Circutor

Combined reactive energy compensation device

OPTIM SVGm

INSTRUCTION MANUAL

(M431B01-03-24A)

CE


22
PAP

SAFETY PRECAUTIONS

Follow the warnings described in this manual with the symbols shown below.

DANGER
Warns of a risk, which could result in personal injury or material damage.

ATTENTION
Indicates that special attention should be paid to a specific point.

If you must handle the unit for its installation, start-up or maintenance, the following should be taken into consideration:

Incorrect handling or installation of the device may result in injury to personnel as well as damage to the device. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire.

Read the manual carefully prior to connecting the device. Follow all installation and maintenance instructions throughout the device's working life. Pay special attention to the installation standards of the National Electrical Code.

Refer to the instruction manual before using the device

In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the device and / or installations.

CIRCUTOR S.A.U. reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

CIRCUTOR S.A.U. reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

CIRCUTOR S.A.U. on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.circutor.com

CIRCUTOR S.A.U. recommends using the original cables and accessories that are supplied with the device.

CONTENTS

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
02/24	M431B01-03-24A	Initial Version

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	Compliant with the relevant European standards.
5 min	After disconnecting the device from all power supplies, wait 5 minute before performing any operations.
	Torque
30	Screwdriver for **Torx 30** head screws

1.- VERIFICATION UPON RECEPTION

1.1.- RECEPTION PROTOCOL

Check the following points when you receive the device:

a) The device meets the specifications described in your order.
b) The device has not suffered any damage during transport.
c) Perform an external visual inspection of the device prior to switching it on.
d) Perform an external and internal visual inspection of the device prior to connecting it.

If any problem is noticed upon reception, immediately contact the transport company and/or **CIRCUTOR's** after-sales service.

1.2.- TRANSPORT AND HANDLING

The transport, loading and unloading and handling of the device must be carried out with proper precautions and using the proper manual and mechanical tools so as not to damage it.
If the device is not to be immediately installed, it must be stored at a location with a firm and level floor, and the storage conditions listed in the technical features section must be observed. In this case, it is recommended that the device be stored with its original protective packaging.

To move the device a short distance, the device's floor support profiles facilitate handling with a pallet jack or forklift. (**Figure 1**)

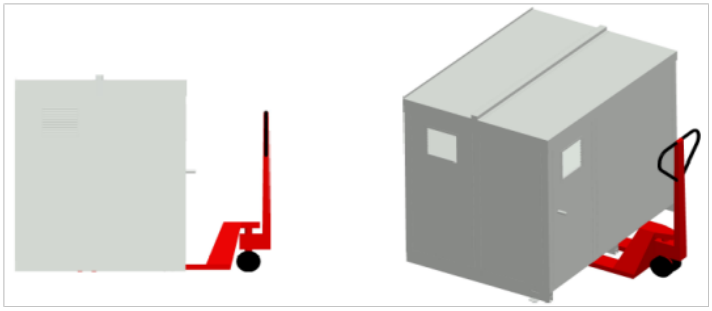


Figure 1: Transport with pallet jack.

The centre of gravity of some devices may be found at a considerable height. Therefore, when handling with a forklift, it is recommended that the device be securely fastened and that no abrupt manoeuvres made. The device should not be lifted more than 20 cm off the ground

When unloading and moving the device, use a forklift with forks long enough to support the entire length of the base. Otherwise, the forks should be long enough to support at least ¾ of said depth. The forks must be flat and supported firmly by the base. Raise the device by placing the forks underneath the profile that supports the device. (**Figure 2**).

There might be an offset in the centre of gravity from the centre of the cabinet, as a result of the uneven distribution of loads inside the device. The necessary precautions must be taken to prevent the device from tipping over during abrupt operations.

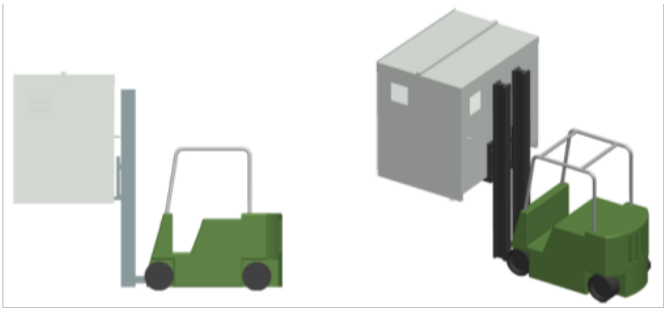


Figure 2: Unloading with a forklift.

When unpacking the device, pay attention to prevent damaging the device if you are using cutting tools, such as cutters, scissors or knives.

The **OPTIM SVGm** devices cabinet type, there are also 4 rings (diameter: 28 mm) in the top panel so that they can be transported by a crane. The angle of the cables must be greater than 45°

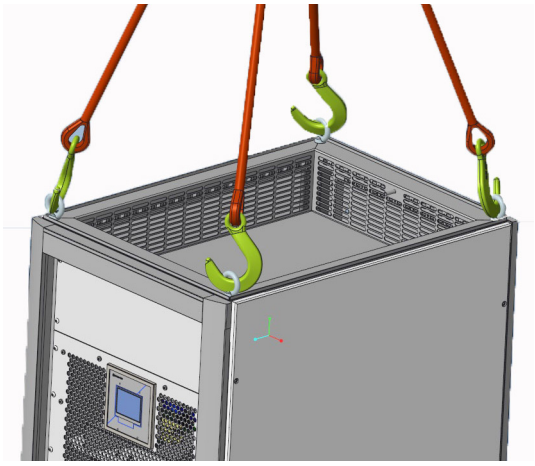


Figure 3: Transport of an cabinet OPTIM SVGm by crane.

1.3.- STORAGE

The device should be stored according to the following recommendations:

- ✓Avoid placing them on uneven surfaces.
- ✓Do not store them in outdoor areas, humid areas or areas exposed to splashing water.
- ✓Avoid hot spots (maximum ambient temperature: 50°C)
- ✓Avoid salty and corrosive environments.
- ✓Avoid storing the devices in areas where a lot of dust is generated or where the risk of chemical or other types of contamination is present.

2.- PRODUCT DESCRIPTION

The **OPTIM SVGm** combined reactive energy compensation device incorporates the following components in a metal enclosure:

✓ An **SVGm-3WF-100R-480** static VAR generator with a reactive power compensation capacity for both lagging (inductive) and leading (capacitive) currents in three-phase networks, with or without neutral, of 100 kvar between 400 and 480 V~.

✓ Rack modules of **fuses + contactor + detuned reactor** with a tuning value of P = 7% (189 Hz for a 50 Hz mains and 227 Hz for a 60 Hz mains), with a unit power of 100 kvar/3 x 440 V/50 (80 kvar/3 x 400 V/50 Hz) or 75 kvar/3 x 480 V/60 Hz.
Note: *the number of modules can vary between 1 and 7, depending on the model.*
Note: *Modules of other unit powers or different tuning frequencies can be used. Check the rating label for the specific values.*

✓A **Computer SMART III 12V-OPTIM-SVGm** electronic reactive regulator to control the connection/disconnection of the capacitor rack modules.

✓Terminals for connecting the device to the mains.

✓Terminals to connect the current measurement signal from three /5A current transformers.

✓Ethernet communications output, with an RJ-45 connector.

There are different device models, depending on the power, see **Table 3** and **Table 4**.

Table 3: List of OPTIM SVGm models (440V/50Hz - 400V/50Hz).

Model	Power		Modules Fuse + Contactor + Reactor	Compensation capacity SVGm
	440V/50Hz	400V/50Hz		
OPTIM SVGm-200-440	200 kvar	182 kvar	1 x 100 kvar	100 kvar
OPTIM SVGm-300-440	300 kvar	264 kvar	2 x 100 kvar	100 kvar
OPTIM SVGm-400-440	400 kvar	346 kvar	3 x 100 kvar	100 kvar
OPTIM SVGm-500-440	500 kvar	428 kvar	4 x 100 kvar	100 kvar
OPTIM SVGm-600-440	600 kvar	510 kvar	5 x 100 kvar	100 kvar
OPTIM SVGm-700-440	700 kvar	592 kvar	6 x 100 kvar	100 kvar
OPTIM SVGm-800-440	800 kvar	674 kvar	7 x 100 kvar	100 kvar

Table 4: List of OPTIM SVGm models (480V/60Hz - 460V/60Hz).

Model	Power		Modules Fuse + Contactor + Reactor	Compensation capacity SVGm
	480V/60Hz	460V/60Hz		
OPTIM SVGm-175-480-60Hz	175 kvar	161 kvar	1 x 75 kvar	100 kvar
OPTIM SVGm-250-480-60Hz	250 kvar	230 kvar	2 x 75 kvar	100 kvar
OPTIM SVGm-325-480-60Hz	325 kvar	299 kvar	3 x 75 kvar	100 kvar
OPTIM SVGm-400-480-60Hz	400 kvar	367 kvar	4 x 75 kvar	100 kvar
OPTIM SVGm-475-480-60Hz	475 kvar	436 kvar	5 x 75 kvar	100 kvar
OPTIM SVGm-550-480-60Hz	550 kvar	505 kvar	6 x 75 kvar	100 kvar
OPTIM SVGm-625-480-60Hz	625 kvar	574 kvar	7 x 75 kvar	100 kvar

3.- DEVICE INSTALLATION

3.1.- PRELIMINARY RECOMMENDATIONS

The device installation and the maintenance operations must only be carried out by authorised and qualified personnel.

In order to use the device safely, it is critical that individuals who handle it follow the safety measures set out in the standards of the country where it is being used, use the personal protective equipment necessary (rubber gloves, face protection and approved flame-resistant clothing) to prevent injuries due to electric shock or electric arc due to exposure to current-carrying conductors and pay attention to the various warnings indicated in this instruction manual.

Incorrect installation or configuration of the device could cause serious damage to the device itself and to other devices of the installation.

Only suitable for assembly on concrete or other non-combustible surfaces, and in restricted access areas.

The devices are not intended for use in life support, medical safety equipment or similar applications, whereby a fault in the device could cause loss of life or physical injury. They are neither intended for military or defence applications. They should be installed in areas with restricted access.

Before doing any servicing or maintenance operation on the OPTIM SVGm, be sure to disconnect the main switch. Then, wait at least 5 minutes before working on the device.

Make sure the device is properly **earthed** before powering up. Any fault in the earth connection might cause a risk of electrocution to the user and damage to the device itself in the case of lightning or other transients.

Before handling the **current transformers**, ensure that the secondary is short-circuited. Never open a current transformer secondary under load.

3.2.- INSTALLATION LOCATION

The device must be installed in an environment where the temperature outside the cabinet is between -10°C and 45°C, with a maximum humidity of 95% without condensation.
Do not install the device close to a hot spot and keep it out of direct sunlight.

Install the **OPTIM SVGm** in a place protected from water, dust, flammable liquids, gases and corrosive substances.

Make sure there are no power factor correction devices installed in the same mains as the **OPTIM SVGm**.
If there are any compensation devices, they must be de-tuned to **P = 7%** to avoid interaction problems between **OPTIM SVGm** and the compensation devices.

3.2.1.- VENTILATION REQUIREMENTS

The cabinet-type **OPTIM SVGm** uses a forced ventilation cooling system, with an air inlet on the front panel and an air outlet at the back of the device.

The front grille and the air outlet holes at the back should not be obstructed, leaving sufficient space to allow the heat to be dissipated.

It is not necessary to leave any space at the sides of the cabinet, and it can be installed next to other cabinets.

Table 5: Ventilation distances.

Ventilation distances


3.3.- STORAGE FOR LONG PERIODS

If the device is not installed after receipt, the following recommendations must be observed to keep the device in a good state:

- ✓Keep the device in a dry atmosphere and at a temperature of between -20°C and 50°C.
- ✓Avoid exposure to direct sunlight.
- ✓Keep the device in its original packaging.

If the **OPTIM SVGm** is stored for a long time disconnected from the mains, a specific process must be

applied to restore the internal dielectric layers of the DC bus capacitors. **Table 6** shows the recommendations for starting the device, according to the length of its storage period.

Table 6: Start-up process, according to storage time.

Storage time	Process
< 1 year	No special treatment required.
> 1 year	Connect the **OPTIM SVGm** to the mains at least one hour before starting up the device. Power the device and leave it in STOP mode.

3.4.- INSTALLATION

OPTIM SVGm are self-supporting cabinets with 4 support points on the floor.

The mounting surface must be solid, support the device's weight and be level.

The cabinet must never be welded to the floor using arc welding, as this may destroy the electronic components.

3.5.- CONNECTION

For the cabinet's power supply, a cable with a cross-section suitable for the maximum current that can flow through the device must be used. Although the device is composed of 100 kvar modules (One **SVGm-3WF-100R-480** and the rest of modules consisting of protection fuses + contactor + reactor + capacitor), to make installation easier, the modules are already wired, and the user only has to take into account the device's total capacity. The recommended minimum cross-sections are:

OPTIM SVGm-200-440 and OPTIM SVGm-175-480-60Hz: 185 mm² (Cu), 240 mm² (Al)
OPTIM SVGm-300-440 and OPTIM SVGm-250-480-60Hz: 2 x 150 mm² (Cu), 2 x 240 mm² (Al)
OPTIM SVGm-400-440 and OPTIM SVGm-325-480-60Hz: 2 x 185 mm² (Cu), 2 x 240 mm² (Al)
OPTIM SVGm-500-440 and OPTIM SVGm-400-480-60Hz:
Cabinet 1/2 (400/325 kvar): 2 x 185 mm² (Cu), 3 x 185 mm² (Al)
Cabinet 2/2 (100/75 kvar): 70 mm² (Cu), 120 mm² (Al)
OPTIM SVGm-600-440 and OPTIM SVGm-475-480-60Hz:
Cabinet 1/2 (400/325 kvar): 2 x 185 mm² (Cu), 3 x 185 mm² (Al)
Cabinet 2/2 (200/150 kvar): 185 mm² (Cu), 240 mm² (Al)
OPTIM SVGm-700-440 and OPTIM SVGm-550-480-60Hz:
Cabinet 1/2 (400/325 kvar): 2 x 185 mm² (Cu), 3 x 185 mm² (Al)
Cabinet 2/2 (300/225 kvar): 2 x 150 mm² (Cu), 2 x 240 mm² (Al)
OPTIM SVGm-800-440 and OPTIM SVGm-625-480-60Hz:
Cabinet 1/2 (400/325 kvar): 2 x 185 mm² (Cu), 3 x 185 mm² (Al)
Cabinet 2/2 (400/300 kvar): 2 x 185 mm² (Cu), 3 x 185 mm² (Al)

Note: *Cable type RV-K 0,6/1 kV or RV-AL 0,6/1 kV.*

The busbars for connecting the **OPTIM SVGm** to the mains are tin-plated, meaning copper or aluminium cables can be used with the appropriate terminal in each case.

Ensure that the **OPTIM SVGm** is earthed correctly to prevent the risk of electric shock.

To measure the current, class **0.5** transformers of the **TC** or **TCH** series are recommended.

The use of transformers with ratios close to the current to be measured is recommended.

The correct connection of the current transformers is vital for the **OPTIM SVGm** to operate properly. If the phases L1, L2 and L3 are switched in the secondary, the device will not work properly.

The **SVGm** devices have built-in fuse overcurrent protection.
Install external protection according to the type of installation, the facility's maximum short-circuit current, the maximum current admissible by the complete device, and the regulations in force at the place of installation.

If local regulations require the use of ground fault protection devices, RCDs sensitive to AC/DC (RCD type B) are recommended for use with **OPTIM SVGm**. The **SVGm** static generator used in these devices works internally with DC currents; in the event of a fault, DC currents can cause type-A protective devices to malfunction.

