button switches to the **Active Reactive Min/Max** (Consumption) sub-screen.

3.3.3. Active - Reactive Power Min/Max (Consumption)

At the left side of the screen, minimum and maximum active powers of each phase for consumption values are shown separately. The right side of the screen shows the reactive power of each phase separately for consumption values. In the reactive power display, capacitance and inductive symbols are drawn in front of the value according to the capacitive or inductive status of the minimum and maximum values of the phase.

While on this screen, pressing the PQ-Tepe (Ü) button switches to the **Active Reactive Min/Max** (Production) sub-screen.

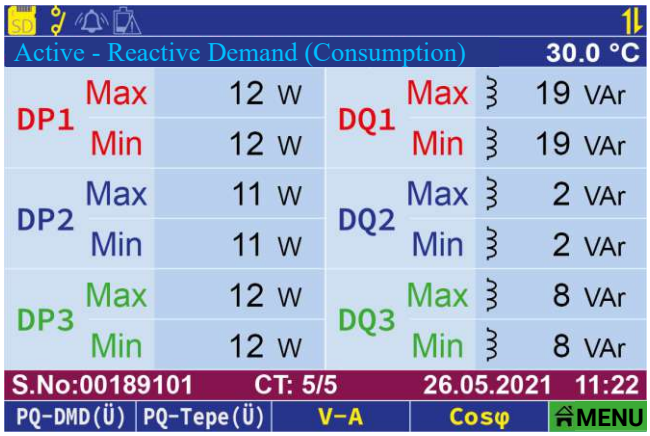
3.3.4. Active - Reactive Power Min/Max (Production)

At the left side of the screen, minimum and maximum active powers of each phase for Production values are shown separately. The right side of the screen shows the reactive power of each phase separately for Production values. In the reactive power display, capacitance and inductive symbols are drawn in front of the value according to the capacitive or inductive status of the minimum and maximum values of the phase.

By pressing the PQ-Tepe(T) button while on this screen, you can switch to the Active Reactive Min/Max (Consumption) sub-screen.

3.3.5. Active - Reactive Demand (Consumption)

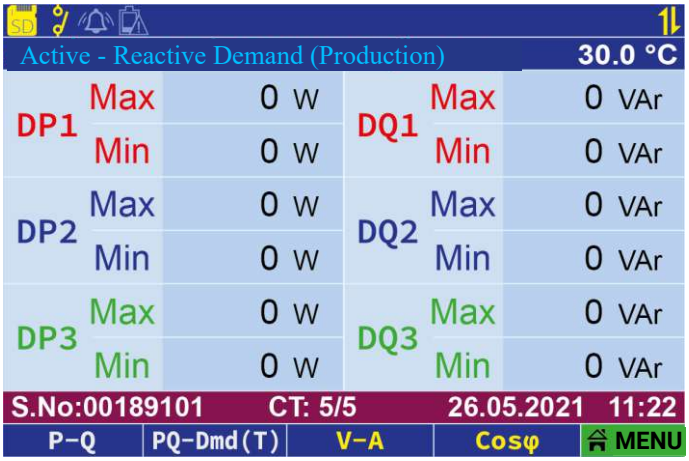
The left side of the screen shows the active maximum and minimum demands of each phase separately for consumption values. The right side of the screen shows the reactive maximum and minimum demands of each phase separately for consumption values.



By pressing the PQ-Dmd(Ü) button on this screen, you can switch to the Active - Reactive Demand (Production) sub-screen.

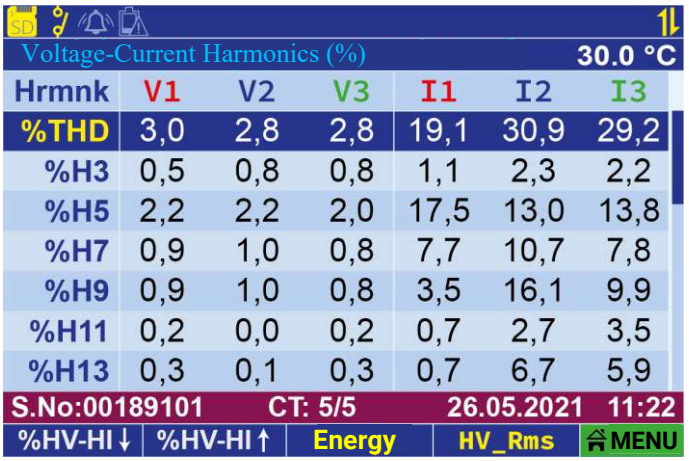
3.3.6. Active - Reactive Demand (Production)

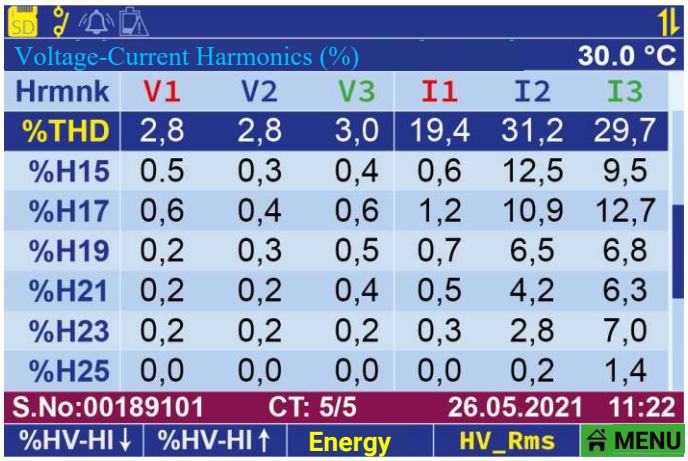
The left side of the screen shows the active maximum and minimum demands of each phase separately for production values. On the right side of the screen, reactive maximum and minimum demands of each phase separately for production values are shown.

