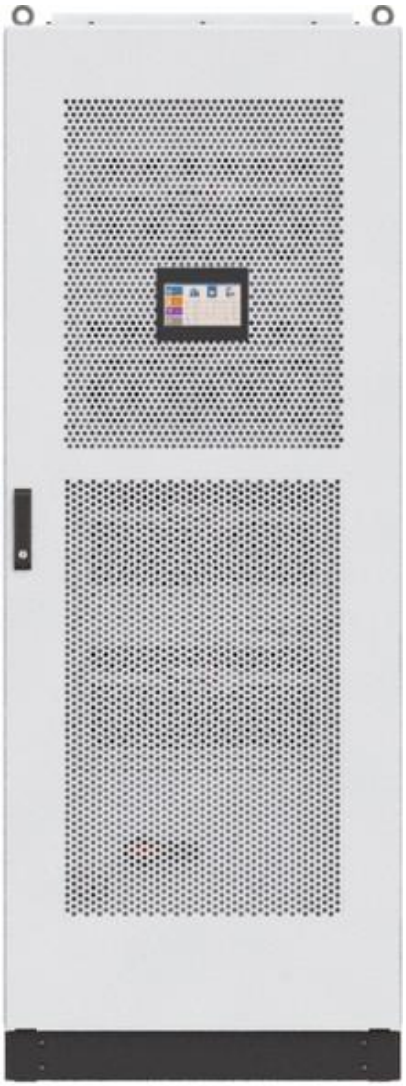
STATIC VAr GENERATOR

USER GUIDE



ELEKTRA

Table of Context

1. Information about Guide

1.1. Target Audience

The procedures specified in this document should only be performed by professionals or authorized personnel.

People who follow protocol must be competent in the mentioned attributes below:

- Have information about structure of device and how to be used.
- The operation of how basic electronic components are made.
- Installation and commissioning of electrical devices
- Understanding specified warnings and commands
- Knowing the dangers that may be encountered in the installation of electrical equipment and have information about what can be done when these situations occur.Security Measures

2. Security Instruction

WARNING

Read the user manual before using the device. There is a risk of injury and damage if the warnings marked with this symbol in the instructions for use are not observed, followed, or the specified point is not applied correctly.

WARNING

Incorrect usage and installation of the device can cause damage to the equipment and pose a life-threatening risk to personnel. Interfering with the device under power can result in electric

shock, fatalities, or serious health issues. Improper installation or service errors can also lead to a fire hazard.

WARNING

The installation, adjustment, operation, and maintenance of the device should only be carried out by competent technical personnel. Before proceeding with any actions related to the device, please read this guide thoroughly. Failure to do so can result in severe physical injury and loss of life.

WARNING

Only qualified technical personnel who understand potential hazards should make changes to the device. Any modifications can cause unstable operation of the equipment. Failure to comply with these warnings can damage the equipment and create a risk of injury. While every effort has been made to provide accurate and sufficient information in this document, ELEKTRA cannot be held responsible for any consequences arising from the implementation of these operating instructions.

DANGER

Any contact with the copper busbar, contactor, or terminal inside the device or connected to the electrical network can cause fire or fatal electric shock. Do not touch any terminals or conductors connected to the electrical network.

DANGER

The device contains capacitors that store high DC voltage even after the power is cut off. After disconnecting the power to the device, wait at least sixty (60) minutes for the DC bus capacitors to discharge. The DC bus capacitors may be charged above 800V. Before intervening in the device, use a voltmeter to check the voltage and ensure that the DC bus capacitors are discharged. Failure to take this precaution can result in serious physical injury and loss of life.

The device contains AC and DC capacitors. Before performing installation and maintenance procedures, short-circuit the phase and neutral terminals to the ground terminal and wait for at least sixty (60) minutes.

Ensure that the secondary of current transformers is short-circuited before intervening in them. Never open the secondary of a current transformer under load.

Always use protective gloves and safety glasses while working on the electrical installation.

Strictly follow the grounding instructions for the device. Improper grounding of the device can cause the device chassis to be exposed to the mains voltage in case of any faults that may occur inside the device. In the event of simultaneous contact with the device chassis and ground, there is a serious risk of physical injury and loss of life.

2.1. More Information

After this page, ELEKTRA ELEKTRONİK SAN. VE TİC. Inc. is abbreviated as ELEKTRA.

You can get support from for https://www.elektra.com.tr or elektra@elektra.com.tr problems or processes that you think are not included in this document.

3. Storage, Lifting and Transport

The device should be stored in accordance with the recommendations below.

- Avoid deploying the device on an unsuitable surface.
- Do not store in an external environment. Avoid humid environments or environments where there is a risk of splashing water.
- The temperature of the environment can't exceed 50°C. Do not apply more heat than 50°C to the device locally.
- Avoid salty and corrosive environments.
- Avoid storing the product in extremely dusty environments.
- Keep away from environments where chemical or any other type of contamination will occur.

WARNING

If you have any problems while receiving the device, please contact the transport company and the ELEKTRA sales department.

WARNING

The transportation, handling and placement of the device must be done by taking the necessary precautions. Otherwise, the device may be damaged. If the device is not to be installed as soon as it is received, the device must be stored and stored on a smooth surface and in an environment suitable for the technical data table. In this case, it is recommended to store the device in its original packaging.

NOTICE

The center of gravity of the device can be at a certain height from the ground. For this reason, if it is to be transported by forklift, make sure that the packaged product is properly tied and fixed. Avoid making sudden and narrow maneuvers. The device should not be raised more than 20 cm from the ground.

WARNING

A packaged device's center of gravity can be unstable or offset. Take caution when transferring the device to avoid falling over.

4. Mechanical Installation

NOTICE

Device installation and service operation must be done by authorized and qualified personnel.

WARNING

Wrong installation or adjustment might cause harm to itself and other devices around.

DANGER

In order to use the device safely, it is critical that the user take the necessary safety precautions in accordance with the standards. Taking personal protective measures (rubber gloves, a face shield, and fireproof clothing) is vital for protection from arcing due to electric shock or contact with live conductors. Follow the warnings stated in this user manual.

4.1. Wall Type

The device must be mounted vertically on a wall. Four (4) 8mm diameter screws suitable for the type of wall should be used for mounting. Figure 1 shows the technical drawing of the mounting holes and the dimensions of the product.

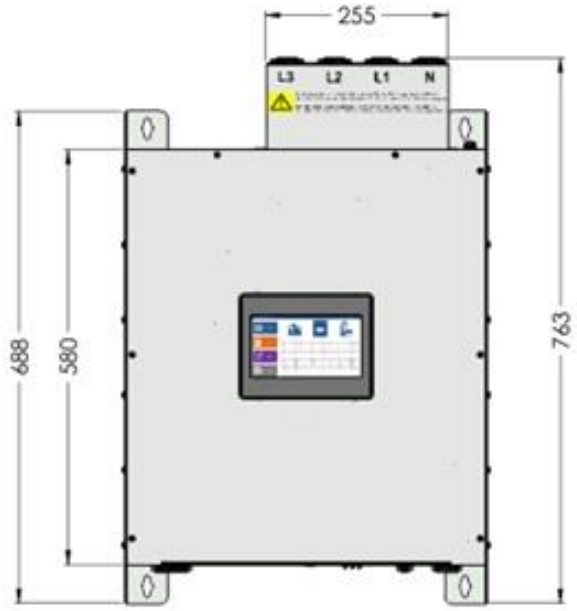


Figure 1: SVG Wall Type Size Measurements

WARNING

Ventilation holes should never be blocked or closed.

WARNING

Make sure that the temperature of the environment where the device is installed is between -10°C and +40°C, the maximum humidity does not exceed 95% and there is no condensation. Do not install the device close to heat sources and keep it away from direct sunlight.

Figure 2: Positioning the SVG Wall Type Device

As shown in Figure 2, if two (2) wall-mounted products are to be operated together, the devices must be mounted side by side so that they do not interrupt each other's air flows. In addition, it is necessary to create a suitable ventilation condition by keeping the distance from the floor and ceiling as specified. Otherwise, the products may overheat, not operate properly, or create a fire risk.

4.2. Panel Type

WARNING

The ventilation holes of the panel must not be blocked or closed.

WARNING

Make sure that the temperature of the environment where the panel is installed is between -10°C and +40°C, the maximum humidity does not exceed 95% and there is no condensation. Do not mount the panel close to heat sources.

Elektra SVG product panels must be installed on a flat surface. All of the feet of the panel should contact the floor formally and evenly. SVG panel dimensions are given in Figure 3. A minimum of 100mm space should be left on each side around the panel in the area where the installation is made.

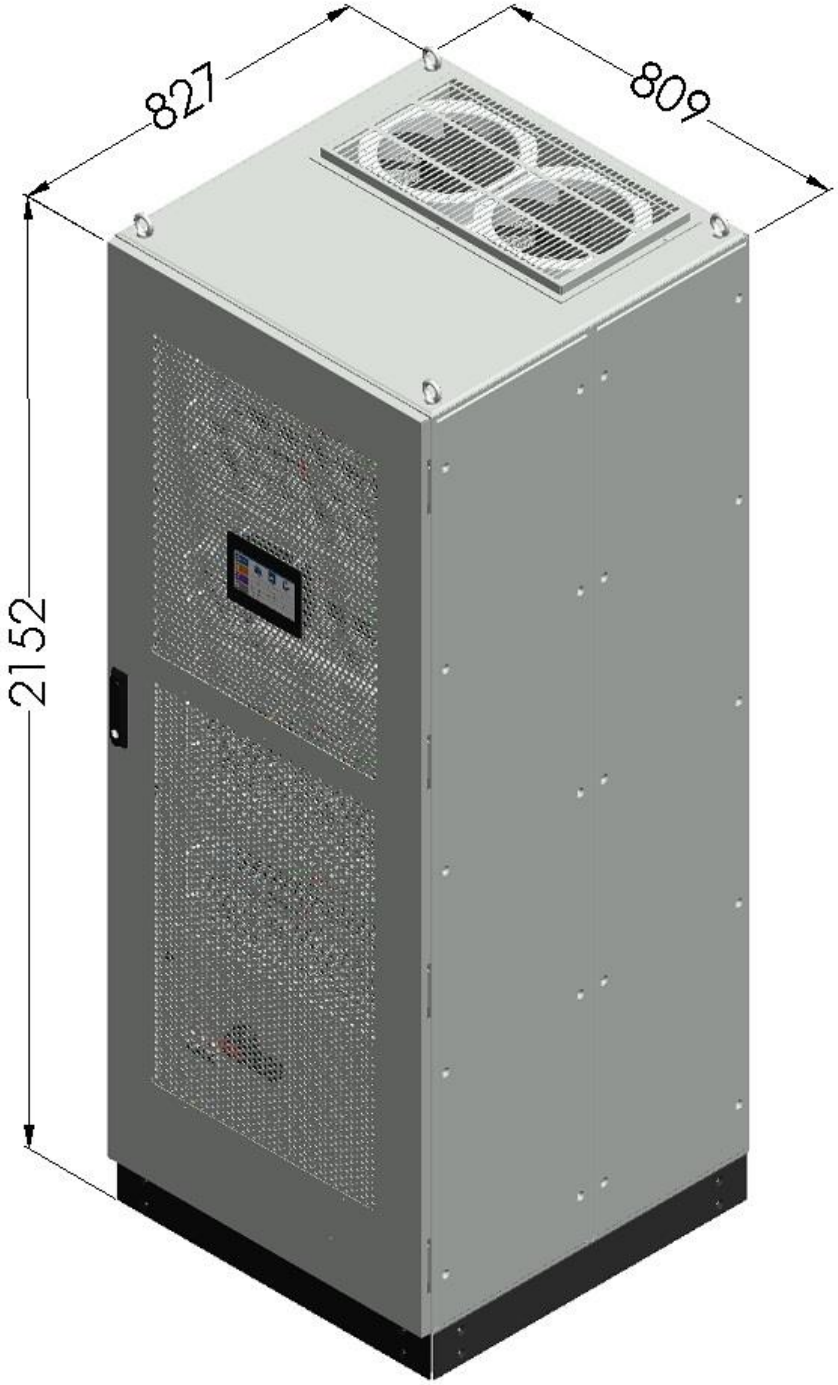


Figure 3: SVG Panel Size

5. Electrical Installation

NOTICE

Device installation and service operation must be done by authorized and qualified personnel.

WARNING

Wrong installation or adjustment might cause harm to itself and other devices around.

DANGER

In order to use the device safely, it is critical that the user take the necessary safety precautions in accordance with the standards. Taking personal protective measures (rubber gloves, a face shield, and fireproof clothing) is vital for protection from arcing due to electric shock or contact with live conductors. Follow the warnings stated in this user manual.

WARNING

There should not be any compensation devices in the facility where the device is connected. If there is any compensation unit, it is obligatory for each compensation stage to have a harmonic filter reactor in order for the device to work properly.

5.1. Energy Connections and Wiring Size

WARNING

To avoid the risk of shock, make sure the product is properly grounded.

WARNING

For energy cables, conductors with a cross-section suitable for the rated current of the device must be used. You can refer to the table below for conductor cross-sections.

Rated Power	35kVAr	50kVAr	100kVAr	200kVAr	300kVAr	400kVAr	500kVAr
Rated Current	50	75	150	300	450	600	750
Phase L1/L2/L3 mm^2	25	35	50	70x2	120x2	185x2	240x2
Neutral mm^2	70	35x3	50x3	95x2	150x2	240x2	185x3
PE mm^2	16	16	25	70	120	185	240
Braker Current	80A	125A	200A	500A	630A	800A	1000A

Table 1: Wiring Size and Breaker Current selection

5.1.1. SVG Wall Type Energy Connection

WARNING

When making the energy connection for the SVG Wall Type product, first of all, the phase sequences must be correctly connected to the product connection busbars. If a 3-phase, 3-conductor (3P3W) connection is to be installed, the neutral busbar of the device should be left empty. The correct connection of the device is shown in Figure 4.

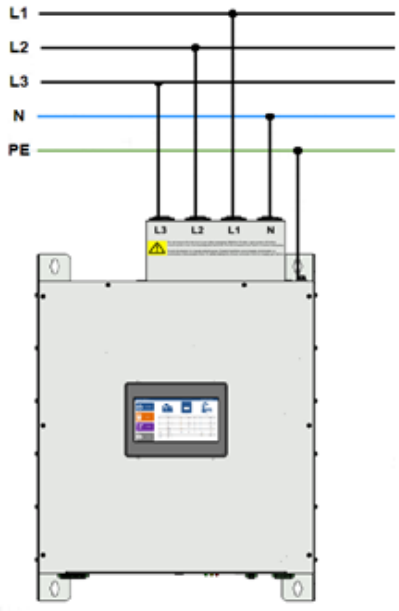


Figure 4: SVG Wall Type Energy Connection

5.1.2. SVG Panel Type Energy Connection

WARNING

When making the energy connection for the SVG Panel type product, first of all, the phase sequences should be connected to the product connection busbars correctly. If a 3-phase, 3-conductor (3P3W) connection is to be installed, the neutral busbar of the device should be left empty. The correct connection of the device is shown in Figure 5.

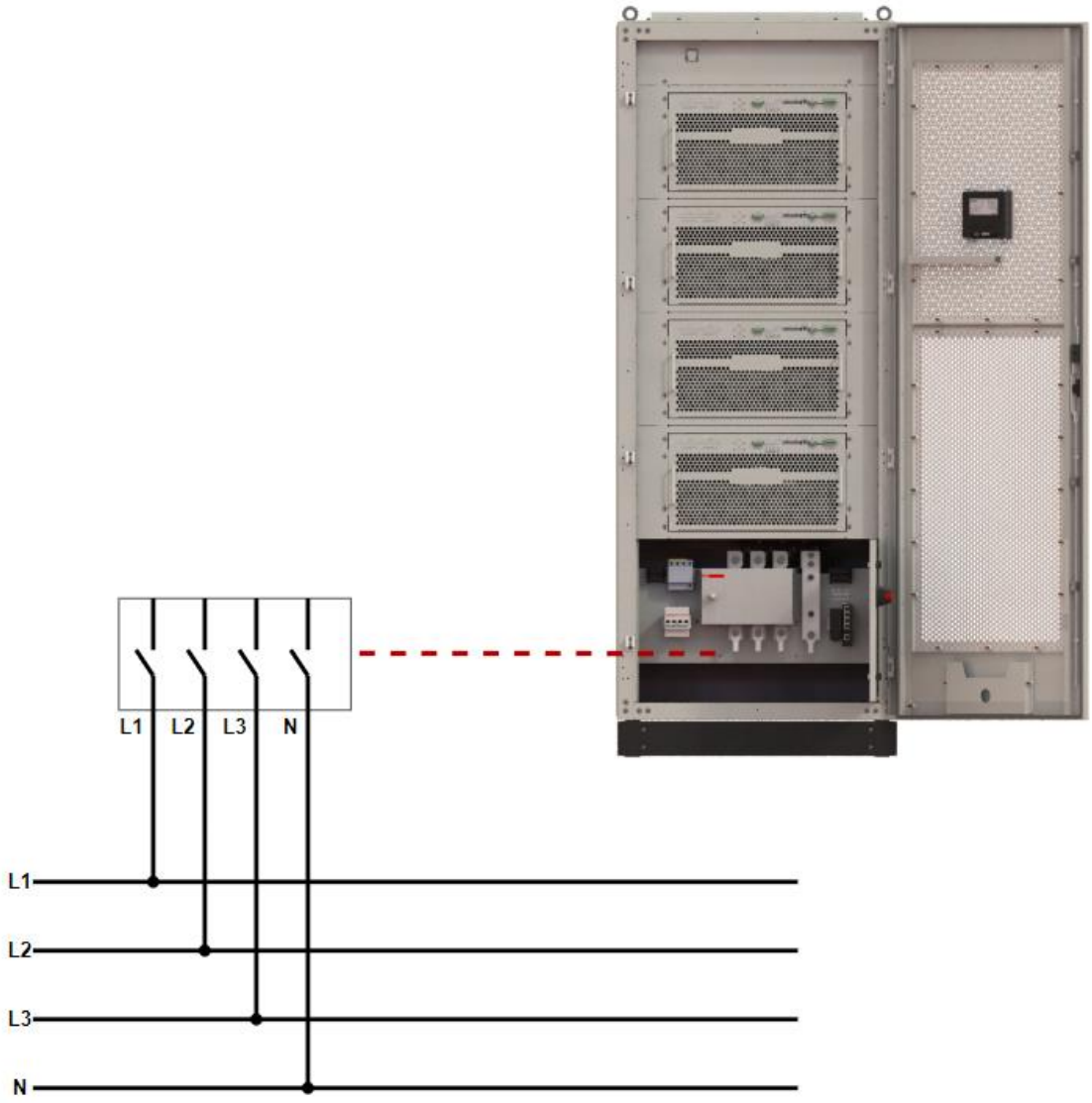


Figure 5: SVG Panel Type Energy Connection

5.2. Current Transformer Connections

External current transformers must be correctly connected for SVG products to filter. When connecting the current transformer, keep the phase sequence, directions, and connection positions in consideration.

WARNING

- Use ELEKTRA-recommended current transformers for current measuring.

- Select the primary current of the current transformer so that it is closest to the current of the facility to which it will be connected. The secondary current is recommended at 5A.

WARNING

- The correct connection of the current transformer is critical for the proper operation of SVG series products. If any of the current transformers are connected in reverse in the secondary direction, if the current transformer is connected to the conductors in reverse direction, and if the phase sequence is connected to the device incorrectly, the device will not work properly. It may damage peripheral devices if left in this way for a long time.

- The turn rates of current transformers must be programmed via the touch interface. Otherwise, the device will not work correctly.

5.2.1. Current Transformer Connection by Connection Location

There are two types of current transformer connections, according to the connection location. These are examined in the following sub-headings: open loop and closed loop.

5.2.1.1. Open Loop Connection

In this connection type, the current transformer only measures the load current and transmits current information to the device. An example connection to the open loop is given in Figure 6.

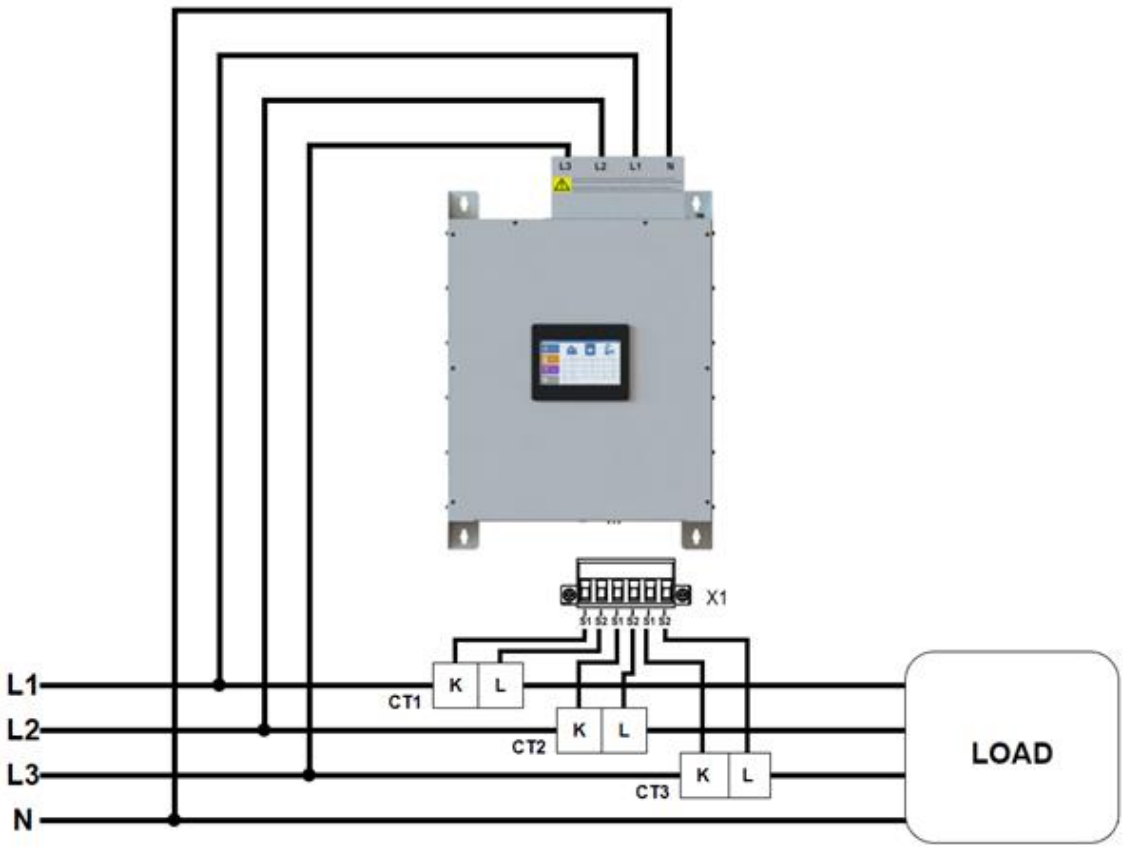


Figure 6: Open Loop Current Transformer Connection

5.2.1.2. Closed Loop Connection

In this type of connection, the current transformer is the type of connection that measures the sum of the load current of the SVG device and transfers it to the device. An example connection to the closed loop is given in Figure 7.