Ensure that the installation of the device in your electric distribution system (TN, VT, IT) complies with current standards.
Note: *In networks with a grounded phase, the permanent phase-to-ground voltage cannot exceed 300 V ~.*

Do not install multiple **OPTIM SVGm** in series, one behind the other, configured to compensate for the same loads, since this can result in an overcompensation of reactive power, which can cause instability in the mains (**Figure 4**)

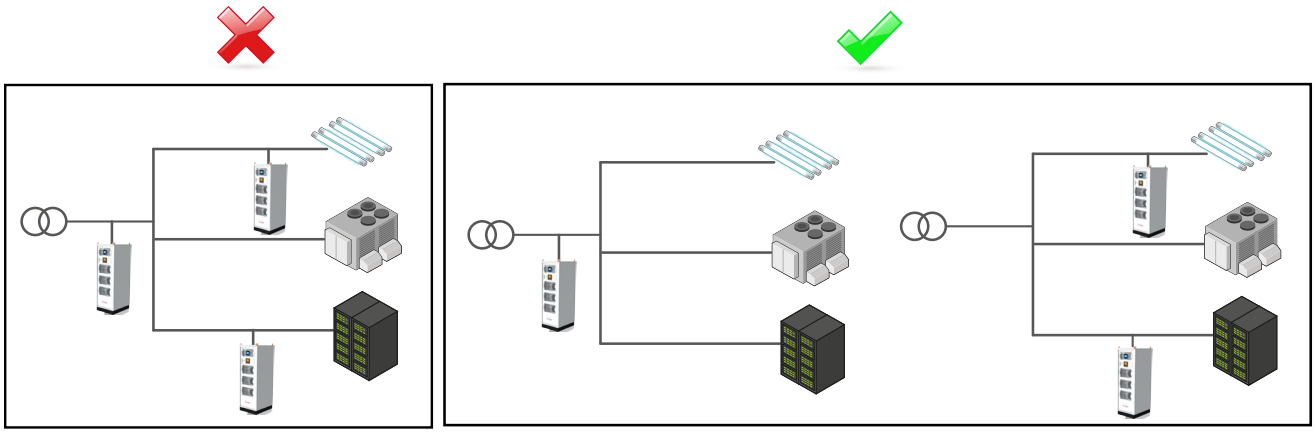


Figure 4: Do not install various OPTIM SVGm in series.

The presence of **notch**-type periodic disturbances in voltage with dv/dt values greater than 30% can cause deterioration and even destruction of certain components of the device even when they are not in operation and are just connected to the mains. Thus, if the presence of these **notches** is suspected due to having loads that are prone to creating them, the network must be studied to record the voltage and current waves under full load conditions for analysis.
If these **notches** are apparent in the readings, the **CIRCUTOR** technical department should be consulted to determine the suitability of installing the combined **OPTIM SVGm** compensation device in the main.

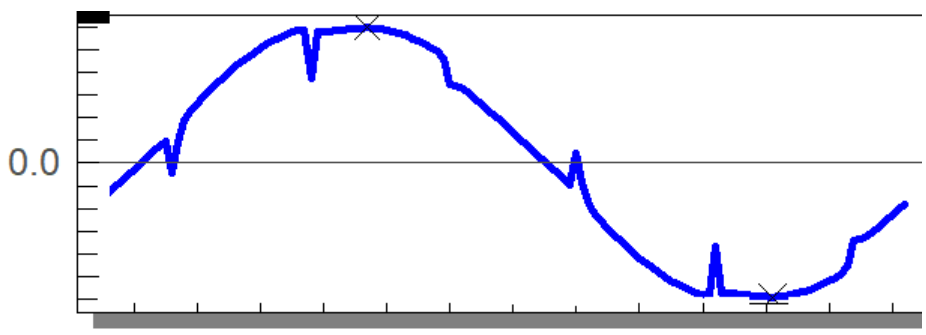


Figure 5: Example of severe notches in the mains voltage.

3.6.- DEVICE TERMINALS

OPTIM SVGm devices are installed in metal cabinets with the connections at the bottom.

The cabinets sliding windows at the bottom of the cabinet so that the connection wiring can be slotted inside, **Figure 6**. These windows can be removed and machined if it is considered necessary to use a cable gland.

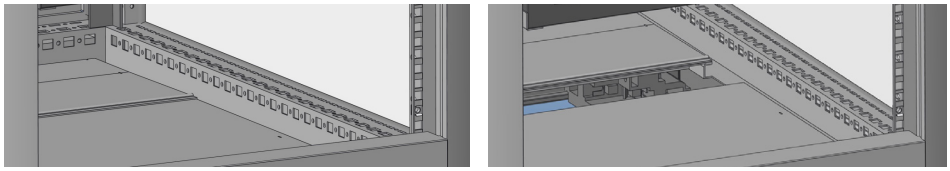


Figure 6: Sliding windows for the connection wiring.

You should never remove the cover closest to the front part.

To access the current input and mains connections, loosen the screws in the lower front cover **Figure 7**.

30

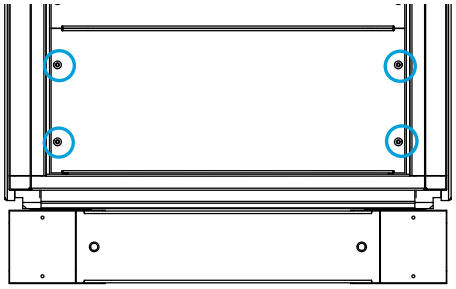


Figure 7: Screws.

Fold down the cover carefully once the front cover is open, the device's terminals can be accessed, **Figure 8** and **Figure 9**.

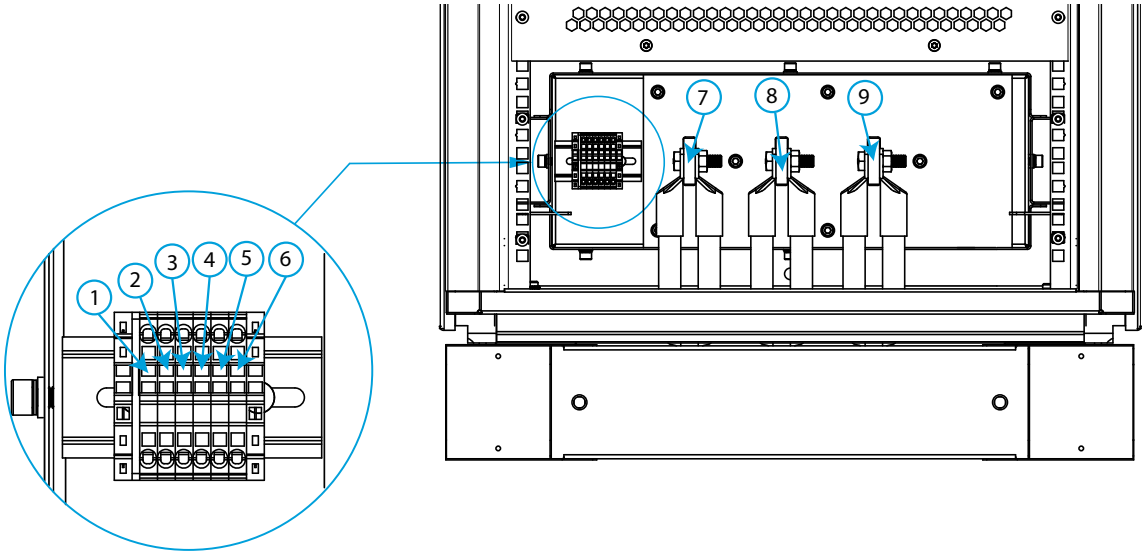


Figure 8: Terminals.

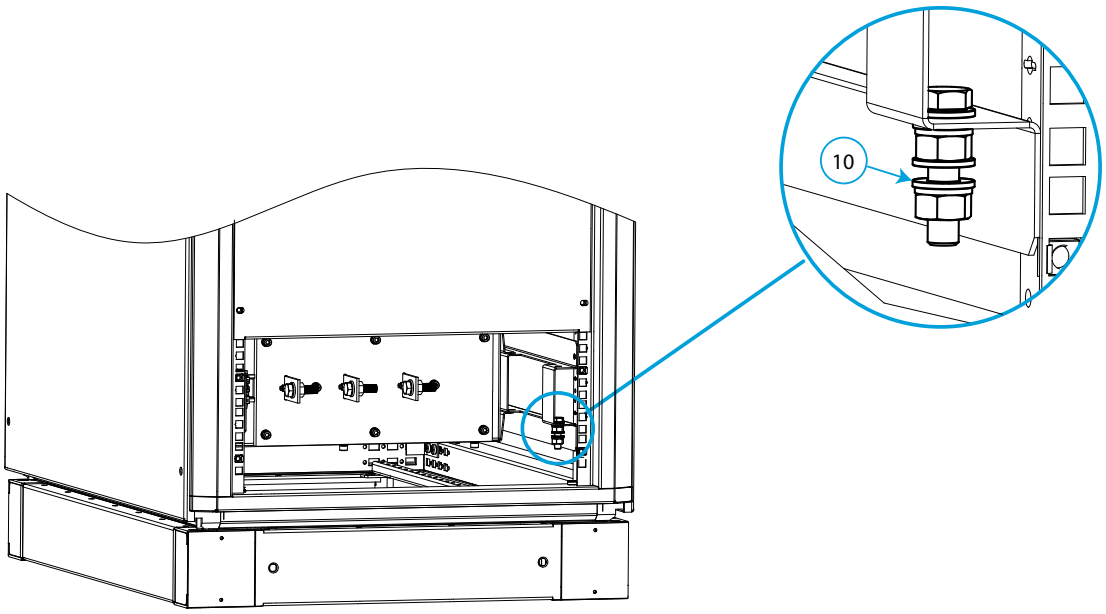


Figure 9: OPTIM SVGm cabinet-type earth terminal.

Table 7: List of terminals.

Device terminals	
1: S1, Current input L1	**6: S2**, Current input L3
2: S2, Current input L1	**7: L1**, Mains connection L1
3: S1, Current input L2	**8: L2**, Mains connection L2
4: S2, Current input L2	**9: L3**, Mains connection L3
5: S1, Current input L3	**10:** Earth connection

Once connected, be sure to re-attach the terminal cover.

3.7.- CONNECTION DIAGRAMS

3.7.1.- CONNECTING OPTIM SVGm MODELS FROM 1 CABINET TO THE MAINS

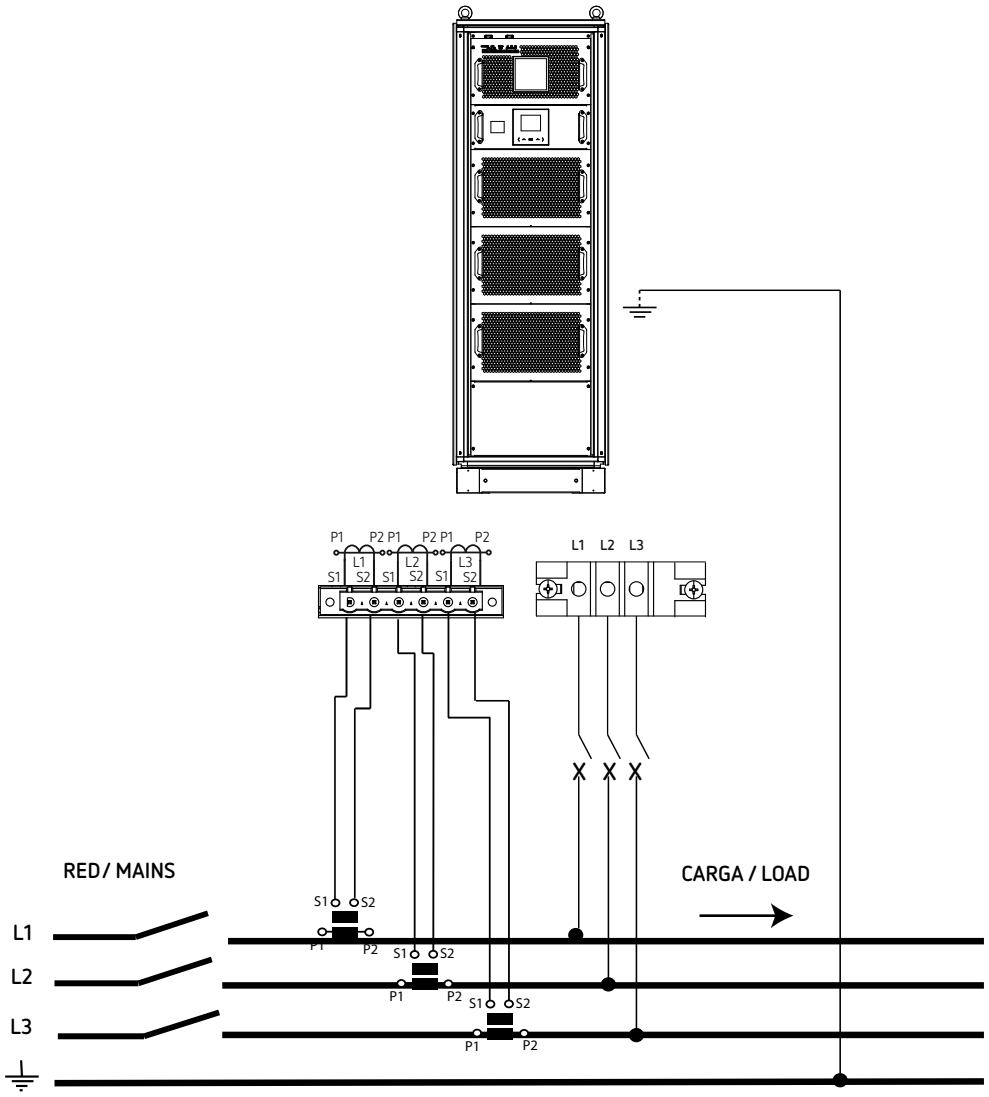


Figure 10: Connecting OPTIM SVGm models from 1 cabinet to the mains.

3.7.2.- CONNECTING OPTIM SVGm MODELS FROM 2 CABINETS TO THE MAINS

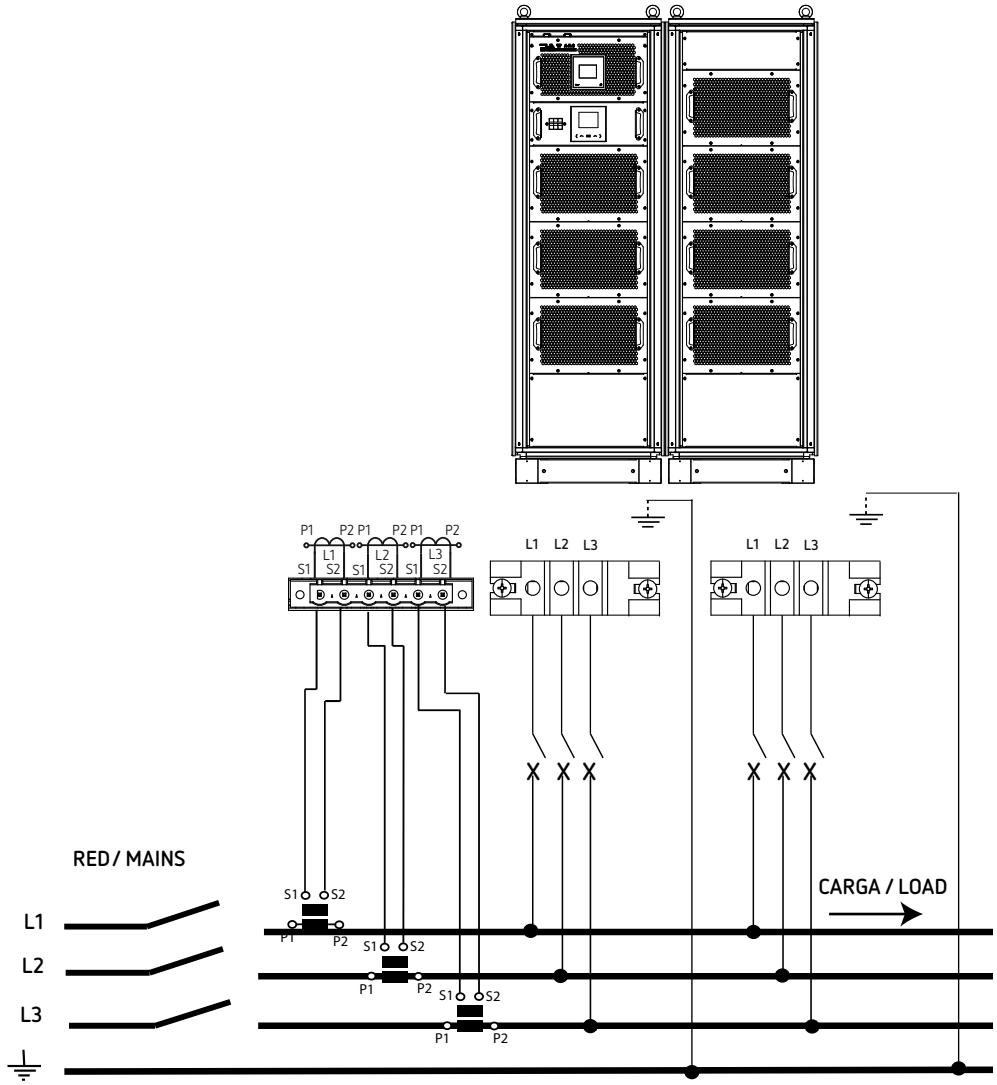


Figure 11: Connecting OPTIM SVGm models from 2 cabinets to the mains.

