Active Parallel Multi-Function Filter

SINAF 3.0

INSTRUCTION MANUAL

(M102B02-03-17B)

CE

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 unit may result in injury to personnel as well as damage to the unit. 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 unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.

	**Refer to the instruction manual before using the unit** 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 unit and /or installations.

LIFASA reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

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

LIFASA on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.lifasa.com

	**LIFASA** recommends using the original cables and accessories that are supplied with the device.

CONTENTS

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
09/17	M102B02-03-17A	Initial Version
12/17	M102B02-03-17B	Changes in sections: 3.2.1.3. - 3.7. - 3.8.2. - 4.1.3. - 11.

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	Compliant with the relevant European standards.
 1 min	After disconnecting the device from all power supplies, wait 1 minute before performing any operations.

Note: *The images of the devices are for illustrative purposes only and may differ from the original device.*

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) Check that it has been delivered with the following:

- Instruction manual
- Communication cable for connecting devices in parallel.
- Trim panel (Cabinet-type **SINAF 3.0** : **SINAF3xxx100** and **SINAF3xxx200**).
- Bag with 5 rubber caps (**SINAF3xxx030F**).

e) 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 **LIFASA'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**)

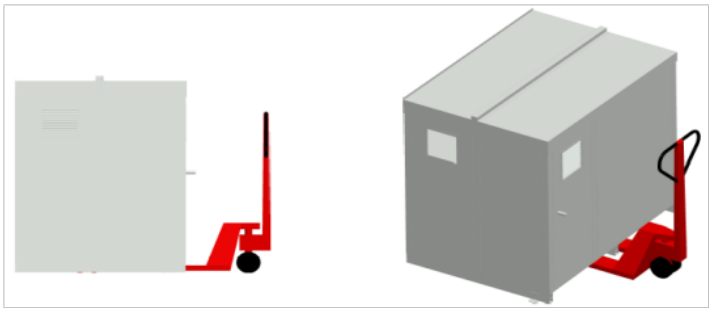


Figure 1: Transport with pallet jack.

⚠	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.

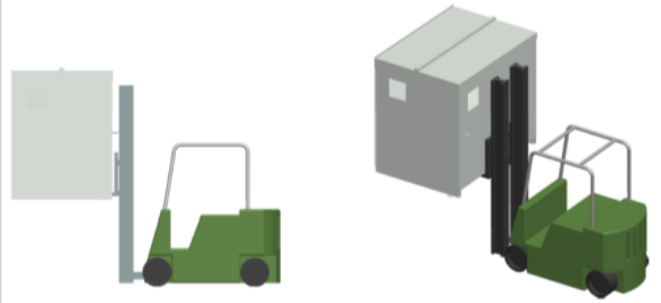


Figure 2: Unloading with a forklift.

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

SINAF 3.0 100 A (SINAF3xxx100) and **200 A (SINAF3xxx200)** cabinets are delivered with the base removed to enable them to be transported with a pallet jack or similar.

There are also 4 rings (diameter : 28 mm) in the top panel so that they can be transported by a crane. The top panel is inverted, with accessories inside, but the rings are mounted to enable it to be transported without any prior set-up required. The angle of the cables must be greater than 45º

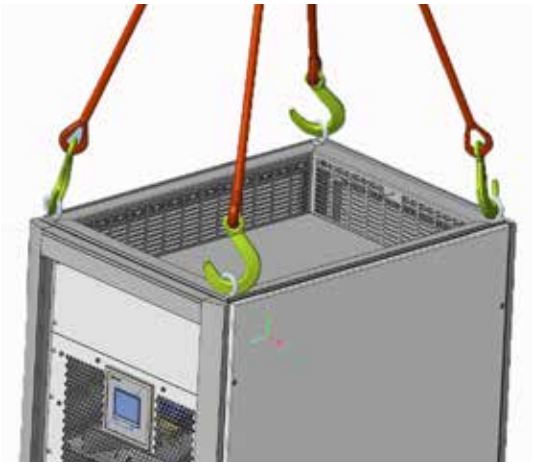


Figure 3: Trasport of an cabinet SINAF 3.0 by crane.

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: 50ºC)
- ✓ 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 **SINAF 3.0** active multi-function filters can be used to:

✓Reduce the harmonic currents up to order 50.
✓Correct the unbalanced current consumption in each phase of the electrical installation.
✓Correct the power factor. For both backward (inductive) and forward (capacitive) currents.

There are different models of the device, for different currents:

✓ **30 A filters,**

The device features:

- **3/4-wire multifunction,** for installation in three-phase mains with or without neutral.
- Parallel installation of up to 100 devices.
- **EMI filters,** optional.
- **LCD touch display**, to view the parameters.
- **RS-485** and **Ethernet** communications.
- Wall enclosure.

Table 3:Relation of models SINAF 3.0 of 30A.

Model	3 Wires (L1, L2, L3)	4 Wires (L1, L2, L3, N)	EMI filter
SINAF3348030	✓	-	-
SINAF3348030F	✓	-	✓
SINAF3440030	-	✓	-
SINAF3440030F	-	✓	✓

	Compliance with the electromagnetic compatibility standards in the version without an EMI filter requires the use of an external filter element. Please contact **LIFASA** for advice on this matter.

✓ **100 A filters,**

There are three types of **100 A** devices:

- ***Rack-type* master** devices, with all of the features (**SINAF3xxx100MR**)
- ***Rack-type* slave** devices, designed to operate as slaves in parallel multi-function filter connections (**SINAF3xxx100SR**)
- **Cabinet-type** devices, with all of the features (**SINAF3xxx100**)

The device features:

- **3/4-wire multifunction,** for installation in three-phase mains with or without neutral.
- Parallel installation of up to 100 devices..
- **LCD touch display**, to view the parameters.
- **RS-485** and **Ethernet** communications.
- **Rack** or **cabinet**-type **enclosure.**
- **Protection** module (Model **SINAF3xxx100**)
- **EMI filters** included (Model **SINAF3xxx100**)

Table 4:Relation of models SINAF 3.0 of 100A.

Model	3 Wires (L1, L2, L3)	4 Wires (L1, L2, L3, N)	Protection module	Operation		Type	
				Master	Slave	Rack	Cabinet
SINAF3348100MR	✓	-	-	✓	-	✓	-
SINAF3440100MR	-	✓	-	✓	-	✓	-
SINAF3348100SR	✓	-	-	-	✓	✓	-
SINAF3440100SR	-	✓	-	-	✓	✓	-
SINAF3348100	✓	-	✓	✓	-	-	✓
SINAF3440100	-	✓	✓	✓	-	-	✓

Compliance with the electromagnetic compatibility standards in the version without an EMI filter requires the use of an external filter element.
Please contact **LIFASA** for advice on this matter.

✓ **200 A filters,**

The **200 A** model (**SINAF3xxx200**) is a cabinet-type model with two **100 A** devices connected in parallel.

The device features:

- **3/4-wire multifunction,** for installation in three-phase mains with or without neutral.
- Parallel installation of up to 100 devices..
- **LCD touch display**, to view the parameters.
- **RS-485** and **Ethernet** communications.
- **Cabinet**-type **enclosure.**
- **Protection** module included.
- **EMI filters** included

Table 5:Relation of models SINAF 3.0 of 100A.

Model	3 Wires (L1, L2, L3)	4 Wires (L1, L2, L3, N)	Protection module	Operation	
				Master	Slave
SINAF3348200	✓	-	✓	✓	-
SINAF3440200	-	✓	✓	✓	-

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.
	**Disconnect the main switch before starting any maintenance task on the active filters.**
	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 -10ºC and 45ºC, 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.

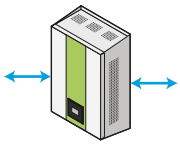
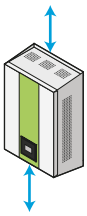
⚠	Install the **SINAF 3.0** in a place protected from water, dust, flammable liquids, gases and corrosive substances.
⚠	Make sure there are no power factor correction devices installed in the same main as the **SINAF 3.0**. If there are any compensation devices, these must be detuned in order to avoid interference between them and the **SINAF 3.0**.

3.2.1.- VENTILATION REQUIREMENTS

3.2.1.1.- 30A SINAF 3.0

The device has a power control system that controls the rotation speed of the fans and the maximum power of the device according to the internal temperature, to ensure the best performance in any condition.

Table 6: Ventilation distances: 30A SINAF 3.0

Ventilation distances	
	
50 mm	**600 mm**

3.2.1.2.- 100A SINAF 3.0 rack-type : SINAF3xxx100xR

The **100 A SINAF3xxx100xR** uses a forced ventilation cooling system, with an air inlet on the front panel and an air outlet at the back of the device.

Once installed, the device's flows of inlet air and outlet air must be allowed to circulate freely. At maximum power, the **SINAF3xxx100xR** circulates an airflow of **600 m^3/h**.

The device has a power control system that controls the rotation speed of the fans and the maximum power of the device according to the internal temperature, to ensure the best performance in any condition.

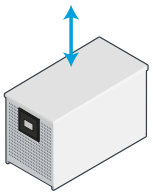
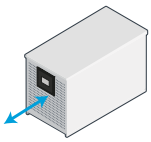
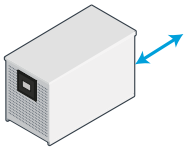
To maintain the device's performance, we recommend ensuring that the air circulates freely through the front panel of the **SINAF3xxx100xR**, and that the rear is free of obstacles, with a gap of at least **300 mm**.

If the device is installed in cabinets with a smaller available space, or with a cover on the back, we recommend using the deflectors that are supplied, which direct the airflows upwards, resulting in the air flowing out of the top of the cabinet. The top of the cabinet must enable proper ventilation.

It should be noted that, depending on the installation conditions in the cabinet and in the room where this is placed, the outflows of hot air may be sucked back in by the device's fans, causing a feedback of hot air that will lower the performance of the device.

It is also necessary to bear in mind the power dissipated by the device when choosing where to install it, to ensure proper air recirculation, to make sure that the intake air is a suitable temperature.

Table 7: Ventilation distances: SINAF3xxx100xR.

Ventilation distances : SINAF3xxx100xR		
		
600 mm(1)	**600 mm**	**600 mm**

(1) With deflectors installed.

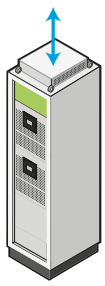
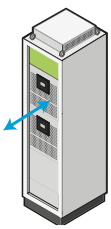
3.2.1.3.- SINAF 3.0 cabinet-type: SINAF3xxx100 and SINAF3xxx200

The cabinet-type **SINAF 3.0** 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 ventilation grille at the top must not be blocked, leaving enough space to the ceiling to allow the heat to dissipate. The distance depends on the characteristics of the installation site.

There is no need to leave space between the sides or at the back of the cabinet; they can be installed next to other cabinets and against a wall.

Table 8: Ventilation distances: SINAF3xxx100 and SINAF3xxx200

Ventilation distances : cabinet type SINAF 3.0	
	
Depends on the characteristics of the site	**600 mm**

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 -20ºC and 50ºC.
- ✓Avoid exposure to direct sunlight.
- ✓Keep the device in its original packaging.

If the active filter is stored for a long time disconnected from the main, a specific process must be applied to restore the internal dielectric layers of the DC bus capacitors. **Table 9** shows the recommendations for starting the device, according to the length of its storage period.

Table 9: Start-up process, according to storage time.

Storage time	Process
< 1 year	No special treatment required.
> 1 year	Connect the **SINAF 3.0** to the mains at least one hour before starting up the device. Power the device and leave it in STOP mode

3.4.- INSTALLATION

3.4.1.- 30 A SINAF 3.0

The **SINAF 3.0** of 30A has a number of holes on the top and bottom of the device, **Figure 4,** to facilitate transport and installation of the device.
These holes can be used as attachment points for external manipulation tools, or a bar (not included) can be passed through them to improve transport and installation of the device.

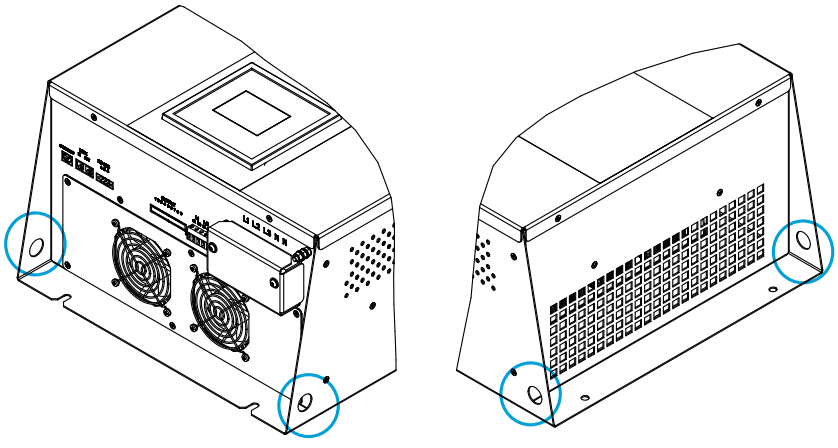


Figure 4: Holes to facilitate transport and installation.

The device must be fixed vertically to a wall or support.
Use 4 fixing screws with a diameter of **8 mm**, suitable for the chosen wall or support.

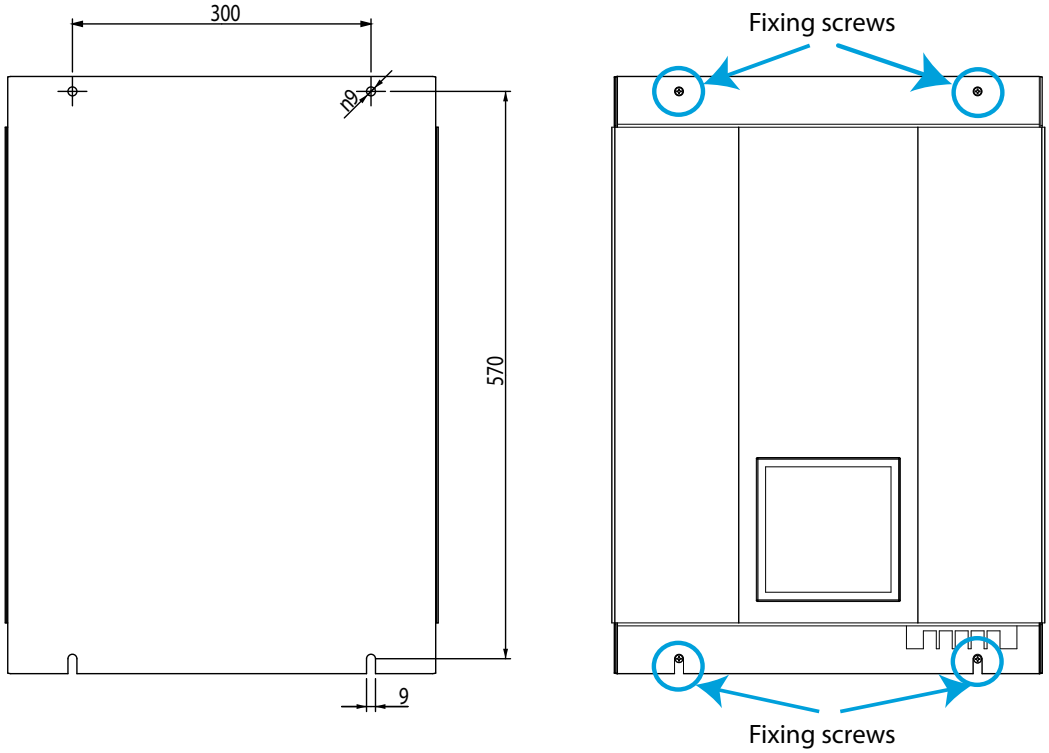


Figure 5: Installation.