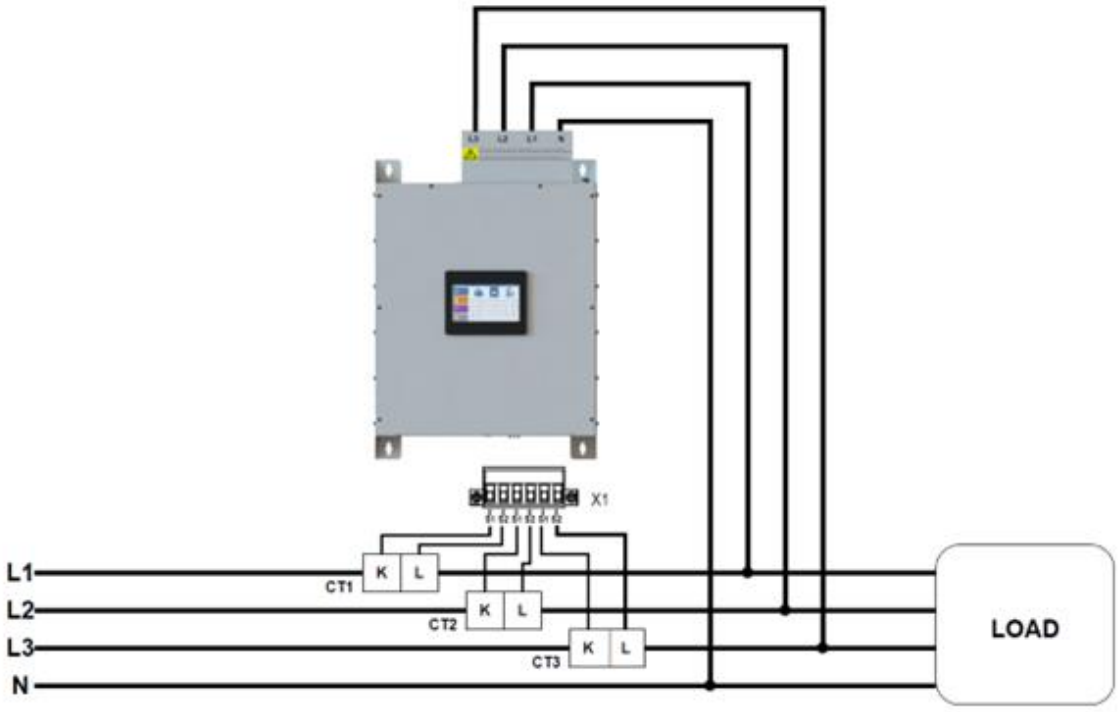


Figure 7: Closed Loop Current Transformer Connection

5.2.2. Current Transformer Connection by Direction

WARNING

The phase conductors going from the grid to the load must be connected to the current transformers in such a way that they enter from the P1 side and the conductor to the load exits from the P2 side. The S1/S2 or K/L terminals on the current transformers should also be connected to the current transformer terminal on the device, paying attention to the S1/S2 order. If the current transformer direction, phase sequence, or S1/S2 sequence is incorrect, the device may operate unstable and strengthen the harmonics instead of damping them.

5.2.2.1. SVG Wall Type Current Transformer Connection

In SVG wall type products, the current transformer connection is made via the X1 terminal. The correct connection method is shown in Figure 8 below.

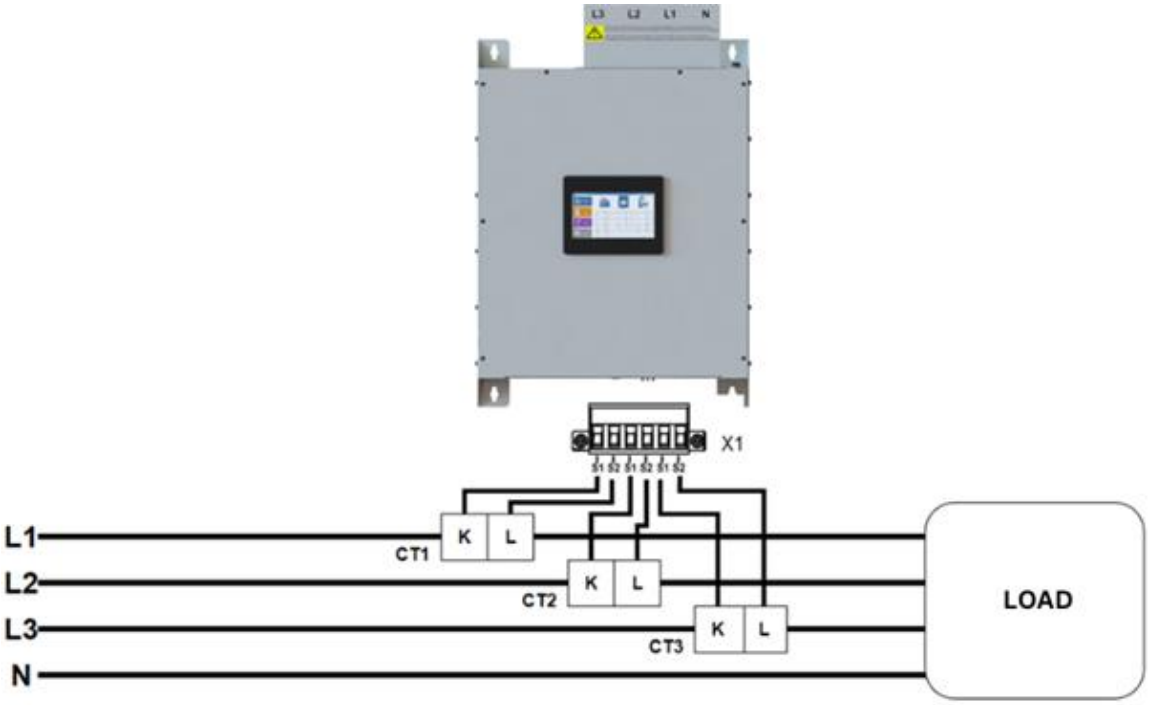


Figure 8: SVG Wall Type Current Transformer Connection

5.2.2.2. SVG Panel Type Current Transformer Connection

In SVG panel type products, the current transformer connection is made via the terminal inside the panel. The correct connection method is shown in Figure 9 below.

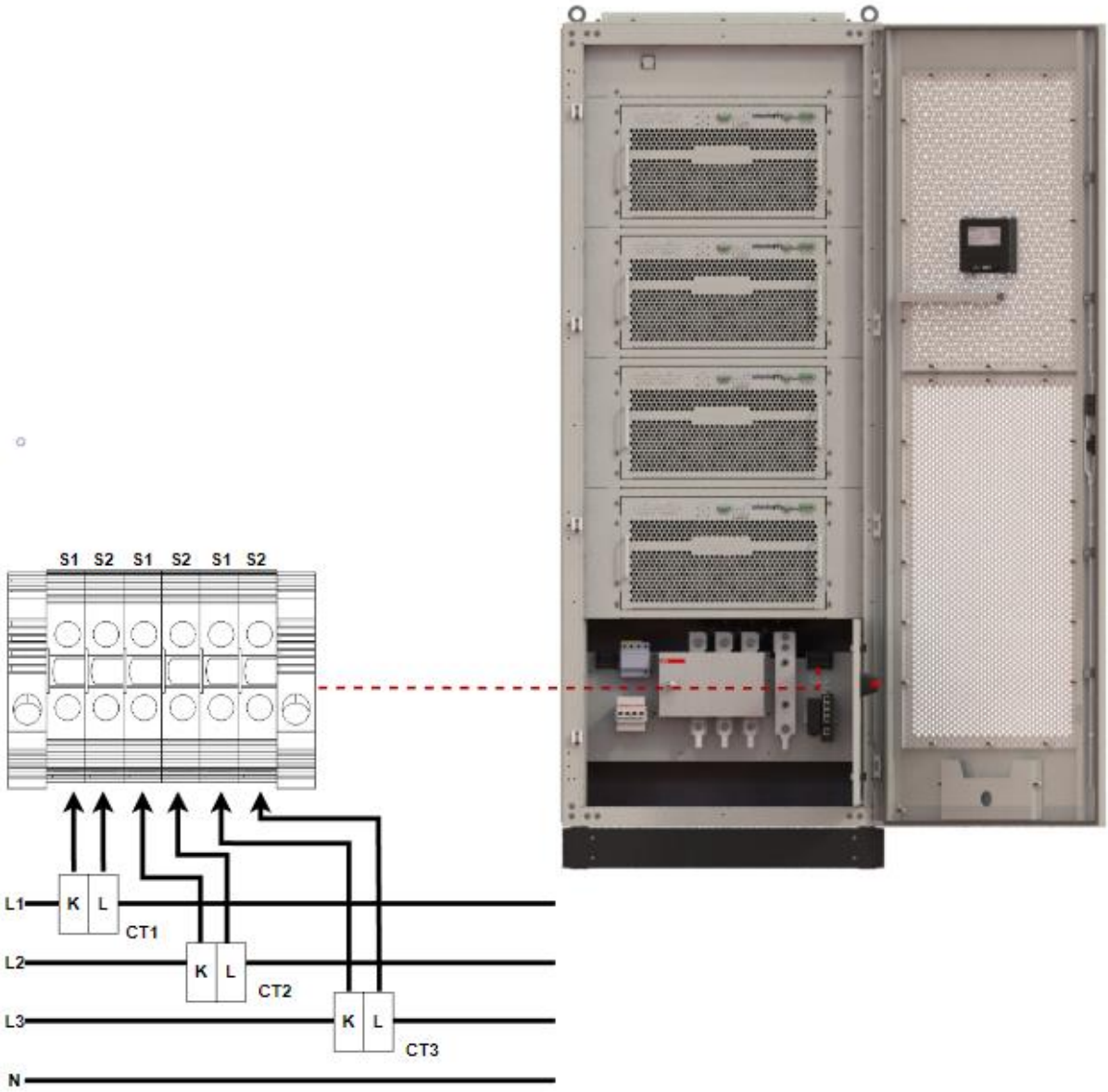


Figure 9: SVG Panel Type Current Transformer Connection

5.3. Hybrid System Connections

WARNING

- The correct connection of the hybrid systems is critical for the proper operation of SVG Hybrid systems. If the hybrid systems are connected to the device incorrectly, the device will not function properly. Leaving them in this state for long periods of time can damage the peripherals. If all units are needed, the connection to socket X11 is made in the same way as the connection to socket X12.

- - If all units are needed, the connection to socket X11 is made in the same way as the connection to socket X12.

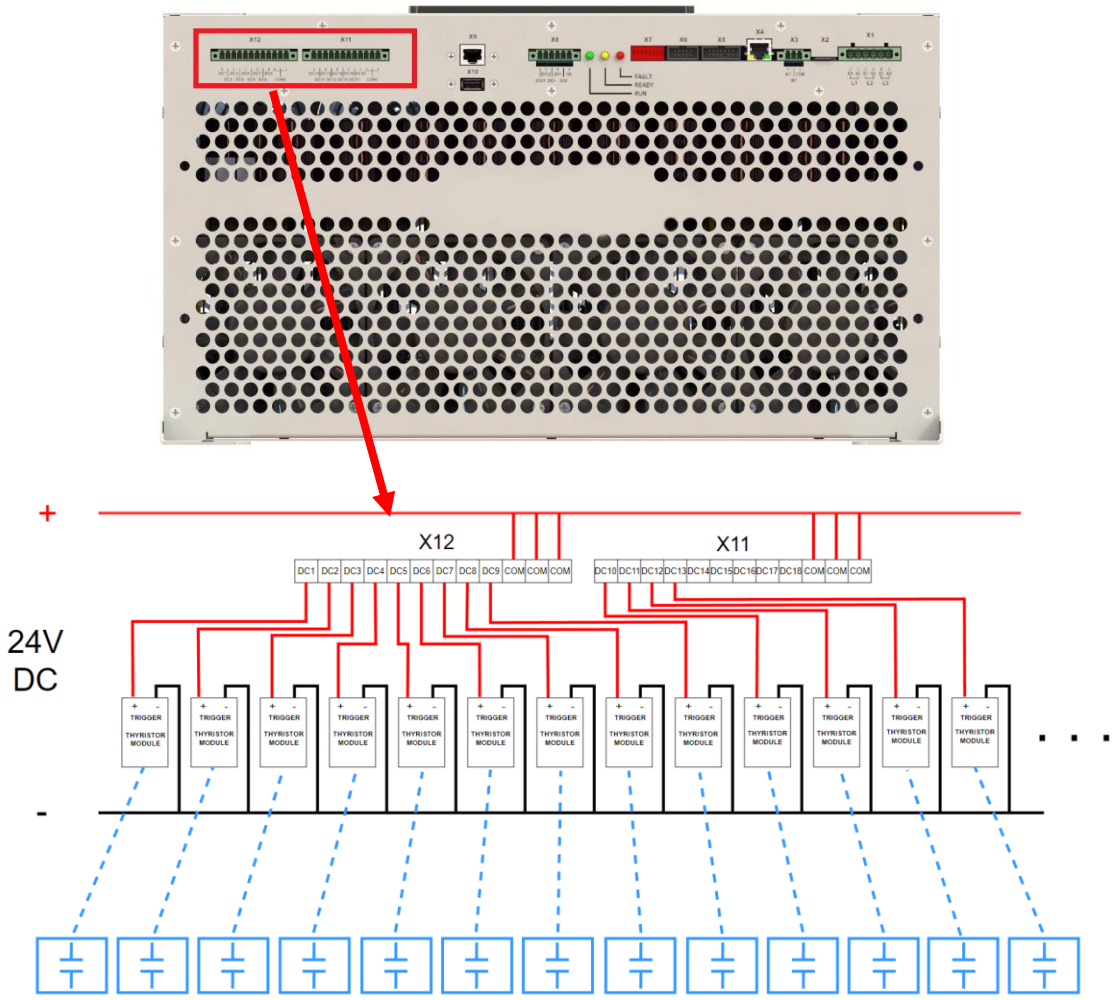


Figure 10.1: Hybrid Systems Connection of SVG Devices with Thyristor module

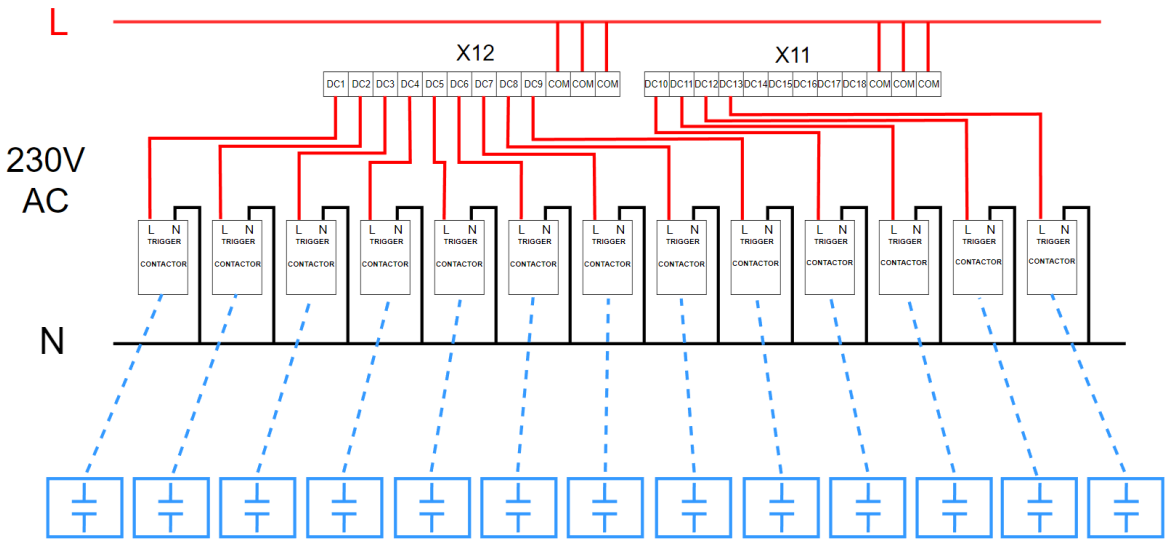


Figure 10.2: Hybrid Systems Connection of SVG Devices with AC Contactor

5.4. External Input Connections

In order to control the device remotely with an external input in unwanted situations, there are 2 input and 2 output external controls on the “X8” terminal. If a 24 V DC signal is applied from these inputs, the device switches to the registered state of that input. The mapping and registered states of the control inputs and outputs are given in the figures and table below.

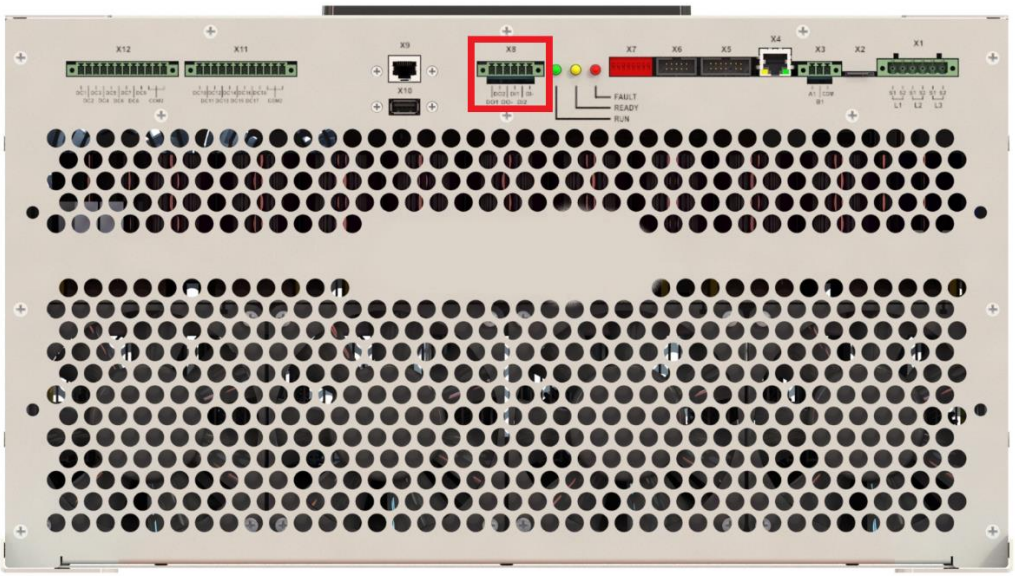


Figure 11: Location of terminal X8 on the device

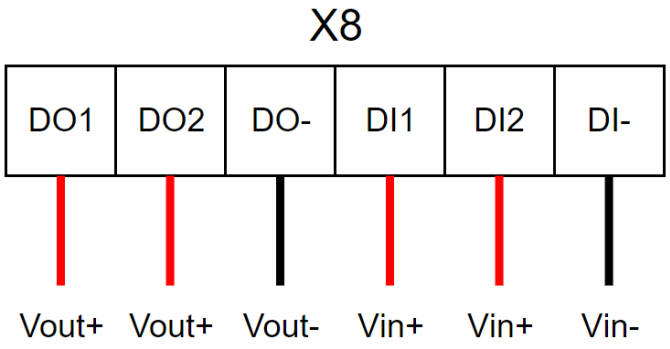


Figure 12: Pin mapping of terminal X8

Triggering with 24V DC	IN1	IN2	OUT1	OUT2
Logic = '1'	Run Harmonic Filt On. Compensation On Hybrid On Comp. And Hybrid On Load Balancing On	Run Harmonic Filt On. Compensation On Hybrid On Comp. And Hybrid On Load Balancing On	Cosϕ THDv Limit THDi Limit Alarm Start-Stop	Cosϕ THDv Limit THDi Limit Alarm Start-Stop.
Logic = '0'	Stop Harmonic Filt. Off Compensation Off Hybrid Off Comp. And Hybrid Off Load Balancing Off	Stop Harmonic Filt. Off Compensation Off Hybrid Off Comp. And Hybrid Off Load Balancing Off	Disable	Disable