3.8.- ELECTRIC SCHEMES

3.8.1.- OPTIM SVGm-200-440, OPTIM SVGm-300-440 and OPTIM SVGm-400-440

Figure 12 shows the electrical diagram of the **OPTIM SVGm-400-440** model. The only difference in the other models is the number of rack modules (Fuse + Contactor + Reactor).

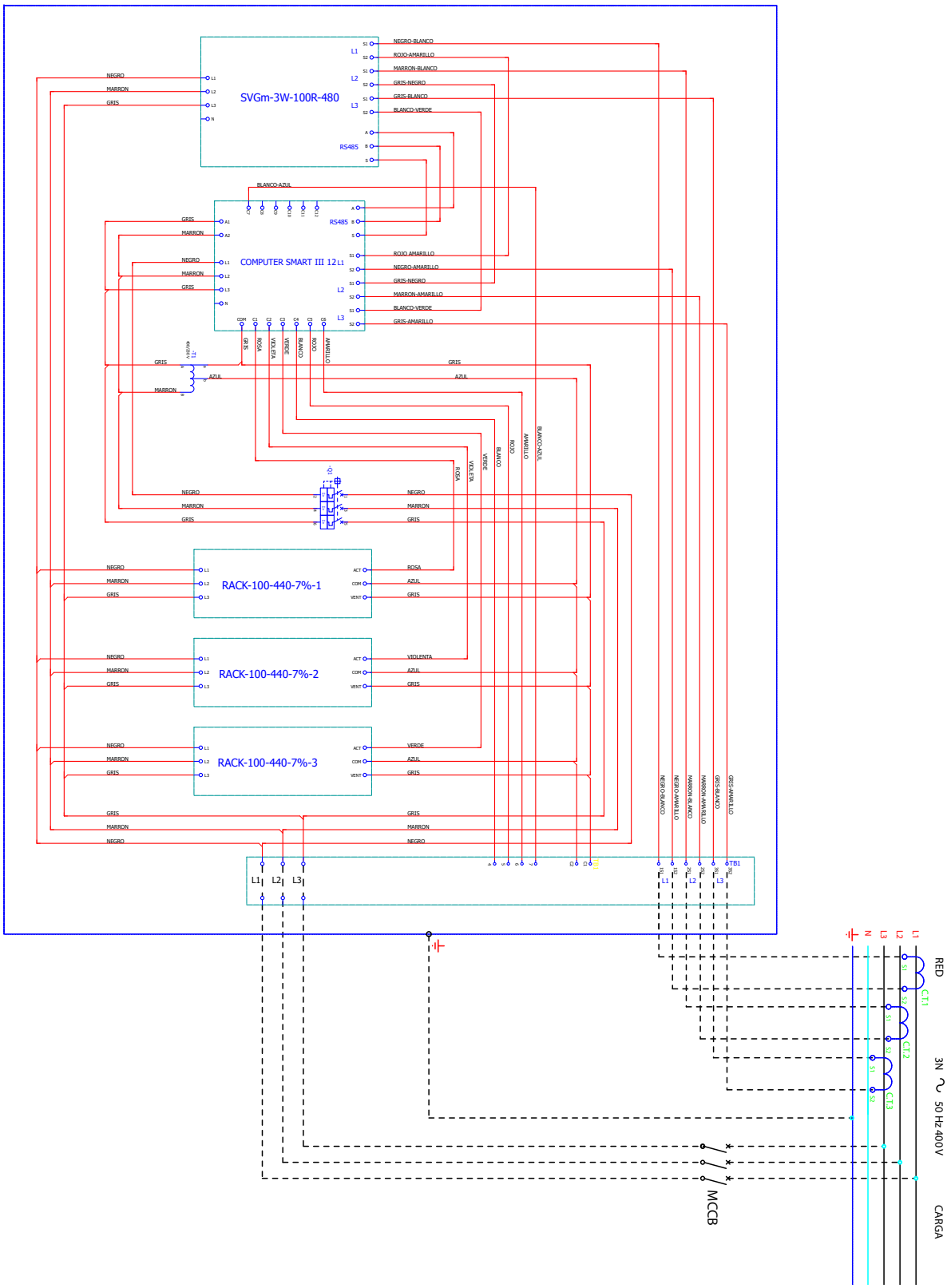


Figure 12: OPTIM SVGm-400-440 Electric schemes.

3.8.2.- OPTIM SVGm-500-440, OPTIM SVGm-600-440, OPTIM SVGm-700-440 and OPTIM SVGm-800-440

Figure 13 shows the electrical diagram of the **OPTIM SVGm-800-440** model. The only difference in the other models is the number of rack modules (Fuse + Contactor + Reactor).

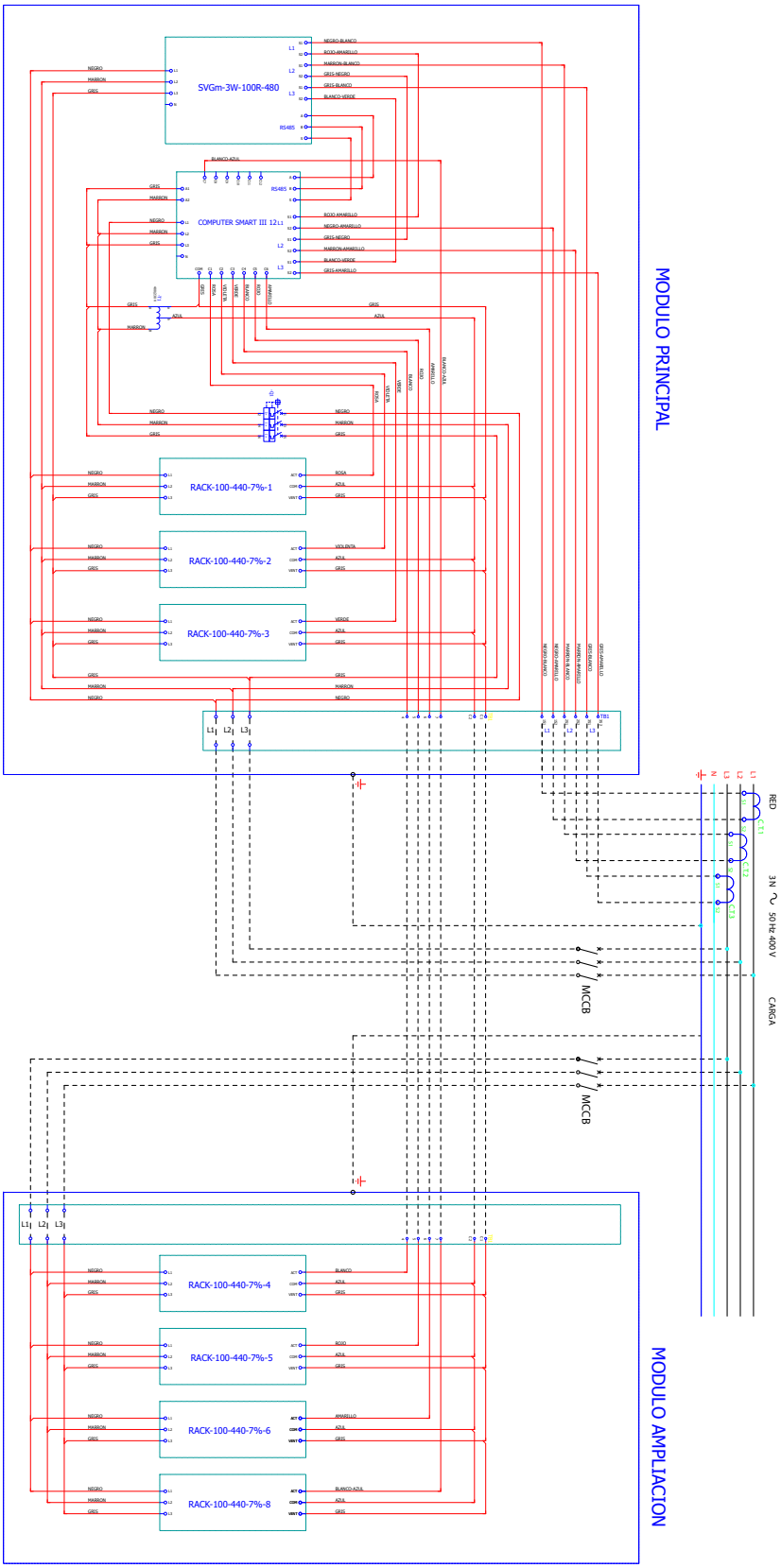


Figure 13: OPTIM SVGm-800-440 Electric schemes.

3.8.3.- OPTIM SVGm-175-480-60Hz, OPTIM SVGm-250-480-60Hz and OPTIM SVGm-325-480-60Hz

Figure 14 shows the electrical diagram of the **OPTIM SVGm-325-480-60Hz** model. The only difference in the other models is the number of rack modules (Fuse + Contactor + Reactor).

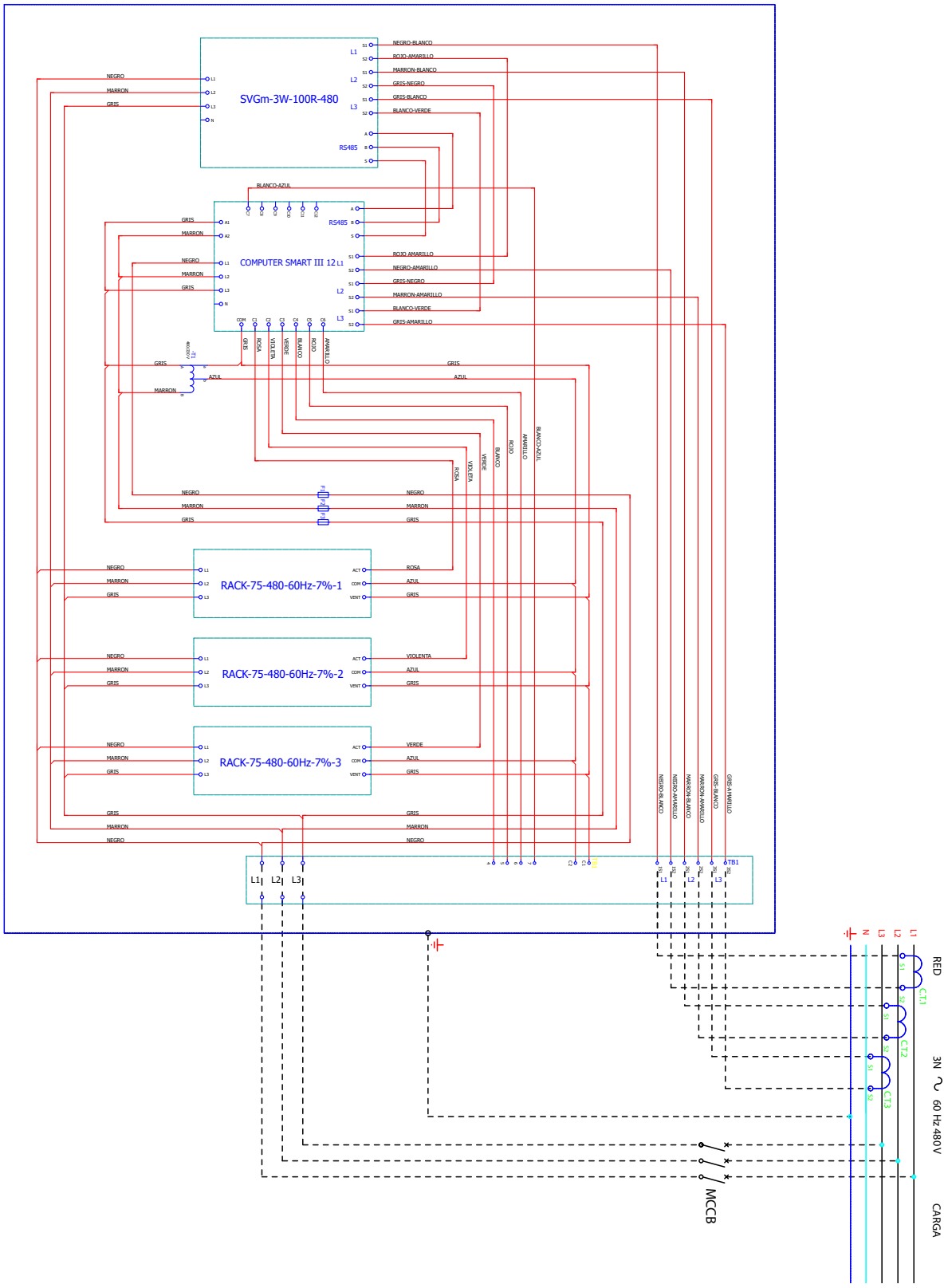


Figure 14: OPTIM SVGm-325-480-60Hz Electric schemes.

3.8.4.- OPTIM SVGm-400-480-60Hz, OPTIM SVGm-475-480-60Hz, OPTIM SVGm-550-480-60Hz and OPTIM SVGm-625-480-60Hz

Figure 15 shows the electrical diagram of the **OPTIM SVGm-625-480-60Hz** model. The only difference in the other models is the number of rack modules (Fuse + Contactor + Reactor).