⚠	The ventilation grilles must not obstructed or covered at any time.

3.4.2.- 100 A SINAF 3.0 RACK-TYPE: SINAF3xxx100xR

The **SINAF3xxx100xR** should be installed in a 19” rack cabinet.
The height of the device is equivalent to 9U. (U is the rack unit, 1U = 4.445 cm)

You can install more than one **SINAF 3.0** in a single cabinet.

Follow these steps to install it inside the cabinet:

1.- Extend the rack cabinet’s anti-tip feet.

⚠	Unless the rack cabinet is secured to the floor, the anti-tip feet have to be extended and fixed to the floor, to ensure maximum safety during the assembly process.

2.- Open or remove the door at the front of the cabinet.

3.- Place the **SINAF 3.0** on the cabinet’s rails or shelves. Make sure that they are suitable for the weight of the device; use cross braces if necessary.

⚠	Fit the device with the help of another person.

4.- Fasten the device to the points provided for this purpose. Use **8 M6** fixing screws.

3.4.3.- 100 A AND 200 A SINAF 3.0 CABINET-TYPE: SINAF3xxx100 AND SINAF3xxx200

The **100 A (SINAF3xxx100)** and **200 A (SINAF3xxx200)** models of the **SINAF 3.0** are free-standing cabinets with 4 bearing supports 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.

The device's top panel is part of the ventilation system. The top panel is inverted to make it easier to transport.
It must be placed in the correct position to enable the device to operate properly. To do this:

1.- Remove the transport rings.

2.- Remove the top panel from the top of the cabinet.

3.- Rotate the top panel. The non-slotted part goes at the front of the cabinet.

4.- Install the transport rings with rubber washers supplied. Torque **20 Nm**

Figure 6: Top panel of an SINAF 3.0 cabinet.

3.5.- CONNECTION

	**SINAF3xxx030x** and **SINAF3xxx100xR** models: Use cables of a cross-section suitable for the nominal current of the filter and that comply with the standards of the country in which they are being installed. The earth conductor must have at least the same cross-section as the phase conductors. If the phase conductors exceed 16 mm^2, the earth conductor will be at least 16 mm^2. If the phase conductors exceed 32 mm^2, the earth conductor can be the half of the cross-section of the phase conductors Under certain circumstances, the contact current may exceed 3.5 mA ~.
	**SINAF3xxx100** and **SINAF3xxx200** models: 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 A modules, 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: **SINAF3xxx100 :** 35 mm^2 **SINAF3xxx200 :** 70 mm^2
	Ensure that the **SINAF 3.0** is earthed correctly to prevent the risk of electric shock.
	To measure the current, class **0.2S** 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 **SINAF 3.0** filters to operate properly. If the phases L1, L2 and L3 are switched in the secondary, the filter will not work properly.
	**SINAF3xxx030x** model: Install a **C curve**, **40 A** cut off device and a cut off power adapted to the point of installation and the standards of the country in which it is being installed, in the main connections of each **SINAF 3.0**.
	**SINAF3xxx100xR** model: Install a **C curve**, **125 A** cut off device and a cut off power adapted to the point of installation and the standards of the country in which it is being installed, in the main connections of each **SINAF 3.0**.
	**SINAF3xxx100** and **SINAF3xxx200** models: Install the necessary external protections, according to the type of installation and the regulations in force at the place of installation.

⚠	If local regulations require the use of earth leakage protection devices, only DC sensitive RCD (RCD type B) should be used with **SINAF 3.0**. Active filters work internally with DC currents, and, in case of failure, the DC currents may produce malfunction on type A RCD devices.
⚠	Ensure that the installation of the device in your electric distribution system (TN, VT, IT) complies with current standards.

Check that there is a neutral in the place where three-phase active filter connections are made with neutral, **SINAF3440xxxxx**.

The active filter must be of the correct size for the harmonic currents it has to filter and to comply with the installation's electrical features.

⚠	Check section ***"4.3.- NOMINAL CURRENT DIMENSIONS"*** to define the correct dimensions of the device. Failing to observe the recommendations described in this section might cause the active filter to work incorrectly and prevent proper compensation of the installation's current harmonics.

⚠	Do not install various filters in series one after another in the same installation, configured to correct the same disturbances. This can produce an overcompensation of the disturbances, which could cause instability in the main (**Figure 7**)

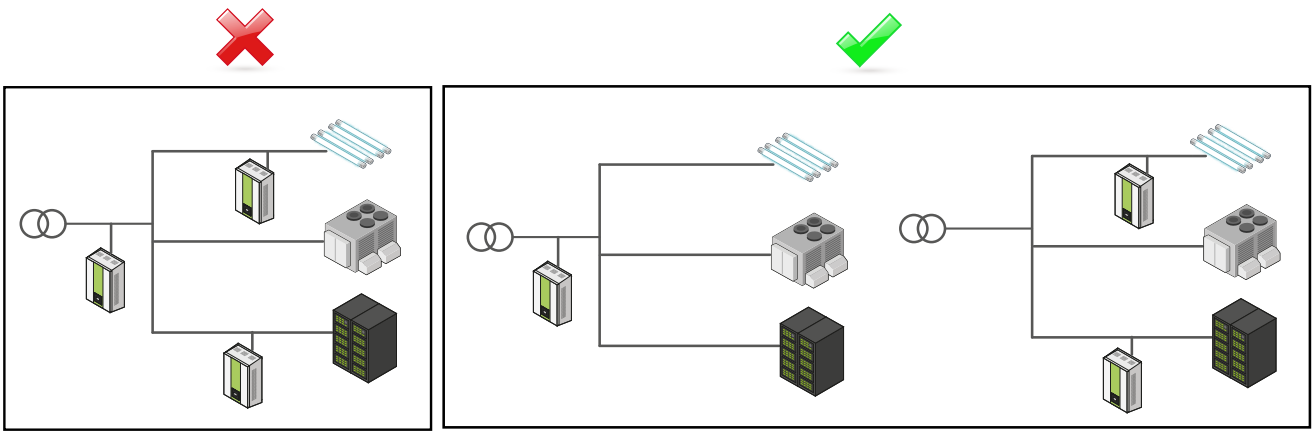


Figure 7: Do not install various active filters in series.

3.6.- DEVICE TERMINALS

3.6.1.- 30 A SINAF 3.0: SINAF3xxx030x

The connection terminals of the **SINAF3xxx030x** model are located on the lower face of the device.

The **SINAF 3.0** model without an EMI filter (**SINAF3xxx030**) has a terminal cover on the main connection terminals.

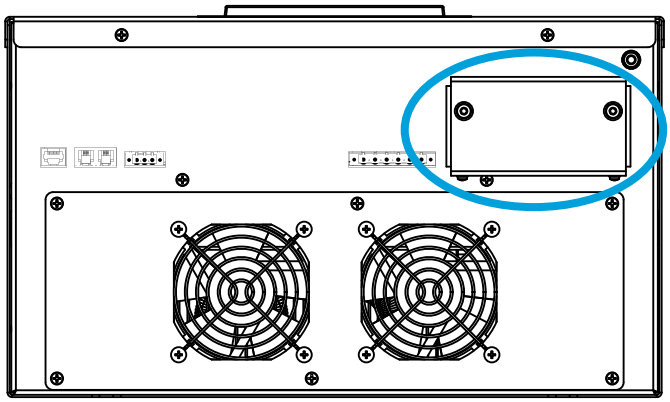


Figure 8: Terminal cover (SINAF3xxx030).

Remove the terminal cover before connecting the device.
Screws: M5
Screw torque: 1.5 Nm

⚠	Put the terminal cover back on once the device has been connected.

Table 10:List of terminals.

Device terminals	
1: ETHERNET, Ethernet Connector	**10: S2**, Current input L2
2: IN, Input for parallel connection	**11: S1,** Current input L3
3: OUT, Output for parallel connection	**12: S2**, Current input L3
4: A, RS-485 communications	**13: L1**, Main connection L1
5: B, RS-485 communications	**14: L2**, Main connection L2
6: S, RS-485 communications	**15: L3**, Main connection L3
7: S1, Current input L1	**16: N**, Main connection N
8: S2, Current input L1	**17: N**, Main connection N
9: S1, Current input L2	**18:** Earth connection

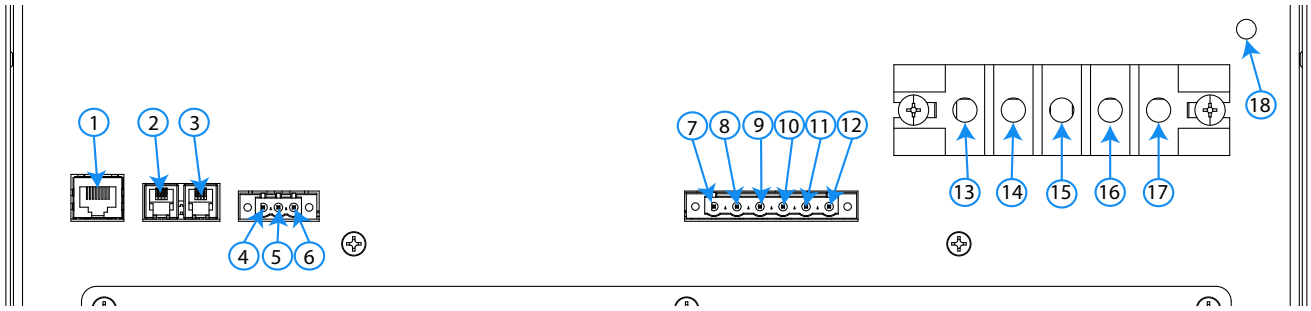


Figure 9:SINAF 3.0 terminals without EMI filter (SINAF3xxx030).

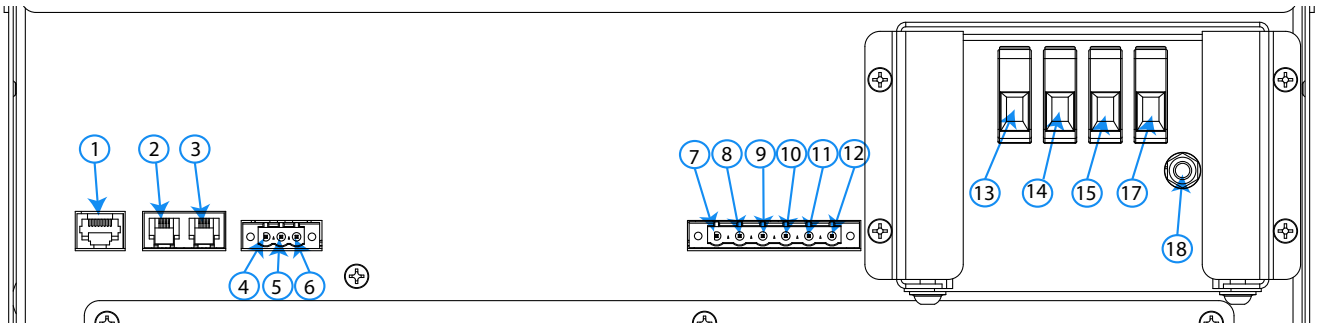


Figure 10:SINAF 3.0 terminals with EMI filter (AFQe-xWF-030M).

Note : SINAF3xxx030F *device includes rubber caps to cover grid terminal screws, if required by installation environment*

	It is recommended to fix the connection cables to the holes that facilitate the transport and installation of the device (**Figure 5**), so that the terminals are not subjected to any mechanical stress.

3.6.2.- 100A SINAF 3.0 RACK-TYPE : SINAF3xxx100xR

The **SINAF3xxx100xR** model's connection terminals are at the back of the device.

Table 11:List of terminals.

Device terminals	
1: ETHERNET, Ethernet Connector	**10: S2**, Current input L2
2: IN, Input for parallel connection	**11: S1,** Current input L3
3: OUT, Output for parallel connection	**12: S2**, Current input L3
4: A, RS-485 communications	**13: L1**, Main connection L1
5: B, RS-485 communications	**14: L2**, Main connection L2
6: S, RS-485 communications	**15: L3**, Main connection L3
7: S1, Current input L1	**16: N**, Main connection N
8: S2, Current input L1	**17: N**, Main connection N
9: S1, Current input L2	**18:** Earth connection

Figure 11:SINAF 3.0 terminals part 1 (SINAF3xxx100xR).

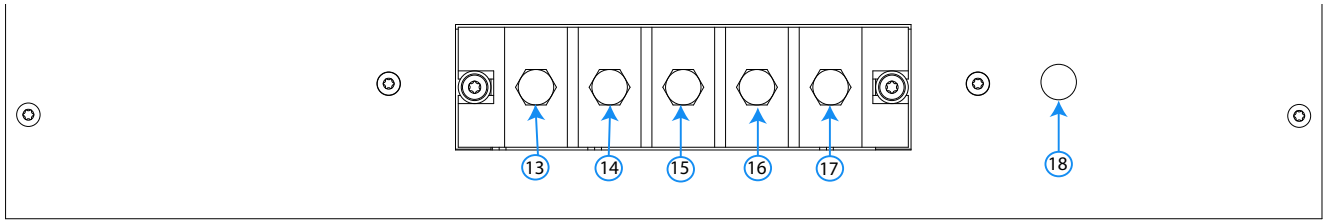


Figure 12:SINAF 3.0 terminals part 2 (SINAF3xxx100xR).

3.6.3.- 100 A AND 200 A SINAF 3.0 CABINET-TYPE : SINAF3xxx100 AND SINAF3xxx200

There are sliding windows at the bottom of the cabinet so that the connection wiring can be slotted inside, **Figure 13**. These windows can be removed and machined if it is considered necessary to use a cable gland.

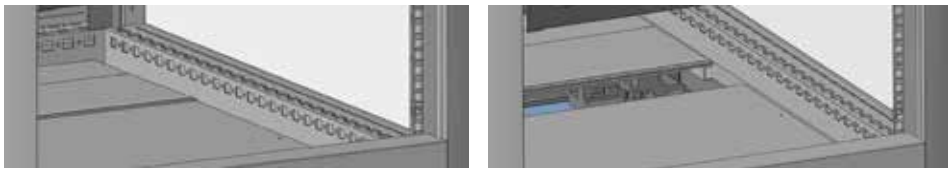


Figure 13: Sliding windows for the connection wiring.