Table 2: Device status according to the logic status of external inputs

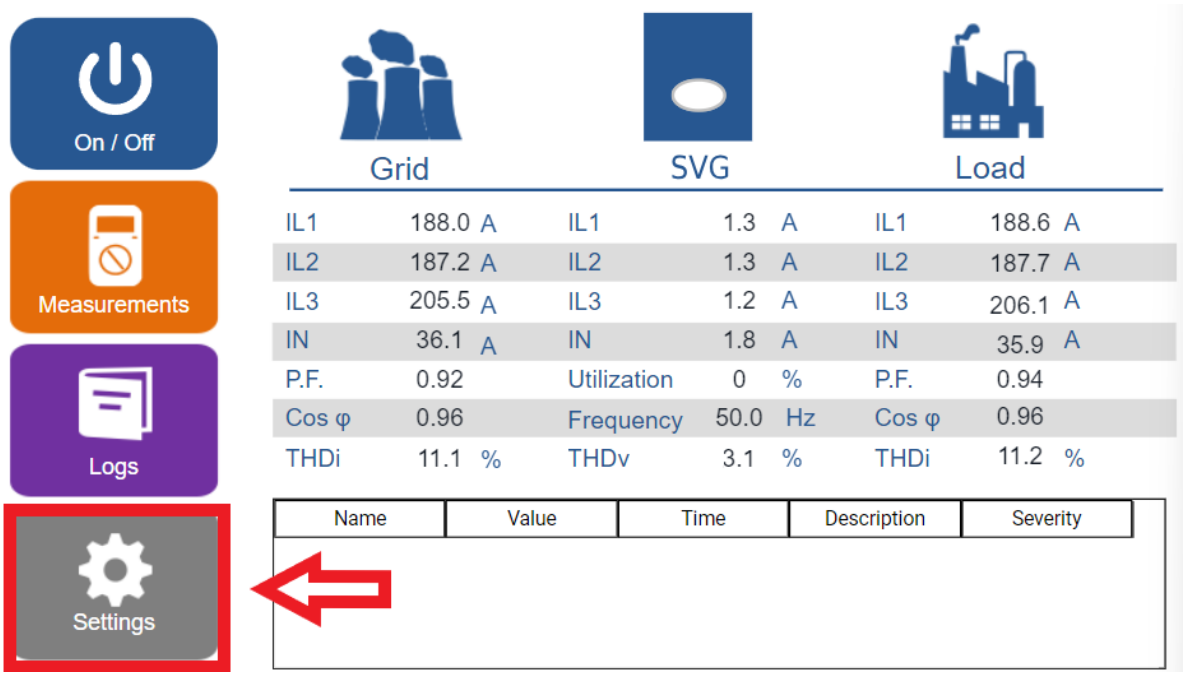


Figure 13: Entering the settings menu

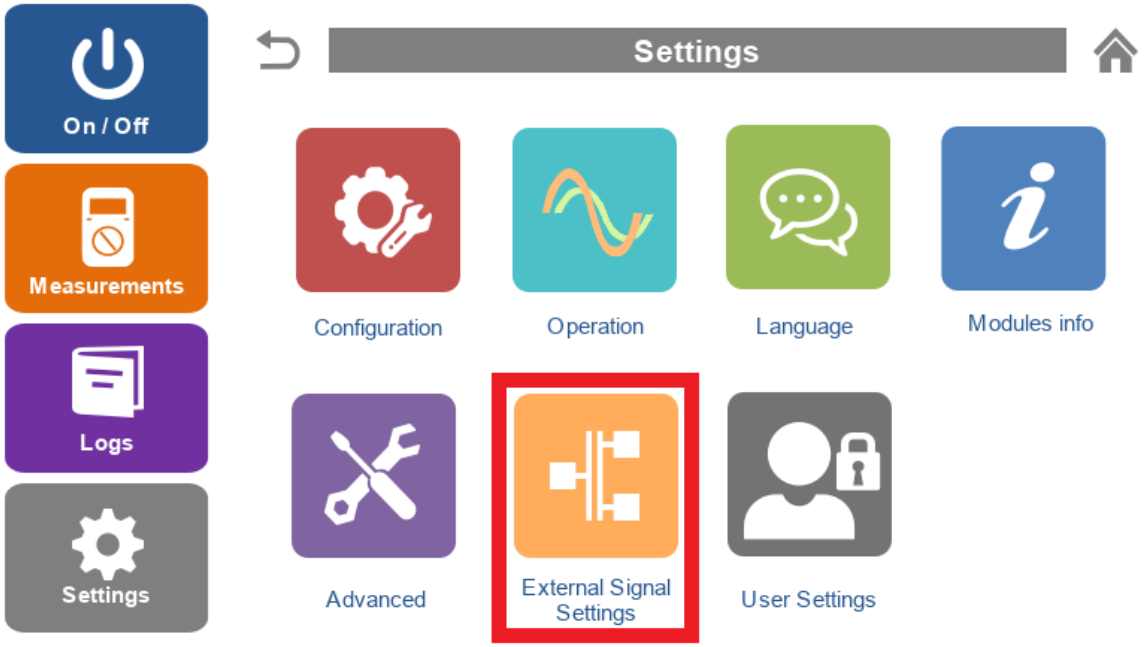


Figure 14: Entering the 'External Signal Settings' menu

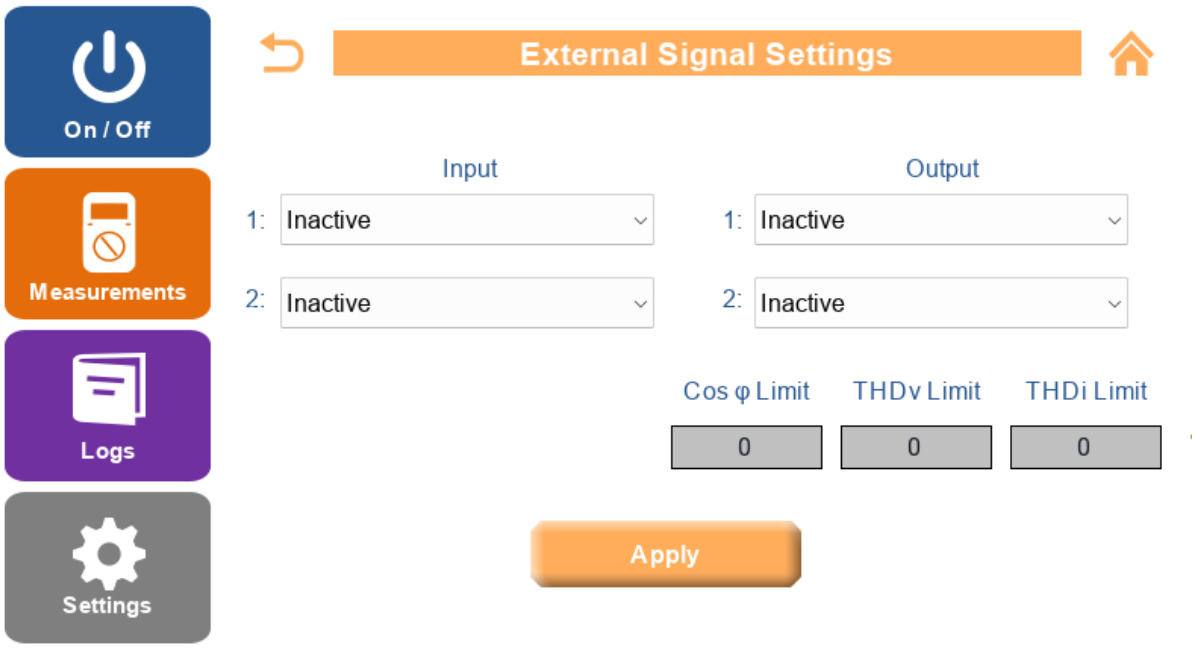


Figure 15: 'External Signal Settings' menu

6. Communication Connection

In order for more than one ELEKTRA SVG products to work together correctly, communication between modules must be provided.

WARNING

1. Accuracy of communication connections is critical for Elektra SVG modules to proper operation in the case of more than one.

6.1. Wall Type

Communication connections provided by ethernet cables of two wall type SVG devices are given in Figure 16.

Figure 16: Communication Connection of two SVG Devices

6.2. Panel Type

Communication connections provided by Ethernet cables for two SVG panel-type devices are given in Figure 17. While the connection between the modules in the panel is established via the "switch" on the panel, the communication between the panels is provided by the "switch" in both panels.

Figure 17: Communication Connection Between Two SVG Panels

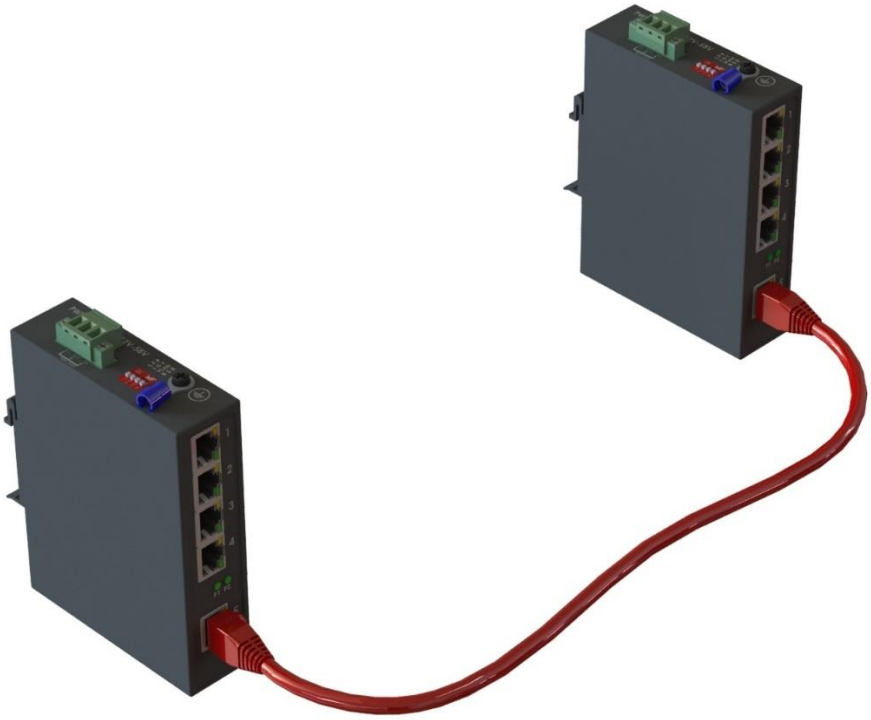


Figure 18: Switch Partnering Operation in Two Separate Panels

7. Initial Setup

In order for ELEKTRA SVG devices to work correctly, initial settings must be made according to the industrial facility where they will be installed.

NOTICE

Device installation and service operation must be done by authorized and qualified personnel.

WARNING

Wrong installation or adjustment might cause harm to itself and other devices around.

7.1. User Login

When the device is energized, the "Main Screen" appears on the screen first as seen in Figure 19.

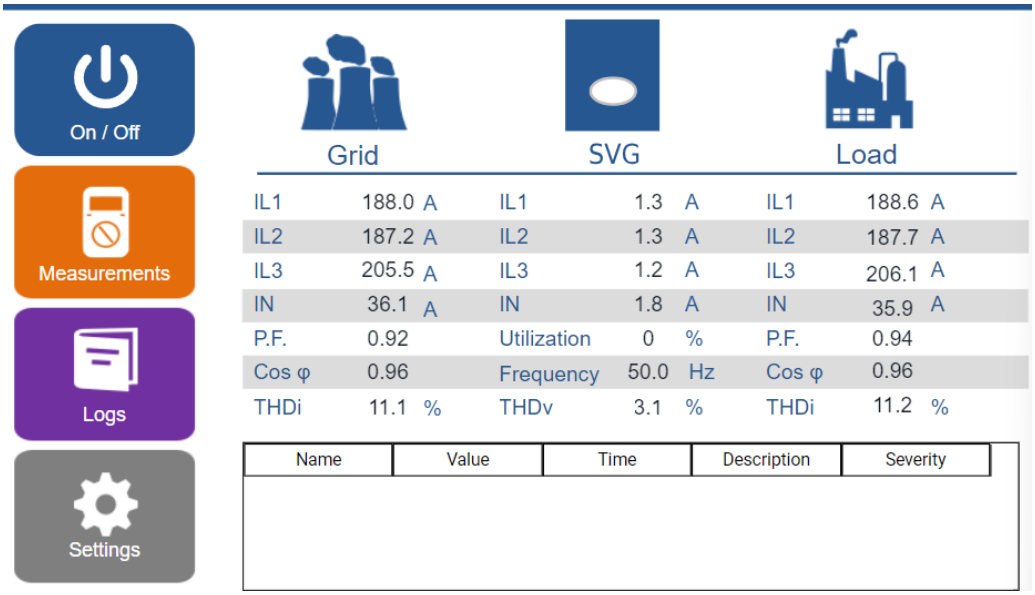


Figure 19: "Main Screen"

The first step to be taken after energized the device for initial setup is to enter the user ID and password provided by ELEKTRA, who installed the industrial facility. Without entering the user's login, no changes can be made to the device. To perform the user login, the following steps should be followed in sequence.

ID	Password	Permissions
svisor	12345	It is the user type with the highest authority on the device. It has the privileges of adding, removing, changing passwords and all user operations.
operator	12345	It is the type of user who has the authority to manage the operations on the device, to activate and deactivate the device.
Monitor	12345	It is the type of user who does not have any authority to operate on the device and only has the authority to observe and follow the device data.

Table 3: User ID and Password

In order to be able to login, the following steps must be followed in order.

- Click on the "Settings" tab on the Main Screen.

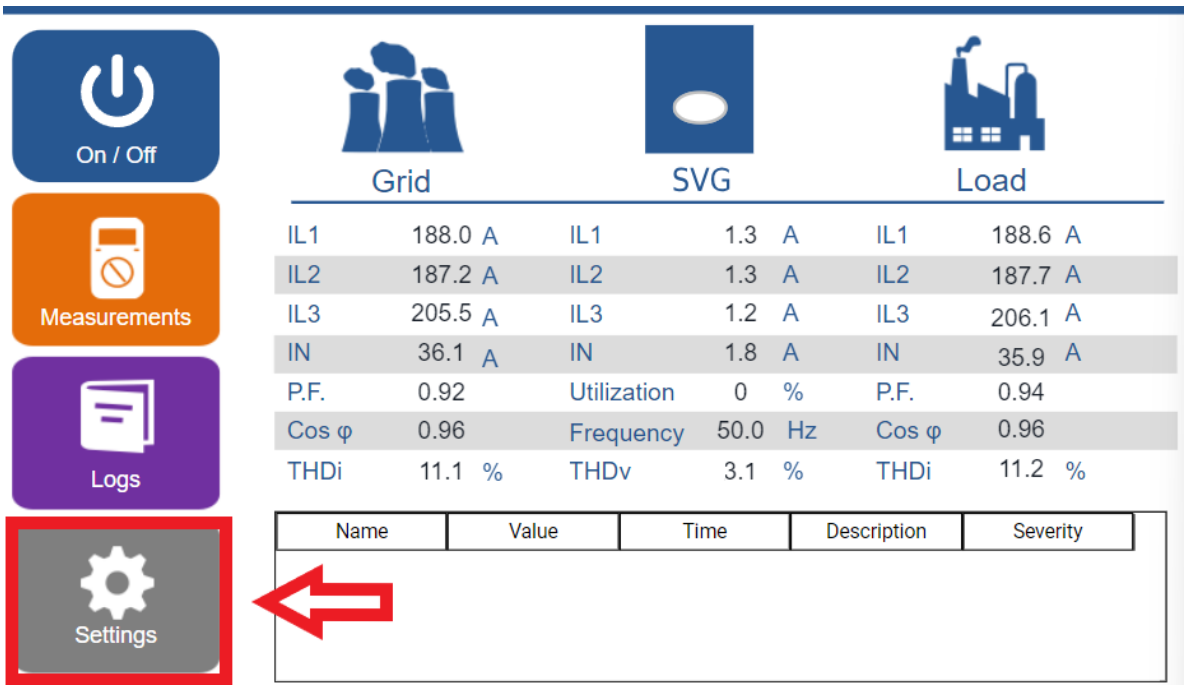


Figure 20: Entering the "Settings" Menu

- "Click on the "User Settings" tab in the "Settings" menu.

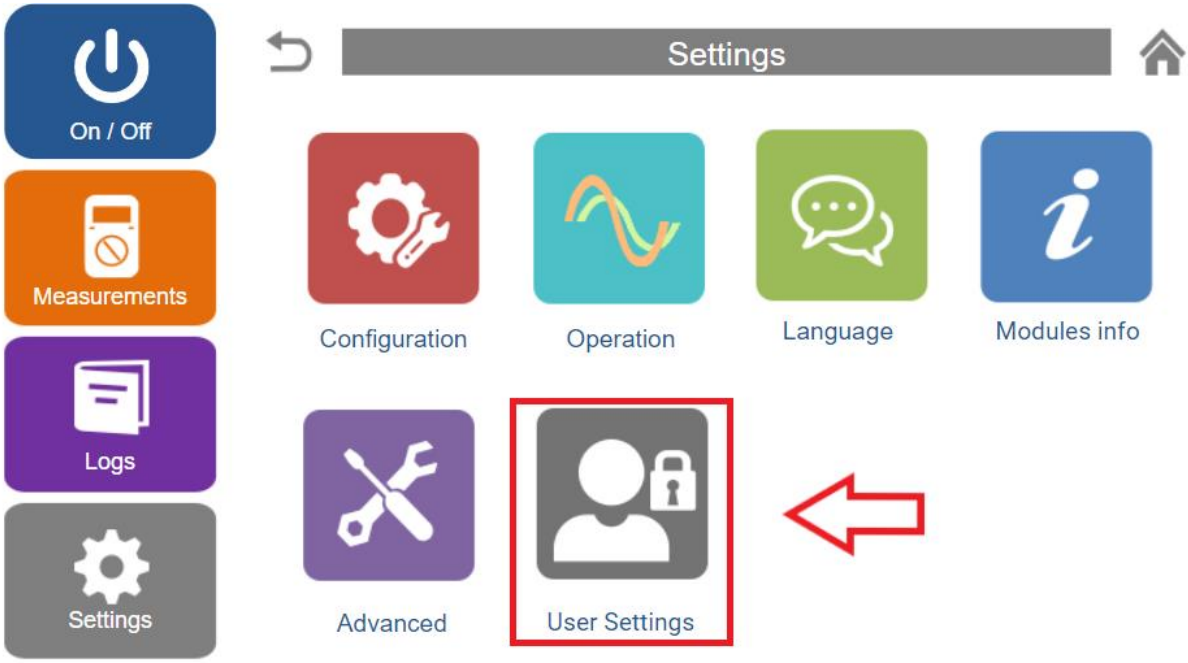


Figure 21: Entering the "User Settings" Menu

➢ “Click the "Switch User" button.

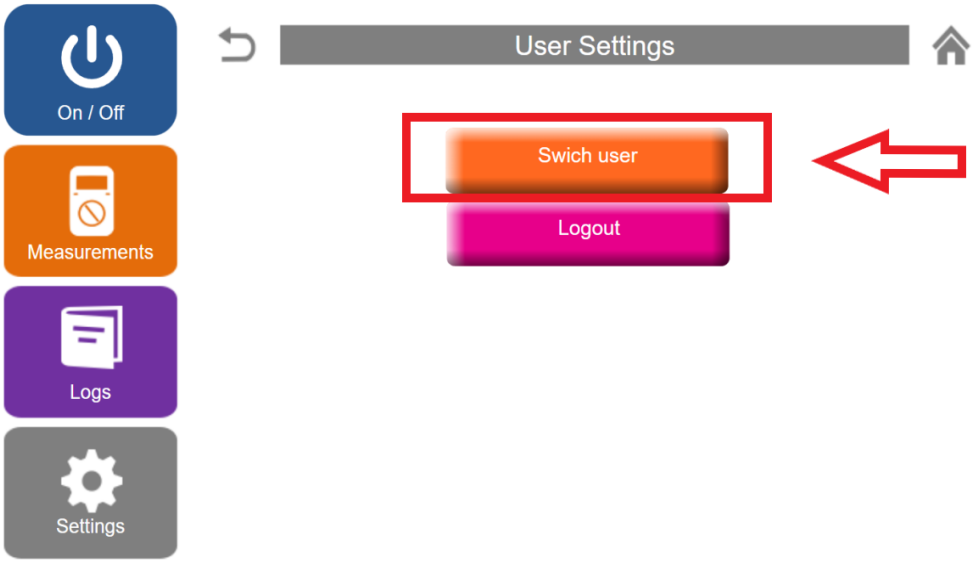


Figure 22: “User Setting” Menu

Figure 23: User Login Screen

7.2. Configuration

In order for the SVG device to operate in industrial facility conditions, it needs to receive certain data from external sources. These include information such as grid frequency, current transformer location, current transformer ratio, and so on, which need to be transferred to the device. This process is performed within the configuration menu. The configuration process should be followed in the following sequence.

➢ Click on the "Settings" tab on the "Main Screen".

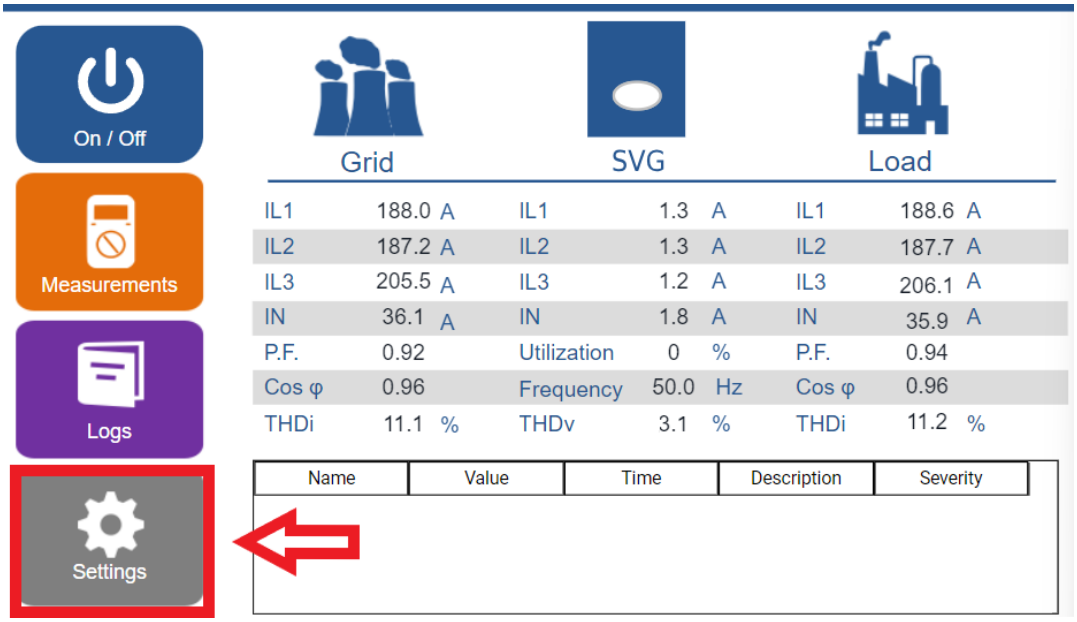


Figure 24: Entering the "Settings" Menu

➢ Click on the “Configuration” tab on the “Settings” menu.

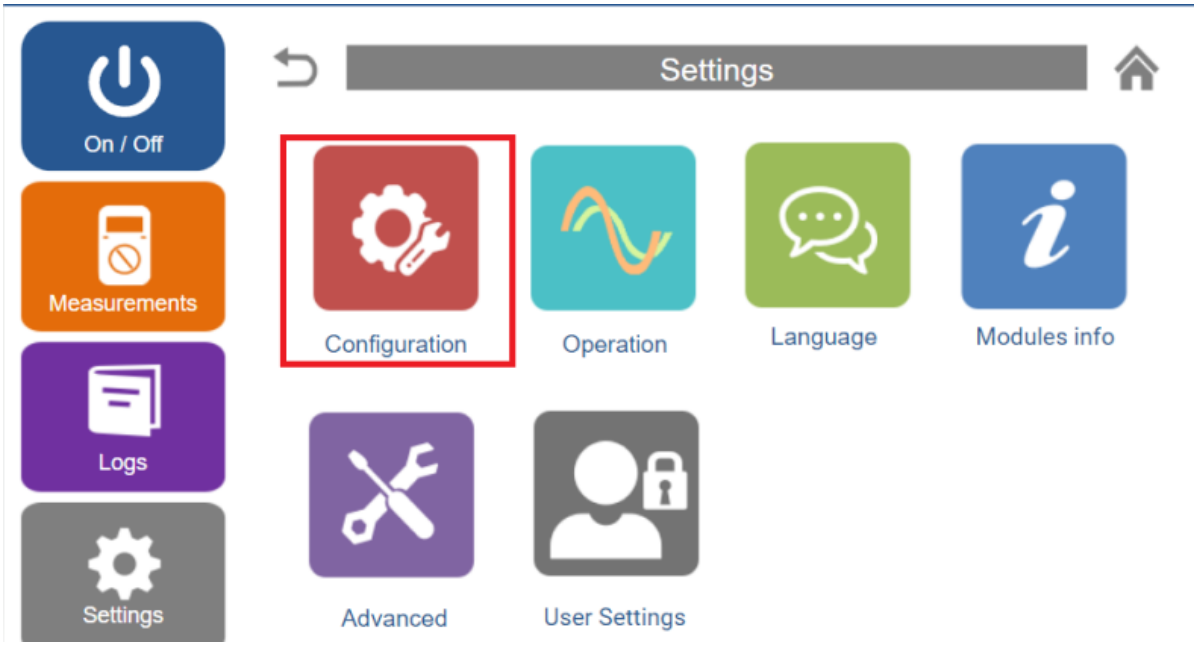


Figure 25: Entering the “Configuration “Menu

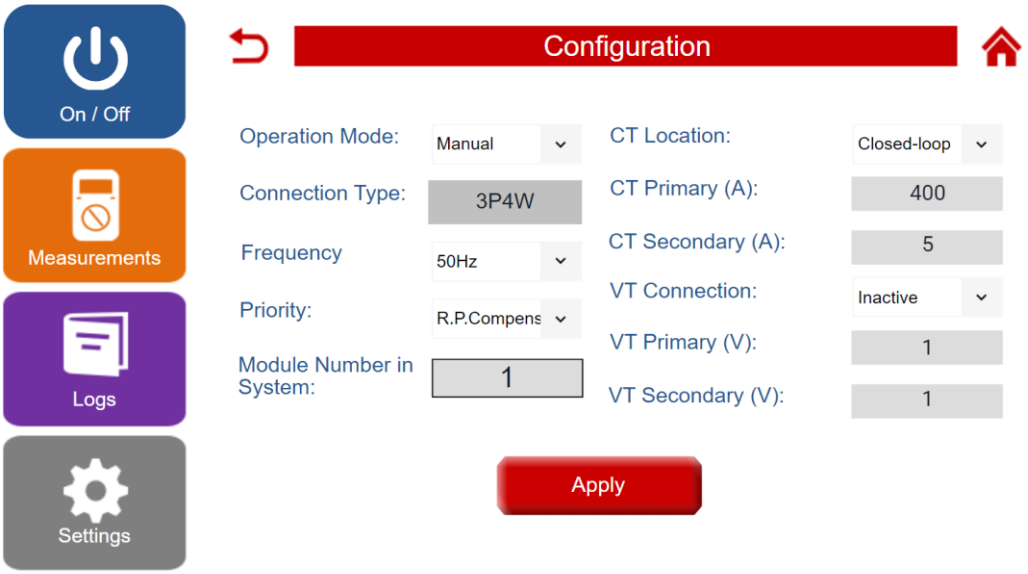


Figure 26: "Configuration" Menu

The options on the configuration menu are examined under the following headings.