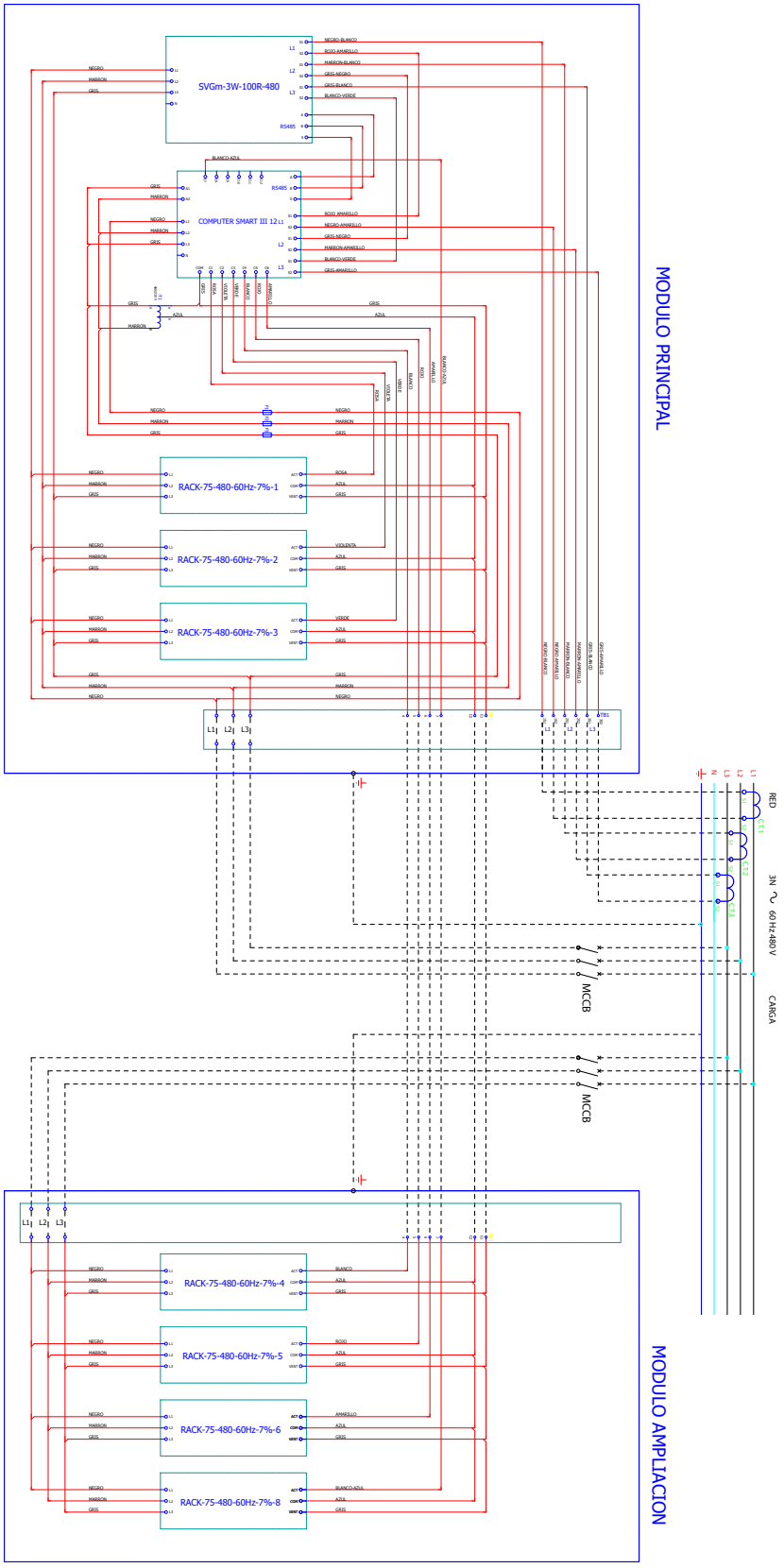


Figure 15: OPTIM SVGm-625-480-60Hz Electric schemes.

4.- OPERATION

4.1.- OPERATING PRINCIPLE

The currents consumed by the loads present in any installation have two components: an **active** component, which generates an effort, and a **reactive** component, generated by the inductive or capacitive nature of the load.

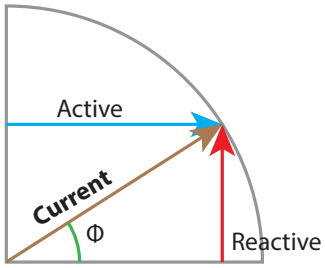


Figure 16: Current Components.

Both components are added when current flows through electrical conductors, which must be sized accordingly to transmit the resulting current. However, only part of these conductors are used to transmit current, so the capacity of the power distribution lines is underused.
Therefore, distribution companies usually impose penalties on consumers with a low **active** to **reactive** current ratio. This current ratio is known as the **power factor**, or **cos Φ**, according to whether it takes into account the content of harmonics or only the fundamental frequency component.

The effects of **reactive** currents in the conductors of distribution lines can be minimised with two methods:

✓ **Passively**, by adding reactive loads with the opposite sign to that of the loads of the installation. For example, adding capacitors to handle inductive loads.

✓**Actively**, by generating a current with the same magnitude as the active current to compensate, in the opposite phase.

The **OPTIM SVGm** is a device that combines both systems:

✓ It has a static VAR generator (**SVGm**) that can generate a counterphase current of such a magnitude as to obtain the **cos Φ** programmed for the installation (target **cos Φ**).

✓ It has capacitor banks equipped with **p = 7%** detuned reactors (suitable for preventing resonances and protecting the capacitors from overloads in the event of voltage and/or current harmonics of order 5 or higher), operated by contactors.

These capacitor banks are controlled by a **Computer SMART III 12V-OPTIM-SVGm** reactive regulator, which measures the compensation demand from the mains through the same current measurement signal as the **SVGm** module, provided by 3 external current transformers.

The **SVGm** static VAR generator is connected to the **Computer SMART III 12V-OPTIM-SVGm** via RS-485, as shown in **Figure 17**. The device leaves the factory with this connection made and must not be altered.

Figure 17: RS-485 connection: SVGm - Computer SMART III 12V-OPTIM-SVGm.

The **SVGm** module permanently analyses the status of the **Computer SMART III 12V-OPTIM-SVGm**, with regard to the availability to connect banks, or to disconnect them, such that when it determines that the compensation can be provided using a bank controlled by the **Computer SMART III 12V-OPTIM-SVGm**, it disconnects itself so that the **Computer SMART III 12V-OPTIM-SVGm** can connect/disconnect one of its banks in a few seconds. As a result, the **SVGm** module remains the device that can provide more accurate compensation of the mains, to more precisely achieve, as far as possible, the target **cos Φ** (**Figure 18**).
By working as a source of current generation, the **SVGm** also provides compensation for capacitive loads, if necessary.

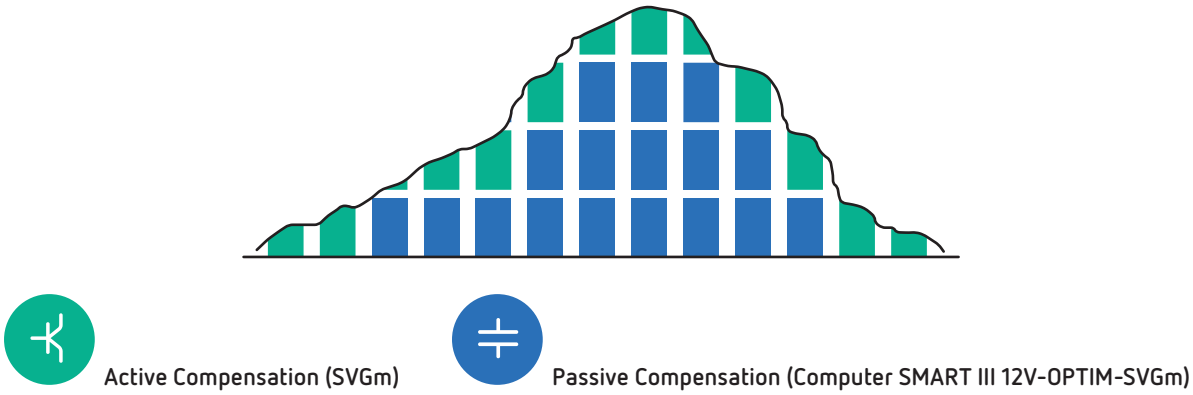


Figure 18: OPTIM SVGm operating principle.

4.2.- THERMAL PROTECTION

The device features several levels of thermal protection:

A.- The **SVGm** module incorporates the following protections:

✓**Ventilation regulation**, the fan speed is adjusted as needed at any given time, thus minimising the noise in the device.

✓**Static temperature limitation,** the device reduces its power if the internal temperature exceeds certain limits. This maximises the availability of the device in any situation.

✓**Dynamic limitation of the device,** one of the factors affecting the reliability of the device is the stress caused by repeated heating and cooling cycles. The device adjusts both its ventilation and power to minimise the impact that thermal cycling has on the life of the device.

✓**Safety shutdown,** despite the above measures, the temperature of certain components may exceed their maximum allowable level if the device is used in environmental conditions beyond the specified range. To avoid damaging the device or installation, the device will completely shut down automatically. The device must be disconnected from its power supply for 30 minutes to rearm this protection

B.- Each capacitor rack module operated by a contactor features the following protection:

✓**Safety shutdown,** using an NC temperature relay, which opens if it exceeds its trip temperature (+55° C), such that the operating signal to the contactor is deactivated, disabling the connection of the bank to the mains. The relay automatically reconnects when the ambient temperature drops below its trip point.

5.- SVGm

Check the **SVGm (M248B01-03-xxx)** manual for more detailed information on the device.

5.1.- DISPLAY

The devices **SVGm** features a 3.5"TFT display on the front part in order to be able to view and configure all of the parameters of the device.

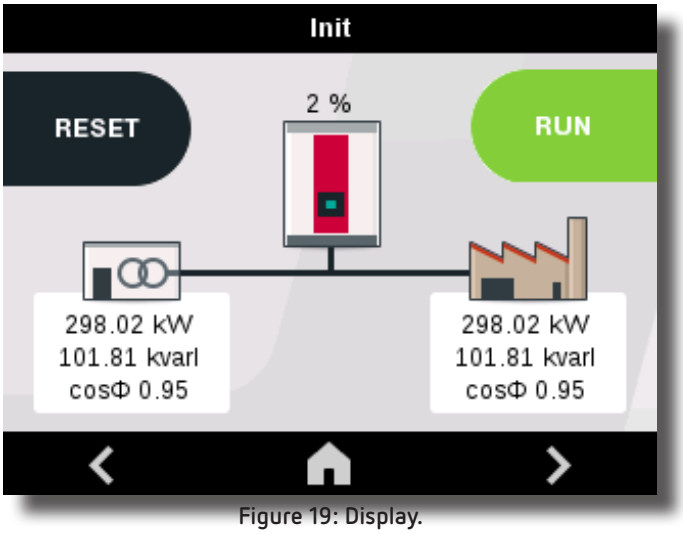


Figure 19: Display.

The display enters the energy saving mode 10 minutes after the last action. To reactivate it, just touch the display. The last screen before entering the energy saving mode will be shown.

The display is divided into three areas (**Figure 20**):

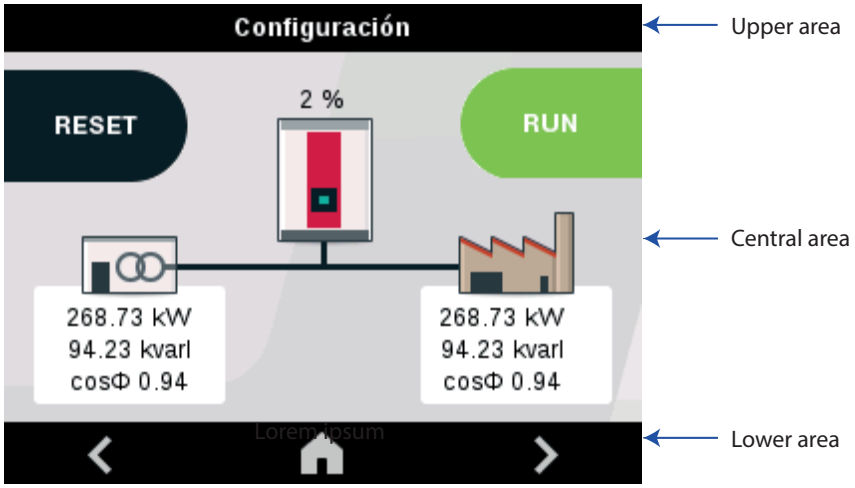


Figure 20: The display is divided into three areas.

5.1.1.- UPPER AREA

The following will be displayed on the upper area:

✓ A short description of the status of the device.
✓ The symbol, when the device requires maintenance, see section "*5.5.- MAINTENANCE*".

5.1.2.- CENTRAL AREA

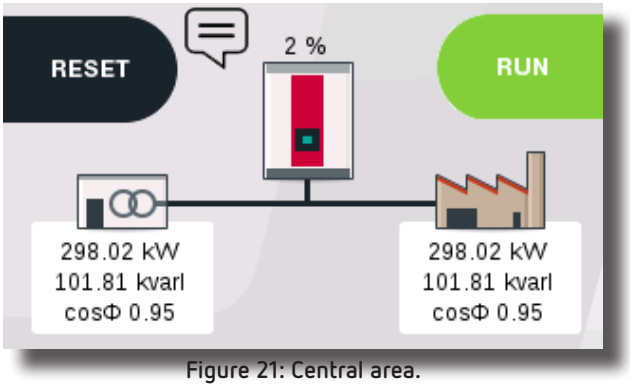


Figure 21: Central area.

This area shows:

✓ The condition of the installation,
✓ All parameters and graphs of the device.

And the necessary keys at each point, **Table 8**.

Table 8: Central area keys.

Key	Function
RESET	Restarts the device after an alarm.
RUN	Starts the device.
STOP	Stops the device.

5.1.3.- LOWER AREA

Figure 22: Lower area.

The lower area displays the navigation and configuration keys of the device.

Table 9: Lower area keys.

Key	Function
	Provides access to the main screen of the device.
	Shifting to the left.
	Shifting to the right.

5.2.- START-UP

When the device has been powered on, the screen shown in **Figure 23** appears on the **SVGm** display.

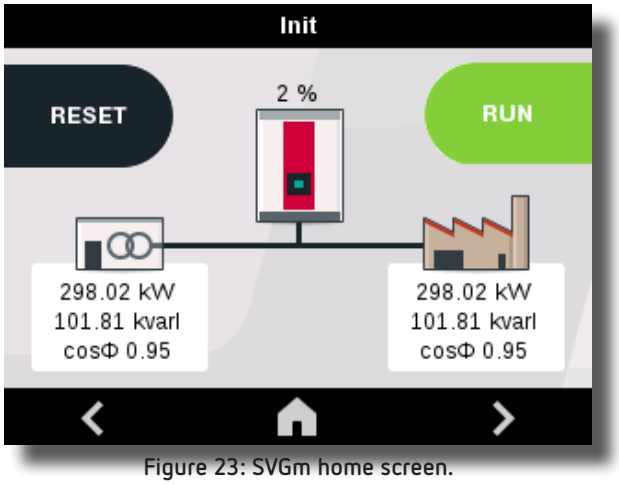


Figure 23: SVGm home screen.

Before starting the **OPTIM SVGm**, it is necessary to follow the steps below:

1.- Use the key to navigate to the configuration screen and implement the appropriate configuration according to the existing installation (*see "5.4.- CONFIGURATION"*).

2.- Use the key to navigate to the voltage and current display screen (*"5.3.2.- VOLTAGE, CURRENT AND FREQUENCY"*), and:

- ✓ Make sure the **voltage** measurements correspond to the real voltages of the installation.
- ✓ Make sure the load **current** measurements correspond to the current levels of the installation.

3.- Use the key to navigate to the display screen of the load parameters (*"5.3.4.- LOAD POWER AND COS ϕ "*) and:

- ✓Make sure the **active power** measurement of the load corresponds to the active power levels of the installation.
- ✓Make sure the **reactive power** measurement of the load corresponds to the reactive power levels of the installation.
- ✓ Check the **cos ϕ** in the three phases. If phases appear with very high reactive power and very low active power levels, this may indicate an error in the phase order. In this case, check the power supply and current input connections.

4.- Go back to the home screen of the device, **Figure 23**, if there is no problem with the connections, the upper area should show the message "**Stop"**.
If there is a problem with the static generator connections or the configuration, the **"Waiting for conditions"** message appears.

5.- Press the RUN key to start the static generator. If it has started correctly, the screen will show the message "**Run**".

5.3.- DISPLAY

5.3.1.- MAIN SCREEN

Figure 24 shows the main screen of the **SVGm** module.