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

To access the power supply and current transformer's connection terminals, you should loosen the **Figure 14 Torx 30** screws from the front covers. To remove the covers, it is necessary to open the casing of the cabinet's front panel.

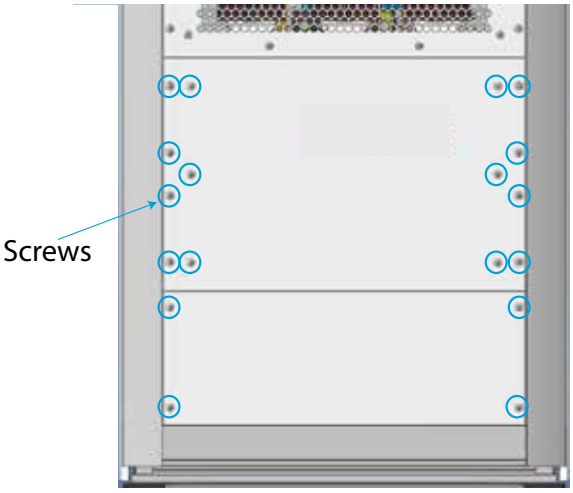


Figure 14: Front cover screws.

When the front cover has been opened, access the terminals from **Table 12**:

Table 12:List of terminals.

Device terminals	
1: S1, Current input L1	**7: L1**, Main connection L1
2: S2, Current input L1	**8: L2**, Main connection L2
3: S1, Current input L2	**9: L3**, Main connection L3
4: S2, Current input L2	**10:** Earth connection
5: S1, Current input L3	**11: N**, Main connection N
6: S2, Current input L3	

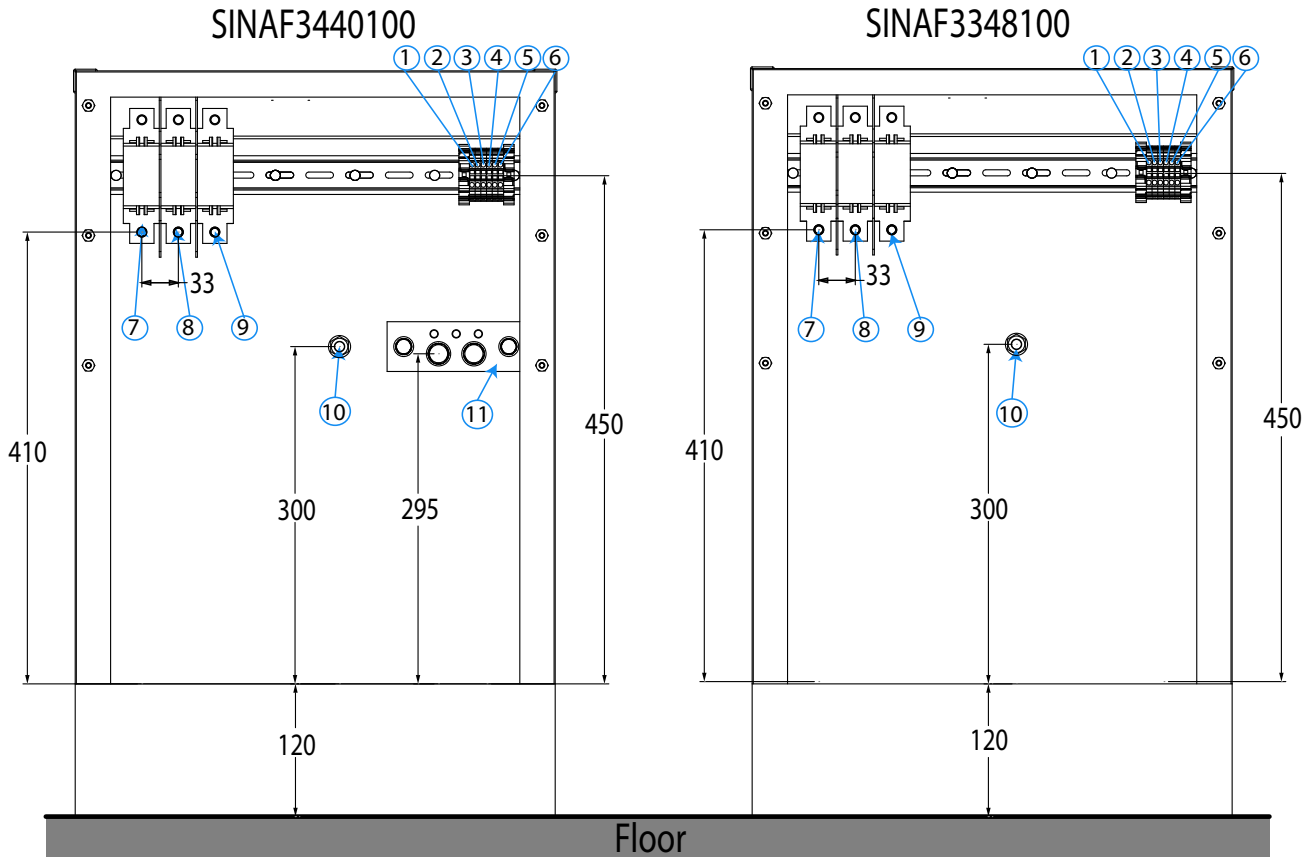


Figure 15: SINAF3xxx100 terminals part 1.

Note: *The dimensions of* ***Figure 15*** *are in mm.*

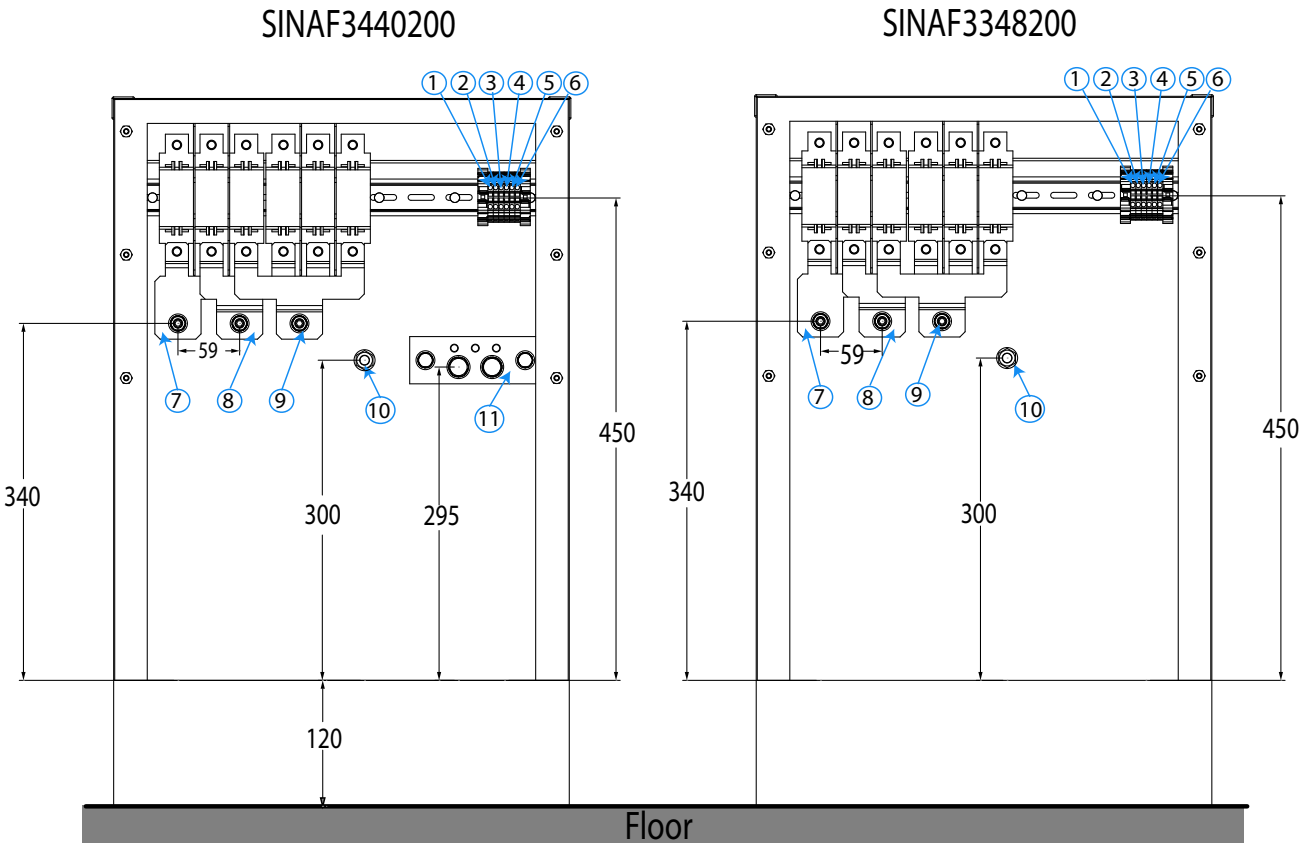


Figure 16: SINAF3xxx200 terminals part 1.

Note: *The dimensions of* ***Figure 16*** *are in mm.*

The **L1** (7), **L2** (8) and **L3** (9) power cables are connected to a terminal strip, protected by a cover. An aluminium or copper wire can be used for this connection.
A **6 mm** allen-type tightening screw is used.

Table 13: Recommended torque.

Diameter of the Wire	Torque
35 mm^2	6 Nm
50 mm^2 ... 70 mm^2	10 Nm
95 mm^2 ... 120 mm^2	19 Nm
... 240 mm^2	25Nm

The cable from the neutral connection, **N** (11), (in the case of the device, 4-wire) can conduct up to 3 times the phase current.
It should be sized according to the estimated neutral current. The neutral conductor is connected to a busbar, via a ring terminal with a diameter of **12 mm**. The busbar allows two neutral cables to be used, enabling cables with a smaller cross-section to be used.

The current transformers' **S1 L1** (1), **S2 L1** (2), **S1 L2** (3), **S2 L2** (4), **S1 L3** (5) and **S2 L3** (6) connection cables should pass through the cable grommet at the bottom of the cabinet.
We recommend separating the cables from the power cables' current transformers, to reduce interference.

The connection terminal strip is a screw terminal strip, which allows cables up to **2.5 mm^2**. The torque is **0.8 Nm**

We recommend clamping the cables to part of the frame of the cabinet, to reduce any tension in the connection.

To access the communications ports, it is necessary to remove the cover at the back of the unit, by loosening the **Torx 30** screws. The list of terminals is shown in **Table 14** and in **Figure 17**.

The ***"master"*** device is the device placed at the top of the cabinet.

Table 14:List of terminals.

Device terminals	
1: ETHERNET, Ethernet Connector	**4: A,** RS-485 communications
2: IN, Input for parallel connection	**5: B,** RS-485 communications
3: OUT, Output for parallel connection	**6: S,** RS-485 communications

Figure 17: SINAF 3.0 terminals part 2 (SINAF3xxx100 and SINAF3xxx200).

The connection cables should be passed through the cable grommet at the bottom of the cabinet. We recommend separating the communications cables from the power cables, to reduce interference.

We recommend running the cables along the side of the cabinet and clamping them to the frame of the cabinet, to reduce disturbances in the airflow and any tension supported by the connections (**Figure 18**).

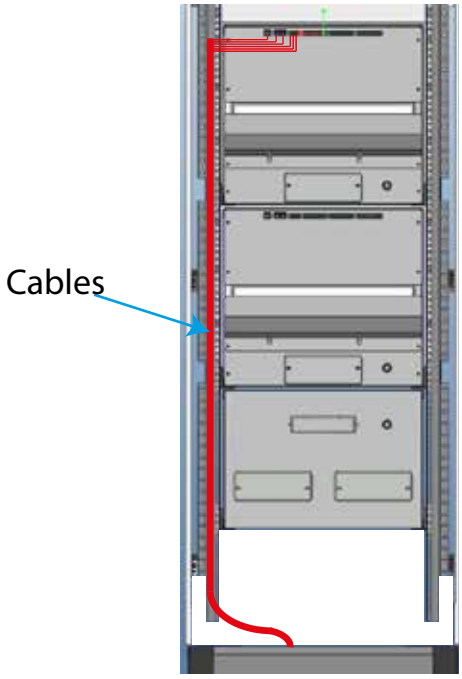


Figure 18: Running the cables along the side of the cabinet.

When the wiring is complete, fit the cover at the back and the front covers (torque **5 Nm**)

3.7.- CONNECTION DIAGRAMS

3.7.1.- 4-WIRE CONNECTION AND CURRENT MEASUREMENT ON THE MAIN SIDE.

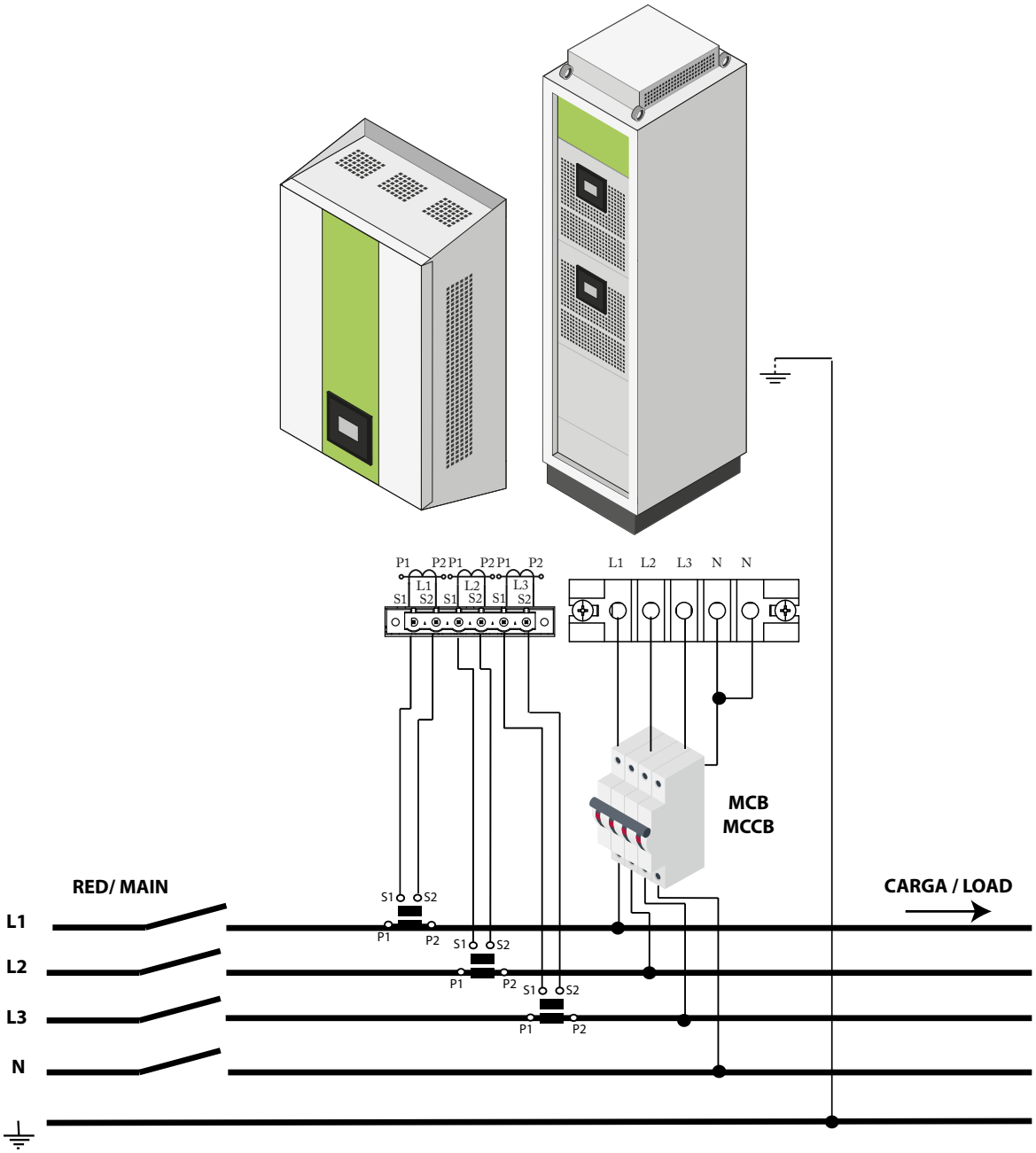


Figure 19: Three-phase measuring with 4-wire connection and current measurement on the main side.