7.2.1. Operating Mode

The operating mode is the option that determines whether the device is activated automatically or under user control when the SVG device is energized or after any power cut. When the manual mode is selected, the device waits for the user command to be activated when it is energized and must be activated by the user. When the automatic mode is selected, when the device is energized, it will be activated automatically without waiting for any user commands.

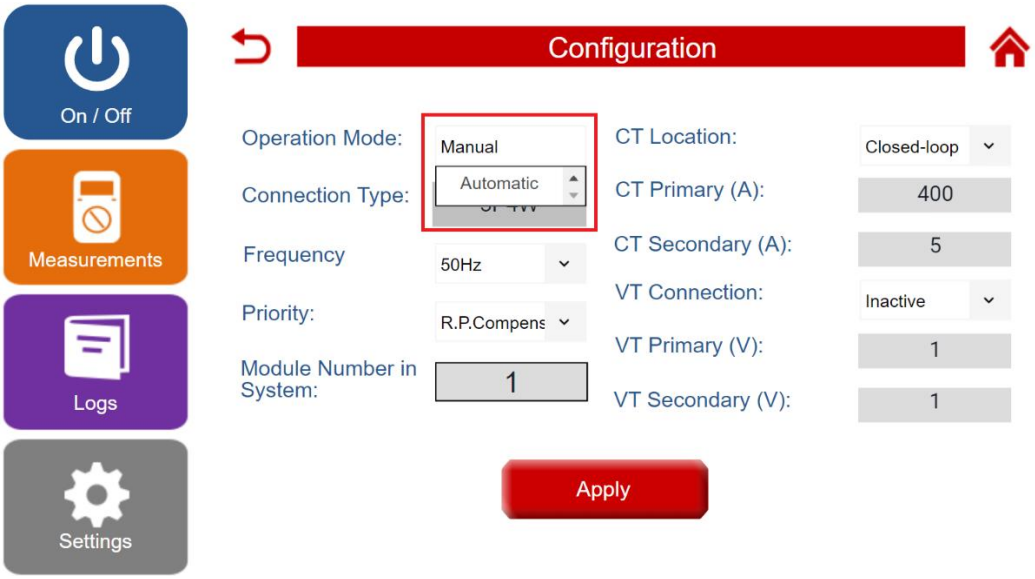


Figure 27: Selection of "Operating Mode"

7.2.2. Frequency

The frequency menu is used to select the grid frequency to which the SVG device is linked. There are two options under this option, 50/60 Hz.

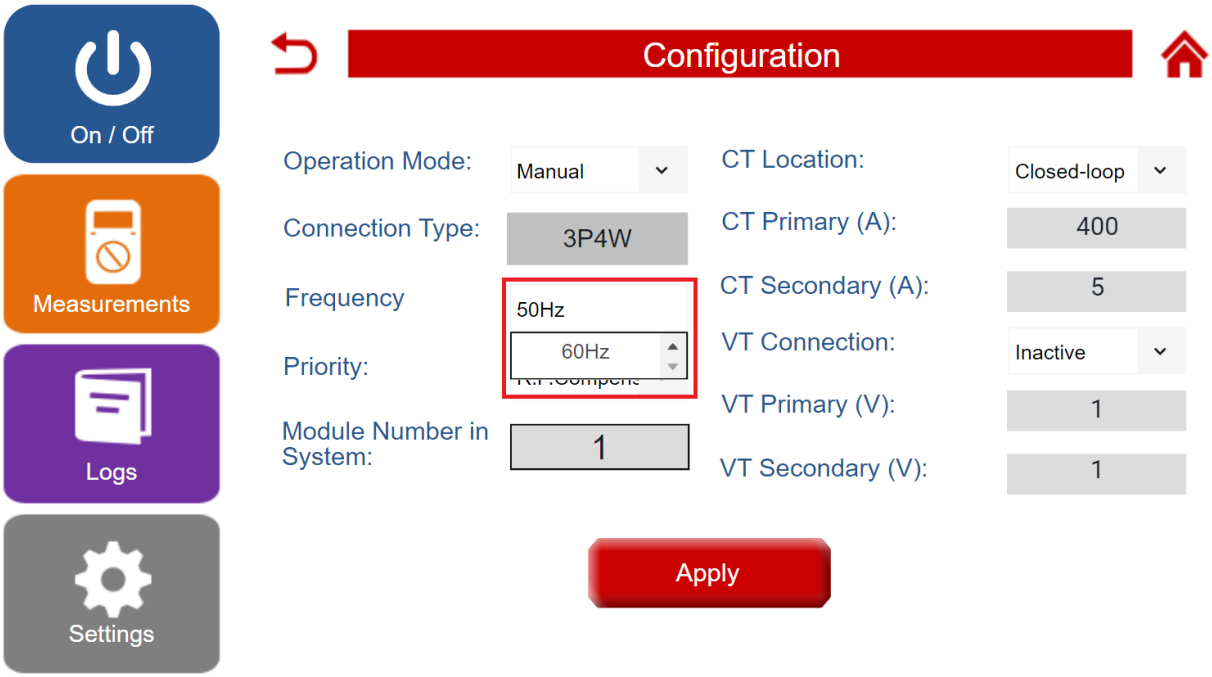


Figure 28: Selection of "Frequency"

7.2.3. Priority

The Priority Tab is also used to determine the order of priority among the basic operating modes of the device. While SVG meets the harmonic filtering, compensation, and load balancing needs in the industrial facility where it is located, it first focuses on the needs according to the priority determined by the user and tries to meet other needs according to the remaining capacity after the need is met. For this reason, it is important to determine the priority of the user according to the basic needs of the industrial facility.

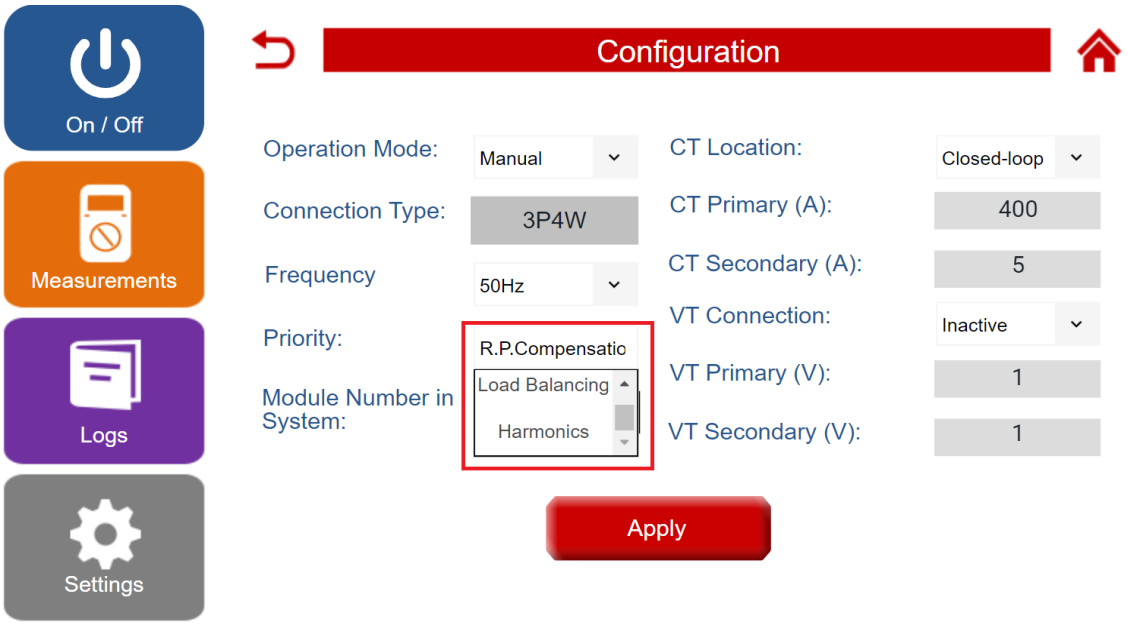


Figure 29: Selection of "Priority"

7.2.4. Location of Current Transformer

The Current Transformer location tells SVG from which point of the power line it is taking the current measurement. If this location is entered incorrectly, SVG will have incorrect data and will not work correctly. Open loop and closed loop connection types are examined under the title "Current Transformer Connection According to Connection Location".

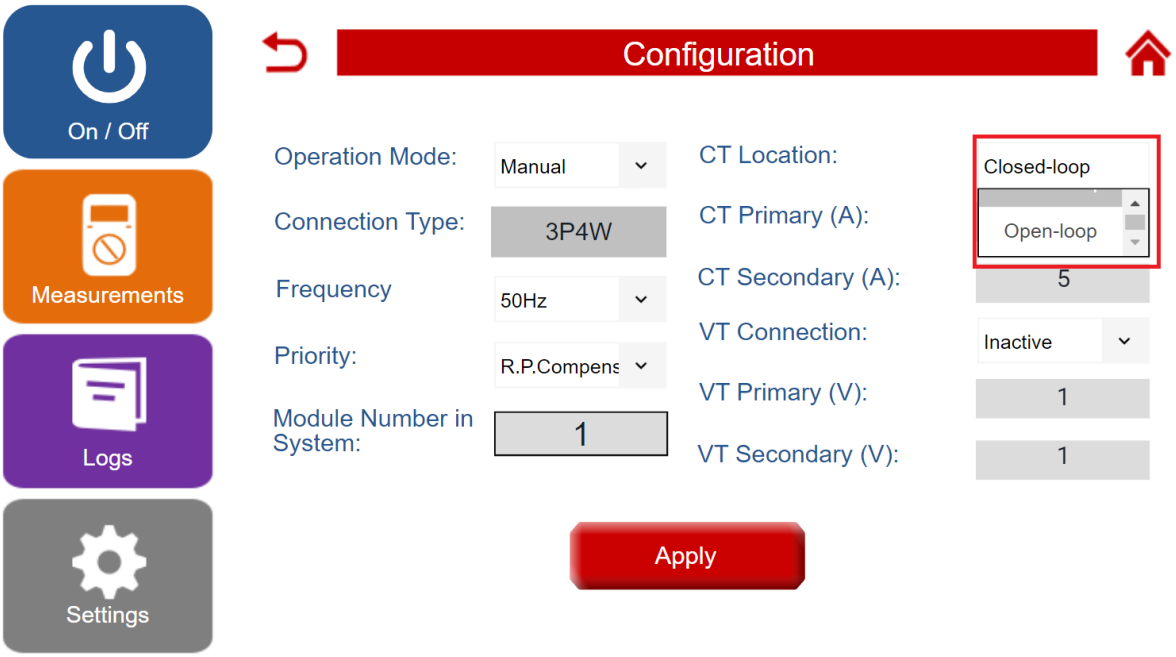


Figure 30: Selection of Current Transformer's Location

7.2.5 Current Transformer's Ratio

The current transformer ratio enables SVG to analyze the current by transferring the current in the power line at a certain reduction ratio. If this ratio is entered incorrectly, SVG will have incorrect data and will not work correctly. As an example, a current transformer with a 400:5 conversion ratio is given in Figure 31.

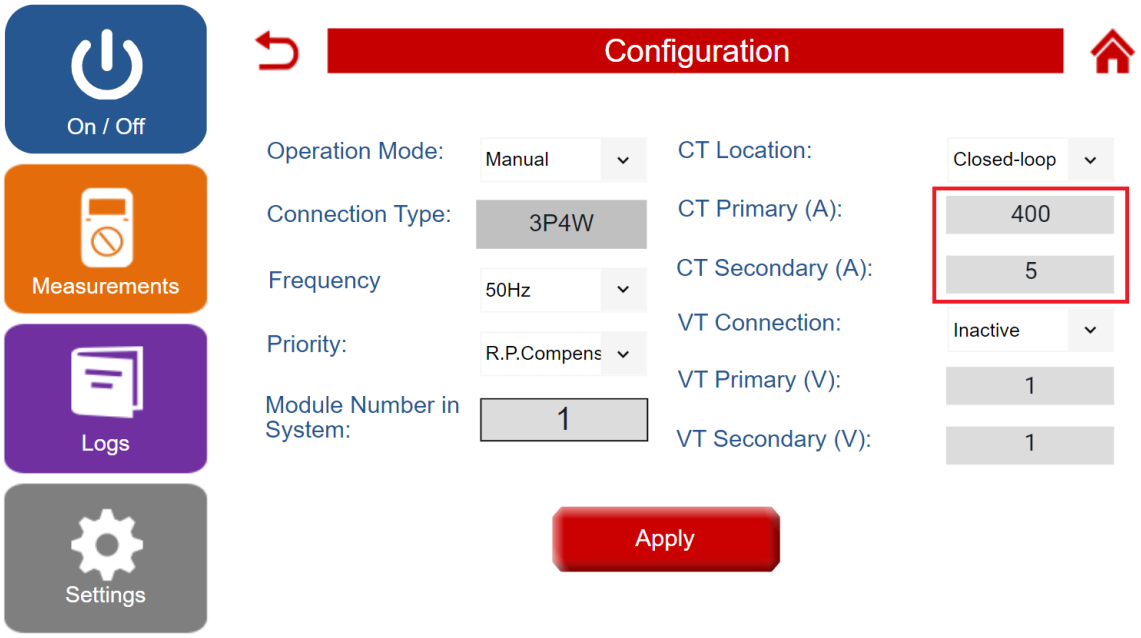


Figure 31: Determination of Current Transformer's Ratio

7.2.6 Type of Voltage Transformer

In places where the low voltage current transformer cannot be connected, the operation of the device is ensured by taking measurements via the medium voltage transformer. By selecting the voltage transformer type from this menu, the device is enabled to make calculations according to this transformer type.

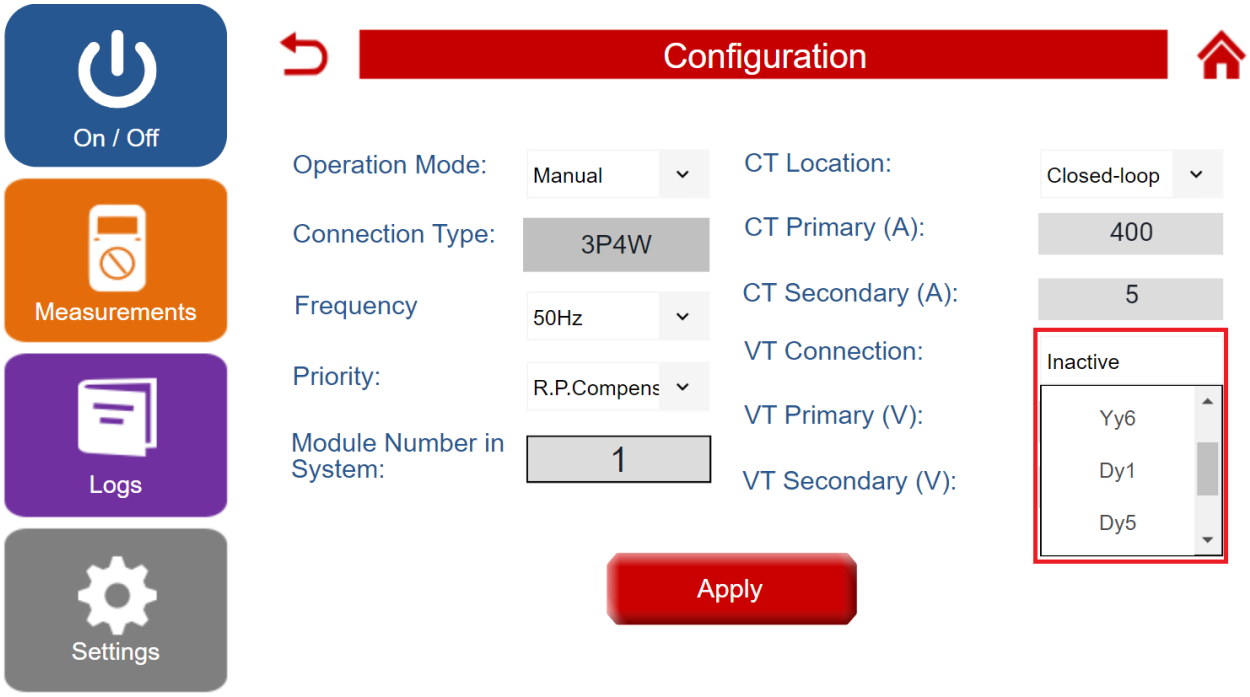


Figure 32: Selection of Voltage Transformer Type

7.2.7 Voltage Transformer's Ratio

In order for the device to mathematically calculate medium voltage power values, it must have voltage and current values. Since the device is connected to the low voltage point, voltage transformer ratios must be entered into the system in order to calculate the values at medium voltage. For example; In a network system with voltage transformer values of 34500:400, the system should be operated by entering 345:4 values.

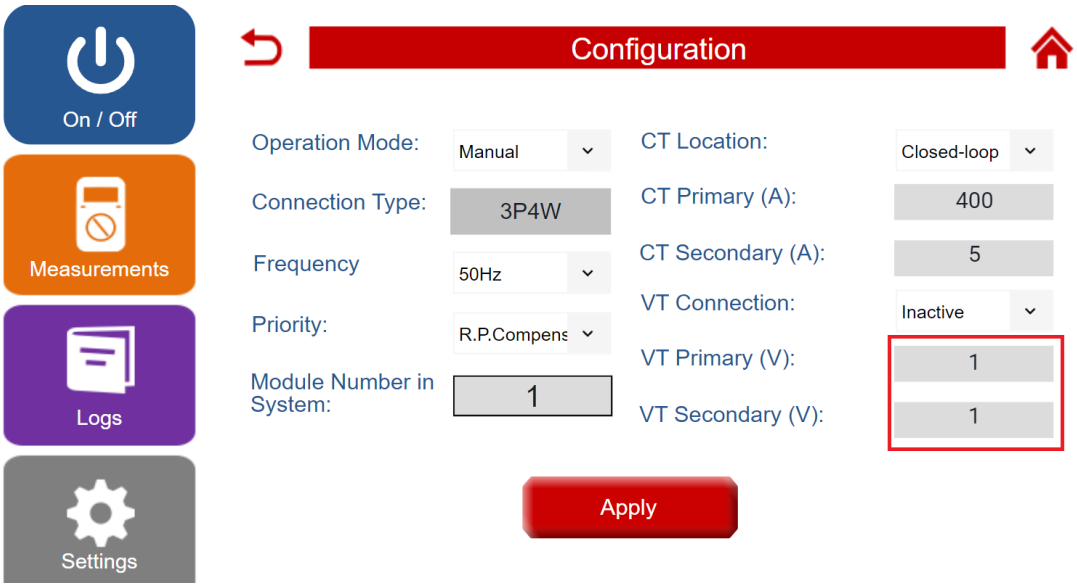


Figure 33: Determination of Voltage Transformer's Ratio

7.3. Operation Menu and Safe Start Position

The "Operation" menu is the section where the operating mode of the device is set. The energy requirements of the installed facility can be met by activating the operations in this section. One important step to consider when configuring is that the device's initial settings are reset by resetting the operation data. This process can be performed under the "Operation" menu.

- "Enter the "Settings" menu.

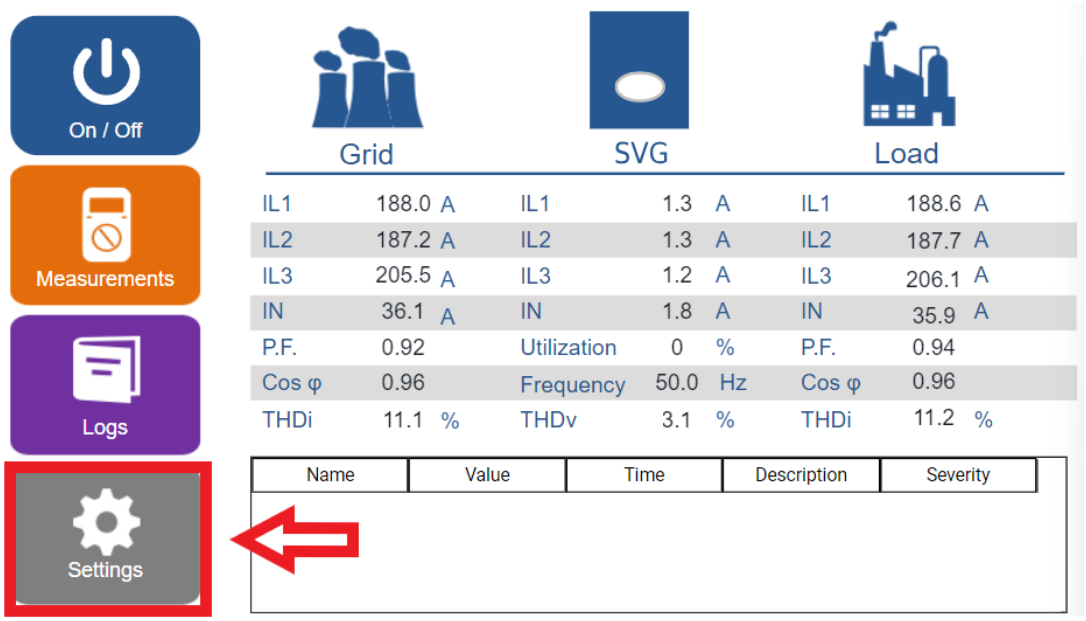


Figure 34: Entering the "Settings" Menu

- "Entering the "Operation" menu.