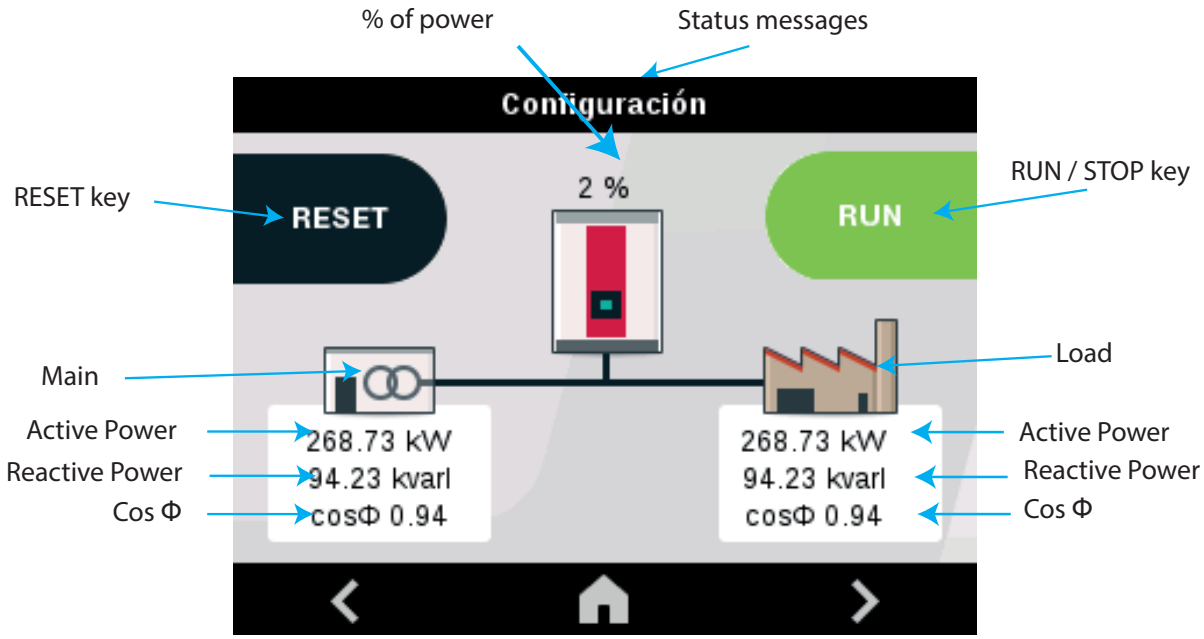


Figure 24: Main screen.

It shows the **Cos ϕ**, **Active** and **Reactive Power** values in the Main and in the Load. And the **% of SVG power** used.

The RESET key allows you to restart the device if an alarm has been generated and this has been resolved.

The RUN / STOP key is the start and stop key of the **SVGm**.

Use the < and > keys to navigate through the different display screens.

In the upper part of the screen, a message with the current status of the device is shown (**Table 10**).

Table 10: Status messages

Status messages	
Starting	
Description	The **SVGm** is starting up.
Init	
Description	The device is starting the systems.
Waiting comms	
Description	Initiating internal communication systems
Waiting for conditions	
Description	Waiting for the conditions to be met in order to operate.
Configuration	
Description	Configuring the device.

Table 10 (Cont.): Status messages

Status messages	
Run	
Description	Device is operating.
Sync	
Description	The **SVGm** is synchronising with the mains.
Charging DC Bus	
Description	Charging process of the internal bus prior to start-up.
Stop	
Description	Device stopped.
Alarm	
Description	An alarm has been generated. Access the Alarms screen (***"5.3.6.- ALARMS"***) to obtain more information.

5.3.2. - VOLTAGE, CURRENT AND FREQUENCY

Figure 25 shows the Voltage, Current and Frequency screen.

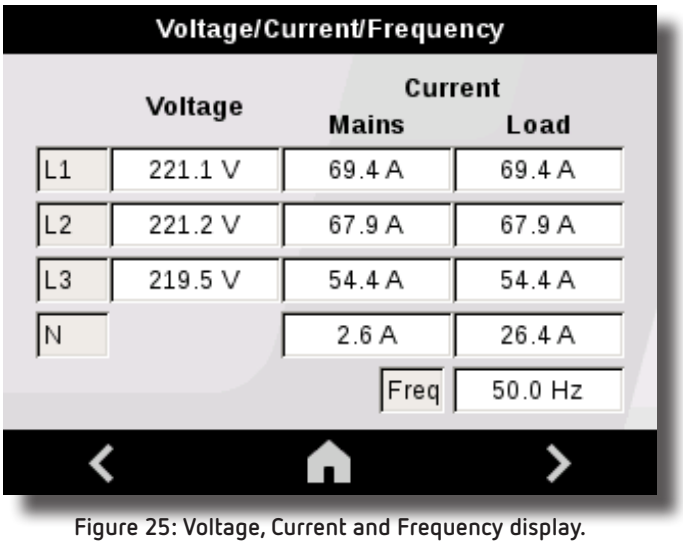


Figure 25: Voltage, Current and Frequency display.

It shows:

- ✓ Phases L1, L2,L3 voltage.
- ✓ Phases L1, L2, L3 and Neutral mains current.
- ✓ Phases L1, L2, L3 and Neutral load current.
- ✓ The Frequency.

Use the < and > keys to navigate through the different display screens.

5.3.3. - MAINS POWER AND COS ϕ

Figure 26 shows the mains power and cos ϕ.

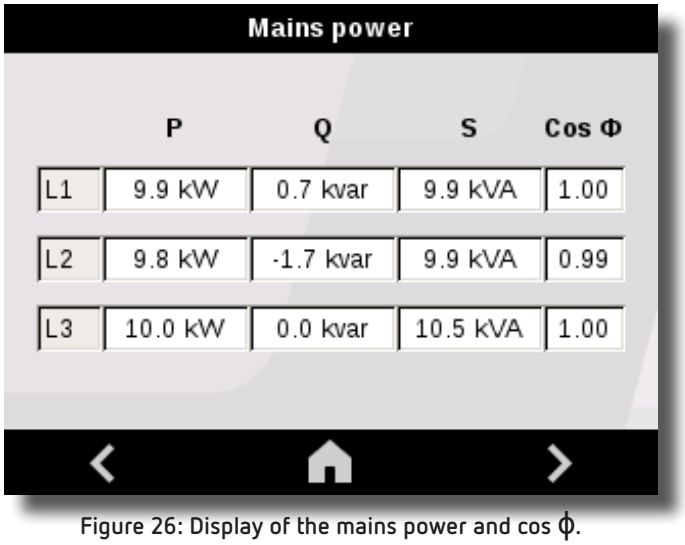


Figure 26: Display of the mains power and cos ϕ.

It shows:

- ✓ The Active Power (P), Reactive Power (Q) and Apparent Power (S).
- ✓ The cos ϕ

Note: *The - sign in reactive power indicates that it is capacitive and the + sign that it is inductive.*

Use the < and > keys to navigate through the different display screens.

5.3.4. - LOAD POWER AND COS ϕ

Figure 27 shows the load power and cos ϕ.

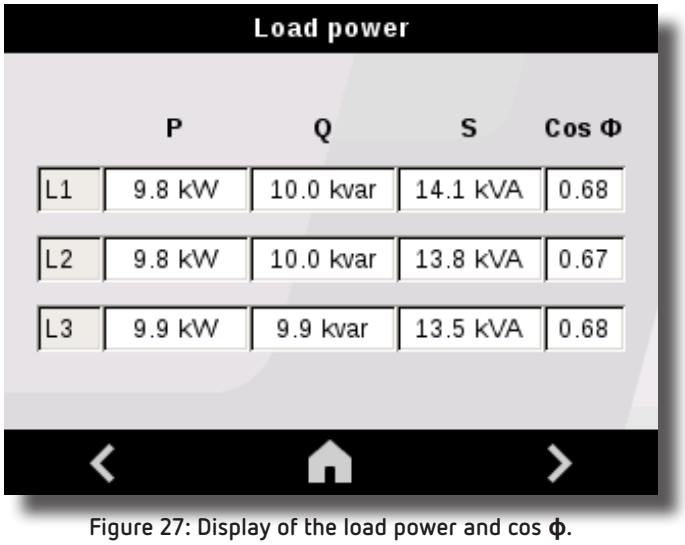


Figure 27: Display of the load power and cos ϕ.

It shows:

- ✓ The Active Power (P), Reactive Power (Q) and Apparent Power (S).
- ✓ The cos ϕ.

Note: *The - sign in reactive power indicates that it is capacitive and the + sign that it is inductive.*

Use the < and > keys to navigate through the different display screens.

5.3.5.- MAINS PHASORS

In this screen, **Figure 28**, the mains phasors are shown.

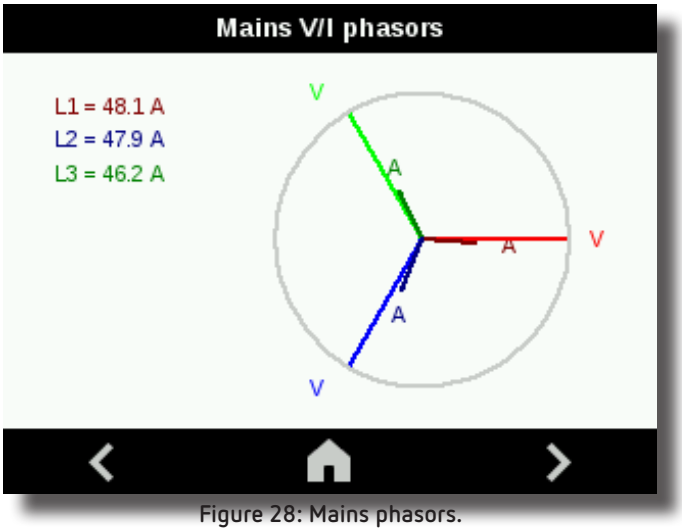


Figure 28: Mains phasors.

Use the < and > keys to navigate through the different display screens.

5.3.6.- ALARMS

In this screen, **Figure 29**, the alarms that have occurred are shown.

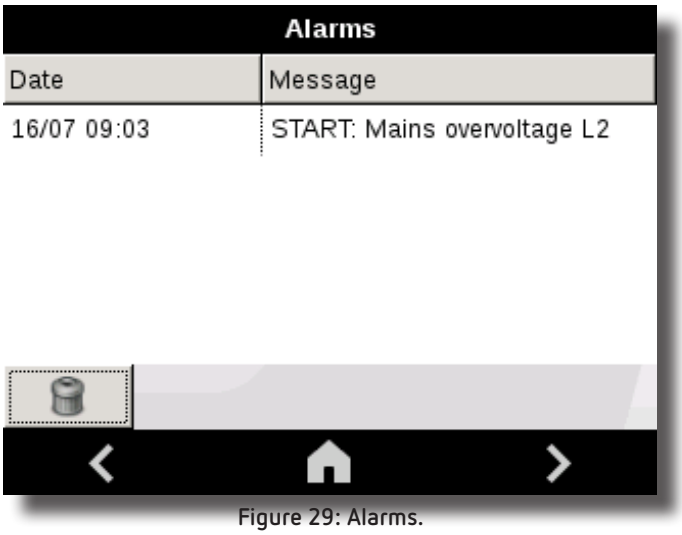


Figure 29: Alarms.

A brief description of the alarm is displayed on the screen, as well as the date and time at which it occurred.

Press the  key to delete the alarm log.

Table 11 shows the messages that could appear on the device.

If the cause of the alarm disappears, the device will be reconnected automatically.

If the same alarm is triggered 5 times during a 1-hour period, the automatic device reconnection function will be disabled.

The RESET key rearms the device if the cause of the alarm has disappeared or has been resolved.

If the device remains in a permanent alarm state, the screen shown in **Figure 30**, is displayed.

Figure 30: Permanent alarms.

If the display has entered energy saving mode, it is automatically disabled. The alarm screen disappears when the display is touched.

Use the < and > keys to navigate through the different display screens.

Table 11:Alarm messages.

Alarm messages	
Communications fault with the capacitor bank	
Description	Loss of communication between the **SVGm** module and the **Computer SMART III 12V-OPTIM-SVGm** regulator.
Corrective action	Check that the **Computer SMART III 12V-OPTIM-SVGm** is powered. Check that the cables are properly connected to the RS-485 output terminal of the **SVGm** module. Check that the **Computer SMART III 12V-OPTIM-SVGm** has the following communication configuration programmed in the COMM 1 section: NO 1 / 9600 / NONE / 1. If the error persists, contact the **Technical Service**.
DC Bus voltage error	
Description	The voltage of the internal DC bus has exceeded the limit.
Corrective action	This is a condition that can be destructive for the device. Check that the AC voltage quality and levels meet the requirements specified in this manual and disconnect the device if they do not.
DC+ Bus overvoltage	
Description	The voltage of the internal DC+ bus has exceeded the limit.
Corrective action	This is a condition that can be destructive for the device. Check that the AC voltage quality and levels meet the requirements specified in this manual and disconnect the device if they do not.
DC- Bus overvoltage	
Description	The voltage of the internal DC- bus has exceeded the limit.
Corrective action	This is a condition that can be destructive for the device. Check that the AC voltage quality and levels meet the requirements specified in this manual and disconnect the device if they do not.
Overcurrent L1/L2/L3	
Description	The **SVGm** current is too high.

Table 11 (Cont.) : Alarm messages.

Alarm messages	
Corrective action	This alarm may be associated with transients and noise in the power supply voltage. Check the quality of the power supply voltage. If it continues, contact the **Technical Service**.
Mains overvoltage L1/L2/L3	
Description	The mains voltage is too high.
Corrective action	This alarm may be associated with transients and noise in the power supply voltage, or with incorrect mains voltage values. This is a condition that can be destructive for the device. Check the configuration. Check the quality of the power supply voltage and disconnect the device if the requirements in the manual are not met. If it continues, contact the **TAS.**
IGBT failure	
Description	IGBT overcurrent.
Corrective action	Condition that can be destructive for the device. Contact the **TAS**.
High temp IGBT	
Description	The temperature of the power module is very high.
Corrective action	Check that the fans are working. Clean or replace them if necessary. If it continues, contact the **Technical Service.**
High temp Inductor	
Description	The temperature of the inductors is very high.
Corrective action	Check that the fans are working. Clean or replace the fans if necessary. If it continues, contact the **Technical Service.**
DC Bus charge failure	
Description	The DC bus has not been pre-charged.
Corrective action	Check AC connection and voltages. If it persists, contact **TAS.**
Initial Conditions	
Description	The start-up conditions have not been met 10 times during the past 5 minutes.
Corrective action	Check the configuration and the ambient temperature. Check the quality of the power supply voltage. If it persists, contact the **Technical Service.**
Hardware failure	
Description	Possible hardware failure detected.
Corrective action	Contact the **Technical Service**.
Selt-test failed	
Description	The self-test system has detected a fault.
Corrective action	Contact the **Technical Service**.
Temperature	
Description	Very high ambient temperature.
Corrective action	Power limited below 50% due to temperature. Check ambient temperature, dirt at the air intake and fans.
DSP failure	
Description	Fault in the DSP
Corrective action	The DSP has suffered an unexpected fault. Appears when updating the software. In any other case, contact **TAS**.
5V supply failure	
Description	Power supply failure.
Corrective action	Contact Technical service.

Table 11 (Cont.) : Alarm messages.

Alarm messages	
Internal comms error	
Description	Failure in internal communications.
Corrective action	Restart. Contact the **Technical Service**.

5.3.7.- WARNINGS

When the device generates a warning, it will continue to operate, but the ⚠ symbol will be displayed on the main screen.

On pressing the RUN key; if there are active warnings, the screen shown in **Figure 31**, will be displayed and the user will be asked for confirmation to continue with the static generator start-up process.

Figure 31: Confirm screen.

This screen, **Figure 32**, shows the active warnings. **Table 12** shows the warnings that can appear on the device's display.

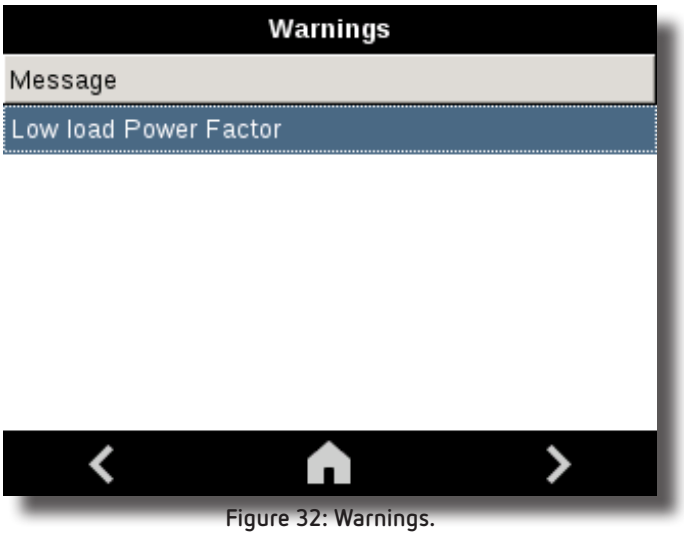


Figure 32: Warnings.

Use the ‹ and › keys to navigate through the different display screens.