⚠	Use the 2 neutral current terminals, as **In** can be: $In \approx 3 * I_{PHASE}$

3.7.2.- 4-WIRE CONNECTION AND CURRENT MEASUREMENT ON THE LOAD SIDE.

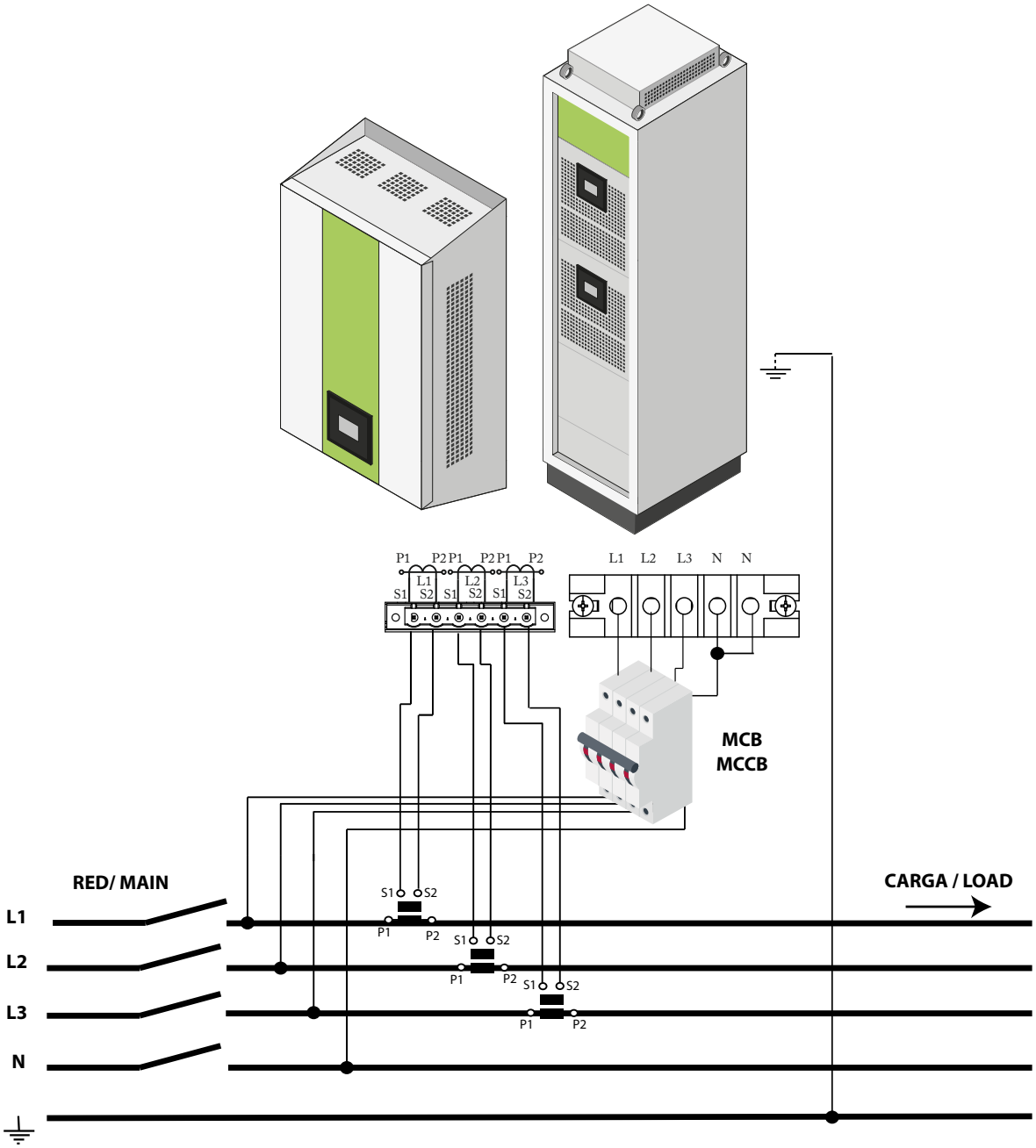


Figure 20: Three-phase measuring with 4-wire connection and current measurement on the load side.

	Use the 2 neutral current terminals, as **In** can be: In ≈ 3 * I_{PHASE}

3.7.3.- 3-WIRE CONNECTION AND CURRENT MEASUREMENT ON THE MAIN SIDE.

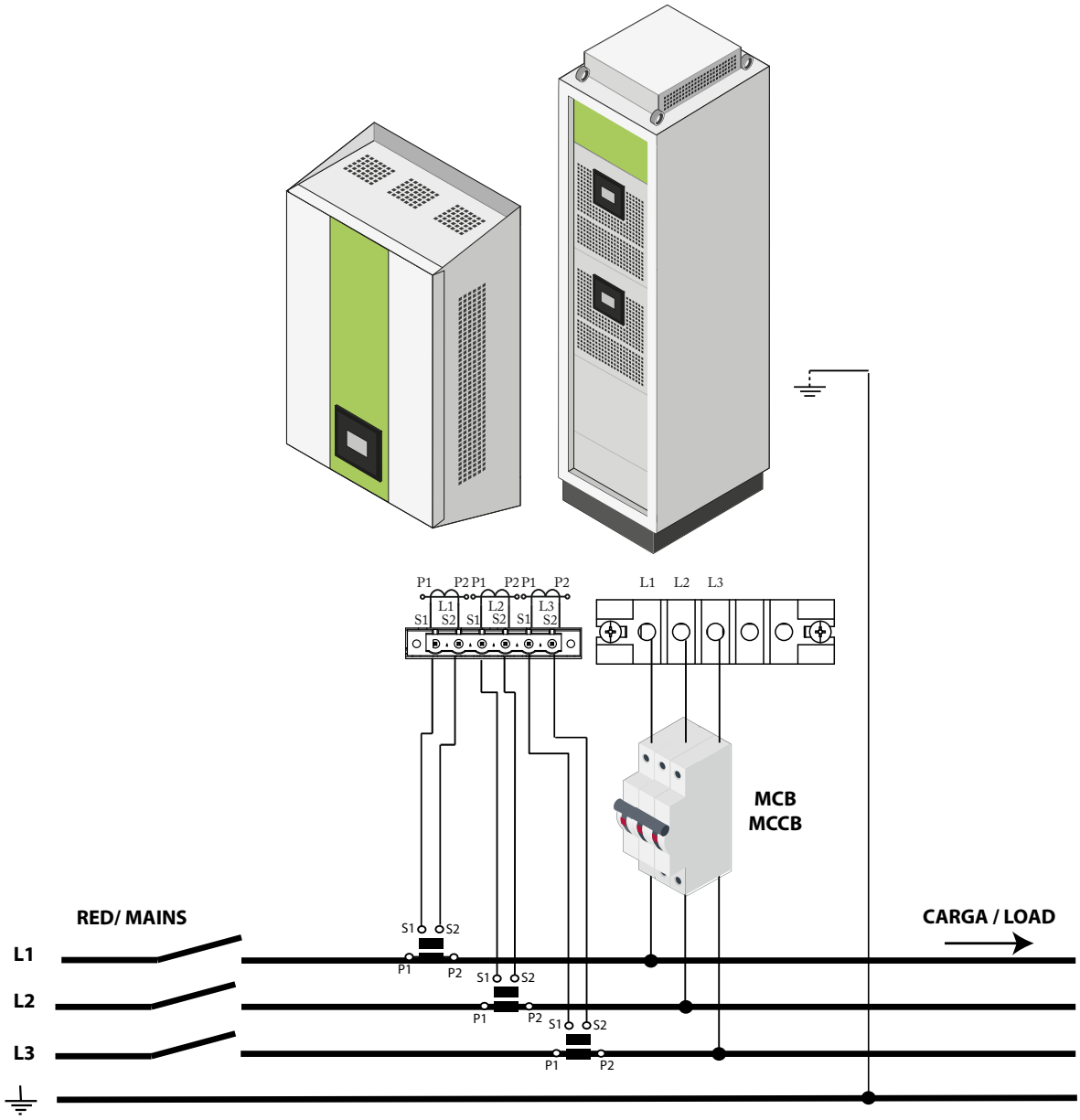


Figure 21: Three-phase measuring with 3-wire connection and current measurement on the main side.

3.7.4.- 3-WIRE CONNECTION AND CURRENT MEASUREMENT ON THE LOAD SIDE.

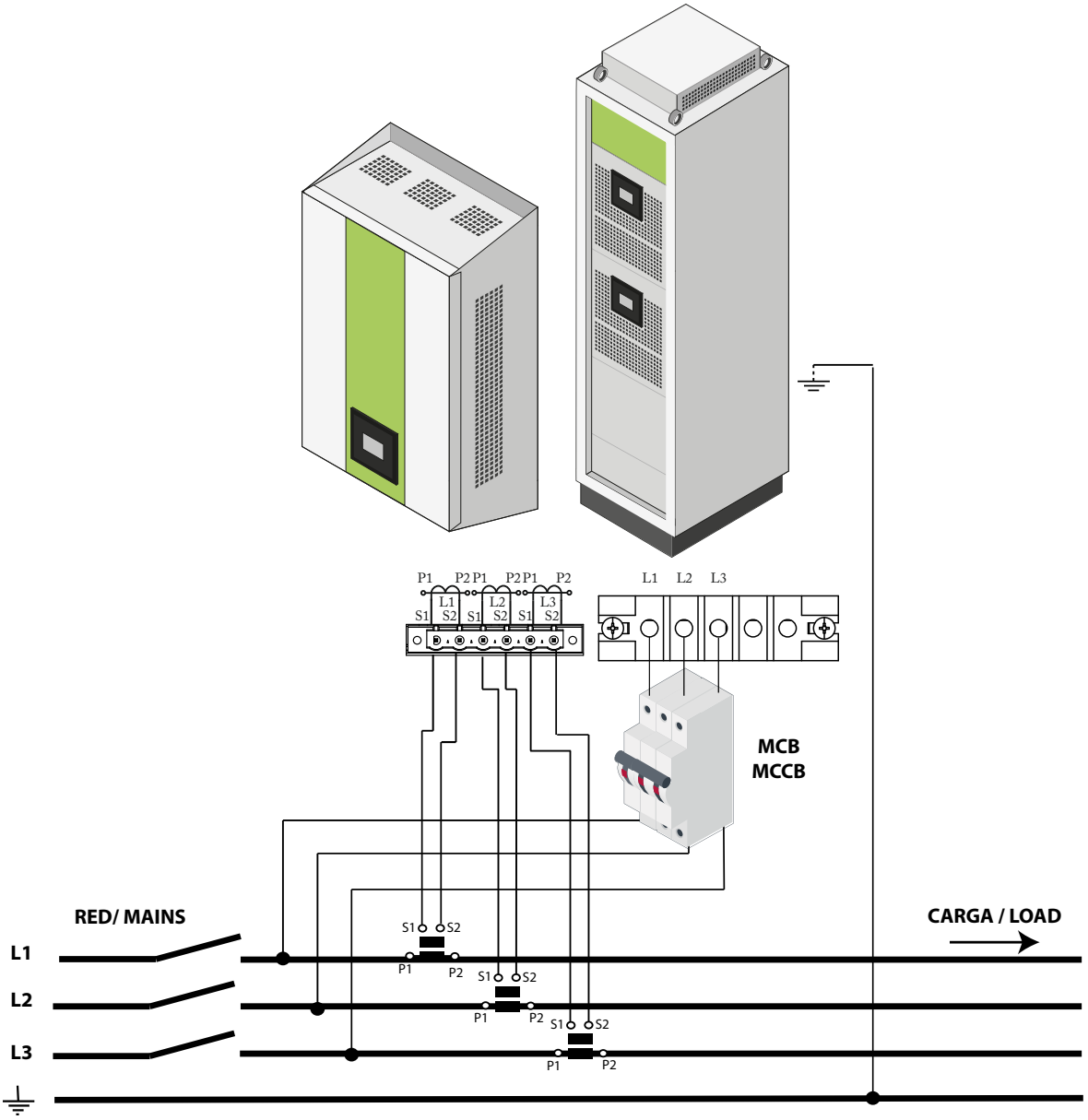


Figure 22: Three-phase measuring with 3-wire connection and current measurement on the load side.

3.7.5.- 3-WIRE CONNECTION AND 2 CURRENT TRANSFORMERS ON THE MAIN SIDE.