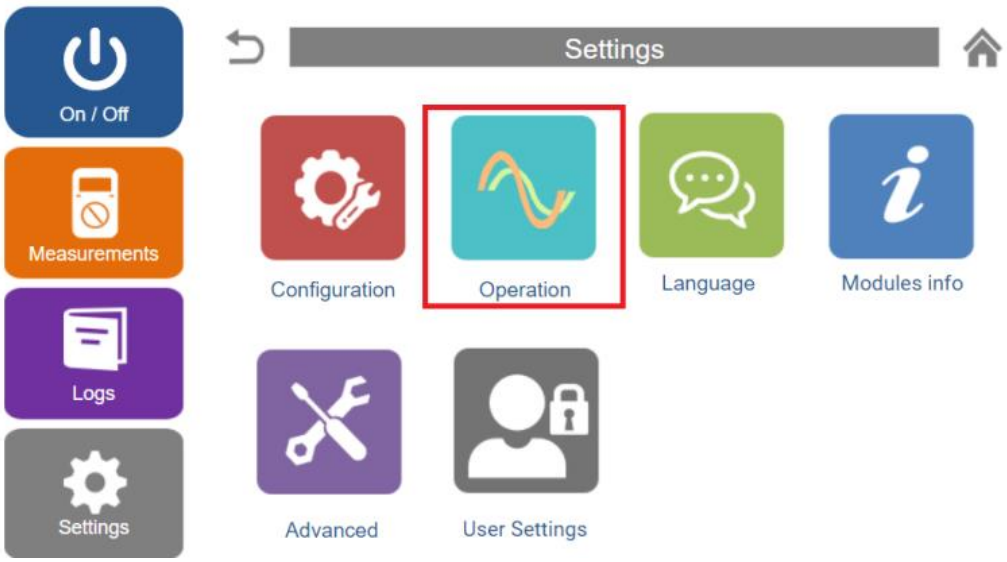


Figure 35: Entering the "Operation" Menu

Figure 36: "Operation" Menu

7.3.1. Harmonic Filtering and Initial Settings

- Enter the "Harmonic Filtering" menu. This menu is the operation menu where the desired harmonics are selected and 100% entered harmonics are filtered. All harmonic filtering must be reset for a safe start during device setup. After entering the operation menu, the submenus "Positive and Negative Component" and "Neutral Harmonics" parameters are reset.

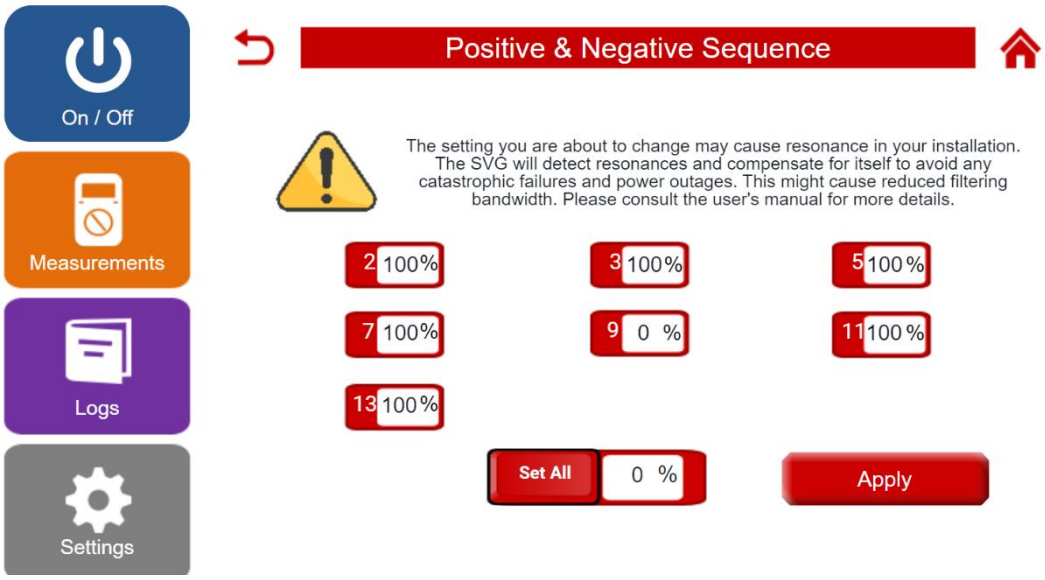


Figure 37: Resetting the "Positive and Negative Component" data.

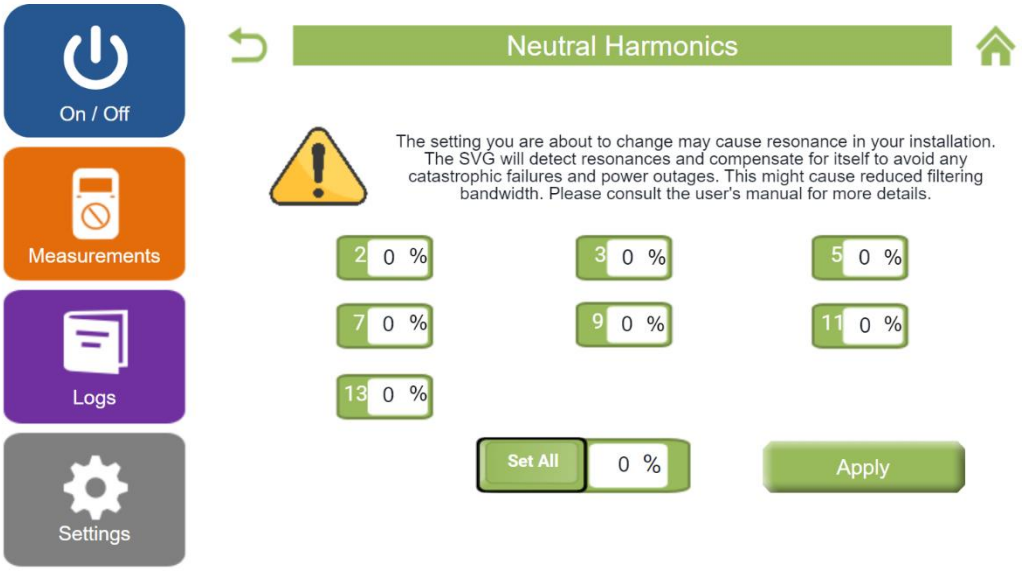


Figure 38: Resetting the "Neutral Harmonics" data.

7.3.2. Load Balancing and Initial Settings

- The "Load Balancing" menu is accessed via the "Operation" menu. This menu is the menu where the load balancing operation takes place. Balancing can be activated by entering 100%. Data is reset and disabled at startup for secure installation.

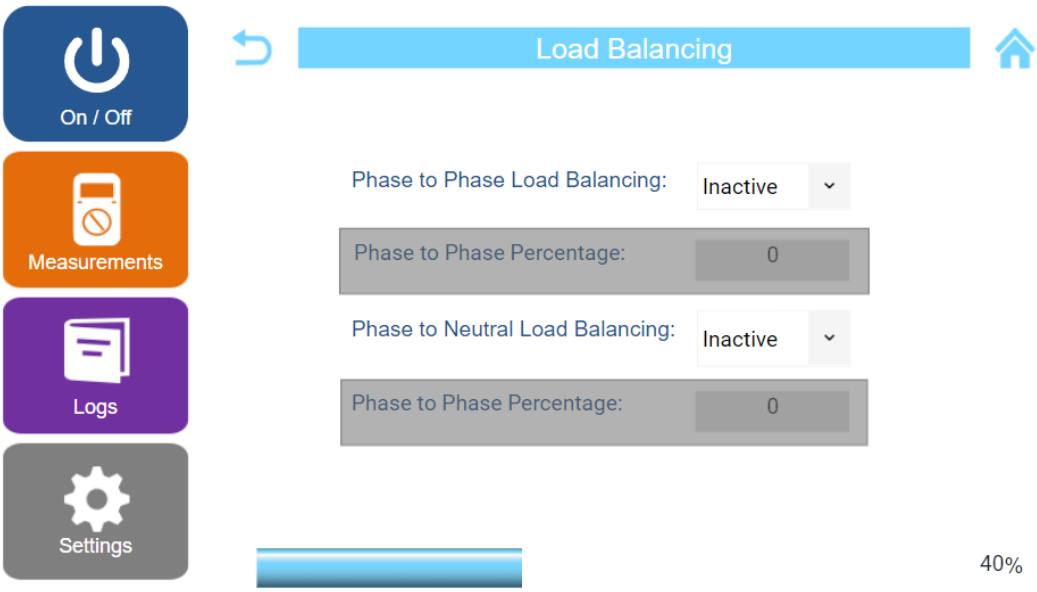


Figure 39: Resetting the "Neutral Harmonics" data.

7.3.3. Reactive Power Compensation and Initial Settings

- The “Reactive Power Compensation” menu is accessed via the “Operation” menu. This menu is the menu where the compensation process is performed. The desired mode can be activated by following the steps below. Initially data is reset and disabled for safe installation.

7.3.3.1. For Constant Current Command mode;

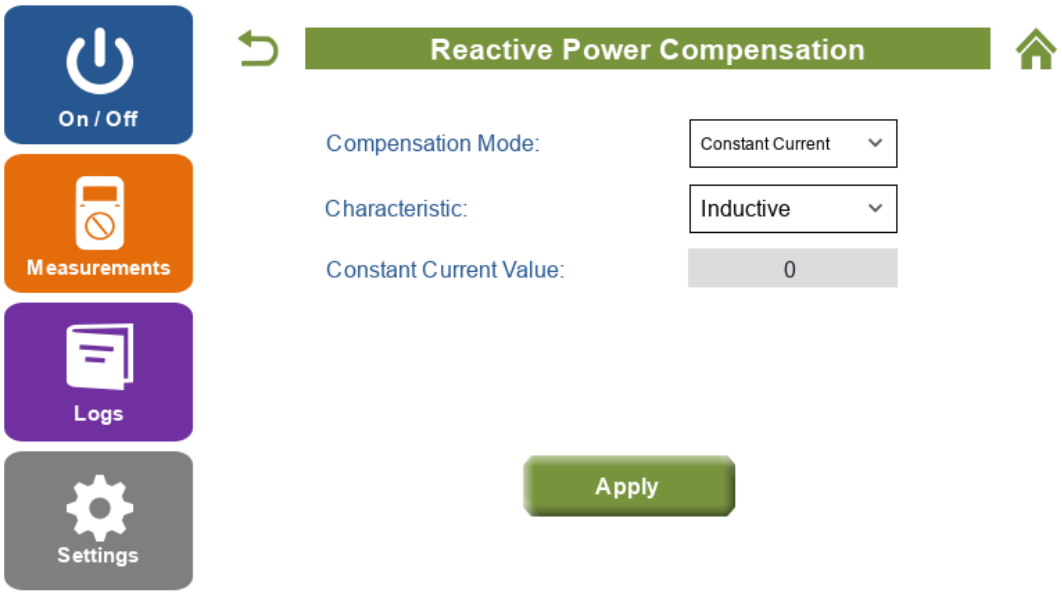


Figure 40: Using the ‘Constant Current’ mode

7.3.3.2. For Fixed Compensation mode;

- Select the Compensation Mode as Reactive Power Control.
- Select the characteristic you want to occur in the network after compensation.
- Enter the kVAr value you want to keep in the grid

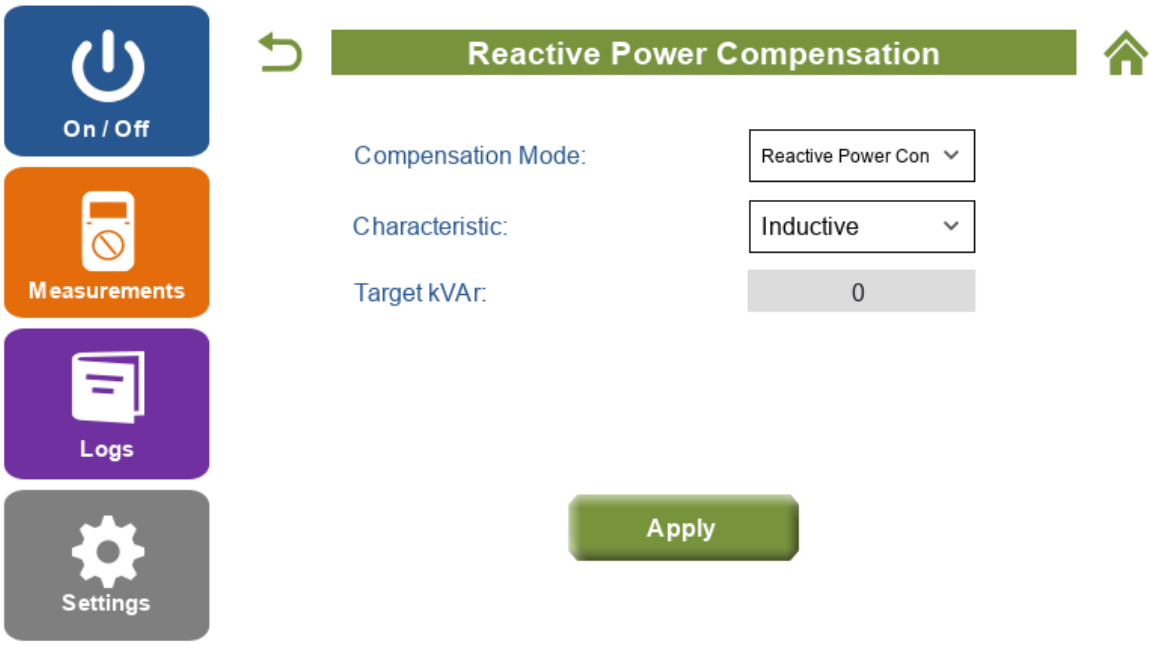


Figure 41: Use of 'Reactive Power Compensation' mode

7.3.3.3. For targeted Cosϕ mode;

- Select Cosϕ Control from the Compensation mode option.
- Select the characteristic you want to occur in the grid after compensation.
- Enter the targeted cosϕ value

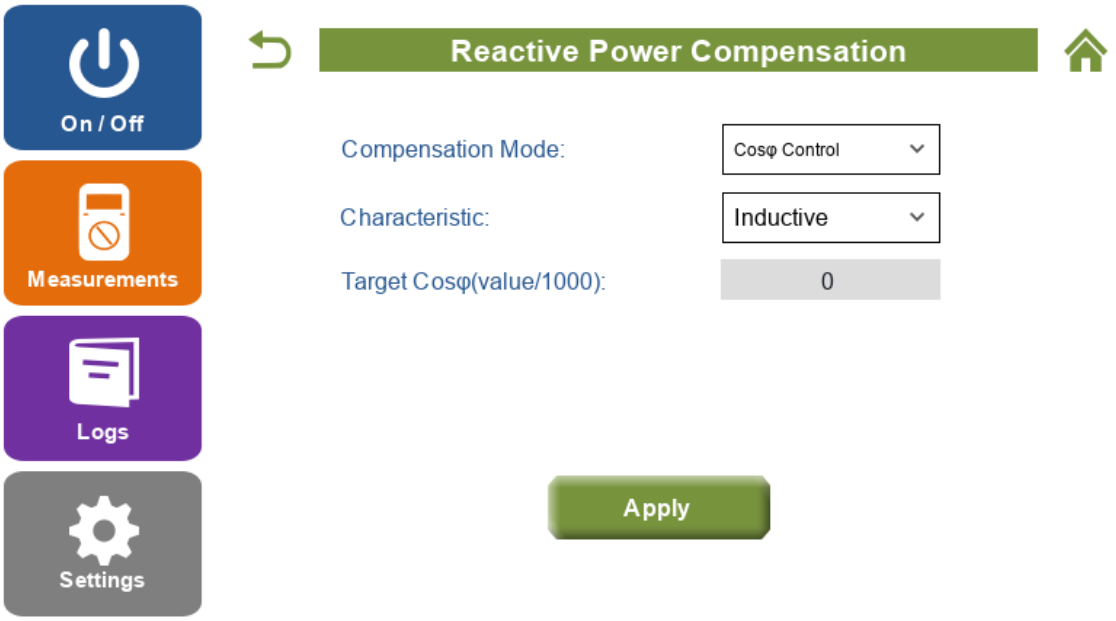


Figure 42: Using the 'Cosϕ Control' mode

7.3.4. Resonance Protection and Initial Settings

Enter the 'Resonance Protection' menu via the 'Operation' menu. By entering certain parameters to the device via the resonance protection menu, the device will be able to detect the resonance condition. These parameters should be entered as 'Method 1: 10, Method 2: 200, Method 3: 1440, Method 4: 20, Method 5: 60'.

WARNING

If the resonance condition persists after entering the parameters, please contact ELEKTRA sales department.

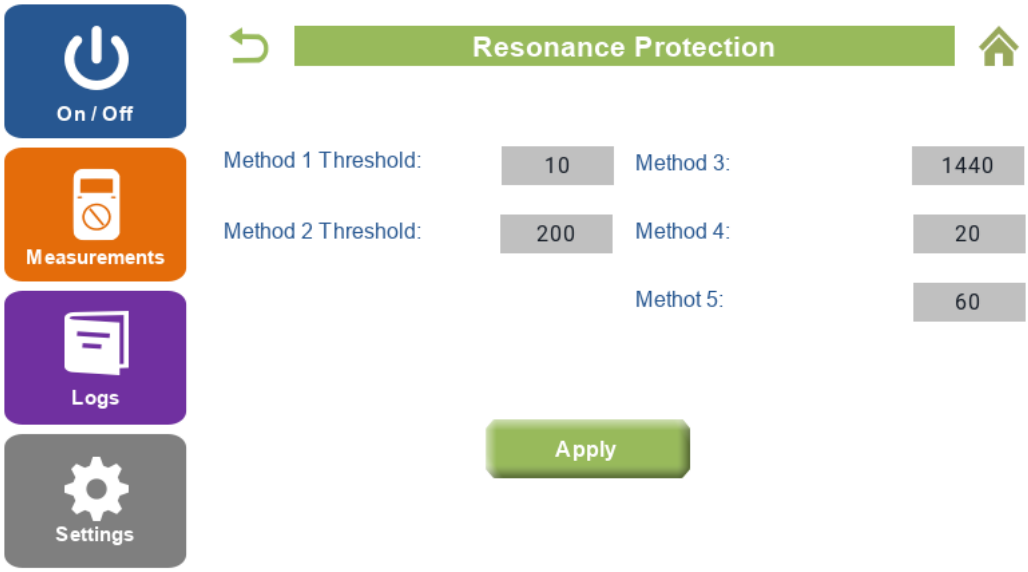


Figure 43: Resetting "Resonance Protection" data

7.3.5. Hybrid System Initial Settings

The hybrid system is a system that provides compensation by activating the existing capacitors as a result of the change of reactive loads or by deactivating the capacitor in case of need. The "Hybrid System" menu is accessed via the "Operation" menu. The total number of capacitor steps to be used is entered into the "Total Number of Units" parameter.

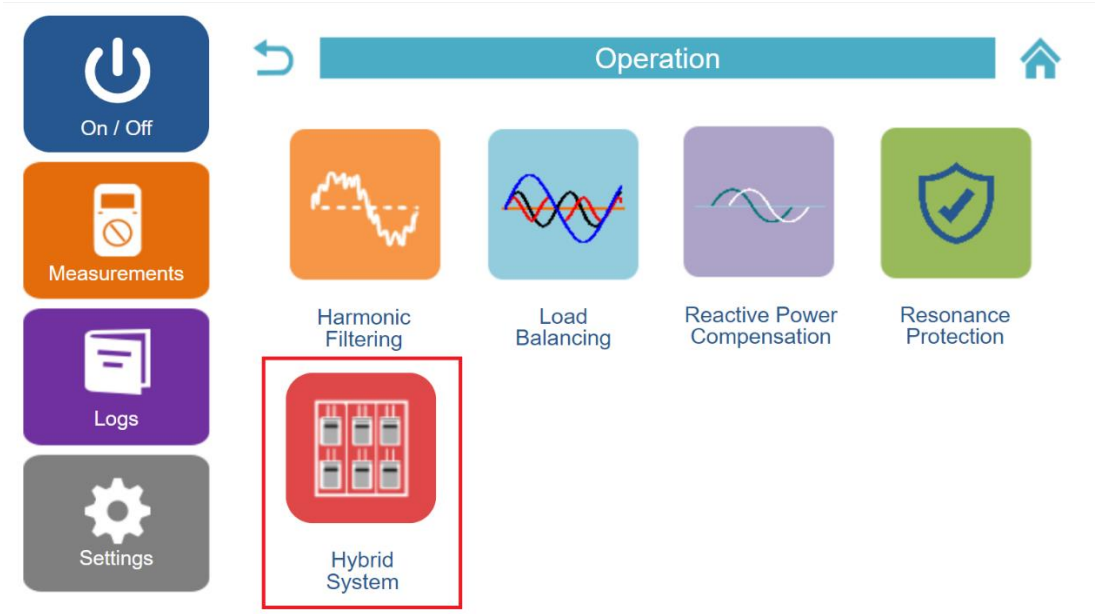


Figure 44: Hybrid System

The 18 capacitor stages that can be used in the system are shown as red (disabled) or green (enabled) LEDs, depending on their activity status. Except for the "Total Number of Units" entered in the previous step, the LEDs of the steps are shown as off.

Two methods are used to identify capacitor kVAr values in the system.

7.3.5.1. Automatic Scanning

From the "Hybrid System" menu, the "Automatic Scanning" button is pressed. The system will start to detect the capacitor values automatically.

The system measures the power of the connected capacitors by switching the stages on and off in sequence during scanning. During automatic scanning, each step is activated and deactivated three times. After typing "Completed" sign as shown in Figure 45, it becomes available for the next step.