5.3.8.- ETHERNET COMMUNICATIONS

In this screen, **Figure 33**, the IP address of the device and the netmask are shown.

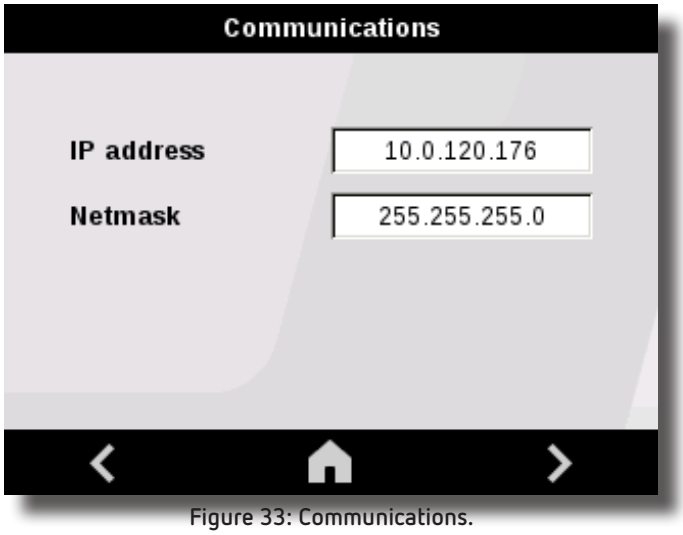


Figure 33: Communications.

Use the < and > keys to navigate through the different display screens.

5.3.9.- DEVICE INFORMATION

In this screen, **Figure 34**, the serial number, HMI and DSP versions of the device are shown.

Figure 34: Device information.

Use the < and > keys to navigate through the different display screens.

5.4.-CONFIGURATION

Figure 35 shows the main configuration screen.

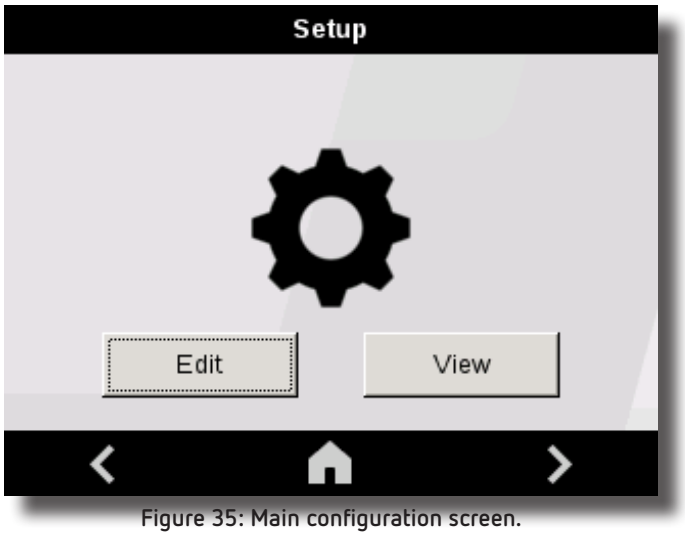


Figure 35: Main configuration screen.

By pressing the View key, the setup menu is accessed in display mode, i.e., all parameters of the device are shown but they cannot be modified.

By pressing the Edit key, the setup menu is accessed in edit mode, i.e., the parameters of the device can be modified. In this case, before entering the setup menu it is necessary to enter the password, **Figure 36**

Password: 1234

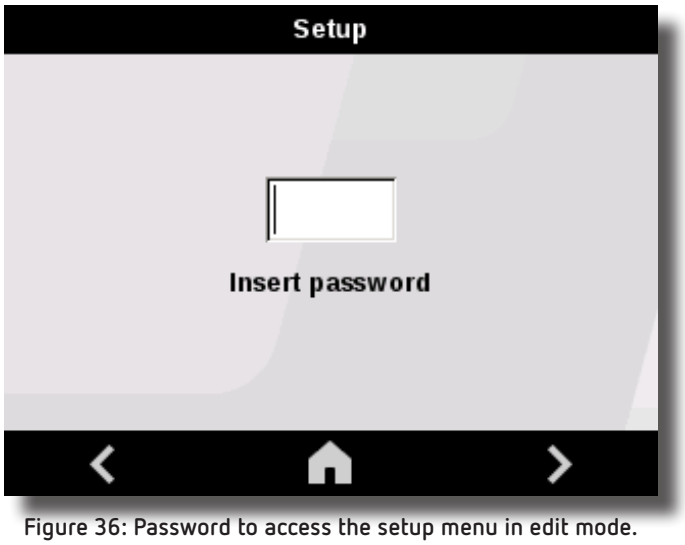


Figure 36: Password to access the setup menu in edit mode.

5.4.1.- LANGUAGE

In this screen, **Figure 37**, the language of the display is selected.

Figure 37: Configuration screen: Language.

- **Language**, display language.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.2.- DEVICE SPECIFICATIONS

Note: *This screen is informative, it can not be modified.*
In this screen, **Figure 38**, the specifications of the device are displayed.

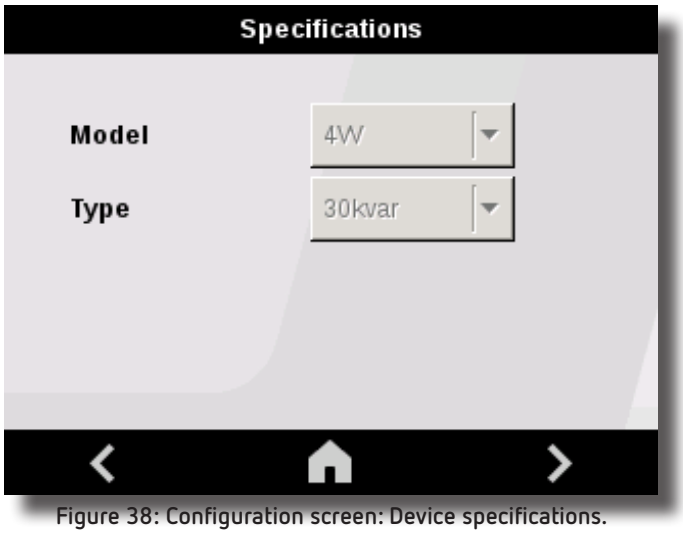


Figure 38: Configuration screen: Device specifications.

- **Model**, device model: **3W:** 3-wire model.
Note: *In special device the model may vary.*

- **Type,** device range: 100 kvar.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.3.- COS Φ

The device is only programmed in reactive power correction Mode 1, as configured out of the factory (**Figure 39**).

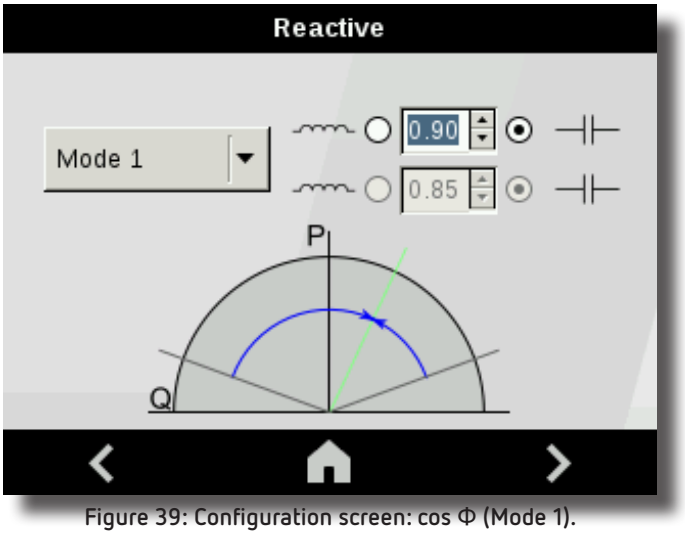


Figure 39: Configuration screen: cos Φ (Mode 1).

- **Mode 1**

In this mode, **cos Φ** is set to a fixed value. The device will attempt to ensure that the reactive power on the mains side corresponds to the specified **cos Φ**.

Table 12: Configuration values: cos Φ.

cos Φ	
Range of values	0.7 ... -0.7

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

ATTENTION: Synchronized configuration between Computer SMART III 12V-OPTIM-SVGm and SVGm.
It is essential to configure both devices similarly; that is, to set an identical target **cos Φ**, as configured by default.
This measure ensures operational consistency and avoids a malfunction in the device's reactive compensation efficiency.

5.4.4.- TRANSFORMER CONFIGURATION

The transformers that will be installed with the device are configured in this screen, **Figure 40**:

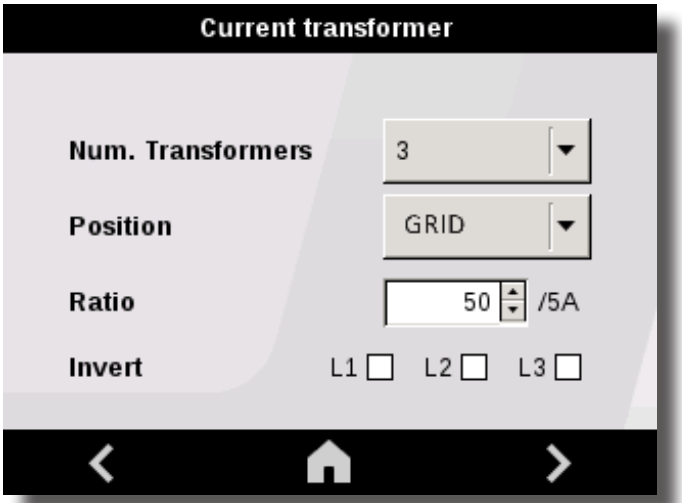


Figure 40: Configuration screen: Transformer configuration.

- **Num transformers**

The number of transformers that will be installed is configured with this parameter. Only 3 current transformers can be used with the **OPTIM SVGm.**

- **Position**

The location of the transformers is configured with this parameter. Only the GRID location is allowed in the **OPTIM SVGm**. In other words, the current transformers must be installed in the mains area, up-stream of the **SVGm**, as per the connection diagrams provided in this manual.

- **Ratio**

The transformer ratio is configured with this parameter, i.e., the ratio between the transformer primary and secondary.

Table 13: Configuration values: Ratio.

Ratio	
Minimum value	5 A
Maximum value	20000 A

- **Invert**

This parameter is used to select the phase in which the device is going to reverse the current flow in the load measurement transformers in order to correct installation errors.

> In order to correctly measure the power of the mains to be compensated, it must also be corrected in the **Computer SMART III 12V-OPTIM-SVGm**.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.5.- ETHERNET COMMUNICATIONS

The Ethernet communication parameters are configured in this screen, **Figure 41**:

Figure 41: Configuration screen: Ethernet communications.

By activating the ☑ **DHCP** option, the device assigns the IP automatically.
If this option is not activated, the parameters must be configured manually:

- **IP Address,** IP address.
- **Netmask,** subnet mask.
- **Gateway,** gateway.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.6.- RS-485 COMMUNICATIONS

The configuration of RS-485 communications between the **SVGm** and the **Computer SMART III 12V-OP-TIM-SVGm** is set to a Baud Rate of 9600 bps, 8 Data bits, 1 Stop bit and no Parity. Only the device's Modbus address can be configured, **Figure 42**.

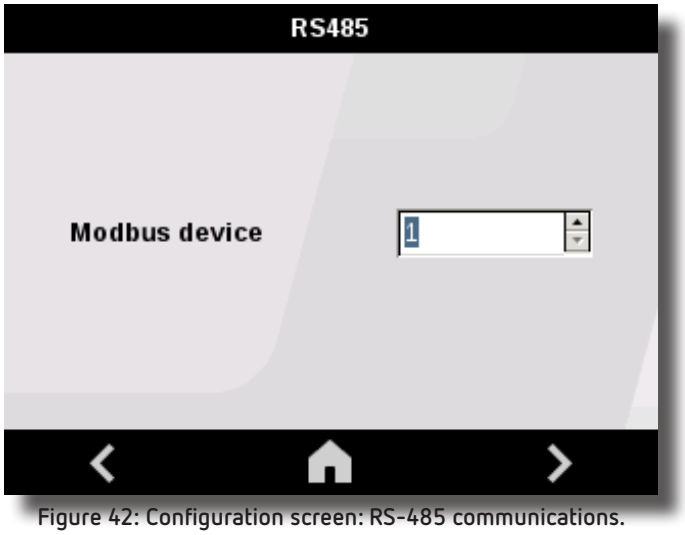


Figure 42: Configuration screen: RS-485 communications.

Check with **Circutor tech support** before modifying the Modbus Address of the device.

- **Modbus device,** modbus address.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.7.- DATE / TIME

The time parameters are configured in this screen, **Figure 43**:

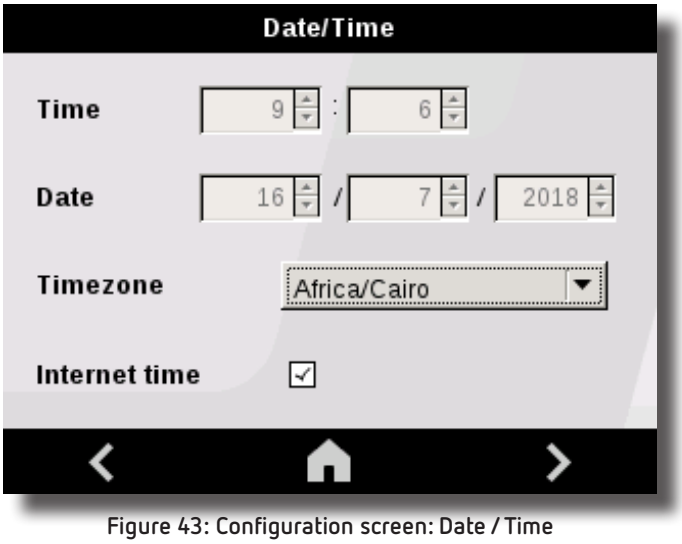


Figure 43: Configuration screen: Date / Time

- **Time**, **Date**, **Time zone**.

By activating the **Internet time** option, the device synchronises with an NTP server.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.8.- PASSWORD

This screen, **Figure 44**, is used to configure the device's password:

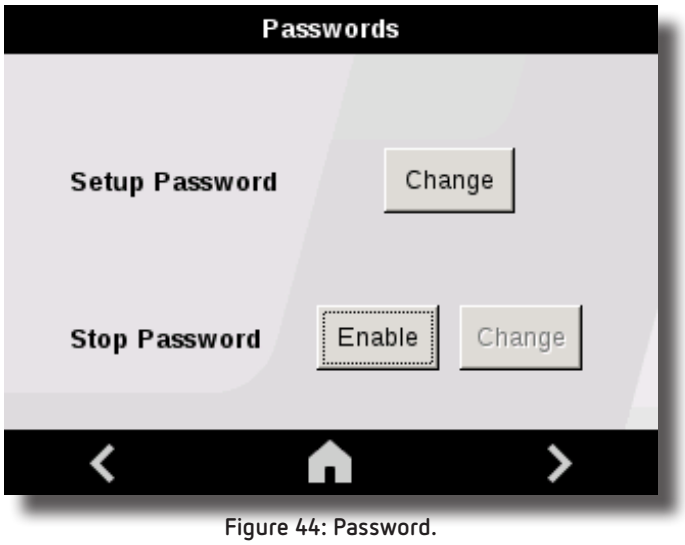


Figure 44: Password.

- **Setup Password**.

This parameter enables the device's configuration access password to be modified.

- **Stop Password**.

The STOP key may be configured with a password; if enabled, the device will request the password on being pressed and will not stop unless the correct password is entered.

Press the key to access the next configuration step
Press the key to access the main screen of the device without saving the configuration values.

5.4.9.- SAVE DATA

The modified configuration values are saved in the final setup menu screen, **Figure 45**.

Figure 45: Final setup menu screen.

Press the Save key to save the modified data.
Press the key to exit the setup menu.

5.5.- MAINTENANCE

The **SVGm** static generator requires minimum preventive maintenance.

It is recommended to follow the notes described in this chapter to avoid premature damage to the device's components.

Table 14 shows the maintenance jobs with their respective time intervals.

Table 14: Static generator maintenance.