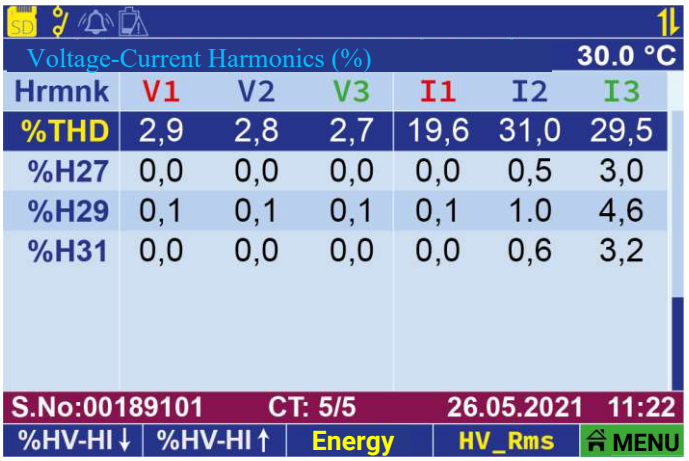


3.4.Voltage-Current Harmonics (%)

The screens on the side and below list the harmonic values for current and voltage in %. The device is capable of measuring up to the 63rd harmonic. The user can set the harmonics and the number of harmonics to be listed in the menu. If the user selects all harmonics from the menu, all harmonics are listed on this screen.



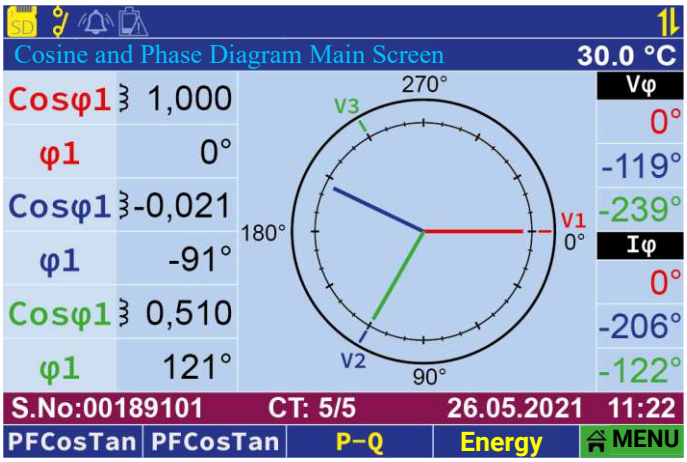




3.5. Cosine and Phase Diagram Main Screen

The next screen shows the smart phasor diagram.The smart phasor diagram allows the user to observe the phase angles between current and voltage.

The phasor diagram has a thick circle on the outside and a thin circle inside it. The short thick and colored sticks between these circles show the angles of the phase voltages. The colored sticks inside the inner circle show the angles of the phase currents. At the same time, the lengths of these current sticks change dynamically based on the size of the current. In this way, the user can understand the size of the current values of each phase from the lengths of the current sticks. To help with angle reading, there are black thick lines at 30° intervals and short thin lines at 10° intervals on the inner circle of the diagram. This allows the user to better observe the angles by looking at these lines.



While on this screen, you can switch to the **Power Factor - Cosϕ - Tanϕ** sub-screen by pressing the **PFCosTan** button.

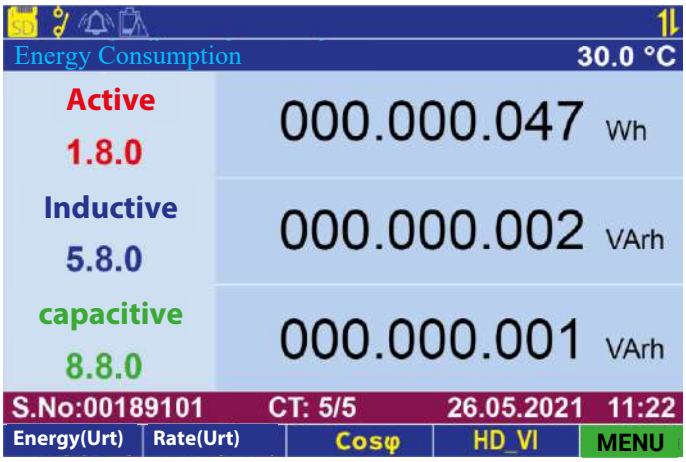
3.5.1. Power Factor

On the right side of the screen, power factors are shown for each phase separately. The left side of the screen also shows the cosine and tangent values for each phase separately.

3.6. Energy Indices

3.6.1. Energy Consumption

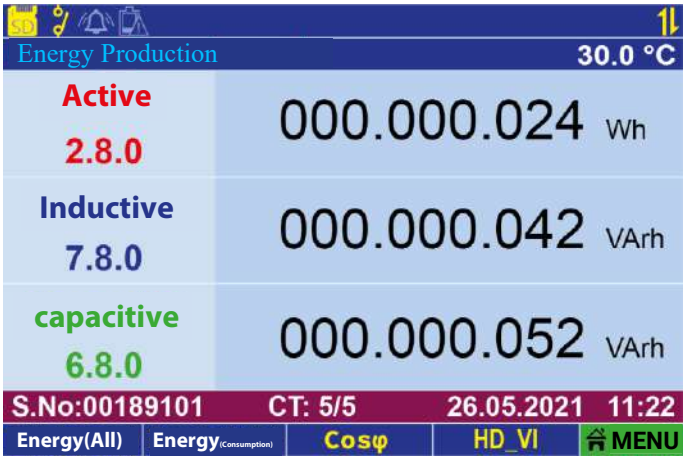
The screen on the left shows the active, inductive and capacitive energy values consumed. OBIS codes of the consumed energies are also shown on this screen.



While on this screen, you can switch to the Energy Productions sub-screen by pressing the Energy (Urt.) button.