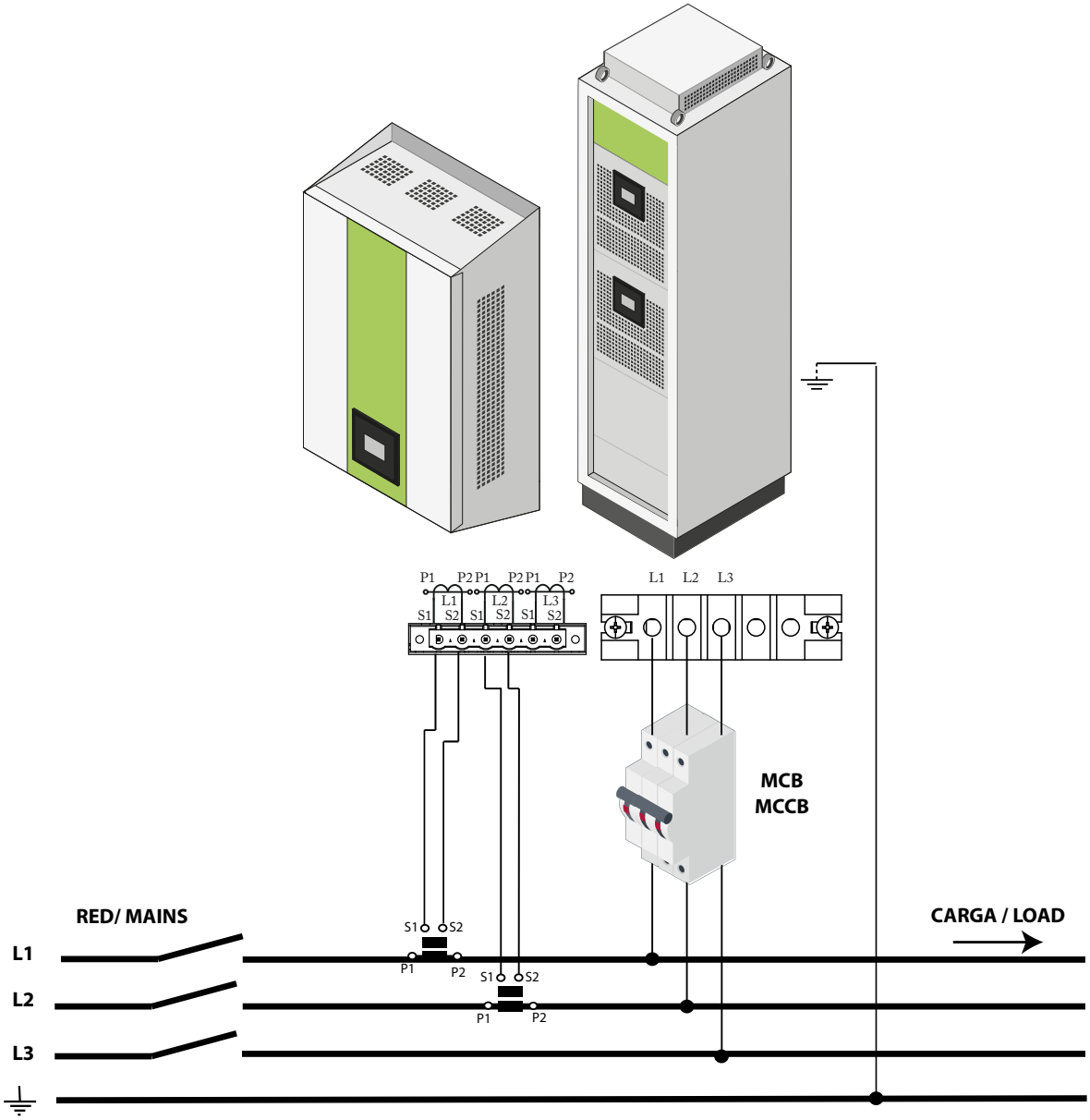


Figure 23: Three-phase measuring with a 3-wire connection and 2 current transformers on the main side.

⚠	The connection of 2 current transformers is only possible in three-phase mains without neutral (3 wires).

3.7.6.- 3-WIRE CONNECTION AND 2 CURRENT TRANSFORMERS ON THE LOAD SIDE.

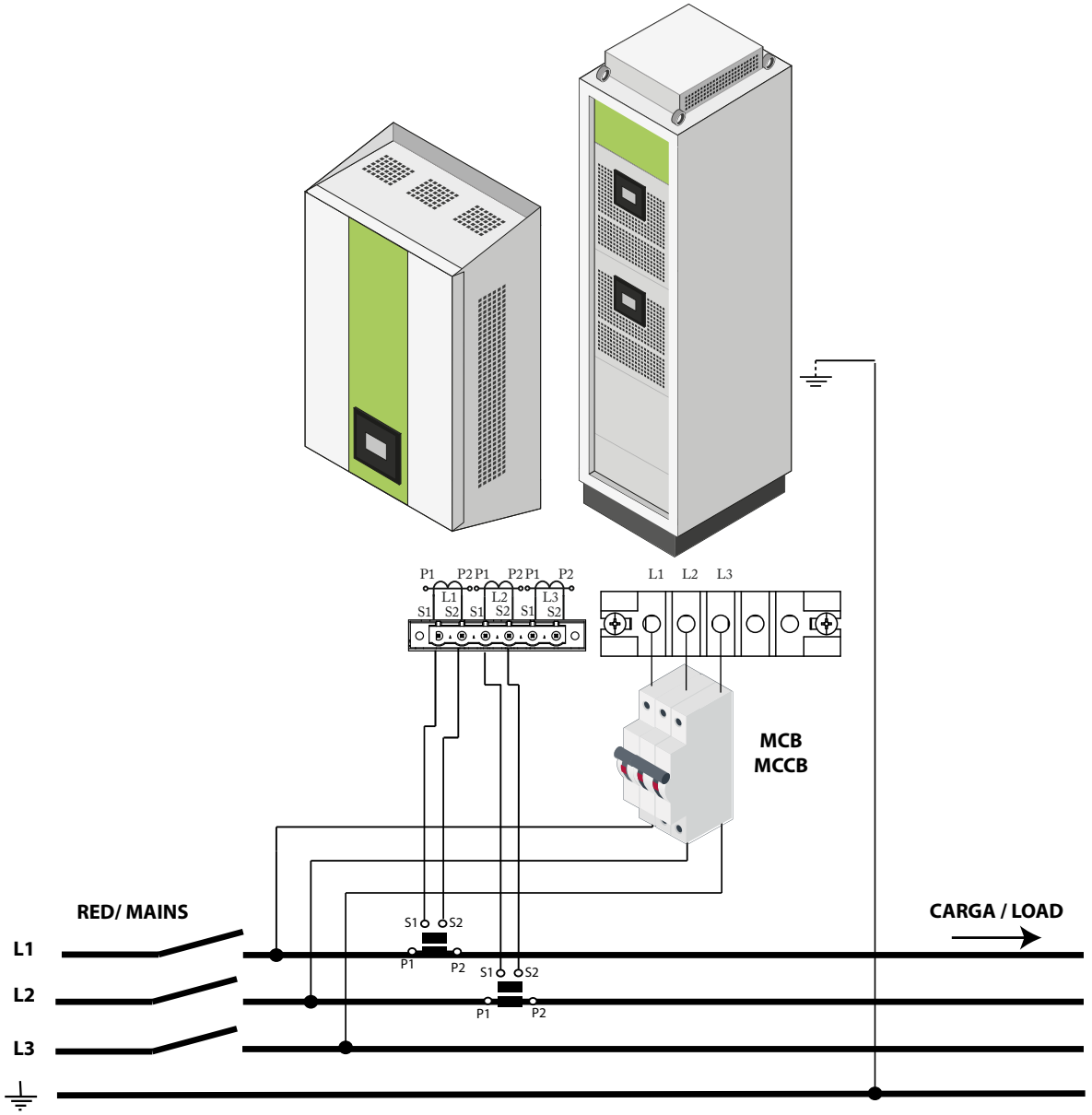


Figure 24: Three-phase measuring with a 3-wire connection and 2 current transformers on the load side.

⚠	The connection of 2 current transformers is only possible in three-phase mains without neutral (3 wires).

3.8.- PARALLEL CONNECTION OF 2 TO 100 ACTIVE FILTERS

The **SINAF 3.0** devices can be arranged in parallel to increase the available filtering power.

Up to 100 devices can be arranged in parallel, either of the **30A** or **100A** models.

In the case of installations with devices in parallel, a device must be defined as the "***master***", while all others will have "***slave***" devices functions.

The "***master***" will be responsible for measuring the network parameters, so only the current transformers will be connected to it. This allows low-power transformers to be used in these installations, since an individual transformer does not have to be connected to each device.

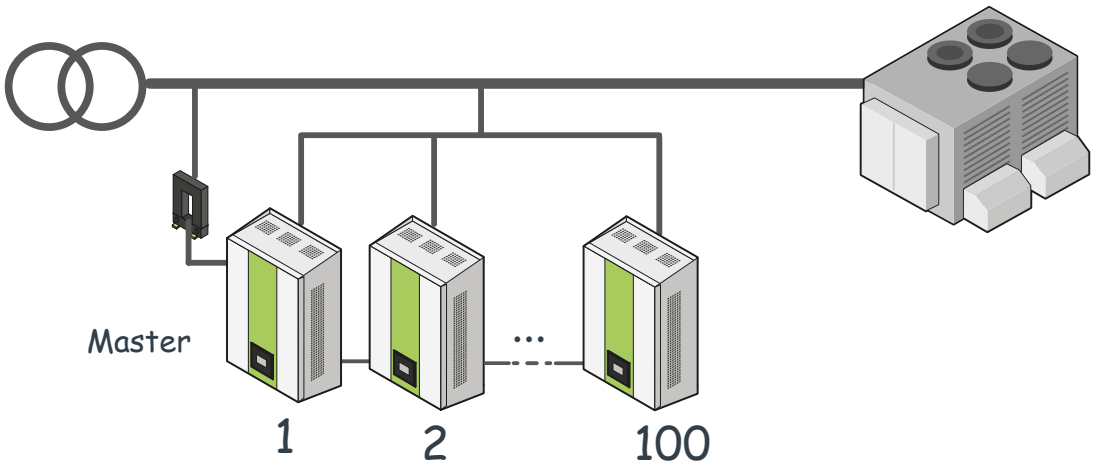


Figure 25:Connection of 2 to 100 filters in parallel (Transformers on the main side).

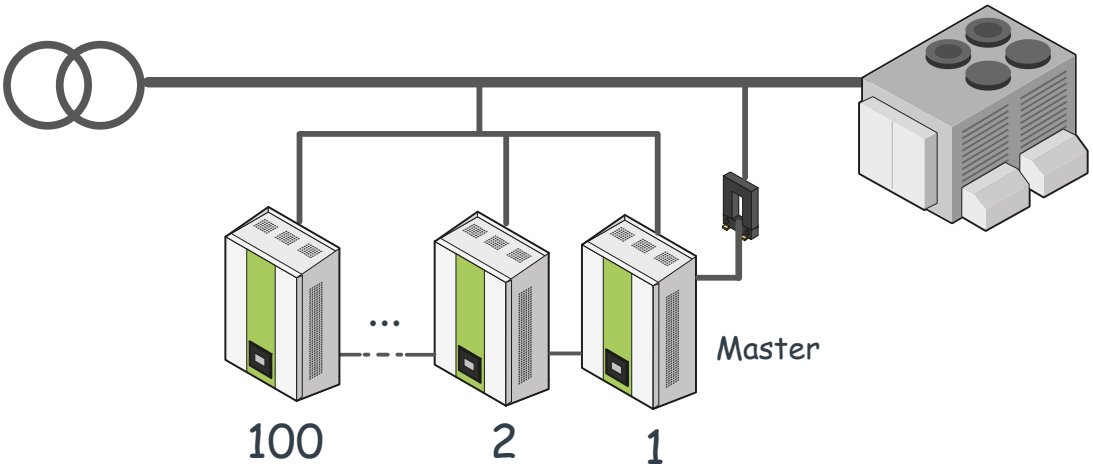


Figure 26:Connection of 2 to 100 filters in parallel (Transformers on the load side).

3.8.1.- CONNECTING INDIVIDUAL DEVICES

***Note: LIFASA** has devices that are factory-configured as slaves to enable devices to be connected in parallel.*

To connect multiple individual devices in parallel, follow these steps:

1.- Select the device that will operate as the "***master***".

***Note:** Devices that are factory-configured as "**slaves**" cannot perform this function.*

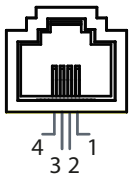
2.- Connect the "***master***" device. The current transformers are only connected to the "***master***" device.

3.- Connect all of the "***slave***" devices.

Note:** Each devices must feature the protection elements indicated in section **"3.5.- CONNECTION".

4.- Connect all of the units using the communication cables (**Table 15**).

Table 15: Communication cable, devices in parallel.

Communication cable	
RJ11 connector	**Pinout**
	**1:** Not connected. **2:** CAN A **3:** CAN B **4:** Not connected.

***Note:** All devices with ID number higher than **804x00400** (see device label) are delivered with a bus terminator plugged to **IN** terminal. There must be only 2 bus terminators in the parallel communications line, one plugged to the **IN** terminal of the "**master**" device, and the other plugged to the **OUT** terminal of the last device of the bus.*

In order to guarantee the communication between devices, it is mandatory to unplug the bus terminators of the devices between master and last slave.

Connect the **OUT** terminal from the "***master***" filter to the **IN** terminal from the second filter, the **OUT** terminal from the second filter to the **IN** terminal of the third, and so on (**Figure 27**).

Figure 27:Connecting 2 devices in parallel, using the communication cable.

Note: *The communication cable must be a CAT 5 cable. Maximum cable length 3 metres.*

5.- Configure the installation in the "***master***" device (see ***"7.- CONFIGURATION"***)
On the **Installed devices** (***"7.7.- INSTALLED DEVICES"***) screen you need to enter the number and type of devices connected, including the "***master***" device.

6.- If the "***slave***" device is not factory-configured as such, go to the **Installed devices** (***"7.7.- INSTALLED DEVICES"***) configuration screen and select the "***slave***" option as the type of device.

Note: *After the device has been configured as the "**slave**", its remaining parameters do not have to be configured, since they will be configured automatically by the "**master**".*

Note: *In the case of "**slave**" devices, the* RUN *. key will be disabled. Devices will be started from the "**master**" device. However, in the event of an emergency, the "**slave**" device can be stopped by pressing the* STOP *key.*

3.8.2.- CONNECTING CABINETS

Note: *The **200 A** (**SINAF3xxx200**) devices are composed of 2 **100 A** devices in parallel. They are connected and configured in parallel in the factory.*

To connect multiple cabinets in parallel, follow these steps:

1.- Select the cabinet that is to contain the "***master***" device.

2.- Connect the "***master***" cabinet. The current transformers are only connected to the "***master***" cabinet.

3.- Connect the "***slave***" cabinets.

4.-
Note: *All devices with ID number higher than **804x00400** (see device label) are delivered with a bus terminator plugged to **IN** terminal. There must be only 2 bus terminators in the parallel communications line, one plugged to the **IN** terminal of the "**master**" device, and the other plugged to the **OUT** terminal of the last device of the bus.*

In order to guarantee the communication between devices, it is mandatory to unplug the bus terminators of the devices between master and last slave.

✓ **100 A** "***master***" **cabinet**:
Connect the **OUT** terminal from the "***master***" cabinet to the **IN** terminal from the "***master***" device of the following cabinet, and the **OUT** terminal from the final "***slave"*** device in this cabinet to the **IN** terminal of the "***master***" device of the following cabinet, and so on (**Figure 28**).