Description	Interval
Standard maintenance	12 months
Replacement of the cooling fans	40000 h

The device controls the maintenance intervals and shows the symbol on the main screen of the device if maintenance is required.
The warnings screen, "***5.3.7.- WARNINGS***" describes the type of maintenance procedures that must be carried out.

Note: *The time intervals of the maintenance operations can vary depending on the device's operating conditions and environmental factors.*

Follow the safety instructions in the ***"SAFETY PRECAUTIONS"*** section before carrying out any maintenance on the **SVGm**.
Failure to follow these instructions may result in injury or even death.

Certain components in the device can reach high temperatures. Allow the device to cool down before performing any maintenance operations.

Check the **SVGm** manual for information on replacing the cooling fans.

5.5.1.- STANDARD MAINTENANCE

Perform maintenance every 6 to 12 months, depending on the level of environmental dirt and operation of the device.
The device will indicate that the maintenance procedures must be carried out every 12 months.

For an installation with devices in parallel, standard maintenance must be performed on all devices at the same time.

The points to be inspected are:

1.- Set the **SVGm** in STOP mode and open the main switch (**OFF** position).
2.- Wait 1 minute for the capacitors to discharge.
3.- Clean the ventilation grilles, removing the dust.
4.- Check the status and torque of the electrical connections, as well as the mechanical attachment to the wall.
5.- Reset the standard maintenance meter, to do so:

Access the main setup screen.

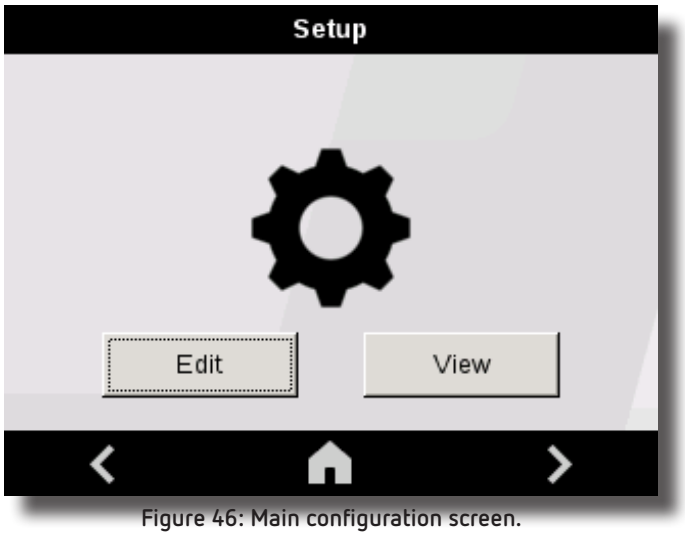


Figure 46: Main configuration screen.

Press the  Edit key and enter the password used to access the maintenance screen (***Maintenance password:*** *8888*).

The screen shown in **Figure 47** will be displayed.

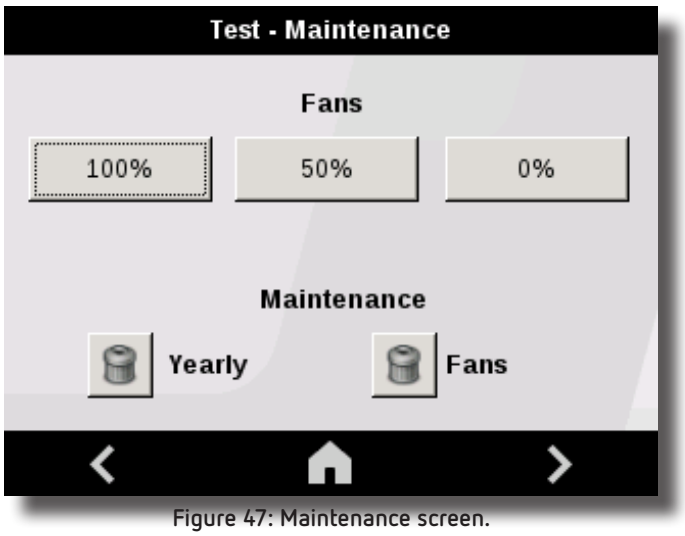


Figure 47: Maintenance screen.

Press the  key to reset the maintenance meter.

6.- COMPUTER SMART III 12V-OPTIM-SVGm

> Check the **Computer SMART III 12V-OPTIM-SVGm (M015B01-03-xxx)** manual for more detailed information on the device.

6.1.- DISPLAY

The device has a backlit LCD display (**Figure 48**):

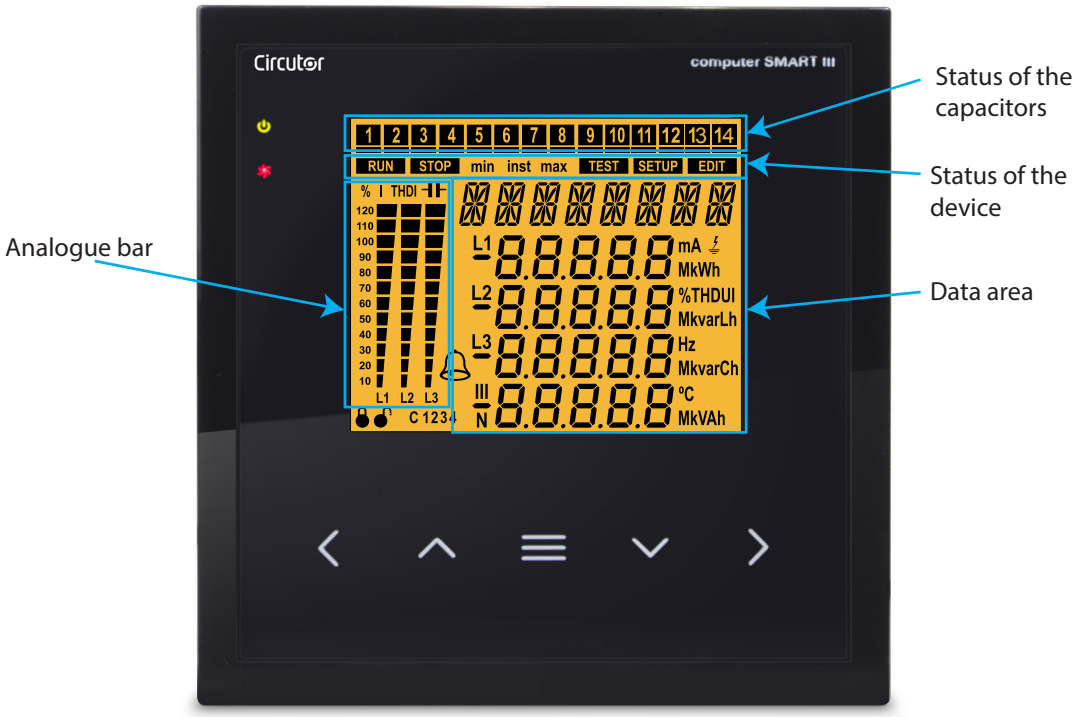


Figure 48: Areas of the Computer SMART III 12V-OPTIM-SVGm display.

The display is divided into four areas:

✓ The **data area:** displays the instantaneous, maximum and minimum values of each one of the phases which the device is measuring or calculating.

✓**Status of the capacitors:** displays the status of the relays of the device.

✓**Status of the device:** displays the current status of the device.

✓**Analogue bar:** configurable, shows the current, current THD or connected power of the capacitor bank as a %.

6.2.- LED INDICATORS

The **Computer SMART III 12V-OPTIM-SVGm** device comprises:

- ✓ A **CPU** LED: Indicates that the device is working properly by flashing once per second.
- ✓ An **Alarm** LED: Indicates that an alarm is activated.
- ✓ A **Fan** LED: Indicates that the fan is operating.
- ✓ A **Key pressed** LED: Lights up when any of the five keys are pressed.

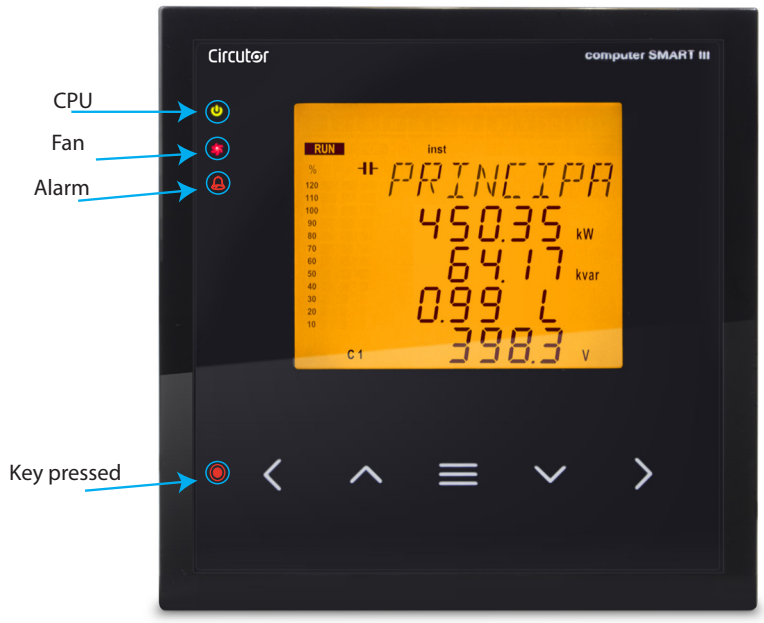


Figure 49:LED indicators of the Computer SMART III 12V-OPTIM-SVGm.

6.3.- CONFIGURATION

This section shows the basic configuration to establish in the **Computer SMART III 12V-OPTIM-SVGm**.

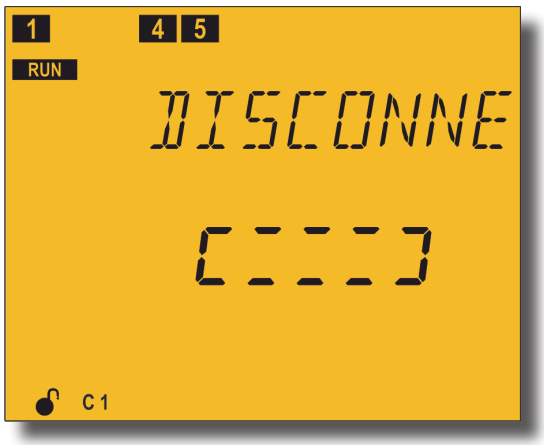
The various configuration parameters of the device can be consulted and edited in the device setup menu.
The device always keeps the capacitors disconnected (except in the Plug&Play function).
This status is identified by the SETUP symbol in the device status area of the display (**Figure 48**).

To access the setup menu, long keystroke the ☰ key (> 3 s).

The Password screen appears on the display. The password to be entered is a combination of keys: ^ ☰ v ☰. It is unique and cannot be configured.

If it is not entered correctly, the device returns to the previous measurement screen.
If it is entered correctly and capacitors are connected, the disconnection screen appears.

Disconnection screen: used for the device to automatically disconnect all the stages before entering the configuration. While in this screen, the device does not respond to the keypad.



The device automatically exits this screen, and this can take a certain amount of time.

6.3.1.- C/K FACTOR

The C/K factor is adjusted according to the reactive current provided by the smallest stage, measured in the secondary of the current transformer (CT). The adjustment value of this factor therefore depends on the power of the smallest stage, the ratio of the CTs and the network voltage.

Table 15 shows the values to which C/K must be adjusted for a mains with 400 VAC between phases, based on the different transformer ratios for a power of 80 kvar in the smallest bank.

Table 15: C/K Factor.

CT Ratio (Ip /Is)	C/K
600/5	0.87
800/5	0.66
1000/5	0.52
1500/5	0.35
2000/5	0.26
2500/5	0.21
3000/5	0.17
4000/5	0.13

For other voltages or conditions not included in the table, the value of C/K can be obtained by means of a simple calculation.

✓**Calculating the C/K Factor**

The equation for calculating the C/K factor is:

$$C/K = \frac{I_C}{K}$$

where, **Ic**: is the smallest capacitor current.
K: the current transformer transformation ratio.

To calculate **Ic** it is necessary to know the reactive power of the smallest capacitor **Q** and the network voltage **V**.

$$I_C = \frac{Q}{\sqrt{3}.V}$$

The transformation ratio K is calculated as:

$$K = I_{prim} / I_{sec}$$

where, **Iprim** : is the nominal current of the transformer primary.
Isec: is the current of the transformer secondary.

Example: *In a 400 V device the smallest capacitor is of 60 kvar with a current transformer having a ratio of 500/5, and the calculation would be made as follows:*

Current of the smallest capacitor, Ic: $I_C = \frac{60000}{\sqrt{3} \cdot 400}$

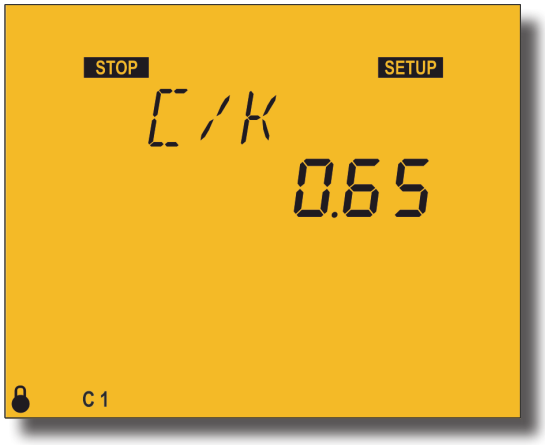
K Factor $K = 500/5 = 100$

The C/K value is: ***0.866***.

If the power of 60 kvar is referenced at 440 V, it should be multiplied by Vred² /440², in which case the C/K value of the previous example would be ***0.72***.

	If the C/K is not set correctly, the **SVGm** module will not perform its compensation function properly in combination with the capacitor banks controlled by the **Computer SMART III 12V-OPTIM-SVGm**; therefore, it is essential to make sure that this C/K value is programmed correctly to guarantee the proper operation of the **OPTIM SVGm** device.
	If the C/K is configured lower than the actual value, connections and disconnections would occur continuously with few load variations (the system performs more operations than necessary).
	If the C/K is configured higher, the regulator requires a higher demand for reactive power in order to switch and perform fewer operations.

Press the  key to enter edit mode. It is identified by the EDIT symbol and the flashing of the digits to be modified.



The < key skips to the previous digit.

The > key skips to the next digit.

The ^ key increases the digit value and the v key reduces the digit value.

Press ≡ to validate the data; the EDIT symbol disappears from the display.

Minimum value: 0.02
Maximum value: 1.0

If the value entered is lower than the minimum value or higher than the maximum value, the backlight of the display flashes and the value entered is replaced with the minimum or maximum value, or with the last value validated.

Press the v key to access the next programming step.
If no keys are pressed for 5 minutes, the device switches to the simulation screen.