3.6.2. Energy Production

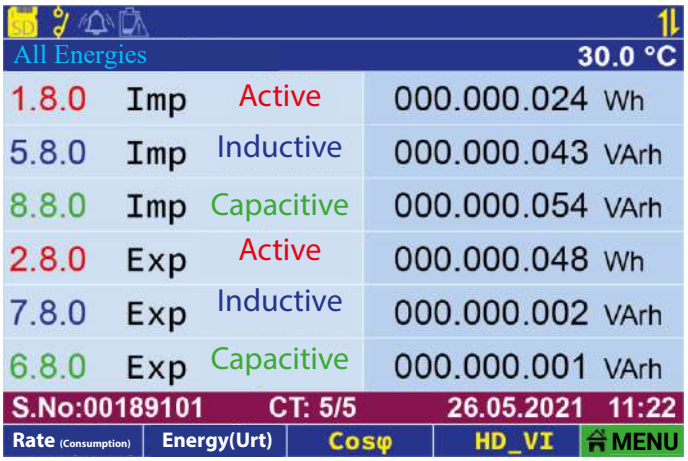
The next screen shows the active, inductive and capacitive energy values generated. OBIS codes of the generated energies are also shown on this screen.



While on this screen, you can switch to the All Energies sub-screen by pressing the Energy (All) button.

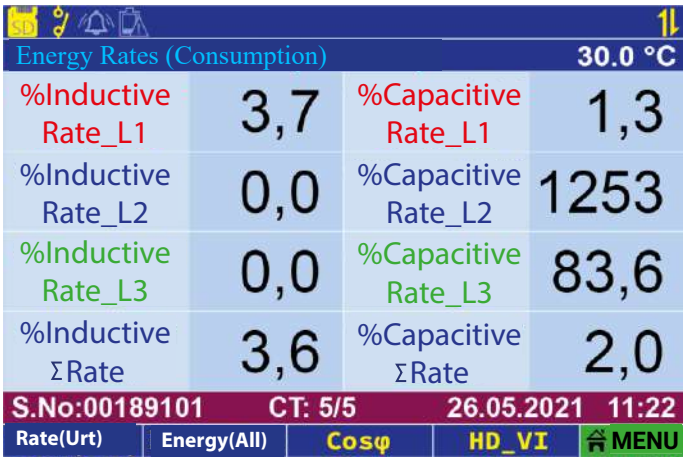
3.6.3. All Energies

The next screen shows the active, inductive and capacitive energy values produced and consumed. OBIS codes of the generated and consumed energies are also shown on this screen.



3.6.4. Energy Rates (Consumption)

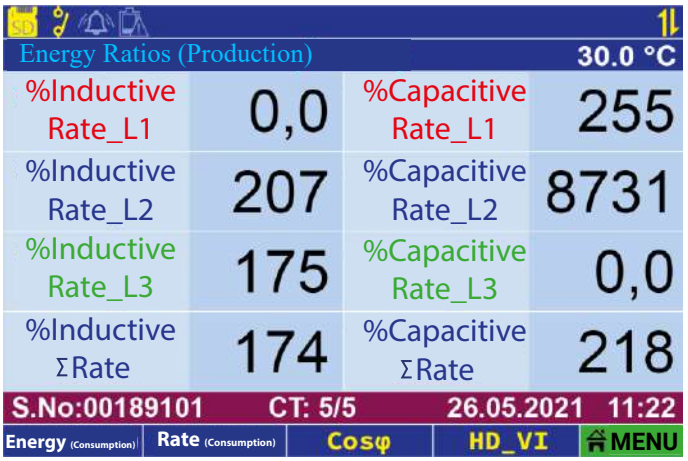
The next screen shows the inductive and capacitive energy consumed separately for each phase.



While on this screen, you can switch to the Energy Ratios (Production) sub-screen by pressing the Ratio (Production) button.

3.6.5. Energy Ratios (Production)

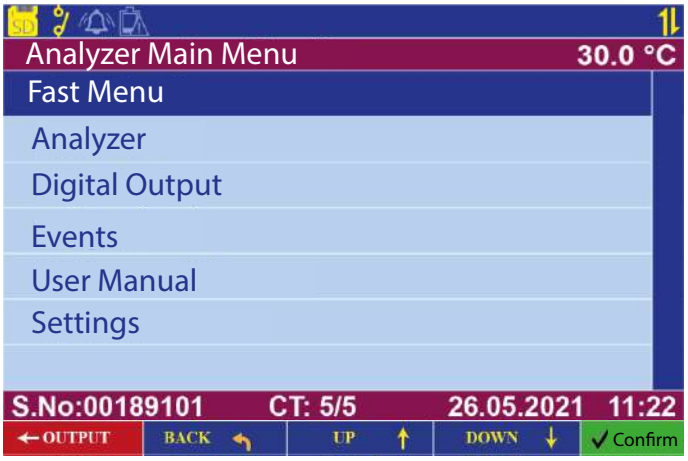
The next screen shows the ratios of inductive and capacitive energy produced separately for each phase.