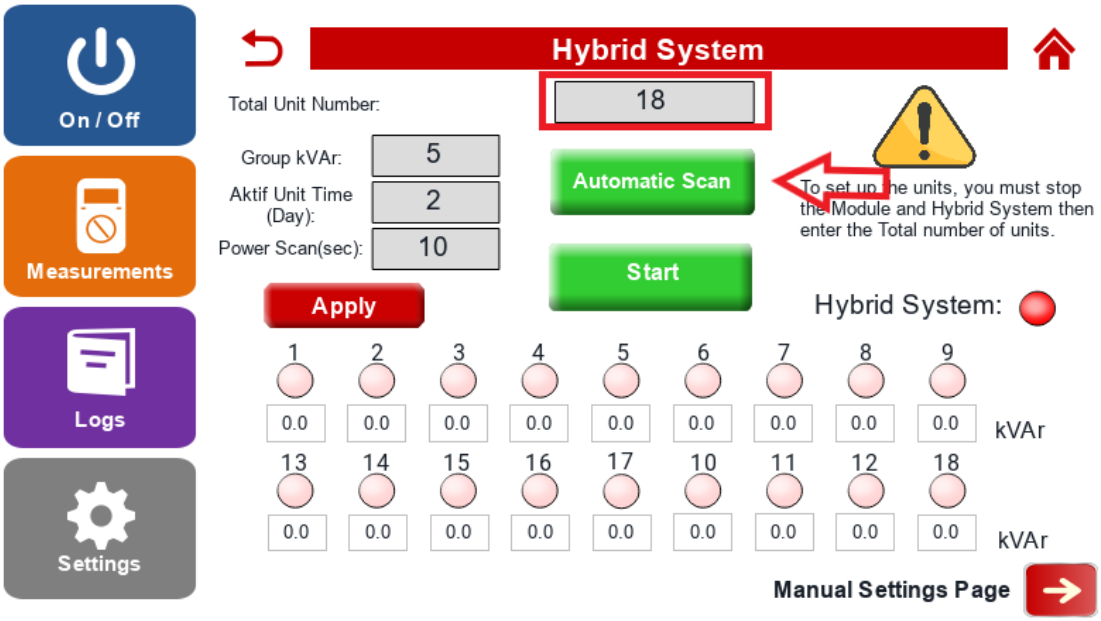


Figure 45: Automatic Scanning

7.3.5.2. Manual Step Input

Users who do not want to perform automatic scanning can enter capacitor values from this menu. From the "Hybrid System" menu, the "Manual Setting Page" button is pressed. The desired kVAr values are entered by clicking on the Value section shown in Figure 46. After all the values are entered, the "Apply" button is pressed. System capacitor values will be defined.

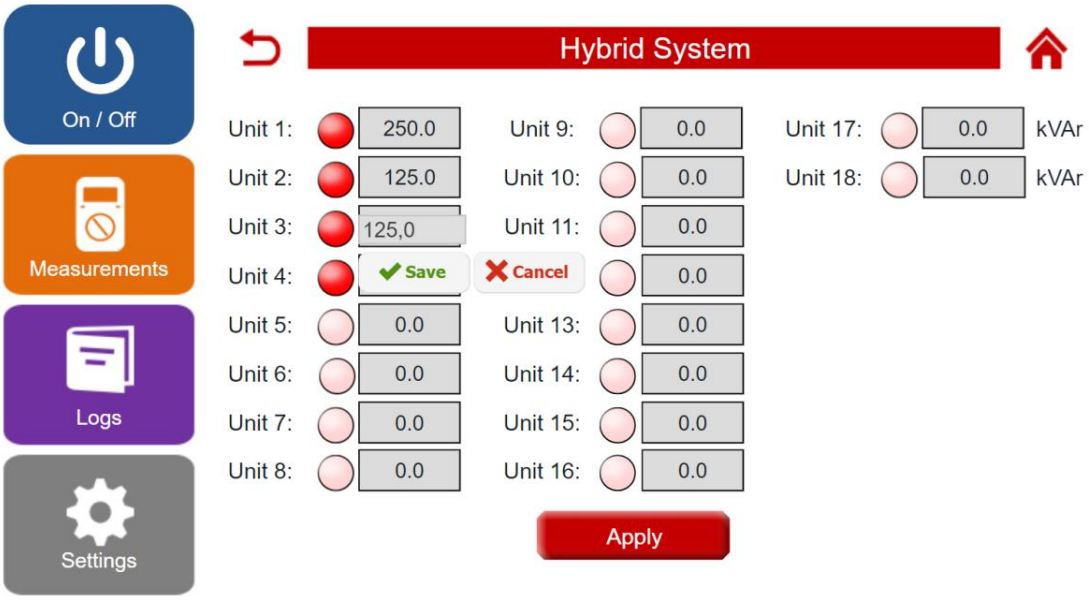


Figure 46: Manual Step Input Menu

7.3.5.3. Capacitor Categorizing

With automatic scanning, a capacitor of 50 kVAr can be measured at 50.8, 49.5, 51 kVAr. The power values of different capacitors measured in a similar way should be determined as a single group and should wear out equally within this group. The difference between the highest and lowest power values of the capacitors to be evaluated as equal should be entered as kVAr group.

For example, in order to evaluate 3 different capacitors measured at 50.8, 49.5, 51 kVAr levels as a group, the difference between the highest measured power amount and the lowest power amount (51- 49.5 = 1.5) kVAr group value should be rounded up to the next whole number and entered as ‘2’.

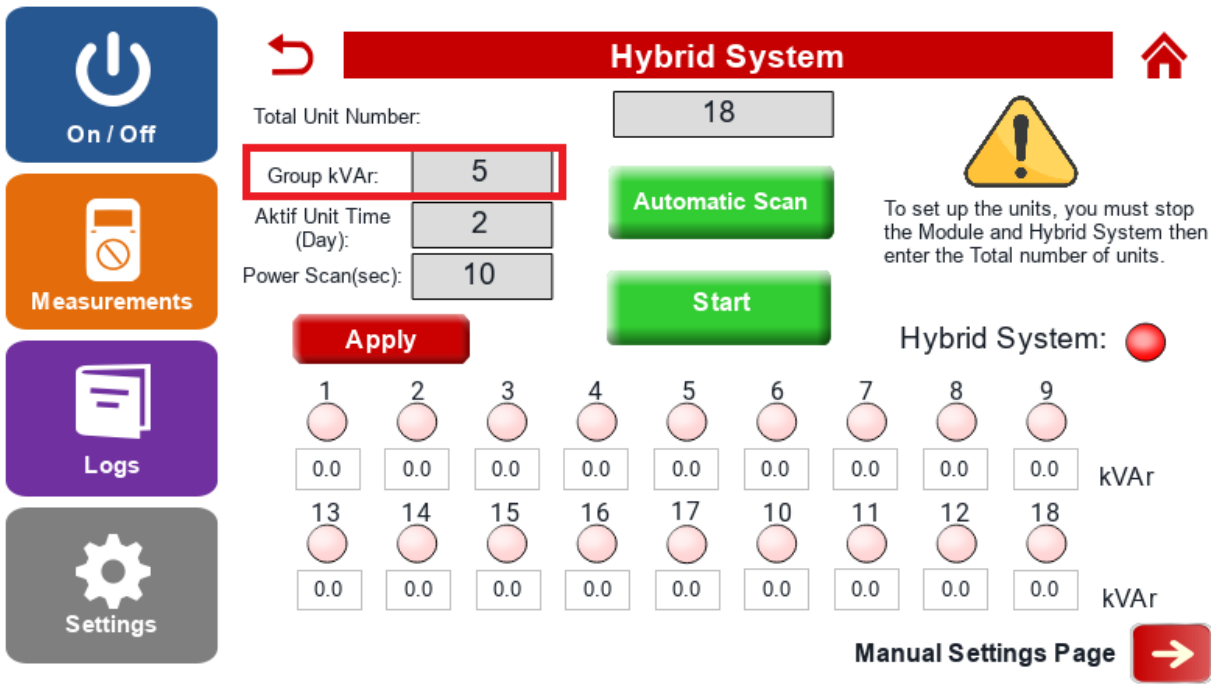


Figure 47: Hybrid Capacitor Matching

7.3.5.4. Equal Abrasion Adjustment

If it is desired to operate the capacitors with a time difference of how many days, it should be entered as the Active Unit Time parameter. For example, let the wear time be Active Unit Time: 15. Assuming that there are 3 equal kVAr capacitors, the capacitor stage is activated for 15 days, respectively.

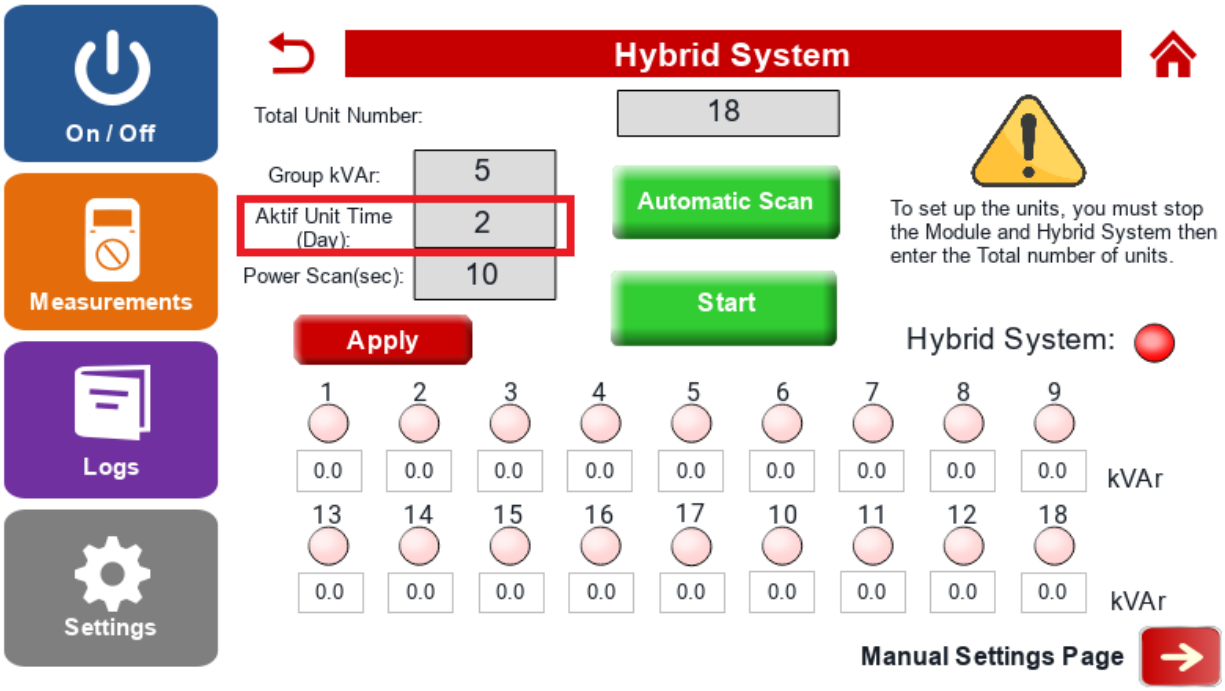


Figure 48: Capacitor Abrasion Time

7.3.5.5. Repeated Step Adjustment

In hybrid compensation systems, re-activation of the disengaged step without discharging may pose a risk for the step. For this reason, the 'Power Scan' parameter must be entered in order to set how long the step can be activated again according to the discharge time in your step.

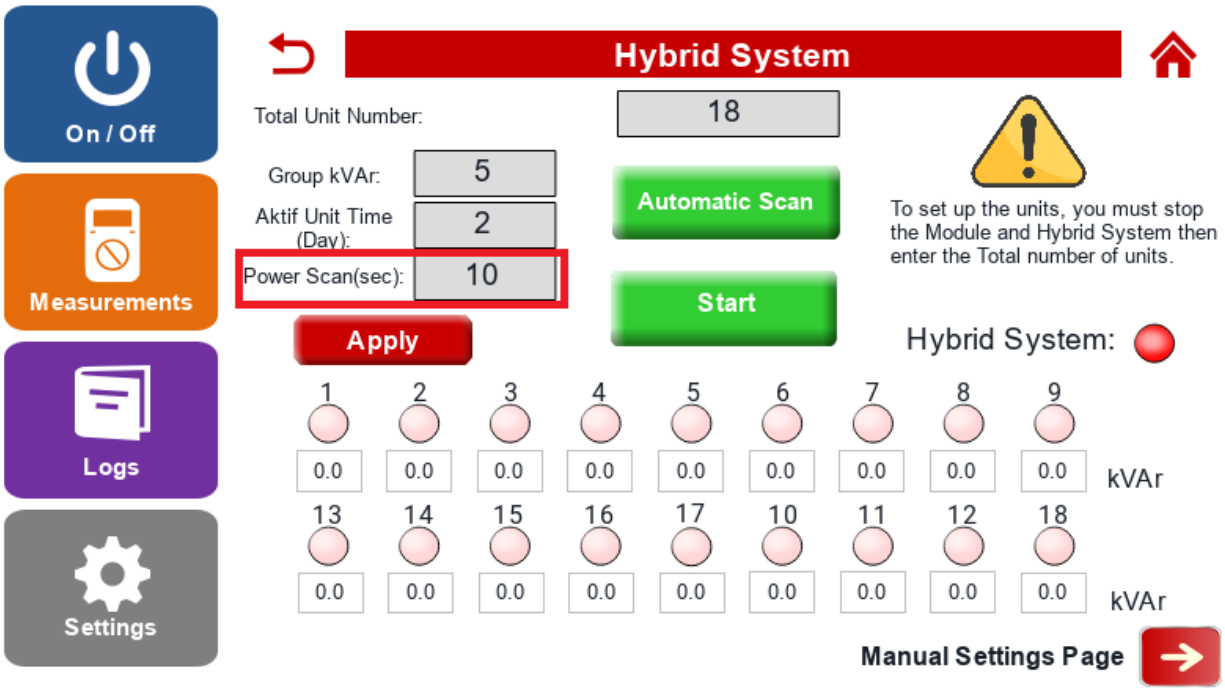


Figure 49 "Setting the Power Scan Time"

8. Control

Some measurement results on the screen must be checked to determine the accuracy of the connections formed. After making the initial settings correctly, you can make sure your connection is correct by checking the following parameters.

WARNING

8.1. Control of Phase Sequence

The phase sequence must be correctly connected to the energy for the SVG devices to operate properly. In two steps, phase sequence control can be tested. These two control processes are examined in detail below.

8.1.1. Frequency Value

If the phase sequence is not correct at the energy input of the device, the frequency value will be different from the desired value since the mains voltage is measured incorrectly. Check the match of the grid frequency with the frequency value on the "Main screen".

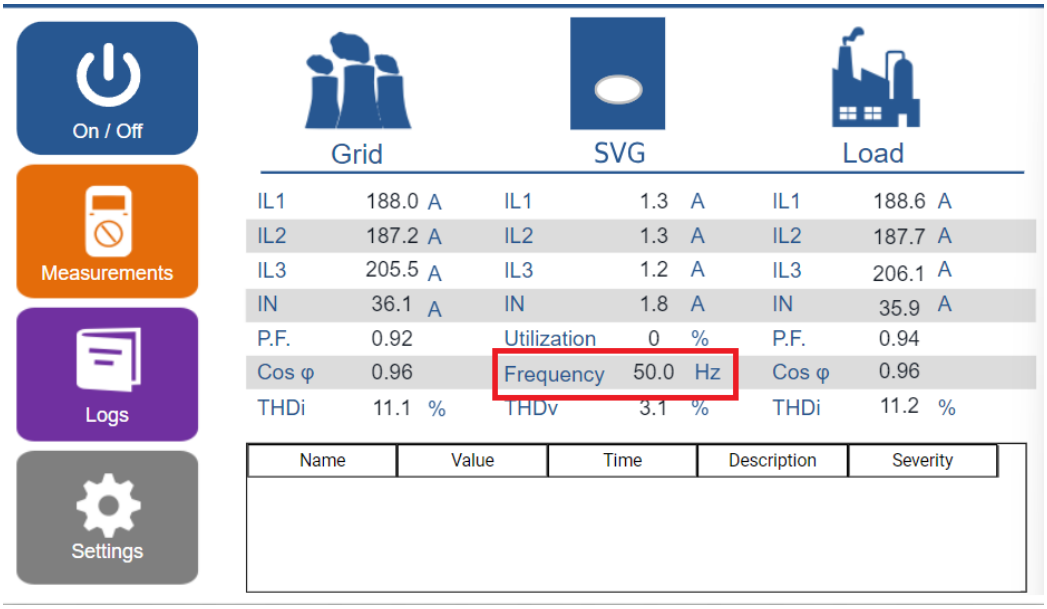


Figure 50: Frequency value control via "Main screen

Example: If the phase sequence is connected incorrectly in a grid with 50±0.2 Hz, you can see the frequency value of 40 Hz on the HMI screen.

8.1.2. Voltage Phase Angle

The correctness of the phase sequence can also be checked from the phase angles of the mains voltage in the Measurements-Grid page. The following steps must be followed to reach the grid page.

➢ Click on the "Measurements" tab on the "Main Screen".

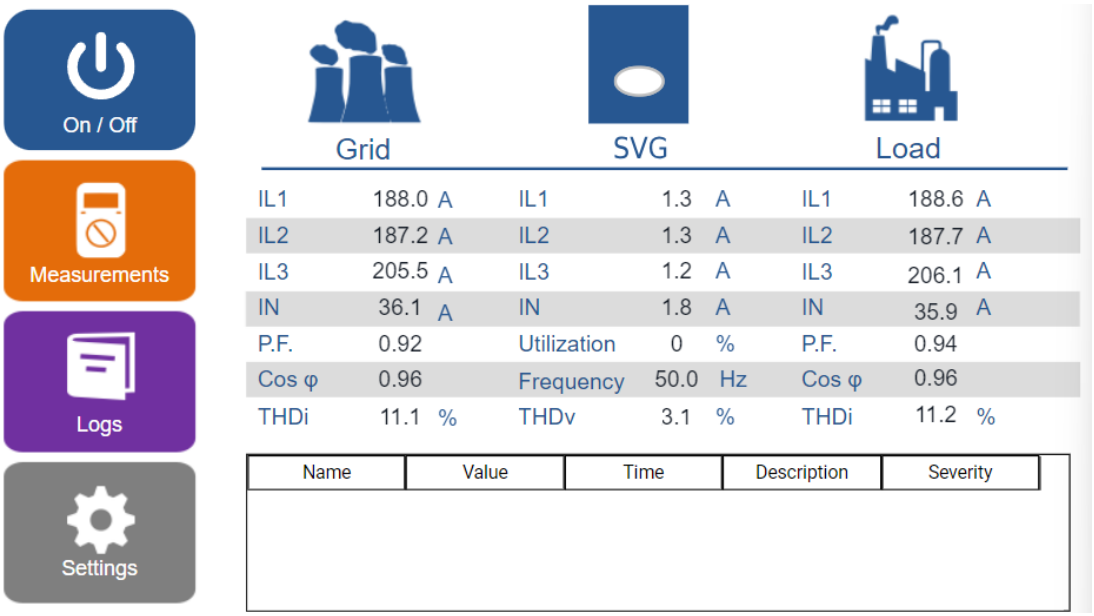


Figure 51: Access to the "Measurements" screen via the "Main screen"

➢ From the “Measurements” menu, click on the “Grid” tab.

Figure 52: Accessing the “Grid” menu via “Measurements.”

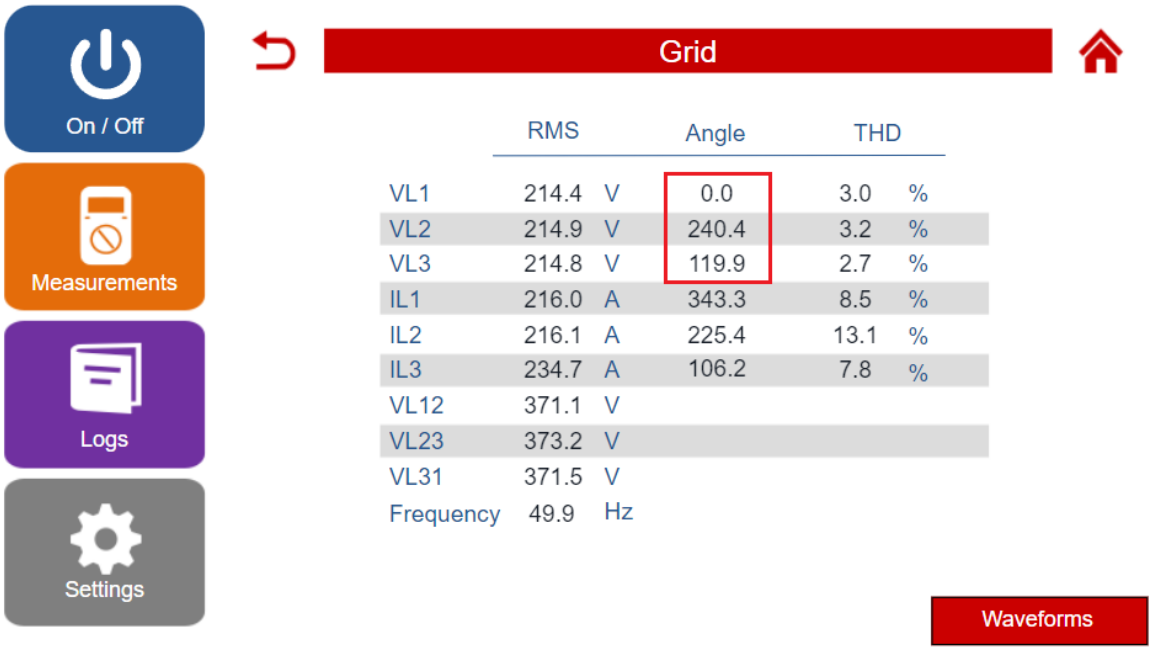


Figure 53: Control of Grid Angles

In this section, you should see the phase angle of L1 as 0, phase angle of L2 as 240, and phase angle of L3 as 120. If any value other than this order is seen, the energy connection should be checked again.

8.2. Control of Current Transformer Connections

For SVG devices to work properly, current transformer connections must be accurate. The current transformer connection control can be checked in two steps. These two control steps are examined in turn below.

8.2.1. Current Phase Angle Control

Current transformer connection is very important for the correct operation of the product. In the initial settings, it should be ensured that the information about the location and ratio of the current transformer is entered correctly. If the connection and settings are made correctly, the phase angles of the mains current in the Measurements Grid page should be consistent with the phase angles of the voltage. In this way, it is ensured that the voltage and current are in the same phase.

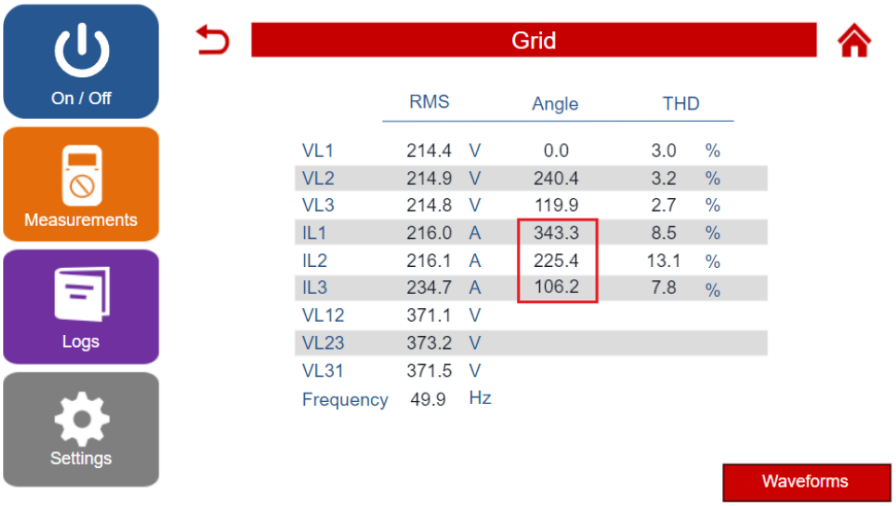


Figure 54: Control of Current Phase Angles

As seen in Figure 54, when the phase angles of the voltage are L1 0, L2 240, and L3 120, respectively, the current phase angles should be IL1 0±α, IL2 240±β, IL3 120±θ in relation to the voltage phase angles.