7.- TECHNICAL FEATURES

Mains voltage		
Rated voltage Un	OPTIM SVGm-xxxx-440	OPTIM SVGm-xxxx-480-60Hz
	400 V~. Ph-Ph ± 5%	480 V~ Ph-Ph ± 5%
Maximum operating voltage Umax	400 V~. Ph-Ph	480 V~ Ph-Ph
Frequency Fn	50 ± 2%	60 ± 2%
Maximum THD V	6 %	
Earthing system	TN, TT	

(At maximum voltage Umax)			
	OPTIM SVGm-200-440	OPTIM SVGm-300-440	OPTIM SVGm-400-440
Maximum Inductive Reactive Power	200 kvar	300 kvar	400 kvar
	OPTIM SVGm-500-440	OPTIM SVGm-600-440	OPTIM SVGm-700-440
	500 kvar	600 kvar	700 kvar
	OPTIM SVGm-800-440	OPTIM SVGm-175-480-60Hz	OPTIM SVGm-250-480-60Hz
	800 kvar	175 kvar	250 kvar
	OPTIM SVGm-325-480-60Hz	OPTIM SVGm-400-480-60Hz	OPTIM SVGm-475-480-60Hz
	325 kvar	400 kvar	475 kvar
	OPTIM SVGm-550-480-60Hz	OPTIM SVGm-625-480-60Hz	
	550 kvar	625 kvar	

(At maximum voltage Umax)			
	OPTIM SVGm-200-440	OPTIM SVGm-300-440	OPTIM SVGm-400-440
Maximum current per phase	262 A	394 A	525 A
	OPTIM SVGm-500-440	OPTIM SVGm-600-440	OPTIM SVGm-700-440
	Cabinet 1/2: 525 A Cabinet 2/2: 131 A	Cabinet 1/2: 525 A Cabinet 2/2: 262 A	Cabinet 1/2: 525 A Cabinet 2/2: 394 A
	OPTIM SVGm-800-440	OPTIM SVGm-175-480-60Hz	OPTIM SVGm-250-480-60Hz
	Cabinet 1/2: 525 A Cabinet 2/2: 525 A	210 A	301 A
	OPTIM SVGm-325-480-60Hz	OPTIM SVGm-400-480-60Hz	OPTIM SVGm-475-480-60Hz
	391 A	Cabinet 1/2: 391 A Cabinet 2/2: 90 A	Cabinet 1/2: 391 A Cabinet 2/2: 180 A
	OPTIM SVGm-550-480-60Hz	OPTIM SVGm-625-480-60Hz	
	Cabinet 1/2: 391 A Cabinet 2/2: 271 A	Cabinet 1/2: 391 A Cabinet 2/2: 360 A	

(At maximum voltage Umax)			
	OPTIM SVGm-200-440	OPTIM SVGm-300-440	OPTIM SVGm-400-440
Maximum consumption	2630 W	3200 W	3770 W
	OPTIM SVGm-500-440	OPTIM SVGm-600-440	OPTIM SVGm-700-440
	4340 W	4910 W	5480 W
	OPTIM SVGm-800-440	OPTIM SVGm-175-480-60Hz	OPTIM SVGm-250-480-60Hz
	6050 W	2615 W	3160 W
	OPTIM SVGm-325-480-60Hz	OPTIM SVGm-400-480-60Hz	OPTIM SVGm-475-480-60Hz
	3705 W	4250 W	4795 W
	OPTIM SVGm-550-480-60Hz	OPTIM SVGm-625-480-60Hz	
	5340 W	5885 W	

Rated insulation voltage Ui	690 V
Impulse withstand voltage Uimp	4kV, CAT III Class 1
Rated operating voltage (Ue) (of a circuit of an assembly)	400 V~
Rated current of a main output circuit Inc	525 A
Rated group current of a main circuit Ing	525 A
Rated permissible peak rated current Ipk	84 kA
Rated permissible short-time withstand current Icw (of a main circuit of a set)	40 kA
Rated conditional short-circuit current Icc	40 kA
Rated simultaneity factor (RDF)	1

Current measurement	
Type	Transformer: 5/5A ... 20000/5A
Consumption	1.5 VA per transformer

Fuses	
Module SVGm-3WF-100R-480	
Quantity	2 per phase
Type	type BS88A1 25A, 500Vac, gG 80kA I^2t 21kA^2s
Module Rack-100-440-7%	
Quantity	1 per phase
Type	NH-00, 160 A, 500 Vac, gG/gL 120 kA
Module Rack-75-480-7%	
Quantity	1 per phase
Type	NH-00, 125 A, 690 Vac, gG/gL 100 kA

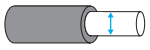
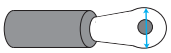
Ethernet communications (Module SVGm-3WF-100R-480)	
Network protocol	TCP/IP, Modbus TCP

User interface	
Display (Module SVGm-3WF-100R-480)	3.5" TFT colour touch screen Web server and datalogger
Display (Module Computer SMART III 12V-OPTIM-SVGm)	LCD Custom COG

Environmental features	
Environmental conditions	**Indoor conditioned IEC 60721-3-3**
Operating temperature	-10°C ... +45°C
Storage temperature	-20°C... +50°C
Relative humidity (with no condensation)	0 ... 95%
Maximum altitude	2000 m a.s.l.
Protection degree IP	IP20
Pollution degree	2
Impact resistance	IK 10
Electromagnetic compatibility	Installation in type-A environments

Standards	
Power capacitors - Low-voltage power factor correction banks	IEC 61921

Mechanical features			
Dimensions (mm)	Figure 50 and Figure 51		
Weight	OPTIM SVGm-200-440 OPTIM SVGm-175-480-60Hz	OPTIM SVGm-300-440 OPTIM SVGm-250-480-60Hz	OPTIM SVGm-400-440 OPTIM SVGm-325-480-60Hz
	250 kg	310 kg	370 kg
	OPTIM SVGm-500-440 OPTIM SVGm-400-480-60Hz	OPTIM SVGm-600-440 OPTIM SVGm-475-480-60Hz	OPTIM SVGm-700-440 OPTIM SVGm-550-480-60Hz
	555 kg	615 kg	675 kg
	OPTIM SVGm-800-440 OPTIM SVGm-625-480-60Hz		
	735 kg		
Enclosure	Free-standing sheet steel cabinet, for installation indoors, without removable parts.		
Device type	Fixed		
Type of construction	Fixed		
Noise	< 63 dBA		

Connections						
Current						
Type						
Spring	2.5 mm²					
Earth (1)						
Type						
Ring terminal	8 mm	10 Nm	Hex 13 mm			
Ethernet (Module SVGm)						
Type						
RJ-45						
Mains						
OPTIM SVGm	Bar	Drill	Diameter of the Cable	Screw	Terminal width	
Per cabinet	40x10	1xM10	≤ 240 mm²	M10 8.8	≤ 37 mm	45 Nm

(1) If the phase conductors exceed 32 mm², the earth conductor can be the half of the cross-section of the phase conductors.

Check the recommended cable sections for connecting each model to the mains.
(See *"3.5.- CONNECTION"*).

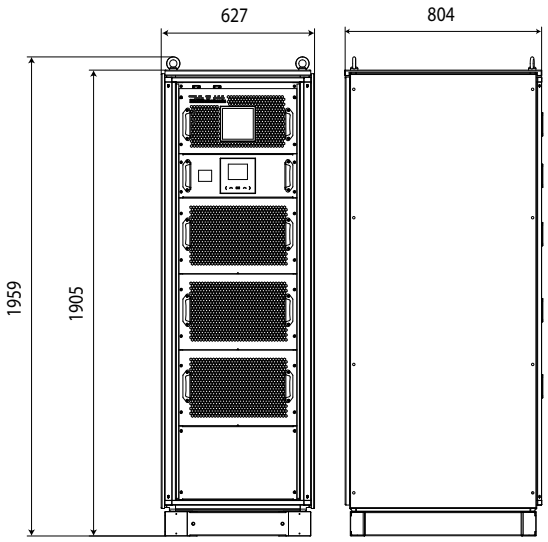


Figure 50:OPTIM SVGm dimensions of 1 cabinet

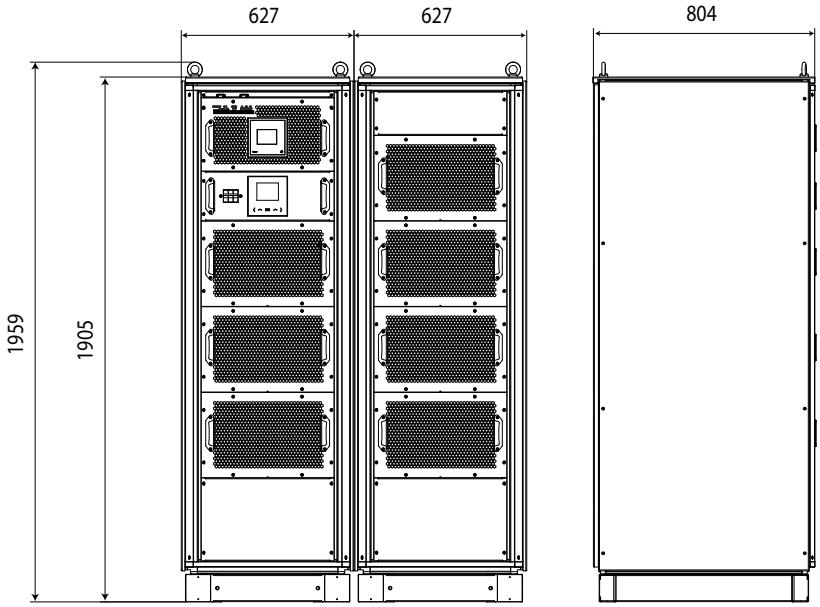


Figure 51:OPTIM SVGm dimensions of 2 cabinets.

8.- TECHNICAL SERVICE

In the case of any query in relation to device operation or malfunction, please contact the **CIRCUTOR S.A.U.** Technical Support Service.

Technical Assistance Service
Vial Sant Jordi, s/n, 08232 - Viladecavalls (Barcelona)
Tel: 902 449 459 (Spain) / +34 937 452 919 (outside of Spain)
email: sat@circutor.com

9.- GUARANTEE

CIRCUTOR guarantees its products against any manufacturing defect for two years after the delivery of the units.

CIRCUTOR will repair or replace any defective factory product returned during the guarantee period.

- No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
- The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. "Improper usage" is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
- **CIRCUTOR** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or "improper usage" of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
  - Overvoltages and/or electrical disturbances in the supply;
  - Water, if the product does not have the appropriate IP classification;
  - Poor ventilation and/or excessive temperatures;
  - Improper installation and/or lack of maintenance;
  - Buyer repairs or modifications without the manufacturer's authorisation.

CIRCUTOR, S.A.U. – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(ES) DECLARACIÓN UE DE CONFORMIDAD

La presente declaración de conformidad se expide bajo la exclusiva responsabilidad de CIRCUTOR con dirección en **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) España**

Producto:

Baterias automáticas combinadas

Serie:

OPTIM SVGm

Marca:

CIRCUTOR

EL objeto de la declaración es conforme con la legislación de armonización pertinente en la UE, siempre que sea instalado, mantenido y usado en la aplicación para la que ha sido fabricado, de acuerdo con las normas de instalación aplicables y las instrucciones del fabricante

2014/35/EU: Low Voltage Directive
2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive
2015/65/EU: RoHS3 Directive

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativos(s):

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Año de marcado "CE":

2024

(EN) EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of CIRCUTOR with registered address at **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spain**

Product:

Combined automatic capacitor banks

Series:

OPTIM SVGm

Brand:

CIRCUTOR

The object of the declaration is in conformity with the relevant EU harmonisation legislation, provided that it is installed, maintained and used for the application for which it was manufactured, in accordance with the applicable installation standards and the manufacturer's instructions

2014/35/EU: Low Voltage Directive
2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive
2015/65/EU: RoHS3 Directive

It is in conformity with the following standard(s) or other regulatory document(s):

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Year of CE mark:

2024

(FR) DÉCLARATION UE DE CONFORMITÉ

La présente déclaration de conformité est délivrée sous la responsabilité exclusive de CIRCUTOR dont l'adresse postale est **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelone) Espagne**

Produit:

Batteries automatiques de condensateurs combinées

Série:

OPTIM SVGm

Marque:

CIRCUTOR

L'objet de la déclaration est conforme à la législation d'harmonisation pertinente dans l'UE, à condition d'avoir été installé, entretenu et utilisé dans l'application pour laquelle il a été fabriqué, conformément aux normes d'installation applicables et aux instructions du fabricant

2014/35/EU: Low Voltage Directive
2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive
2015/65/EU: RoHS3 Directive

Il est en conformité avec la(les) suivante (s) norme(s) ou autre(s) document(s) réglementaire (s):

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Année de marquage « CE »:

2024

Viladecavalls (Spain), 9/5/2024
Chief Executive Officer: Joan Comellas Cabeza

Circutor
NIF A-08513178
Vial Sant Jordi s/n.
08232 Viladecavalls
Barcelona (Spain)
t. +34 93 745 29 00

CIRCUTOR, S.A.U. – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(DE)

KONFORMITÄTSERKLÄRUNG UE

Vorliegende Konformitätserklärung wird unter alleiniger Verantwortung von CIRCUTOR mit der Anschrift, Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spanien, ausgestellt

Produkt:

Kombinierte automatische Kondensatorbänke

Serie:

OPTIM SVGm

Marke:

CIRCUTOR

Der Gegenstand der Konformitätserklärung ist konform mit der geltenden Gesetzgebung zur Harmonisierung der EU, sofern die Installation, Wartung undVerwendung der Anwendung seinem Verwendungszweck entsprechend gemäß den geltenden Installationsstandards und der Vorgaben des Herstellers erfolgt

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive	2015/65/EU: RoHS3 Directive

Es besteht Konformität mit der/den folgender/folgenden Norm/Normen oder sonstigem/sonstiger Regelwerk/Regelwerken

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Jahr der CE-Kennzeichnung:

2024

(PT)

DECLARAÇÃO DA UE DE CONFORMIDADE

A presente declaração de conformidade é expedida sob a exclusiva responsabilidade da CIRCUTOR com morada em **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Espanha**

Producto:

Baterias automáticas de condensadores combinadas

Série:

OPTIM SVGm

Marca:

CIRCUTOR

O objeto da declaração está conforme a legislação de harmonização pertinente na UE, sempre que seja instalado, mantido e utilizado na aplicação para a qual foi fabricado, de acordo com as normas de instalação aplicáveis e as instruções do fabricante.

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive	2015/65/EU: RoHS3 Directive

Está em conformidade com a(s) seguinte(s) norma(s) ou outro(s) documento(s) normativo(s):

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Ano de marcação "CE"::

2024

(IT)

DICHIARAZIONE DI CONFORMITÀ UE

La presente dichiarazione di conformità viene rilasciata sotto la responsabilità esclusiva di CIRCUTOR, con sede in **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcellona) Spagna**

prodotto:

Banchi di condensatori combinati automatici

Serie:

OPTIM SVGm

MARCHIO:

CIRCUTOR

L'oggetto della dichiarazione è conforme alla pertinente normativa di armonizzazione dell'Unione Europea, a condizione che venga installato, mantenuto e utilizzato nell'ambito dell'applicazione per cui è stato prodotto, secondo le norme di installazione applicabili e le istruzioni del produttore.

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive	2015/65/EU: RoHS3 Directive

È conforme alle seguenti normative o altri documenti normativi:

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Anno di marcatura "CE":

2024

Viladecavalls (Spain), 9/5/2024
Chief Executive Officer: Joan Comellas Cabeza

Circutor
NIF A-08513178
Vial Sant Jordi s/n.
08232 Viladecavalls
Barcelona (Spain)
t. +34 93 745 29 00

CIRCUTOR, S.A. – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(PL)

DEKLARACJA ZGODNOŚCI UE

Niniejsza deklaracja zgodności zostaje wydana na wyłączną odpowiedzialność firmy CIRCUTOR z siedzibą pod adresem: **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Hiszpania**

produk:

Automatyczne kombinowane baterie kondensatorów

Seria:

OPTIM SVGm

marka:

CIRCUTOR

Przedmiot deklaracji jest zgodny z odnośnymi wymaganiami prawodawstwa harmonizacyjnego w Unii Europejskiej pod warunkiem, że będzie instalowany, konserwowany i użytkowany zgodnie z przeznaczeniem, dla którego został wyprodukowany, zgodnie z mającymi zastosowanie normami dotyczącymi instalacji oraz instrukcjami producenta

2014/35/EU: Low Voltage Directive	2014/30/EU: EMC Directive
2011/65/EU: RoHS2 Directive	2015/65/EU: RoHS3 Directive

Jest zgodny z następującą(ymi) normą(ami) lub innym(i) dokumentem(ami) normatywnym(i):

IEC 61921:2017 IEC 61439-1:2020
EN IEC 63000:2018

Rok oznakowania "CE":

2024

Viladecavalls (Spain), 9/5/2024
Chief Executive Officer: Joan Comellas Cabeza

Circutor
NIF A-08513178
Vial Sant Jordi s/n.
08232 Viladecavalls
Barcelona (Spain)
t. +34 93 745 29 00

CIRCUTOR S.A.U.
Vial Sant Jordi, s/n
08232 - Viladecavalls (Barcelona)
Tel: (+34) 93 745 29 00 - Fax: (+34) 93 745 29 14
www.circutor.com central@circutor.com