4. ANALYZER MAIN MENU

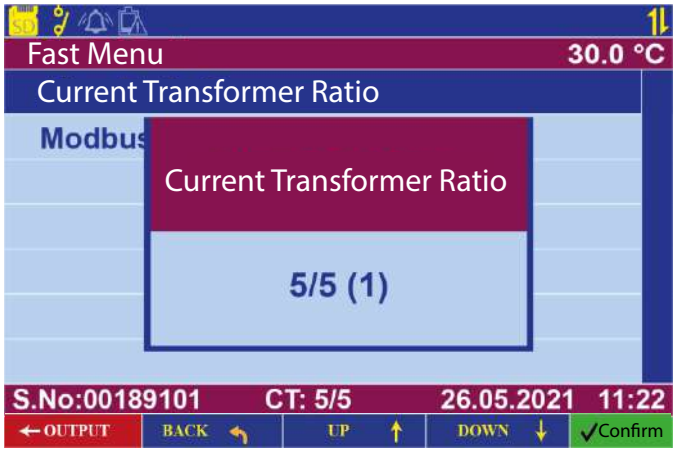
4.1. Fast Menu

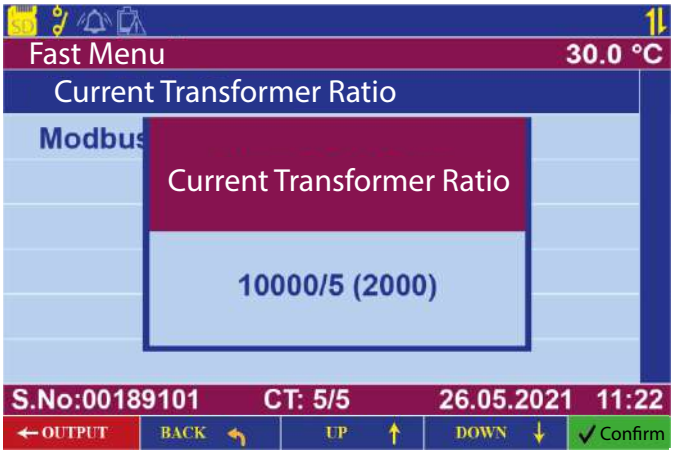
This menu can be used to quickly change the current transformer ratio and modbus address of the device.



4.1.1. Current Transformer Ratio

In this menu, the current transformer ratio is set.

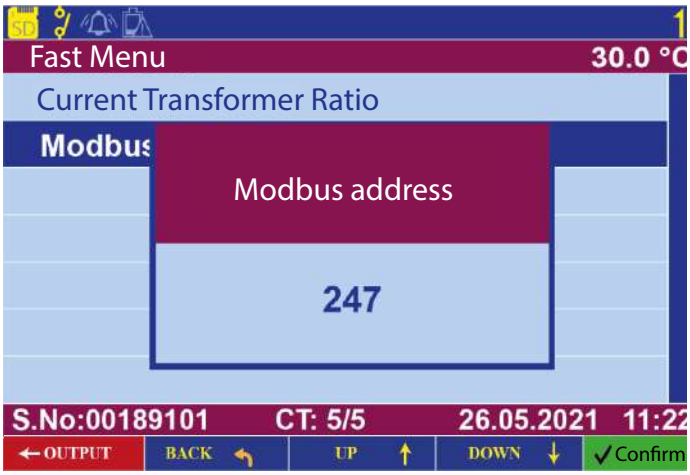




Within the current transformer window, the current transformer ratio will flash. The current transformer ratio can be set to the required value by using the up and down arrow keys. By pressing the Confirm button, the requested value is confirmed.

4.1.2. Modbus Address

In the communication settings menu, settings related to Modbus communication of the device are made. Modbus address can take values between 1 - 247. After selecting the required value, it is confirmed by pressing the Confirm button.



NOT: The device's factory default Modbus address is 1.

4.2 Analyzer

4.2.1. Harmonics

MENU > Analyzer > Harmonics

Profile

Between 1-13 Single: Demonstration of single harmonics of current and voltage between 1 and 13

Pair between 1-13: Demonstration of pair harmonics of current and voltage between 1 and 13

All between 1-13: Demonstration of all harmonics of current and voltage between 1 and 13

Between 1-13 Single: Demonstration of single harmonics of current and voltage between 1 and 31

Pair between 1-13: Demonstration of pair harmonics of current and voltage between 1 and 13

All between 1-13: Demonstration of all harmonics of current and voltage between 1 and 13

Between 1-63 Single: Demonstration of single harmonics of current and voltage between 1 and 63

Pair between 1-63: Demonstration of pair harmonics of current and voltage between 1 and 63

All between 1-63: Demonstration of all harmonics of current and voltage between 1 and 63

All Harmonics: Demonstration of all harmonics of current and voltage

Detail: In case you want to create a special harmonic profile, this option should be selected. By selecting this option, the harmonic values to be measured will be the harmonics set via the detail menu.

Detail

If detail is selected via the Profile menu, the harmonics to be measured will be monitored according to the limit and analysis values selected via this menu.

Limit: The limit of the harmonics to be measured can be set via this menu.

Analysis: It is possible to select whether the harmonics selected via the Limit menu are single, double or all.

4.2.2. Delete Energies

Menu > Analyzer > Energies

If you want to reset the energy values, select the **"Yes"** option with the direction buttons and confirm this option with the Confirm button. Thus, the energies are deleted.

4.2.3. Delete Peak Values

Menu > Analyzer > Delete Values

This is the menu where minimum and maximum values of electrical quantities are reset. If you want to reset the peak values, select the "Yes" option with the direction buttons and confirm this option with the Confirm button. In this way, Peak values are deleted.

4.2.4. Demands

Menu > Analyzer > Demands

This is the menu where the periods of Demand values are set and the values are reset.

Demand Period : Demand period can be set between 1-60 minutes. The setting process is done with the direction buttons. The required value is selected with the Confirm button.

NOT: The factory default demand period of the device is 15 minutes.

Delete Demands: If you want to reset the demand values, select "Yes" option with the direction buttons and confirm this option with the Confirm button. Thus, demand values are deleted.

4.2.5. SD Card

Menu > **Analyzer** >SD Card

In case an SD card is inserted into the SD card slot on the network analyzer, the SD card symbol on the TFT screen is colored yellow. After the SD card is inserted, if required, the SD card occupancy rate can be checked via the menu or the SD card can be formatted so that all files inside the SD card can be deleted. In order to activate the periodic recording feature of the device, the SD card recording feature can be started by setting the relevant parameters via the menu. If the SD card recording is in progress successfully, the SD card symbol on the screen will turn green/yellow every second. If there is a problem during SD card recording or the SD card memory is insufficient, this symbol will be colored red.

NOT: In order for the SD card feature to work smoothly, it is recommended that the SD card to be inserted by the user be in FAT32 format.

The SD card periodic recording process is carried out in csv extension for the period and duration set via the menu. When the user wants to observe the recorded values, he/she can remove the SD card and insert it into a computer and look at the values through the excel program.