8.2.2. Active Power Control

In the connection of current transformers, the direction of the current transformers should be checked as well as the phase sequence. Correct connection is S1 to mains and S2 to load. After making sure that the directions of the current transformer are correct, it is necessary to check that the current transformer ends are correctly connected to the product. The active power value in the Measurements-Power pages must be positive.

- From the "Measurements" page, click on the "Power" tab.

Figure 55: Entering "Power" Menu

Figure 56: Control of Active Power Value

Here, the values must be positive when controlling the active power values. If the K-L terminals of the current transformer are reversed, one or more of the active power values are displayed as negative. In order to correct this situation, after the device is de-energized and a safe working condition is established, the K-L terminals must be replaced, and the processes must be repeated from the beginning.

8.3. Checking Error Records

Another point that should be checked before activating the device is the device error records. A safe start must be ensured by checking whether there is an active error on the device via this menu. The following steps should be followed to check device error.

- The Logs menu is selected on the home page.

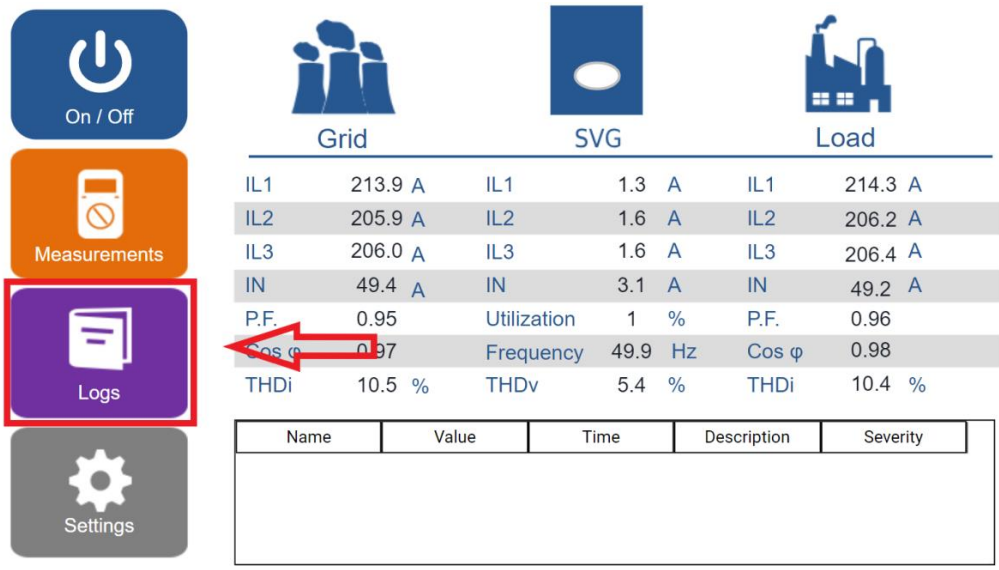


Figure 57: Entering the Logs Menu

- Active alarms menu is accessed via Records menu.

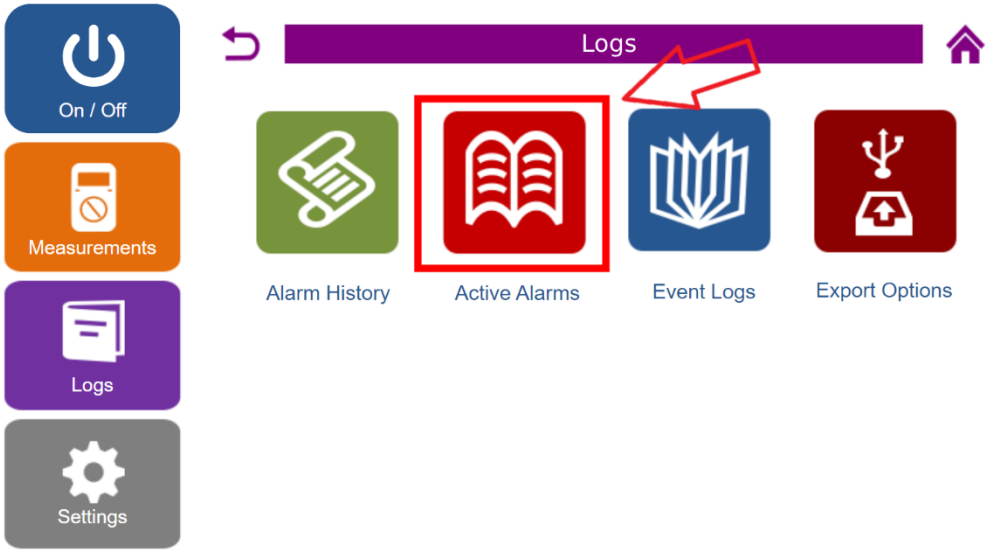


Figure 58: Entering the Active Alarms Menu

Active errors can be observed through this menu.

The following table shows the errors and error codes that may occur on the device.

FAULT CODE	FAULT DESCRIPTION
Fault OCP	Over current fault
Fault OVP	Over voltage fault
Fault WDT	CPU Reset Failed due to previous faults
Fault VOR	Voltage out of range faults
Fault COR	Current out of range faults
Fault FOR	Frequency out of range faults
Fault DCOR	DC Bus voltage out of range faults
Fault FAN	Fan faults
Fault IGBT	IGBT tempature faults
Fault LR	LR board tempature faults
Fault GIB	GIB board tempature faults
Fault FUSE_LINE	Line fuse is broken faults
Fault FUSE_GIB	GIB fuse is broken faults
Fault ETH	Communication faults
Fault DC_INPUT	Extarnal fault signal

Table4: Error codes and meanings

DANGER

After the initial setup and control stages are successfully completed, the device can be operated by clicking the "On-Off" button on the screen of the device. If any step may not work correctly or may malfunction.

9. Contact Info

SVG devices can be controlled via remote access as well as with the display. There are two remote access type. These

• Remote access via web interface

• Remote access via Modbus

9.1. Remote access via Web Interface

In remote access with the web interface, communication is provided between the web interface and the device by the Ethernet cable, which connects to the device screen. It should be considered that to connect to the device over the web, it must be connected to the same network. The following steps can be followed to connect to the device from the web interface:

- IP information is accessed on the screen; “Settings” → “Advanced Settings.”

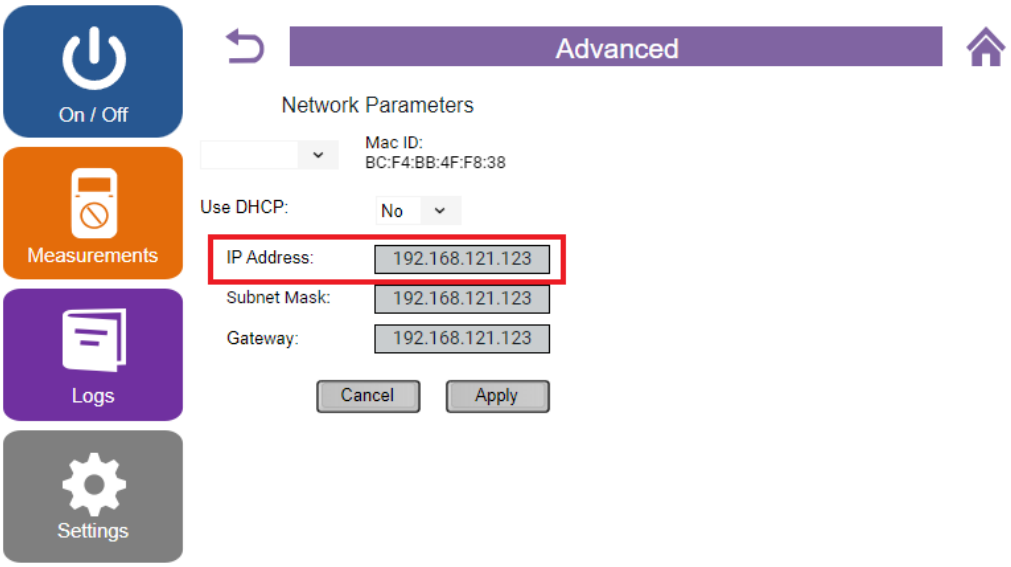


Figure 59: "Advanced Settings" Menu

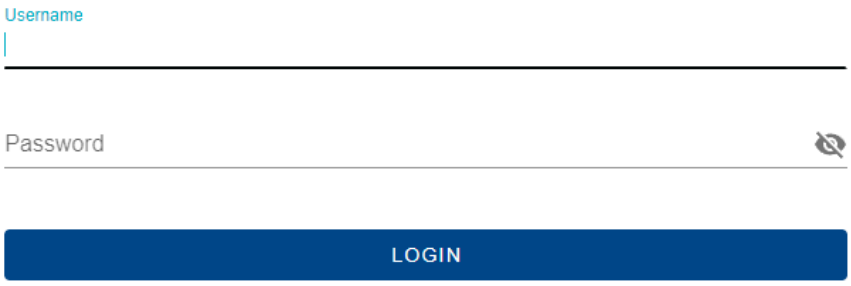


Figure 60: "User Login" Menu

After the user login, remote access to the device has been realized.

9.2. Remote Access with Modbus

Another method of remote access to the SVG device is remote access via Modbus. After the device is connected to the internet, follow the steps below to connect to the device via Modbus.

- IP information is accessed on the screen; "Settings"→ "Advanced Settings."

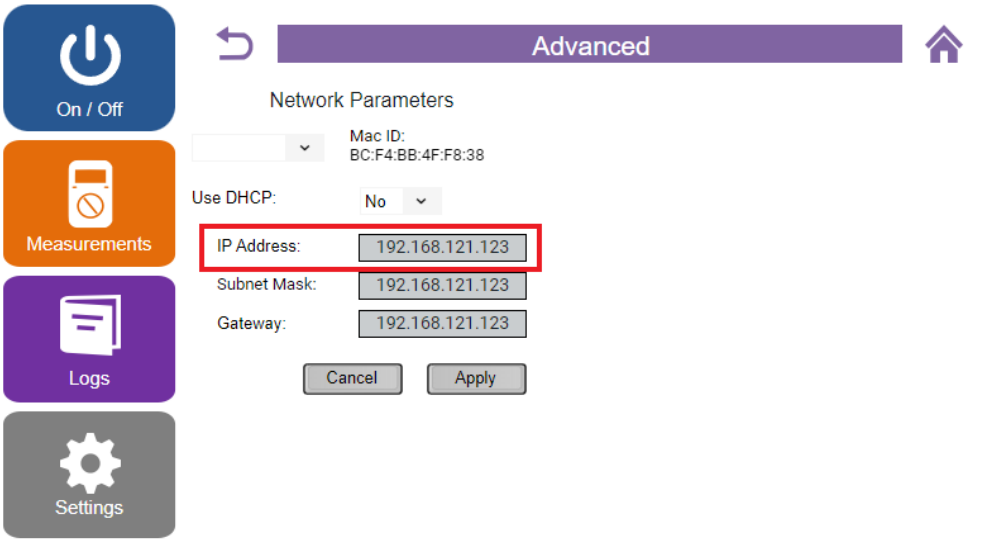


Figure 61: "Advanced Settings" Menu

- Using the IP address, the device is connected to the Modbus system.

Modbus control address map is given in the table below. Device control can be provided with the help of Modbus over addresses.

9.2.1. Basic Control List

Register Address	Byte	Description Modifiable	Remark
400001 (0x61A81)	2	Run Stop	0 : Standby 1 : Run
400002 (0x61A82)- 400099 (0x61AE3)	-	Reserved	-

9.2.2. Adjustable Parameters List

Register Address	Byte	Description Modifiable	Remark
400401 (0x61C11)	2	2. Positive-Negative Harmonic Percentage	%
400402 (0x61C12)	2	3. Positive-Negative Harmonic Percentage	%
400403 (0x61C13)	2	5. Positive-Negative Harmonic Percentage	%
400404 (0x61C14)	2	7. Positive-Negative Harmonic Percentage	%
400405 (0x61C15)	2	9. Positive-Negative Harmonic Percentage	%
400406 (0x61C16)	2	11. Positive-Negative Harmonic Percentage	%
400407 (0x61C17)	2	13. Positive-Negative Harmonic Percentage	%

*These registers are calculated in Software automatically

Harmonic Percentage List (Neutral)

Register Address	Byte	Description Modifiable	Remark
400453 (0x61C45)	2	2. Neutral Harmonic Percentage	%
400454 (0x61C46)	2	3. Neutral Harmonic Percentage	%
400455 (0x61C47)	2	5. Neutral Harmonic Percentage	%
400456 (0x61C48)	2	7. Neutral Harmonic Percentage	%
400457 (0x61C49)	2	9. Neutral Harmonic Percentage	%
400458 (0x61C4A)	2	11. Neutral Harmonic Percentage	%
400459 (0x61C4B)	2	13. Neutral Harmonic Percentage	%
400476(0x61C5C)…400477(0x61C5D)	-	Reserved	-

9.2.3. Configuration List

Register Address	Byte	Description Modifiable	Remark
400500 (0x61C74)	2	Reserved	-
400501 (0x61C75)	2	CT Location	0 : Disabled 1: Closed-loop 2: Open-loop
400502 (0x61C76)	2	Frequency	0 : 50Hz 1 : 60Hz
400503 (0x61C77)	2	CT Primary	Value (Turn Ratio)
400504 (0x61C78)	2	CT Secondary	Value (Turn Ratio)
400505(0x61C79)	2	Priority	0 : Disabled 1 : Compensation 2 : Load Balancing 3: Harmonics
400506(0x61C7A)	2	Resonance Threshold(Method 1)	Value (0 - 32767)
400507(0x61C7B)	2	Resonance Threshold(Method 2)	Value (0 - 32767)
400508(0x61C7C)	2	Compensation Mode	0 : Disabled 1 : Constant Current 2 : Constant Power 3 : CosPhi Control 4: Compensation
400509(0x61C7D)	2	Constant Current Command	Value(A)

400510(0x61C7E)	2	Current Direction	0: Inductive 1: Capacitive
400511(0x61C7F)	2	Constant Power Command	Value(kVAr)
400512(0x61C80)	2	Current Direction	0: Inductive 1: Capacitive
400513(0x61C81)	2	CosPhi Control	Value (0-100)
400514(0x61C82)	2	CosPhi Direction	0: Inductive 1: Capacitive
400515(0x61C83)	2	Compensation Percentage	Value (0-100) %
400516(0x61C84)	2	Load Balancing Phase to Phase	0: Inactive 1: Active
400517(0x61C85)	2	Load Balancing Phase to Phase Value	Value (0-100) %
400518(0x61C86)	2	Load Balancing Phase to Neutral	0: Inactive 1: Active
400519(0x61C87)	2	Load Balancing Phase to Neutral Value	Value (0-100) %
400520(0x61C88)	2	MV CT Location	0: Disabled 7 : Dd0 1: Yy0 8 : Dd2 2: Yy6 9: Dd4 3: Yd1 10: Dd6 4: Yd5 11 : Dy1 5: Yd7 12 : Dy5 6: Yd11 13 : Dy7 14 : Dy11
400521(0x61C89)	2	MV CT Primary	Value (Turn Ratio)
400522(0x61C8A)	2	MV CT Secondary	Value (Turn Ratio)
400523(0x61C8B) …400529(0x61C91)	-	Reserved	-
400530(0x61C92)	2	*Hybrid Component Unit Number	Value (0-24)
400531(0x61C93) …400555(0x61CAB)	2	*Hybrid Components Value	Value (kVAr)

400556(0x61CAC) …400925(0x61E1D)	2	Reserved	-

*Don’t change while Device and Hybrid System is running!
*Hybrid Component Unit Number must be equal to defined Hybrid Components.

9.2.4. Telemetry List

Register Address	Byte	Description Modifiable	Unit	Note:
400100 (0x61AE4)	2	Grid Voltage Line 1	V	Read Only
400101 (0x61AE5)	2	Grid Voltage Line 2	V	Read Only
400102 (0x61AE6)	2	Grid Voltage Line 3	V	Read Only
400103 (0x61AE7)	2	Grid Voltage Line 1 to Line 2	V	Read Only
400104 (0x61AE8)	2	Grid Voltage Line 2 to Line 3	V	Read Only
400105 (0x61AE9)	2	Grid Voltage Line 3 to Line 1	V	Read Only
400106 (0x61AEA)	2	Grid Current L1	A	Read Only
400107 (0x61AEB)	2	Grid Current L2	A	Read Only
400108 (0x61AEC)	2	Grid Current L3	A	Read Only
400109 (0x61AED)	2	Grid Current LN	A	Read Only
400110 (0x61AEE)	2	Load Current L1	A	Read Only
400111 (0x61AEF)	2	Load Current L2	A	Read Only
400112 (0x61AF0)	2	Load Current L3	A	Read Only
400113 (0x61AF1)	2	Load Current LN	A	Read Only
400114 (0x61AF2)	2	System Current L1	A	Read Only

400115 (0x61AF3)	2	System Current L2	A	Read Only
400116 (0x61AF4)	2	System Current L3	A	Read Only
400117 (0x61AF5)	2	System Current LN	A	Read Only
400118 (0x61AF6) …400137(0x061B09)	-	Reserved	-	-
400138 (0x61B0A)	2	Grid Frequency	Hz	Read Only
400139 (0x61B0B)	2	Load Power Factor	-	Read Only
400140 (0x61B0C)	2	Grid Power L1	kW	Read Only
400141 (0x61B0D)	2	Grid Power L2	kW	Read Only
400142 (0x61B0E)	2	Grid Power L3	kW	Read Only
400143 (0x61B0F)	2	Grid Power Total	kW	Read Only
400144 (0x61B10)	2	Grid Reactive Power L1	kVAr	Read Only
400145 (0x61B11)	2	Grid Reactive Power L2	kVAr	Read Only
400146 (0x61B12)	2	Grid Reactive Power L3	kVAr	Read Only
400147 (0x61B13)	2	Grid Reactive Power Total	kVAr	Read Only
400148 (0x61B14)	2	Grid Apparent Power L1	kVA	Read Only
400149 (0x61B15)	2	Grid Apparent Power L2	kVA	Read Only
400150 (0x61B16)	2	Grid Apparent Power L3	kVA	Read Only
400151 (0x61B17)	2	Grid Apparent Power Total	kVA	Read Only
400152 (0x61B18)	2	Load Power L1	kW	Read Only
400153 (0x61B19)	2	Load Power L2	kW	Read Only

400154 (0x61B1A)	2	Load Power L3	kW	Read Only
400155 (0x61B1B)	2	Load Power Total	KW	Read Only
400156 (0x61B1C)	2	Load Reactive Power L1	kVAr	Read Only
400157 (0x61B1D)	2	Load Reactive Power L2	kVAr	Read Only
400158 (0x61B1E)	2	Load Reactive Power L3	kVAr	Read Only
400159 (0x61B1F)	2	Load Reactive Power Total	KVAr	Read Only
400160 (0x61B20)	2	Load Apparent Power L1	kVA	Read Only
400161 (0x61B21)	2	Load Apparent Power L2	kVA	Read Only
400162 (0x61B22)	2	Load Apparent Power L3	kVA	Read Only
400163 (0x61B23)	2	Load Apparent Power Total	kVA	Read Only
400164 (0x61B24)	2	Grid Voltage L1 Phase Angle	°	Read Only
400165 (0x61B25)	2	Grid Voltage L2 Phase Angle	°	Read Only
400166 (0x61B26)	2	Grid Voltage L3 Phase Angle	°	Read Only
400167 (0x61B27)	2	Grid Current L1 Phase Angle	°	Read Only
400168 (0x61B28)	2	Grid Current L2 Phase Angle	°	Read Only
400169 (0x61B29)	2	Grid Current L3 Phase Angle	°	Read Only
400170 (0x61B2A) …400172(0x61B2C)	-	Reserved	-	-
400173 (0x61B2D)	2	Grid CosPhi L1	-	Read Only
400174 (0x61B2E)	2	Grid CosPhi L2	-	Read Only
400175 (0x61B2F)	2	Grid CosPhi L3	-	Read Only

400176 (0x61B30)	2	Grid CosPhi	-	Read Only
400177 (0x61B31)	2	Load CosPhi L1	-	Read Only
400178 (0x61B32)	2	Load CosPhi L2	-	Read Only
400179 (0x61B33)	2	Load CosPhi L3	-	Read Only
400180 (0x61B34)	2	Load CosPhi	-	Read Only
400181 (0x61B35)	2	Grid THDv L1	%	Read Only
400182 (0x61B36)	2	Grid THDv L2	%	Read Only
400183 (0x61B37)	2	Grid THDv L3	%	Read Only
400184 (0x61B38)	2	Grid THDi L1	%	Read Only
400185 (0x61B39)	2	Grid THDi L2	%	Read Only
400186 (0x61B3A)	2	Grid THDi L3	%	Read Only
400187 (0x61B3B)	2	Load THDi L1	%	Read Only
400188 (0x61B3C)	2	Load THDi L2	%	Read Only
400189 (0x61B3D)	2	Load THDi L3	%	Read Only
400190 (0x61B3F)	2	Grid Power Factor 1	-	Read Only
400191 (0x61B40)	2	Grid Power Factor 2	-	Read Only
400192 (0x61B41)	2	Grid Power Factor 3	-	Read Only
400193 (0x61B42)	2	Grid Power Factor	-	Read Only
400194 (0x61B43)	2	Load Power Factor 1	-	Read Only
400195 (0x61B44)	2	Load Power Factor 2	-	Read Only

400196 (0x61B45)	2	Load Power Factor 3	-	Read Only
400197 (0x61B46)	2	Grid THDv	%	Read Only
400198 (0x61B47)	2	Grid THDi	%	Read Only
400199 (0x61B48)	2	Load THDi	%	Read Only
400200(0x61B49) …400400(0x61C10)	-	Reserved	-	-

MODULE 1

Register Address	Byte	Description Modifiable	Unit	Note:
401000 (0x61E68) …401108(0x61ED4)	2	Reserved	-	-
401109(0x61ED5)	2	Module 1 Current L1	A	Read Only
401110(0x61ED6)	2	Module 1 Current L2	A	Read Only
401111(0x61ED7)	2	Module 1 Current L3	A	Read Only
401112(0x61ED8)	-	Reserved	-	Read Only
401113(0x61ED9)	2	Module 1 CT Current L1	A	Read Only
401114(0x61EDA)	2	Module 1 CT Current L2	A	