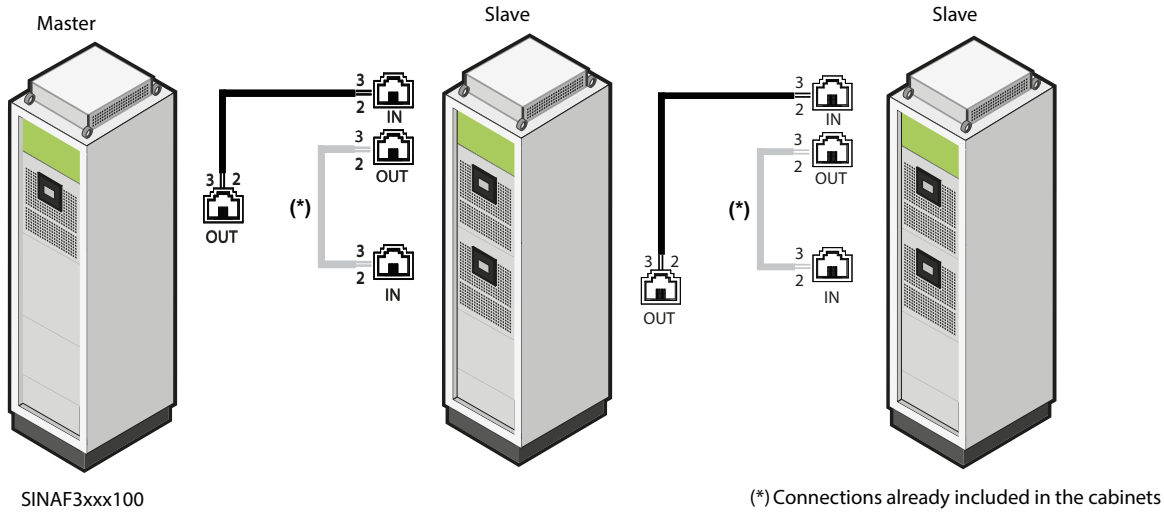
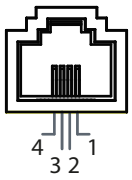


Figure 28:Connecting 3 devices in parallel, using the communication cable (100 A master SINAF 3.0).

Connect them using the communication cables (**Table 16**).

Table 16: Communication cable, devices in parallel.

Communication cable	
RJ11 connector	**Pinout**
	**1:** Not connected. **2:** CAN A **3:** CAN B **4:** Not connected.

Note: *The communication cable must be a CAT 5 cable. Maximum cable length 3 metres.*

✓ **200 A "*master*" cabinet**:

Connect the **OUT** terminal from the final slave device in the "***master***" cabinet to the **IN** terminal from the "***master***" device of the following cabinet, and the **OUT** terminal from the final "***slave"*** device in this cabinet to the **IN** terminal of the "***master***" device of the following cabinet, and so on (**Figure 28**).

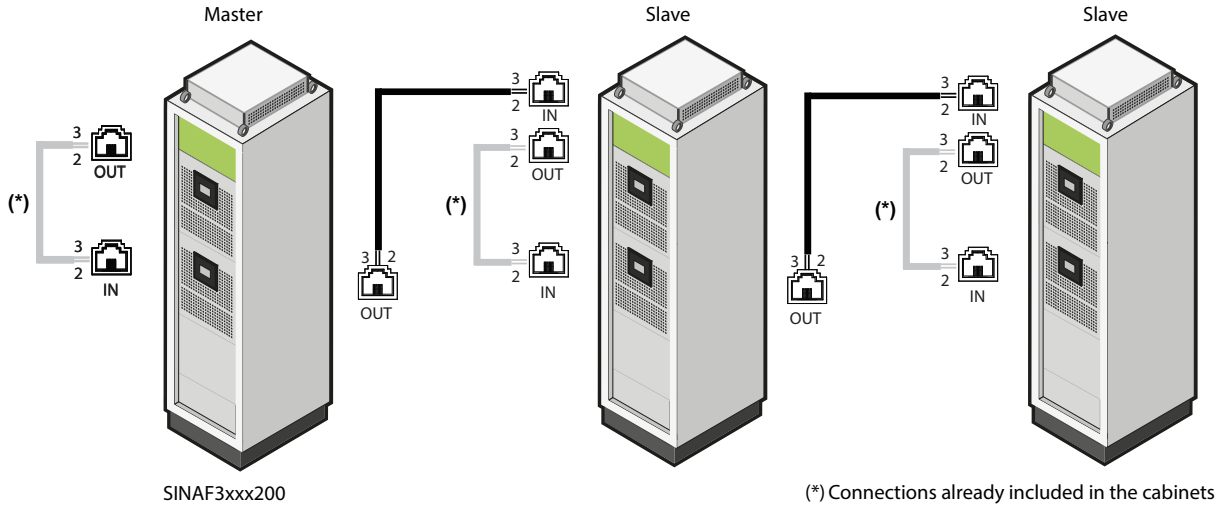


Figure 29:Connecting 3 devices in parallel, using the communication cable (200 A master SINAF 3.0).

Connect them using the communication cables supplied (**Table 16**).

Note: *The communication cable must be a CAT 5 cable. Maximum cable length 3 metres.*

5.- Configure the installation in the "***master***" device (see ***"7.- CONFIGURATION"***)
On the **Installed devices** (***"7.7.- INSTALLED DEVICES"***) screen you need to enter the number and type of devices connected, including the "***master***" device.

Example: *The connection of two 200 A cabinets is composed of* **four** *100 A devices.*

6.- Go to the **Installed devices** (***"7.7.- INSTALLED DEVICES"***) configuration screen of the "***master***" device of each of the "***slave***" cabinets and select the "***slave***" option as the type of device.

Note: *After the device has been configured as the "**slave**", its remaining parameters do not have to be configured, since they will be configured automatically by the "**master**".*

Note: *In the case of "**slave**" devices, the* 

*. key will be disabled. Devices will be started from the "**master**" device. However, in the event of an emergency, the "**slave**" device can be stopped by pressing the* 

key.

4.- OPERATION

4.1.- HARMONICS

Non-linear loads such as: rectifiers, inverters, variable speed drives, ovens, etc., absorb periodic non sine-wave currents from the main.

These currents are composed of a fundamental frequency component, rated at 50 or 60 Hz, plus a series of overlapping currents, with frequencies that are multiples of the fundamental frequency; they are defined as **HARMONICS**.

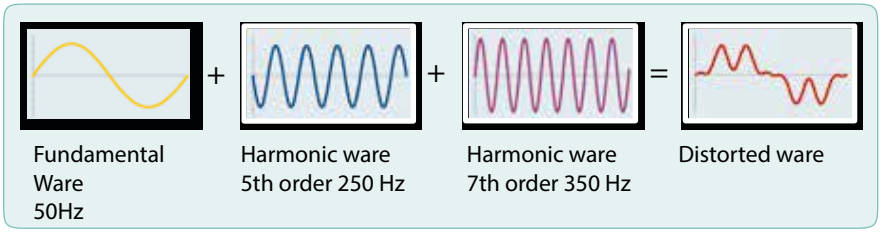


Figure 30:Distorted wave shape decomposition.

The result is a deformation of the current and, as a consequence, of the voltage, causing a series of associated side effects. These can be machinery overload, electric cable heating, circuit breaker disconnection, damage to sensitive devices, etc.

Table 17: Frequency of each harmonic.

Order (n)	Mains frequency	
	Fundamental: 50 Hz	Fundamental: 60 Hz
3	150 Hz	180 Hz
5	250 Hz	300 Hz
7	350 Hz	420 Hz
...	...	...

4.1.1.- BASIC CONCEPTS

It is best to define some terms related to harmonics, fundamental for interpreting any measurement and study:

✓**Fundamental frequency (f_1)**: Original wave frequency (50/60 Hz).

✓**Order of a harmonic (n)**: A whole number given by the ratio between the frequency of a harmonic and the fundamental frequency. The order determines the frequency of the harmonic (E.g.: 5th harmonic → 5•50 Hz: 250 Hz)

✓**Fundamental component (U_1 or I_1)**: A sine wave component of order 1 of the Fourier frequency serial development equal to the original periodic wave.

✓**Harmonic component (U_n or I_n)**: A sine wave component of order over 1 of the Fourier frequency serial development a whole multiple of the original frequency.

✓**Individual distortion rate (U_n% or I_n%)**: A ratio in % between the RMS value of the voltage or harmonic current (Un or In) and the RMS value of the fundamental component (U_1 or I_1).

$$U_n\,\% = \frac{U_n}{U_1} * 100 \qquad I_n\,\% = \frac{I_n}{I_1} * 100$$

Equation 1:Individual distortion rate

✓**True root mean square value (TRMS)**: The square root of the sum of the squares of all components forming the wave.

$$U = \sqrt{U_1^2 + U_2^2 + U_3^2 + U_5^2 + \cdots}$$

$$I = \sqrt{I_1^2 + I_2^2 + I_3^2 + I_5^2 + \cdots}$$

Equation 2:True root mean square value

✓**Harmonic content**: The difference between the total voltage or current and the corresponding fundamental value.

✓**Harmonic distortion rate (THD)**: The ratio between the RMS value of the harmonic content of the voltage and/or current and the value of the fundamental component.

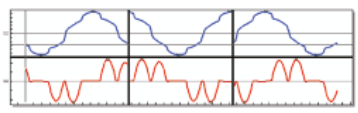
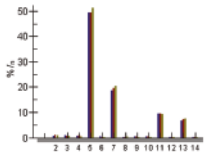
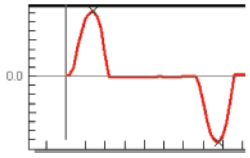
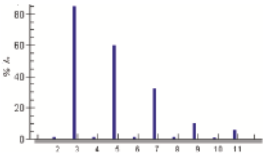
$$THD(U)\% = \frac{\sqrt{U_2^2 + U_3^2 + U_5^2 + \cdots}}{U_1} \qquad THD(I)\% = \frac{\sqrt{I_2^2 + I_3^2 + I_5^2 + \cdots}}{I_1}$$

Equation 3:Harmonic distortion rate.

4.1.2.- MOST COMMON HARMONICS

Table 18 lists the most common harmonic generator loads and the wave shape of the current they consume, as well as their harmonic spectrum.

Table 18: Most common harmonics.

Type of load	Wave shape	Harmonic spectrum THD(I)
6-pulse converters Variable speed drives UPS Three-phase rectifiers Converters for electrolysis and baths		
Discharge lamps Single-phase converters Lighting lines Computer lines Sound and image devices		

4.1.3.- HARMONIC COMPENSATION

Active filters are devices responsible for the compensation of harmonic currents.
Compensation is achieved by injecting harmonic currents equal to those in the installation in counter phase.
This means that upstream of the filter connection point, the signal shows virtually no harmonic distortion (**Figure 31**).

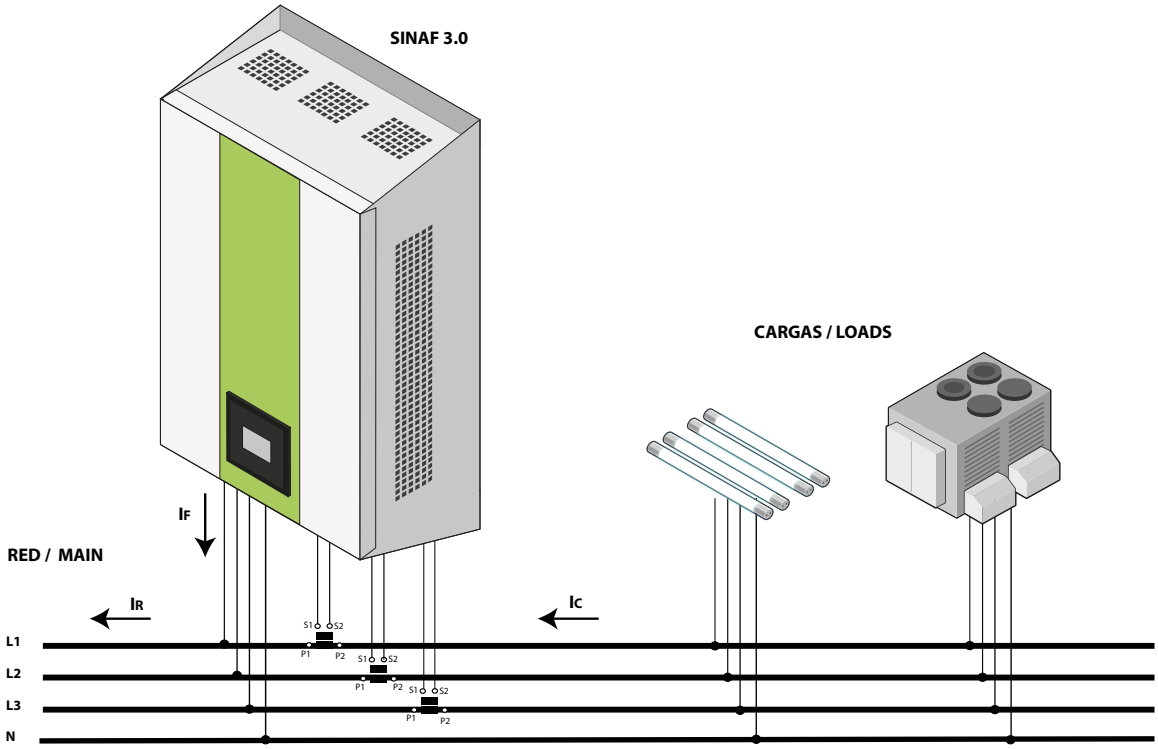


Figure 31:General connection diagram of an active filter.

4.2.- OPERATING PRINCIPLE

Active filters are based on the following principle:

$$I_{FILTER} = I_{MAIN} - I_{LOAD}$$

Equation 4:Operating principle.

In other words, they detect the difference between the desired sine wave (I_{MAIN}) of the current and the signal deformed by the harmonics (I_{LOAD}). And they inject the difference between both waves (I_{FILTER}).

Figure 32 shows the wave shapes of the currents injected by the active filters.
These show the required wave, the existing deformed wave and the filter current (I_{FILTER}).

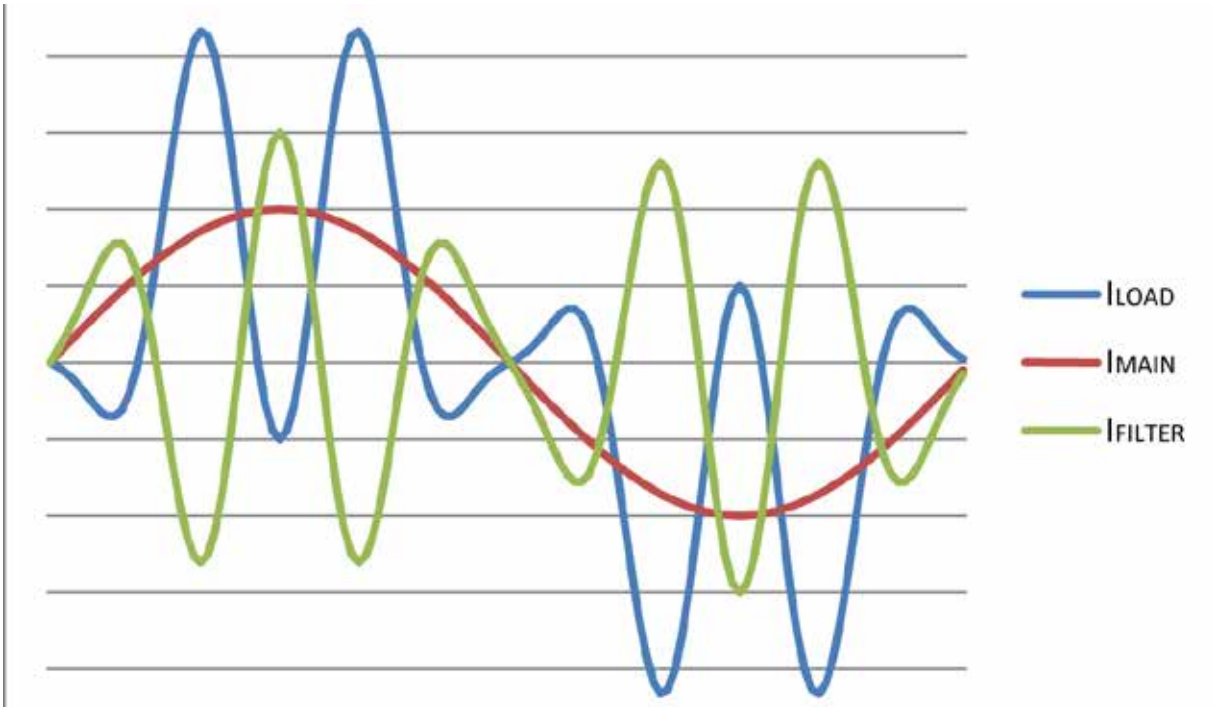


Figure 32:Current in the load, in the filter and in the main.