The electrical quantities to be recorded to the SD card can be set by the user. According to the electrical quantities selected, the file name created for recording to the SD card changes.

The files created on the SD card and their contents are described below.

Temel.csv

Harmonic Profile to Show
NH: No Harmonic

Unit of Quantities Displayed

Zaman (A1-NH)	V1 (0.1V)	V2 (0.1V)	V3 (0.1V)	V12 (0.1V)	V23 (0.1V)	V31 (0.1V)	I1 (mA)	I2 (mA)	I3 (mA)	Vort (0.1V)	F1 (0.01Hz)	F2 (0.01Hz)	F3 (0.01Hz)
15.09.21-09:44:11:430	2232	2230	2232	2	2	0	3	3	3	2231	4999	4998	4999
15.09.21-09:44:12:430	2233	2231	2233	2	2	0	3	3	3	2232	4999	4998	4998
15.09.21-09:44:13:430	2233	2231	2233	2	2	0	3	3	3	2232	4999	4999	4999
15.09.21-09:44:14:430	2233	2232	2234	1	2	1	3	3	3	2233	4999	4998	4999
15.09.21-09:44:15:430	2232	2231	2233	1	2	1	3	3	3	2232	4999	5000	4999
15.09.21-09:44:16:490	2233	2231	2233	2	2	0	3	3	3	2232	4999	4999	5000
15.09.21-09:44:17:430	2233	2232	2234	1	2	1	3	3	3	2233	4999	5000	5000
15.09.21-09:44:18:430	2232	2230	2232	2	2	0	3	3	3	2231	5000	5000	4999
15.09.21-09:44:19:430	2233	2231	2233	2	2	0	3	3	3	2232	4999	5000	5000

Time Information

Harmonic.csv

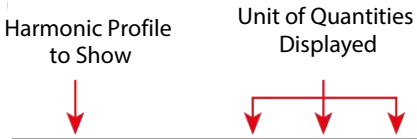
Harmonic Profile to Show
HT31: Single Harmonics up to 31st Harmonic

Unit of Quantities Displayed

Zaman (A1-HT31)	L1-HI3 (%0.1)	L2-HI3 (%0.1)	L3-HI3 (%0.1)	L1-HI5 (%0.1)	L2-HI5 (%0.1)	L3-HI5 (%0.1)	L1-HI7 (%0.1)	L2-HI7 (%0.1)	L3-HI7 (%0.1)	L1-HI9 (%0.1)
15.09.21-09:43:57:890	2000	571	0	1091	727	0	1091	104	0	1130
15.09.21-09:43:58:890	2000	571	0	1091	727	0	1091	104	0	1130
15.09.21-09:43:59:890	2000	571	0	1091	727	0	1091	104	0	1130
15.09.21-09:44:00:890	2000	571	0	1091	727	0	1091	104	0	1130
15.09.21-09:44:01:890	2000	571	0	1091	727	0	1091	104	0	1130

Time Information

Basic and Harmonic.csv



Zaman (A1-HT31)	V1 (0.1V)	V2 (0.1V)	V3 (0.1V)	V12 (0.1V)	V23 (0.1V)	V31 (0.1V)	I1 (mA)	I2 (mA)	I3 (mA)	Vort (0.1V)	F1 (0.01Hz)	F2 (0.01Hz)	F3 (0.01Hz)	PF1 (0.001)	PF2 (0.001)	PF3 (0.001)
15.09.21-09:43:44:150	2233	2231	2233	2	2	0	3	3	3	2232	5000	5000	5000	0	0	0
15.09.21-09:43:45:150	2233	2232	2234	1	2	1	3	3	3	2233	5000	4999	5000	0	0	0
15.09.21-09:43:46:150	2233	2231	2233	2	2	0	3	3	3	2232	4999	4999	4999	0	0	0
15.09.21-09:43:47:150	2235	2233	2235	2	2	0	3	3	3	2234	5000	5000	5000	0	0	1000
15.09.21-09:43:48:150	2236	2234	2236	2	2	0	3	3	3	2235	5000	5000	5000	0	0	0
15.09.21-09:43:49:150	2233	2232	2234	1	2	1	3	3	3	2233	5000	5001	5000	0	0	0
15.09.21-09:43:50:150	2233	2231	2233	2	2	0	3	3	3	2232	5000	5000	5001	0	0	0

Time Information

Start Record: The SD card starts the periodic recording process with the parameters set.

Stop Recording: Safely stops the previously started SD card periodic recording process.

Recording Period: The SD card is used to set the period value required for periodic recording. his parameter can be set between 500ms and 25 seconds. For example, when this value is set to 1 second, the SD card periodic recording process occurs every second.

Total Recording Time: This parameter is used to set how long the SD card periodic recording will continue in total in hours. This parameter can be set between 1 hour and 250 hours. If this parameter is set to 1 hour, periodic recording will stop automatically after 1 hour.

Sizes to be recorded: The electrical parameters to be periodically recorded on the SD card are selected with this setting. This parameter cannot be changed while recording is in progress. There are 3 selections on this parameter screen.

- Basic Measurements
  - Phase/neutral voltage, Phase/phase voltage, Phase currents, Average voltage, Phase frequencies, PF, Active power, Reactive power, THDV, THDI, Current and voltage angles
- All Harmonics
  - Harmonic values set via Menu Analyzer/Harmonics screen
- All Measurements
  - All quantities in Basic Measurements and All harmonics

Remove the SD Card: To safely remove the SD card. This option cannot be operated while the

SD Card Detection: Re-detects the SD card if the SD card detect option was previously selected.

Format SD card: In case you want to delete all the information on the SD card, this format function can be executed. This function cannot be executed while the SD card is recording. When this option is selected, all information on the SD card will be deleted. This process takes some time.

SD Card Memory: The memory status of the inserted SD card can be displayed on this screen.

4.3. Digital Output

Menu > Digital Output

This is the menu where the settings of the optocoupled digital output on the analyzer are made. The settings related to the digital output are given in the sub-headings.