				Read Only
401115(0x61EDB)	2	Module 1 CT Current L3	A	Read Only
401116 (0x61EDC) …401117(0x61EDD)	2	Reserved	-	-
401118(0x61EDE)	2	Module 1 DC BUS Voltage	V	Read Only
401119(0x61EDF)..401124(0x61EE4)	-	Reserved	-	-
401125(0x61EE5)	2	Module 1 IGBT 1A Temperature	°C	Read Only
401126(0x61EE6)	2	Module 1 IGBT 2A Temperature	°C	Read Only
401127(0x61EE7)	2	Module 1 IGBT 1B Temperature	°C	Read Only
401128(0x61EE8)	2	Module 1 IGBT 2B Temperature	°C	Read Only
401129(0x61EE9)	2	Module 1 IGBT 1C Temperature	°C	Read Only
401130(0x61EEA)	2	Module 1 IGBT 2C Temperature	°C	Read Only
401131(0x61EEB)..401133(0x61EED)	-	Reserved	-	-
401134(0x61EEE)	2	Module 1 LR1 Temperature	-	Read Only
401135(0x61EEF)	2	Module 1 LR2 Temperature	-	Read Only
401136(0x61EF0)	2	Module 1 LR3 Temperature	-	Read Only
401137(0x61EF1)	2	Module 1 Over Current Fault	-	Read Only
401138(0x61EF2)	2	Module 1 Over Voltage Fault	-	Read Only
401139(0x61EF3)	2	Module 1 WatchDog Fault	-	Read Only
401140(0x61EF4)	2	Module 1 Voltage Out of Range Fault	-	Read Only
401141(0x61EF5)	2	Module 1 Current Out of Range Fault	-	Read Only

401142(0x61EF6)	2	Module 1 Frequency Out of Range Fault	-	Read Only
401143(0x61EF7)	2	Module 1 DC BUS Voltage Out of Range Fault	-	Read Only
401144(0x61EF8)	2	Module 1 Fan Fault	-	Read Only
401145(0x61EF9)	2	Module 1 IGBT Temperature Fault	-	Read Only
401146(0x61EFA)	2	Module 1 LR Temperature Fault	-	Read Only
401147(0x61EFB)	-	Reserved	-	Read Only
401148(0x61EFC)	2	Module 1 Line Fuse Broken	-	Read Only
401149(0x61EFD)	2	Module 1 GIB Fuse Broken	-	Read Only
401150(0x61EFE)	2	Module 1 Communication Fault	-	Read Only
401151(0x61EFF)…401199(0x61F2F)	-	Reserved	-	Read Only

MODULE 2

Register Address	Byte	Description Modifiable	Unit	Note:
401200 (0x61F30)…401208(0x61F38)	2	Reserved	-	-
401209(0x61F39)	2	Module 2 Current L1	A	Read Only
401210(0x61F3A)	2	Module 2 Current L2	A	Read Only
401211(0x61F3B)	2	Module 2 Current L3	A	Read Only
401212(0x61F3C)	-	Reserved	-	Read Only
401213(0x61F3D)	2	Module 2 CT Current L1	A	Read Only

401214(0x61F3E)	2	Module 2 CT Current L2	A	Read Only
401215(0x61F3F)	2	Module 2 CT Current L3	A	Read Only
401216 (0x61F40)…401217(0x61F41)	2	Reserved	-	-
401218(0x61F42)	2	Module 2 DC BUS Voltage	V	Read Only
401219(0x61F43)..401224(0x61F48)	-	Reserved	-	-
401225(0x61F49)	2	Module 2 IGBT 1A Temperature	°C	Read Only
401226(0x61F4A)	2	Module 2 IGBT 2A Temperature	°C	Read Only
401227(0x61F4B)	2	Module 2 IGBT 1B Temperature	°C	Read Only
401228(0x61F4C)	2	Module 2 IGBT 2B Temperature	°C	Read Only
401229(0x61F4D)	2	Module 2 IGBT 1C Temperature	°C	Read Only
401230(0x61F4E)	2	Module 2 IGBT 2C Temperature	°C	Read Only
401231(0x61F4F)..401233(0x61F51)	-	Reserved	-	-
401234(0x61F52)	2	Module 2 LR1 Temperature	-	Read Only
401235(0x61F53)	2	Module 2 LR2 Temperature	-	Read Only
401236(0x61F54)	2	Module 2 LR3 Temperature	-	Read Only
401237(0x61F55)	2	Module 2 Over Current Fault	-	Read Only
401238(0x61F56)	2	Module 2 Over Voltage Fault	-	Read Only
401239(0x61F57)	2	Module 2 WatchDog Fault	-	Read Only
401240(0x61F58)	2	Module 2 Voltage Out of Range Fault	-	Read Only
401241(0x61F59)	2	Module 2 Current Out of Range Fault	-	Read Only

401242(0x61F5A)	2	Module 2 Frequency Out of Range Fault	-	Read Only
401243(0x61F5B)	2	Module 2 DC BUS Voltage Out of Range Fault	-	Read Only
401244(0x61F5C)	2	Module 2 Fan Fault	-	Read Only
401245(0x61F5D)	2	Module 2 IGBT Temperature Fault	-	Read Only
401246(0x61F5E)	2	Module 2 LR Temperature Fault	-	Read Only
401247(0x61F5F)	-	Reserved	-	Read Only
401248(0x61F60)	2	Module 2 Line Fuse Broken	-	Read Only
401249(0x61F61)	2	Module 2 GIB Fuse Broken	-	Read Only
401250(0x61F62)	2	Module 2 Communication Fault	-	Read Only
401251(0x61F63)…401299(0x61F93)	-	Reserved	-	Read Only

MODULE 3

Register Address	Byte	Description Modifiable	Unit	Note:
401300 (0x61F94)…401308(0x61F9C)	2	Reserved	-	-
401309(0x61F9D)	2	Module 3 Current L1	A	Read Only
401310(0x61F9E)	2	Module 3 Current L2	A	Read Only
401311(0x61F9F)	2	Module 3 Current L3	A	Read Only
401312(0x61FA0)	-	Reserved	-	Read Only
401313(0x61FA1)	2	Module 3 CT Current L1	A	Read Only
401314(0x61FA2)	2	Module 3 CT Current L2	A	Read Only

401315(0x61FA3)	2	Module 3 CT Current L3	A	Read Only
401316 (0x61FA4)…401317(0x61FA5)	2	Reserved	-	-
401318(0x61FA6)	2	Module 3 DC BUS Voltage	V	Read Only
401319(0x61FA7)..401324(0x61FAC)	-	Reserved	-	-
401325(0x61FAD)	2	Module 3 IGBT 1A Temperature	°C	Read Only
401326(0x61FAE)	2	Module 3 IGBT 2A Temperature	°C	Read Only
401327(0x61FAF)	2	Module 3 IGBT 1B Temperature	°C	Read Only
401328(0x61FB0)	2	Module 3 IGBT 2B Temperature	°C	Read Only
401329(0x61FB1)	2	Module 3 IGBT 1C Temperature	°C	Read Only
401330(0x61FB2)	2	Module 3 IGBT 2C Temperature	°C	Read Only
401331(0x61FB3)..401333(0x61FB5)	-	Reserved	-	-
401334(0x61FB6)	2	Module 3 LR1 Temperature	-	Read Only
401335(0x61FB7)	2	Module 3 LR2 Temperature	-	Read Only
401336(0x61FB8)	2	Module 3 LR3 Temperature	-	Read Only
401337(0x61FB9)	2	Module 3 Over Current Fault	-	Read Only
401338(0x61FBA)	2	Module 3 Over Voltage Fault	-	Read Only
401339(0x61FBB)	2	Module 3 WatchDog Fault	-	Read Only
401340(0x61FBC)	2	Module 3 Voltage Out of Range Fault	-	Read Only
401341(0x61FBD)	2	Module 3 Current Out of Range Fault	-	Read Only
401342(0x61FBE)	2	Module 3 Frequency Out of Range Fault	-	Read Only

401343(0x61FBF)	2	Module 3 DC BUS Voltage Out of Range Fault	-	Read Only
401344(0x61FC0)	2	Module 3 Fan Fault	-	Read Only
401345(0x61FC1)	2	Module 3 IGBT Temperature Fault	-	Read Only
401346(0x61FC2)	2	Module 3 LR Temperature Fault	-	Read Only
401347(0x61FC3)	-	Reserved	-	Read Only
401348(0x61FC4)	2	Module 3 Line Fuse Broken	-	Read Only
401349(0x61FC5)	2	Module 3 GIB Fuse Broken	-	Read Only
401350(0x61FC6)	2	Module 3 Communication Fault	-	Read Only
401351(0x61FC7)…401399(0x61FF7)	-	Reserved	-	Read Only

MODULE 4

Register Address	Byte	Description Modifiable	Unit	Note:
401400 (0x61FF8)…401408(0x62000)	2	Reserved	-	-
401409(0x62001)	2	Module 4 Current L1	A	Read Only
401410(0x62002)	2	Module 4 Current L2	A	Read Only
401411(0x62003)	2	Module 4 Current L3	A	Read Only
401412(0x62004)	-	Reserved	-	Read Only
401413(0x62005)	2	Module 4 CT Current L1	A	Read Only
401414(0x62006)	2	Module 4 CT Current L2	A	Read Only
401415(0x62007)	2	Module 4 CT Current L3	A	Read Only

401416 (0x62008)…401417(0x62009)	2	Reserved	-	-
401418(0x6200A)	2	Module 4 DC BUS Voltage	V	Read Only
401419(0x6200B)..401424(0x62010)	-	Reserved	-	-
401425(0x62011)	2	Module 4 IGBT 1A Temperature	°C	Read Only
401426(0x62012)	2	Module 4 IGBT 2A Temperature	°C	Read Only
401427(0x62013)	2	Module 4 IGBT 1B Temperature	°C	Read Only
401428(0x62014)	2	Module IGBT 2B Temperature	°C	Read Only
401429(0x62015)	2	Module 4 IGBT 1C Temperature	°C	Read Only
401430(0x62016)	2	Module 4 IGBT 2C Temperature	°C	Read Only
401431(0x62017)..401433(0x62019)	-	Reserved	-	-
401434(0x6201A)	2	Module 4 LR1 Temperature	-	Read Only
401435(0x6201B)	2	Module 4 LR2 Temperature	-	Read Only
401436(0x6201C)	2	Module 4 LR3 Temperature	-	Read Only
401437(0x6201D)	2	Module 4 Over Current Fault	-	Read Only
401438(0x6201E)	2	Module 4 Over Voltage Fault	-	Read Only
401439(0x6201F)	2	Module 4 WatchDog Fault	-	Read Only
401440(0x62020)	2	Module 4 Voltage Out of Range Fault	-	Read Only
401441(0x62021)	2	Module 4 Current Out of Range Fault	-	Read Only
401442(0x62022)	2	Module 4 Frequency Out of Range Fault	-	Read Only
401443(0x62023)	2	Module 4 DC BUS Voltage Out of Range Fault	-	Read Only

401444(0x62024)	2	Module 4 Fan Fault	-	Read Only
401445(0x62025)	2	Module 4 IGBT Temperature Fault	-	Read Only
401446(0x62026)	2	Module 4 LR Temperature Fault	-	Read Only
401447(0x62027)	-	Reserved	-	Read Only
401448(0x62028)	2	Module 4 Line Fuse Broken	-	Read Only
401449(0x62029)	2	Module 4 GIB Fuse Broken	-	Read Only
401450(0x6202A)	2	Module 4 Communication Fault	-	Read Only
401451(0x6202B)…401499(0x6205B)	-	Reserved	-	Read Only

MODULE 5

Register Address	Byte	Description Modifiable	Unit	Note:
401500 (0x6105C)…401508(0x62064)	2	Reserved	-	-
401509(0x62065)	2	Module 5 Current L1	A	Read Only
401510(0x62066)	2	Module 5 Current L2	A	Read Only
401511(0x62067)	2	Module 5 Current L3	A	Read Only
401512(0x62068)	-	Reserved	-	Read Only
401513(0x62069)	2	Module 5 CT Current L1	A	Read Only
401514(0x6206A)	2	Module 5 CT Current L2	A	Read Only
401515(0x6206B)	2	Module 5 CT Current L3	A	Read Only
401516 (0x6206C)…401517(0x6206D)	2	Reserved	-	-

401518(0x6206E)	2	Module 5 DC BUS Voltage	V	Read Only
401519(0x6206F)..401524(0x62074)	-	Reserved	-	-
401525(0x62075)	2	Module 5 IGBT 1A Temperature	°C	Read Only
401526(0x62076)	2	Module 5 IGBT 2A Temperature	°C	Read Only
401527(0x62077)	2	Module 5 IGBT 1B Temperature	°C	Read Only
401528(0x62078)	2	Module 5 IGBT 2B Temperature	°C	Read Only
401529(0x62079)	2	Module 5 IGBT 1C Temperature	°C	Read Only
401530(0x6207A)	2	Module 5 IGBT 2C Temperature	°C	Read Only
401531(0x6207B)..401533(0x6207D)	-	Reserved	-	-
401534(0x6207E)	2	Module 5 LR1 Temperature	-	Read Only
401535(0x6207F)	2	Module 5 LR2 Temperature	-	Read Only
401536(0x62080)	2	Module 5 LR3 Temperature	-	Read Only
401537(0x62081)	2	Module 5 Over Current Fault	-	Read Only
401538(0x62082)	2	Module 5 Over Voltage Fault	-	Read Only
401539(0x62083)	2	Module 5 WatchDog Fault	-	Read Only
401540(0x62084)	2	Module 5 Voltage Out of Range Fault	-	Read Only
401541(0x62085)	2	Module 5 Current Out of Range Fault	-	Read Only
401542(0x62086)	2	Module 5 Frequency Out of Range Fault	-	Read Only
401543(0x62087)	2	Module 5 DC BUS Voltage Out of Range Fault	-	Read Only
401544(0x62088)	2	Module 5 Fan Fault	-	Read Only

401545(0x62089)	2	Module 5 IGBT Temperature Fault	-	Read Only
401546(0x6208A)	2	Module 5 LR Temperature Fault	-	Read Only
401547(0x6208B)	-	Reserved	-	Read Only
401548(0x6208C)	2	Module 5 Line Fuse Broken	-	Read Only
401549(0x6208D)	2	Module 5 GIB Fuse Broken	-	Read Only
401550(0x6208E)	2	Module 5 Communication Fault	-	Read Only
401251(0x6208F)…401599(0x620BF)	-	Reserved	-	Read Only

MODULE 6

Register Address	Byte	Description Modifiable	Unit	Note:
401600 (0x620C0)…401608(0x620C8)	2	Reserved	-	-
401609(0x620C9)	2	Module 6 Current L1	A	Read Only
401610(0x620CA)	2	Module 6 Current L2	A	Read Only
401611(0x620CB)	2	Module 6 Current L3	A	Read Only
401612(0x620CC)	-	Reserved	-	Read Only
401613(0x620CD)	2	Module 6 CT Current L1	A	Read Only
401614(0x620CE)	2	Module 6 CT Current L2	A	Read Only
401615(0x620CF)	2	Module 6 CT Current L3	A	Read Only
401616 (0x620D0)…401617(0x620D1)	2	Reserved	-	-
401618(0x620D2)	2	Module 6 DC BUS Voltage	V	Read Only

401619(0x620D3)..401624(0x620D8)	-	Reserved	-	-
401625(0x620D9)	2	Module 6 IGBT 1A Temperature	°C	Read Only
401626(0x620DA)	2	Module 6 IGBT 2A Temperature	°C	Read Only
401627(0x620DB)	2	Module 6 IGBT 1B Temperature	°C	Read Only
401628(0x620DC)	2	Module 6 IGBT 2B Temperature	°C	Read Only
401629(0x620DD)	2	Module 6 IGBT 1C Temperature	°C	Read Only
401630(0x620DE)	2	Module 6 IGBT 2C Temperature	°C	Read Only
401631(0x620DF)..401633(0x620E1)	-	Reserved	-	-
401634(0x620E2)	2	Module 6 LR1 Temperature	-	Read Only
401635(0x620E3)	2	Module 6 LR2 Temperature	-	Read Only
401636(0x620E4)	2	Module 6 LR3 Temperature	-	Read Only
401637(0x620E5)	2	Module 6 Over Current Fault	-	Read Only
401638(0x620E6)	2	Module 6 Over Voltage Fault	-	Read Only
401639(0x620E7)	2	Module 6 WatchDog Fault	-	Read Only
401640(0x620E8)	2	Module 6 Voltage Out of Range Fault	-	Read Only
401641(0x620E9)	2	Module 6 Current Out of Range Fault	-	Read Only
401642(0x620EA)	2	Module 6 Frequency Out of Range Fault	-	Read Only
401643(0x620EB)	2	Module 6 DC BUS Voltage Out of Range Fault	-	Read Only
401644(0x620EC)	2	Module 6 Fan Fault	-	Read Only
401645(0x620ED)	2	Module 6 IGBT Temperature Fault	-	Read Only

401646(0x620EE)	2	Module 6 LR Temperature Fault	-	Read Only
401647(0x620EF)	-	Reserved	-	Read Only
401648(0x620F0)	2	Module 6 Line Fuse Broken	-	Read Only
401649(0x620F1)	2	Module 6 GIB Fuse Broken	-	Read Only
401650(0x620F2)	2	Module 6 Communication Fault	-	Read Only
401651(0x620F3)…401699(0x62123)	-	Reserved	-	Read Only

MODULE 7

Register Address	Byte	Description Modifiable	Unit	Note:
401700 (0x62124)…401708(0x6212C)	2	Reserved	-	-
401709(0x6212D)	2	Module 7 Current L1	A	Read Only
401710(0x6212E)	2	Module 7 Current L2	A	Read Only
401711(0x6212F)	2	Module 7 Current L3	A	Read Only
401712(0x62130)	-	Reserved	-	Read Only
401713(0x62131)	2	Module 7 CT Current L1	A	Read Only
401714(0x62132)	2	Module 7 CT Current L2	A	Read Only
401715(0x62133)	2	Module 7 CT Current L3	A	Read Only
401716 (0x62134)…401717(0x62135)	2	Reserved	-	-
401718(0x62136)	2	Module 7 DC BUS Voltage	V	Read Only
401719(0x62137)..401724(0x6213C)	-	Reserved	-	-

401725(0x6213D)	2	Module 7 IGBT 1A Temperature	°C	Read Only
401726(0x6213E)	2	Module 7 IGBT 2A Temperature	°C	Read Only
401727(0x6213F)	2	Module 7 IGBT 1B Temperature	°C	Read Only
401728(0x62140)	2	Module 7 IGBT 2B Temperature	°C	Read Only
401729(0x62141)	2	Module 7 IGBT 1C Temperature	°C	Read Only
401730(0x62142)	2	Module 7 IGBT 2C Temperature	°C	Read Only
401731(0x62143)..401733(0x62145)	-	Reserved	-	-
401734(0x62146)	2	Module 7 LR1 Temperature	-	Read Only
401735(0x62147)	2	Module 7 LR2 Temperature	-	Read Only
401736(0x62148)	2	Module 7 LR3 Temperature	-	Read Only
401737(0x62149)	2	Module 7 Over Current Fault	-	Read Only
401738(0x6214A)	2	Module 7 Over Voltage Fault	-	Read Only
401739(0x6214B)	2	Module 7 WatchDog Fault	-	Read Only
401740(0x6214C)	2	Module 7 Voltage Out of Range Fault	-	Read Only
401741(0x6214D)	2	Module 7 Current Out of Range Fault	-	Read Only
401742(0x6214E)	2	Module 7 Frequency Out of Range Fault	-	Read Only
401743(0x6214F)	2	Module 7 DC BUS Voltage Out of Range Fault	-	Read Only
401744(0x62150)	2	Module 7 Fan Fault	-	Read Only
401745(0x62151)	2	Module 7 IGBT Temperature Fault	-	Read Only
401746(0x62152)	2	Module 7 LR Temperature Fault	-	Read Only

401747(0x62153)	-	Reserved	-	Read Only
401748(0x62154)	2	Module 7 Line Fuse Broken	-	Read Only
401749(0x62155)	2	Module 7 GIB Fuse Broken	-	Read Only
401750(0x62156)	2	Module 7 Communication Fault	-	Read Only
401751(0x62157)…401799(0x62187)	-	Reserved	-	Read Only

MODULE 8

Register Address	Byte	Description Modifiable	Unit	Note:
401800 (0x62188)…401808(0x62190)	2	Reserved	-	-
401809(0x62191)	2	Module 8 Current L1	A	Read Only
401810(0x62192)	2	Module 8 Current L2	A	Read Only
401811(0x62193)	2	Module 8 Current L3	A	Read Only
401812(0x62194)	-	Reserved	-	Read Only
401813(0x62195)	2	Module 8 CT Current L1	A	Read Only
401814(0x62196)	2	Module 8 CT Current L2	A	Read Only
401815(0x62197)	2	Module 8 CT Current L3	A	Read Only
401816 (0x62198)…401817(0x62199)	2	Reserved	-	-
401818(0x6219A)	2	Module 8 DC BUS Voltage	V	Read Only
401819(0x6219B)..401824(0x621A0)	-	Reserved	-	-
401825(0x621A1)	2	Module 8 IGBT 1A Temperature	°C	Read Only

401826(0x621A2)	2	Module 8 IGBT 2A Temperature	°C	Read Only
401827(0x621A3)	2	Module 8 IGBT 1B Temperature	°C	Read Only
401828(0x621A4)	2	Module 8 IGBT 2B Temperature	°C	Read Only
401829(0x621A5)	2	Module 8 IGBT 1C Temperature	°C	Read Only
401830(0x621A6)	2	Module 8 IGBT 2C Temperature	°C	Read Only
401831(0x621A7)..401833(0x621A9)	-	Reserved	-	-
401834(0x621AA)	2	Module 8 LR1 Temperature	-	Read Only
401835(0x621AB)	2	Module 8 LR2 Temperature	-	Read Only
401836(0x621AC)	2	Module 8 LR3 Temperature	-	Read Only
401837(0x621AD)	2	Module 8 Over Current Fault	-	Read Only
401838(0x621AE)	2	Module 8 Over Voltage Fault	-	Read Only
401839(0x621AF)	2	Module 8 WatchDog Fault	-	Read Only
401840(0x621B0)	2	Module 8 Voltage Out of Range Fault	-	Read Only
401841(0x621B1)	2	Module 8 Current Out of Range Fault	-	Read Only
401842(0x621B2)	2	Module 8 Frequency Out of Range Fault	-	Read Only
401843(0x621B3)	2	Module 8 DC BUS Voltage Out of Range Fault	-	Read Only
401844(0x621B4)	2	Module 8 Fan Fault	-	Read Only
401845(0x621B5)	2	Module 8 IGBT Temperature Fault	-	Read Only
401846(0x621B6)	2	Module 8 LR Temperature Fault	-	Read Only
401847(0x621B7)	-	Reserved	-	Read Only

401848(0x621B8)	2	Module 8 Line Fuse Broken	-	Read Only
401849(0x621B9)	2	Module 8 GIB Fuse Broken	-	Read Only
401850(0x621BA)	2	Module 8 Communication Fault	-	Read Only
401851(0x621BB)…401899(0x621EB)	-	Reserved	-	Read Only

10. Contact Info

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