4.3.- NOMINAL CURRENT DIMENSIONS

The purchased active filter must be sized for the harmonic currents it has to filter. The nominal current of the **SINAF 3.0** must be at least 20% higher than the maximum level of harmonics to be filtered. This factor may be higher depending on the installation features.

The active filters can suffer from overloading when trying to cancel the harmonic currents in high-impedance, short-circuit mains. The clearest symptom for detecting such cases is that they originally start from a **THD(V)** (under voltage) of over 3%. It has been seen that the higher the initial **THD(V)**, the greater the chance of filter overload.
The reason for this behaviour is that the load does not behave as a current source, but rather the larger the harmonic current absorbed by the filter the more harmonics are produced by the load, which can produce up to more than double what was initially measured.
To avoid this phenomenon, it is best to oversize the active filter by multiplying the initial current of harmonics measured in the load by a **safety factor** (FS_h). In other words:

$$I_{FILTER}(\text{SINAF 3.0}) = [FS_h * I_{LOAD} * THD(I)]$$

Where:

I_{FILTER} **(SINAF 3.0)**: nominal current of the active filter.

FS_h: safety factor > 1.2.

I_{LOAD}: maximum current of the load.

THD(I): harmonic distortion of the load current.

Equation 5:Nominal current of the SINAF 3.0.

To calculate this **safety factor** you must first know the parameter called **short-circuit ratio R_{SC}**, at the connection point of the PCL transducers (not on the installation input). The short-circuit ratio is defined as the ratio between the short-circuit current of a main (I_{SC}) and the nominal current of the set of non-linear transducers (I_{CNL}) producing the harmonics to be filtered.
(**Equation 6**)

$$R_{SC} = \frac{I_{SC}}{I_{CNL}}$$

Equation 6:Calculating the short-circuit ratio R_{SC}.

In a real installation, the short-circuit current (I_{SC}) in the PCL can be assessed by having the voltage at the said point for two different load currents.
For example, full load, I_A and 10% load, I_B. If V_{OC} is the rated voltage at no-load, the I_{SC}, can be calculated using the formula shown in **Figure 33**:

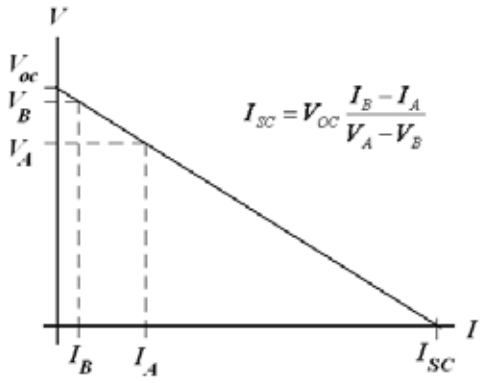


Figure 33:Graph for calculating I_{SC}.

The safety factor (FS_h) can be obtained from the graph in **Figure 34**:

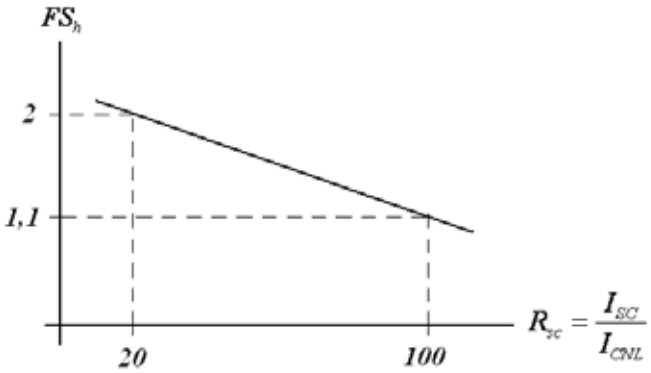


Figure 34:Approximate graph for calculating the FS_h.

4.4.- RESONANCE DETECTION

The **SINAF 3.0** acts as a current, frequency and variable amplitude generator. This current circulates via the path of least impedance, which should be the main.

In certain cases, there may be a load that provides less impedance than the main, in which case a resonance phenomenon will be produced with that load. The **SINAF 3.0** has a detection system for resonance with loads, which automatically deactivates the harmonic that causes that resonance.

In environments with a high level of short-circuit impedance of the main and a high level of voltage **THD**, a condition may occur that the filter erroneously detects as resonance.

In such conditions, the filter action improves the current **THD**, which causes an improvement of the voltage **THD**. The improvement of the voltage **THD** causes the loads to increase their consumption, producing a deterioration of the current **THD**. The user will see that the current **THD** is worse when connecting the filter, or that the filter does not correct the current **THD** as expected. In addition, the filter detects an increase in the current when correcting the current **THD**, which it understands as a resonance, thus activating the protection elements.
If the installation behaves in this way, contact the Technical Assistance Service to carry out the necessary checks to deactivate the resonance alarm safely.

4.5.- DISPLAY

The device 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.

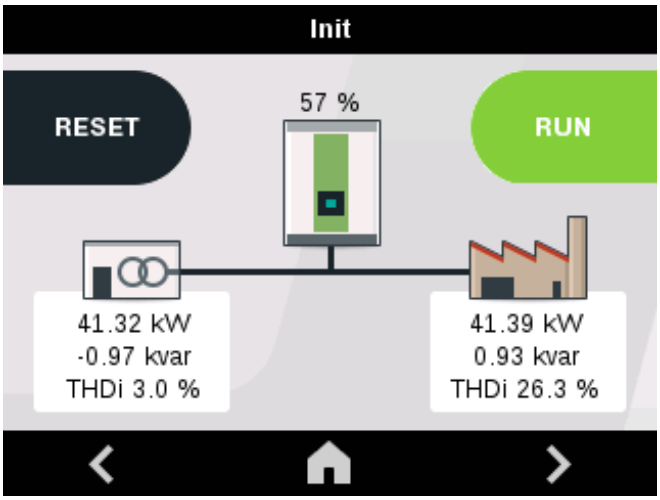


Figure 35: Display.

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 36**):

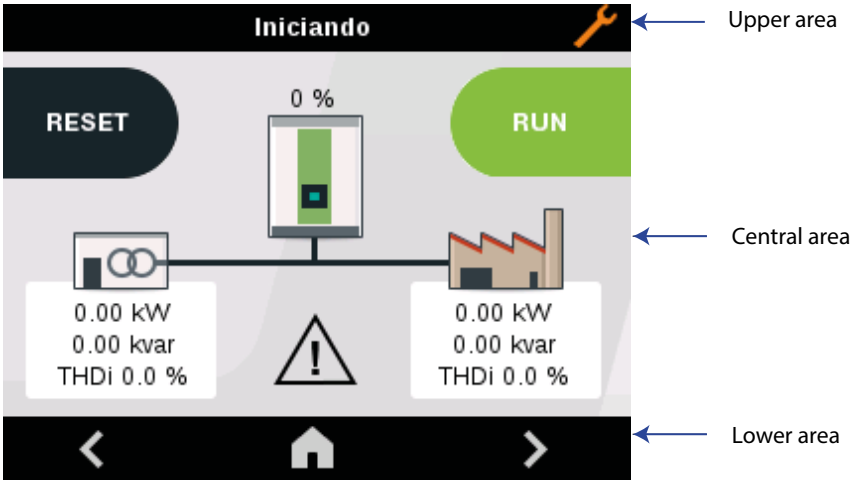


Figure 36:The display is divided into three areas.

4.5.1.- 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 "***10.- MAINTENANCE***".

4.5.2.- CENTRAL AREA

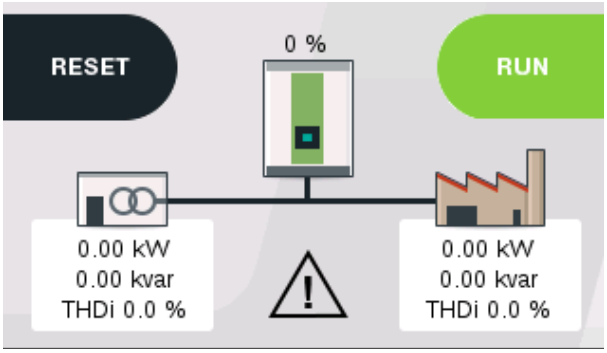


Figure 37: Central area.

This area shows:

✓ The condition of the installation,
✓ All parameters and graphs of the device.
✓ The symbol, when a warning has been generated. See section "***6.13.- WARNINGS***"

And the necessary keys at each point, **Table 19**.

Table 19: Central area keys.

Key	Function
	Restarts the device after an alarm.
	Starts the active filter.
	Stops the active filter.

4.5.3.- LOWER AREA

Figure 38: Lower area.

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

Table 20: Lower area keys.

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

5.- START-UP

When the device has been powered up, the display will show the screen in **Figure 39**.

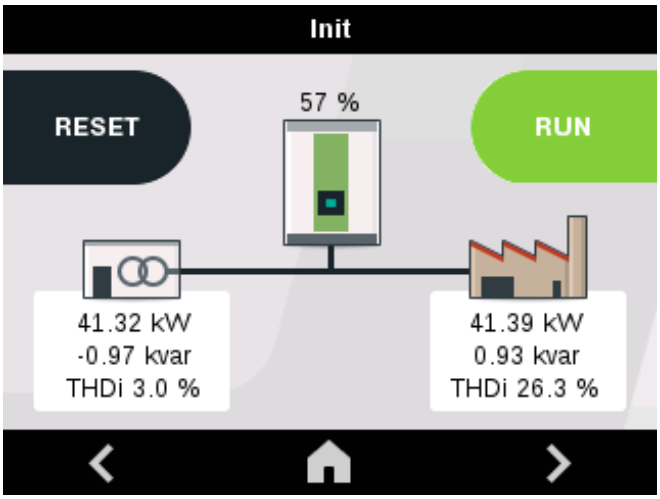


Figure 39: Home screen.

Before starting the active filter, 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 **"7.- CONFIGURATION"***).

2.- Use the key to navigate to the voltage and current display screen (***"6.3.- 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 (***"6.5.- POWER AND COS ϕ OF LOAD"***) 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 39**, if there is no problem with the connections, the upper area should show the message "**Stop"**.
If there is a problem with the filter connections or the configuration, the **"Waiting for conditions"** message appears.

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

6.- DISPLAY

6.1.- MAIN SCREEN

Figure 40 shows the main screen of the device.

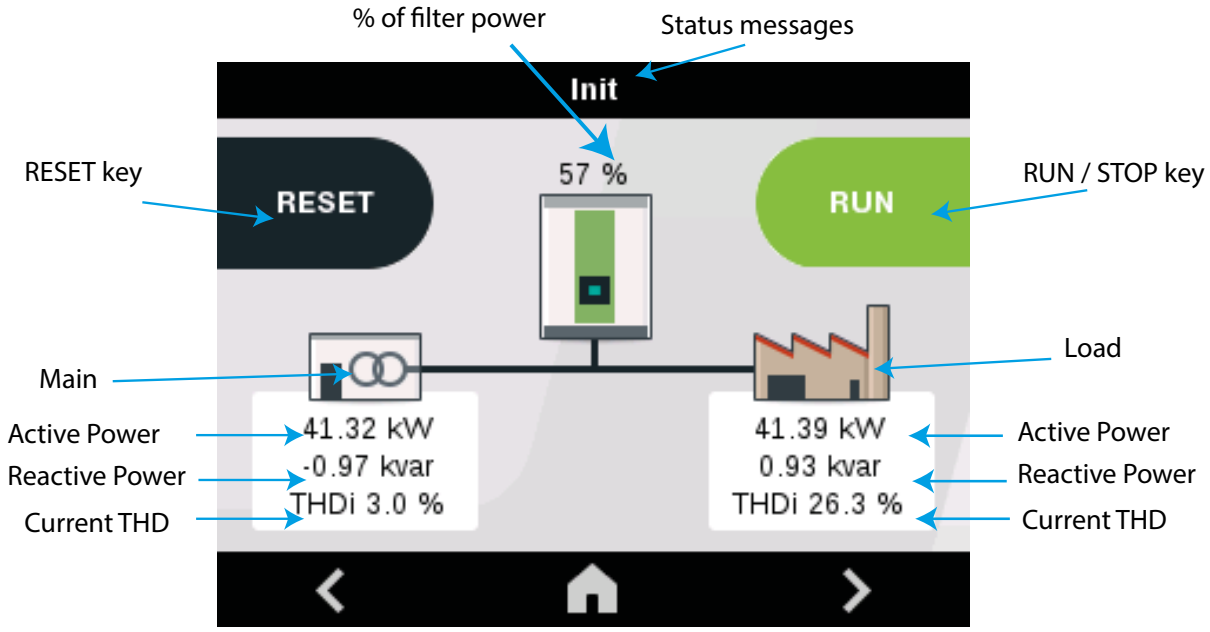


Figure 40: Main screen.

It shows the **Active Power** and **Reactive Power** values, as well as the **Current THD** value in the Main and in the Load. The **% of filter 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 active filter.

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 21**).

Table 21:Status messages

Status messages	
Starting	
Description	The **SINAF 3.0** is starting up.
Init	
Description	The device is starting the systems.
Waiting for conditions	
Description	Waiting for the conditions to be met in order to operate.
Calibration	
Description	Calibrating the internal sensors.
Configuration	

Table 21 (Cont.) : Status messages

Status messages	
Description	Configuring the device.
Run	
Description	Device is operating.
Sync	
Description	The **SINAF 3.0** is synchronising with the main.
Charging Bus DC	
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 (***"6.12.ALARMS"***) to obtain more information.

6.2.- THD

By pressing the key from the main screen, the THD display screen is accessed.