4.3.1. Select Size

Menu > Digital Output > Select Size

In this section, the user selects the parameter to be associated with the digital output.

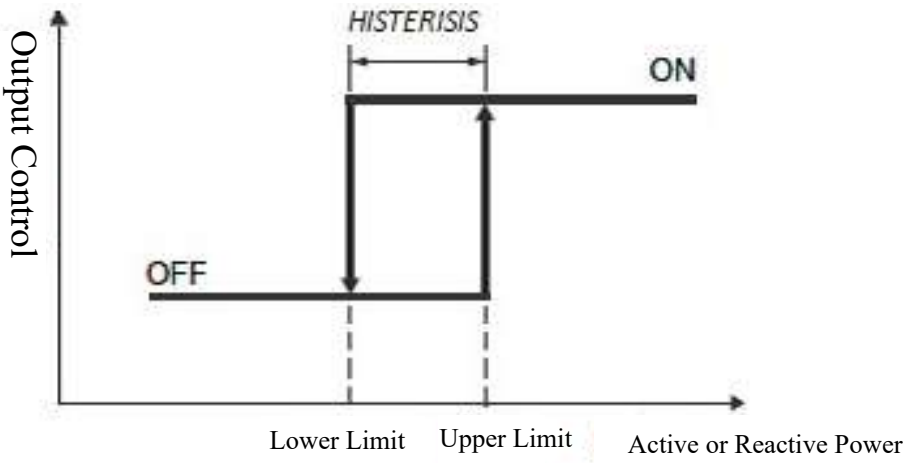
Reactive Power: Output controls are based on reactive power. When the reactive power parameter is selected, the upper limit point represents the magnitude (-999 / 999,9) required for the analyzer output to be "ON". If the reactive power value is higher than the upper limit value, the analyzer output turns "ON" and the relay symbol on the information sticker turns off and turns green. If the value is less than the lower limit value, the relay switches to "Off".

NOT: Values are compared in absolute value.

NOT: The values entered are in KiloWatt and KiloVAr.

Active Power: Output controls are based on active power. When the active power parameter is selected, the upper limit point refers to the magnitude (-999 / 999.9) required for the analyzer output to be "ON". If the active power value is higher than the upper limit value, the analyzer turns the output "ON" and the relay symbol on the information bar turns off and turns green. If the measured active power value falls below the lower limit value while the output is ON, the output turns "OFF".

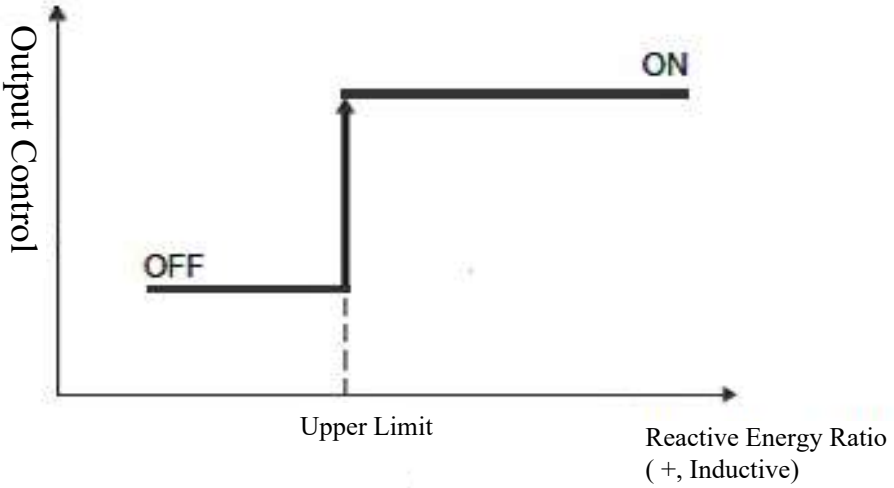
NOT: Values are compared in absolute value.



Rate: Output controls are based on energy ratios. When the ratio parameter is selected, the upper limit point represents the magnitude (0 - 999.9%) required for the analyzer output to be "ON". If the energy ratios are higher than the upper limit value, the analyzer output will turn "ON" and the relay symbol on the information stick will turn off and turn green.

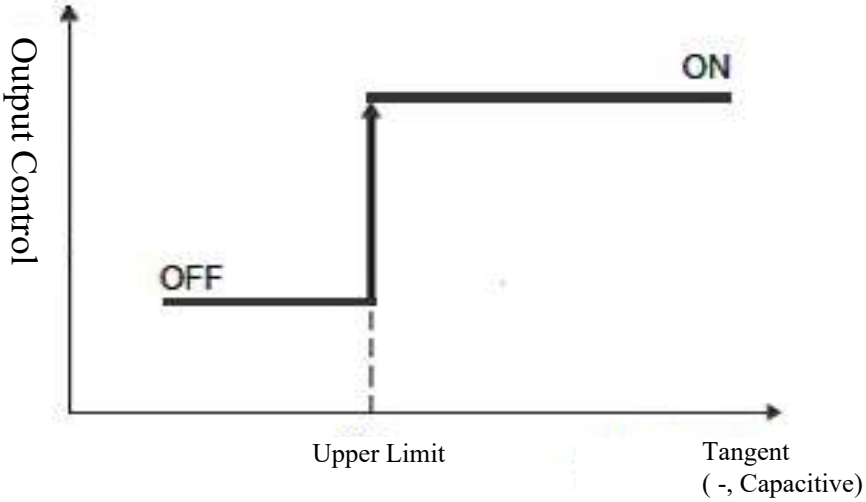
📌NOT: The values displayed on the screen are in percent.

📌NOT: "Upper limit value" indicates the "+", inductive value of the reactive energy ratio, while "lower limit value" indicates the "-", capacitive value.

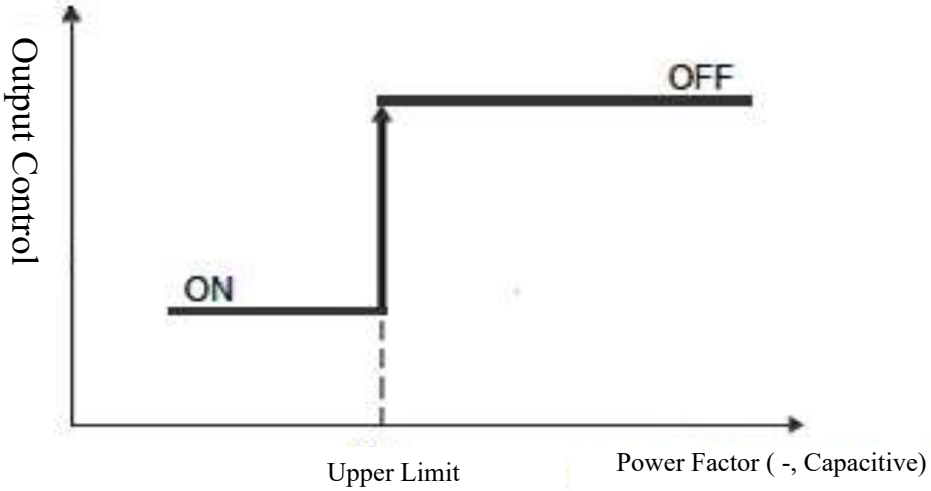


Tangent: Output controls are made through the tangent parameter. When the tangent parameter is selected, the lower limit point represents the magnitude (between 0 - 99.99 tan) required for the analyzer output to be "ON". If the tangent value is higher than the upper limit value, the analyzer output turns "ON" and the relay symbol on the information bar turns off and turns green.

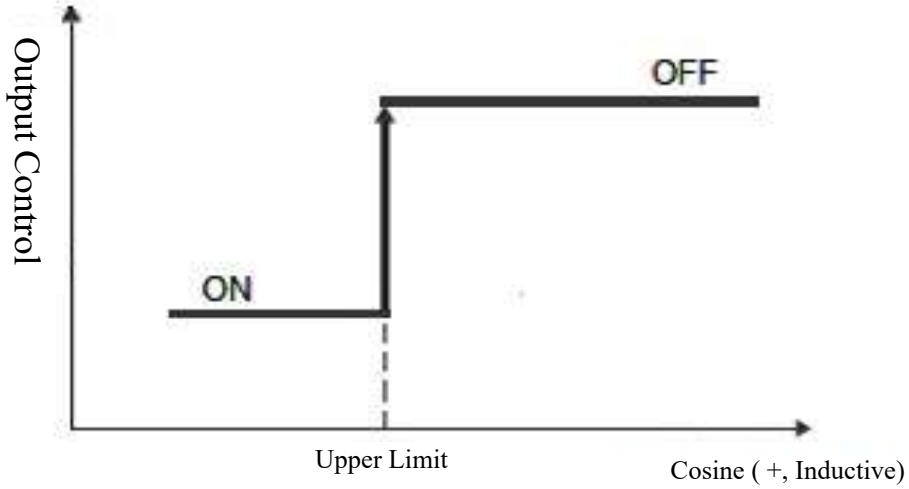
📌NOT: Upper limit value indicates the "+", inductive value of the Tangent. Lower limit value "-" indicates the capacitive value of the tangent.



Power Factor: Output control is made through the power factor (PF) parameter. When the power factor parameter is selected, the lower limit point represents the magnitude (between 0.75 and 1) required for the analyzer output to be "OFF". If the power factor value is less than the upper limit value, the analyzer output will be "ON" and the relay symbol in the information bar will be off and light green. If it is higher than the upper limit value, the output is "OFF".



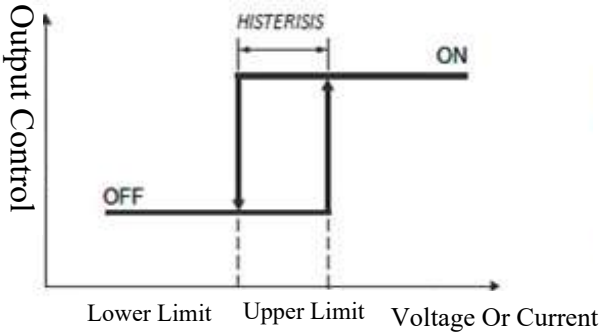
Cosine: Output controls are made through the cosine(cos) parameter. When the cosine parameter is selected, the lower limit point represents the magnitude (between 0.75 and 1) required for the analyzer output to be "OFF". If the cosine value is less than the upper limit value, the analyzer output will be "ON" and the relay symbol on the information stick will turn off and light green. If it is higher than the upper limit value, the output is "OFF".



Current: Output controls are made through current parameter. If the current parameter is selected, the upper limit value point expresses the magnitude (0-9999) required for the output to be "ON". If the current value is higher than the upper limit value, the analyzer turns the output "ON" and the relay symbol on the information bar turns off and turns green. If the current value is less than the lower limit value, the analyzer output turns "OFF" and the relay symbol on the information stick turns on and goes out.

📌NOT: The values entered are in Amps and Volts.

Voltage: Output control is made through the voltage parameter. If the voltage parameter is selected, the upper limit value point expresses the magnitude (between 0-9999) required for the output to be "ON". If the voltage value is higher than the upper limit value, the analyzer turns the output "ON" and the relay symbol on the information bar turns off and the relay symbol turns green. If the voltage value is less than the lower limit value, the analyzer output turns "OFF" and the relay symbol on the information stick turns on and goes out.



The upper limit and lower limit point shown in the figure are the points current and voltage points. If selected from the "select phase" menu mode (e.g. L1 phase) is higher than the upper limit value, the analyzer makes the output "ON". If the measured value is less than the lower limit value the analyzer makes the output "OFF".

Remote Control: Output controls are made remotely, through Modbus (communication).

None of them: For output control, no parameter is selected.

4.3.2. Select Phase

Menu > Digital Output > Select Phase

From the "Select Phase" menu, the selected output shows what the control parameter should operate on.

- L1 Phase Only
- L2 Phase Only
- Only L3 Phase
- Any Phase
- Three Phase Averaging

4.3.3. Invert Output

Menu > Digital Output > Invert Output

If you enter the "Invert Output" menu and select "Yes", the digital outputs are set to the opposite of the current state.

4.3.4. Upper Limit Value

Menu > Digital Output > Upper Limit Value

This is the tab where the alarm upper limit value is entered.

4.3.5. Lower Limit Value

Menu > Digital Output > Lower Limit Value

This is the tab where the alarm lower limit value is entered.

4.3.6. Start-up Time

Menu > Digital Output > Start-up Time

In case the relevant electrical values exceed the upper limit value, the time to wait for output is determined.

4.3.7. Deactivation Time

Menu > Digital Output > Deactivation Time

In case the relevant electrical values fall below the lower limit value, the time to wait for the output to turn OFF is determined.

4.4. Events

Menu > Events

This is the menu where settings such as listing and deleting alarm conditions on the device and activating the alarm icon are made.

4.4.1. List

Menu > Events > List

This section lists the date and time of the alarm conditions that occur on the device and how many times they occur.

4.4.2. Alarm Icon

Menu > Events > Alarm Led

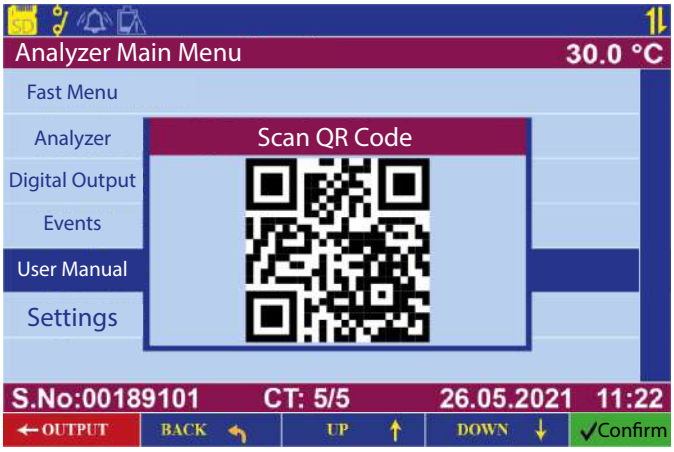
In case of an alarm occurring during the operation of the device, this option must be set to " Activated" when the alarm symbol is to be colored red.

4.4.3. Delete

Menu > Events > Delete

The alarm conditions that occur are deleted.

4.5. User Manual



Menu > User Manual

This menu displays a QR code that directs you to the website where the user manual is available.

4.6. Settings

Menu -> Settings

The Settings menu is the menu where the settings of the device are made.

4.6.1. Measurement & Transformers

Menu > Settings > Measurement & Transformers

In this menu, the current transformer ratio is set to the required value between 5/5 - 10000/5. In the current transformer window, the present current transformer ratio will flash. Here, the current transformer ratio can be set to the required value by using the up and down arrow keys. The requested value is confirmed by pressing the confirm button.

Voltage Transformers: It is the menu where line voltage and measurement voltage settings are made.

Line Voltage: In this menu, the line voltage is set to the required value in the range 173 V - 46000 V. In the line voltage window, the current line voltage values will flash. The line voltage can be set to the required value by using the up and down arrow keys. The required value is confirmed by pressing the confirm button.

Measuring Voltage: In this menu, the measuring voltage is set to the required value in the range 22 V - 725 V. In the measurement voltage window, the current measurement voltage values will flash. The measurement voltage can be set to the required value by using the up and down arrow keys. The required value is confirmed by pressing the Confirm button.

4.6.2. Modbus Settings

Menu > Settings >Modbus Settings

In the Modbus settings menu, the settings related to the Modbus communication of the device are made.

Modbus Address: The device is assigned a different Modbus address from other connected devices. The values are changed between 0-247 with the direction keys and the required address can be given to the device with the Confirm key.

Modbus Speed: The Modbus communication speed (Baud Rate) of the device is determined. The speeds can be changed with the direction keys and the required communication speed can be selected with the Confirm button.

If **"4800"** is selected, the communication speed is 4800 bps.

If **"9600"** is selected, the communication speed is 9600 bps.

If **"19200"** is selected, the communication speed is 19200 bps.

If **"38400"** is selected, the communication speed is 38400 bps.

If **"57600"** is selected, the communication speed is 57600 bps.

If **"115200"** is selected, the communication speed is 115200 bps.

Reading Protection: If you enter the menu and select "Yes", the user is asked for a password to read the device remotely via Modbus communication.

4.6.3. Screen Settings

Menu > Settings > Screen Settings

Password Protection: In case you want to restrict access to the menus of the device, this option must be activated. This way a password is required to access certain menus.

Access Level: Enables encrypted activation of access levels.

Waiting Time: The required time for the device's screen saver to start working is selected with this option. This parameter can be set between 1-30 minutes.

Brightness Level: When you want to change the brightness setting of the TFT screen on the device, you can change the brightness value in % from this option.

4.6.4. Date & Time

Menu > Settings > Date & Time

If you want to set the date and time of the device, you can change the related date and time parameters via this menu.

4.6.5. Expert Settings

Menu > Settings > Expert Settings

Factory Settings: Enables the device to return to factory settings.

Device Reset: Enables the device to be reset.

Energy Period: This is the menu where the energy period of the device is set.

Quality Control: If the device has failed the quality control test during production, it is used to re-perform the quality control test.

4.6.6. Device Information

Menu > Settings > Device Information

Serial Number: If it is required to observe the serial number of the device, the serial number can be viewed via this menu.

Software Version: This is the screen where the version of the device's software is monitored.

Hardware Version: This is the screen where the hardware version of the device is observed.

Language: When you want to change the language of the device, you can select Turkish/English language on this screen.