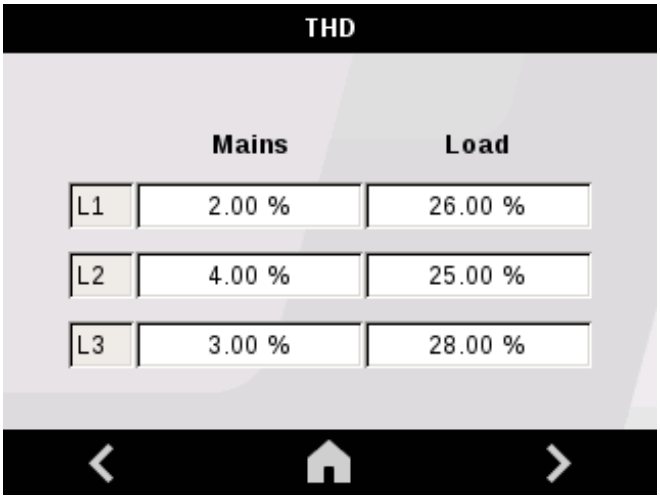


Figure 41: THD display.

It shows:

- ✓ The current THD in the Main in each of the phases, L1, L2 and L3.
- ✓ The current THD in the Load in each of the phases, L1, L2 and L3.

Note: *If a system has been configured with devices in parallel, the values displayed for the device configured as the* ***"master"*** *correspond to all devices in parallel.*

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

6.3.- VOLTAGE, CURRENT AND FREQUENCY

Figure 42 shows the Voltage, Current and Frequency screen.

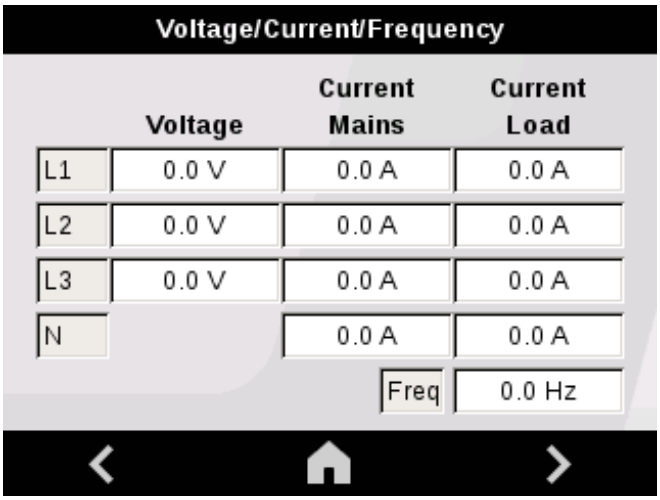


Figure 42: Voltage, Current and Frequency display.

It shows:

- ✓ The Voltage in each of the phases, L1, L2 and L3.
- ✓ The Current in the Main in each of the phases, L1, L2, L3 and Neutral.
- ✓ The Current in the Load in each of the phases, L1, L2, L3 and Neutral.
- ✓ The Frequency.

***Note:** If a system has been configured with devices in parallel, the values displayed for the device configured as the **"master"** correspond to all devices in parallel.*

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

6.4.- POWER AND COS ϕ OF MAINS

Figure 43 shows the power and cos ϕ of the main.

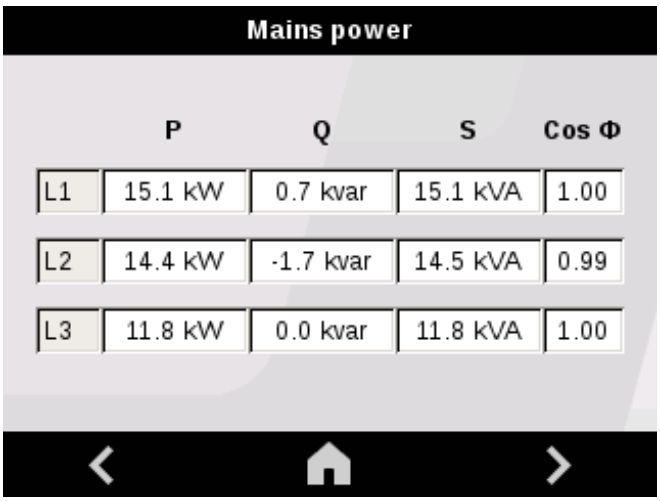


Figure 43: Display of the power and cos ϕ of the main.

It shows:

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

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

Note: *If a system has been configured with devices in parallel, the values displayed for the device configured as the* ***"master"*** *correspond to all devices in parallel.*

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

6.5.- POWER AND COS ϕ OF LOAD

Figure 44 shows the power and cos ϕ of the load.

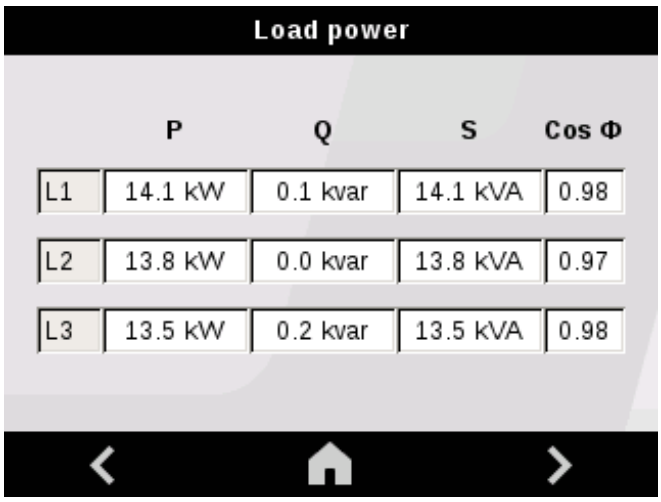


Figure 44: Display of the power and cos ϕ of the load.

It shows:

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

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

Note: *If a system has been configured with devices in parallel, the values displayed for the device configured as the* ***"master"*** *correspond to all devices in parallel.*

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

6.6.- MAINS HARMONICS

In this screen, **Figure 45**, the odd harmonics of the Main, from 3 to 25, are shown for each of the phases.

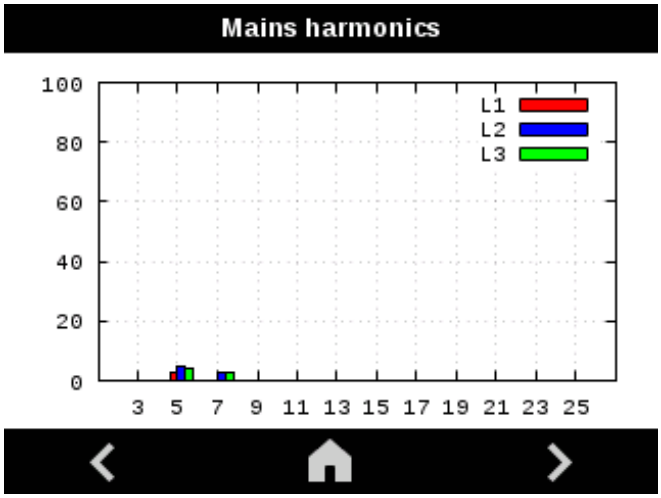


Figure 45: Display of the Mains harmonics.

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

6.7.- LOAD HARMONICS

In this screen, **Figure 46**, the odd harmonics of the Load from 3 to 25 are shown for each of the phases.

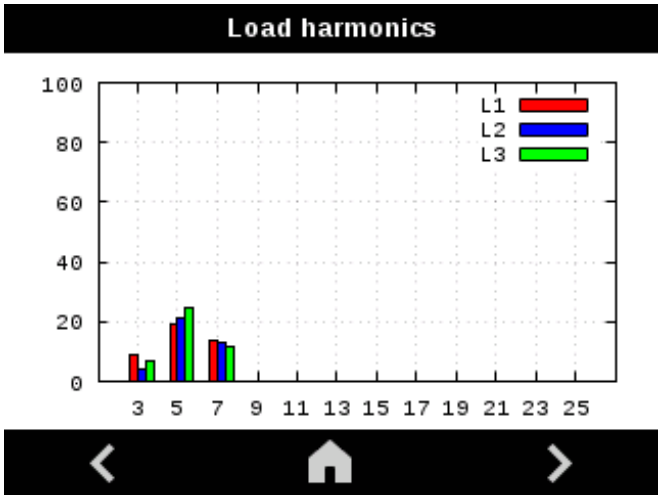


Figure 46: Display of the Load harmonics.

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

6.8.- WAVE SHAPE OF MAIN CURRENT

In this screen, **Figure 47**, the wave shape of the main current is shown for each of the phases.

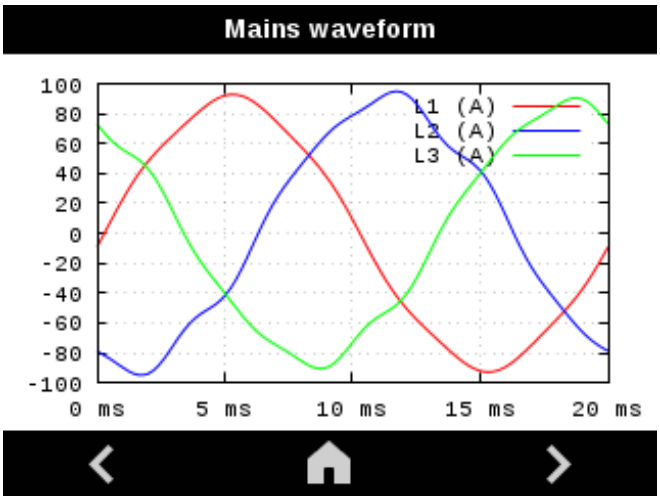


Figure 47: Wave shape of main current.

Press on the graphs to select the separate display of each phase.

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

6.9.- WAVE SHAPE OF LOAD CURRENT

In this screen, **Figure 48**, the wave shape of the load current is shown for each of the phases.

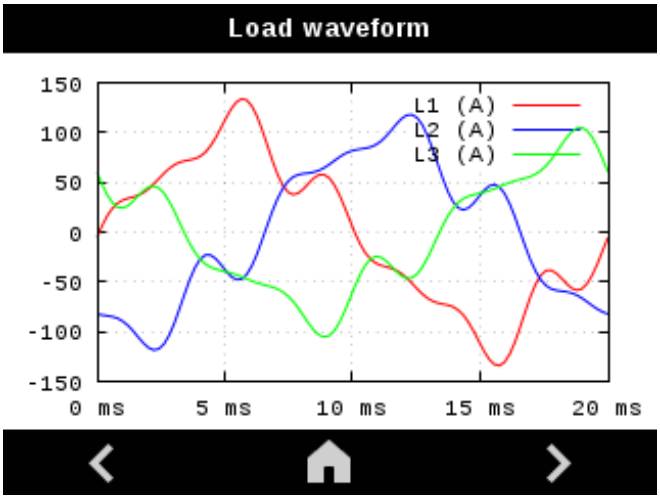


Figure 48: Wave shape of Load current.

Press on the graphs to select the separate display of each phase.

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

6.10.- MAINS PHASORS

In this screen, **Figure 49**, the main phasors are shown.

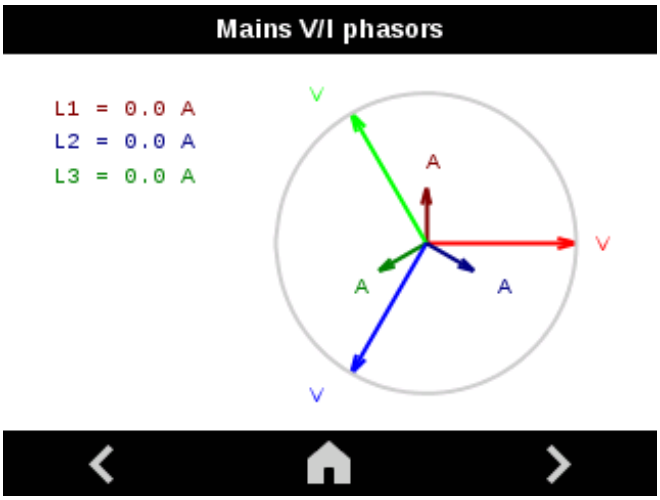


Figure 49: Main phasors.

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

6.11.- LOAD PHASORS

In this screen, **Figure 50**, the load phasors are shown.

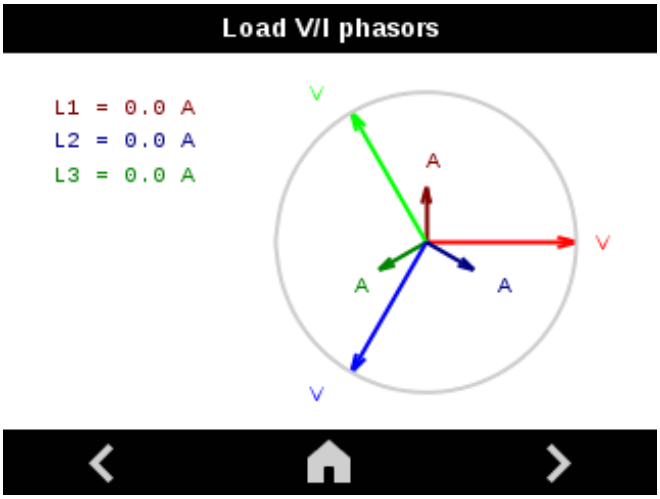


Figure 50: Load phasors.

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

6.12.- ALARMS

In this screen, **Figure 51**, the alarms that have occurred are shown.

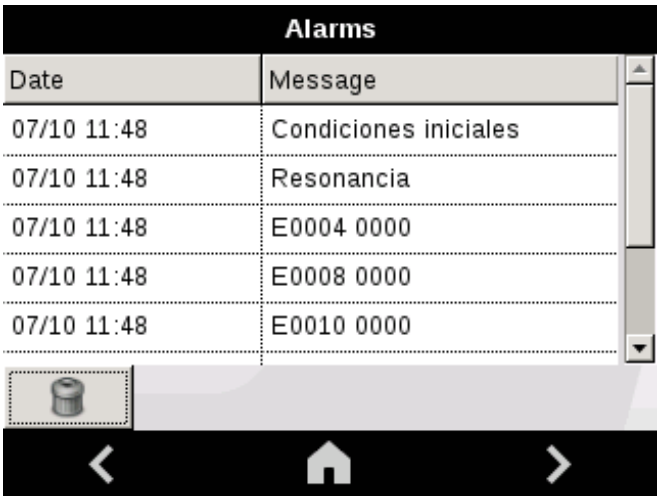


Figure 51: Alarms.

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 22 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 

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

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

Table 22:Alarm messages.

Alarm messages	
Overcurrent L1/L2/L3	
Description	The **SINAF 3.0** current is too high.
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 Assistance Service
Main overvoltage L1/L2/L3	
Description	The main voltage is too high.
Corrective action	This alarm may be associated with transients and noise in the power supply voltage, or with incorrect main voltage values. Check the configuration. Check the quality of the power supply voltage. If it continues, contact the Technical Assistance Service
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 Assistance Service

Table 22 (Cont.) : Alarm messages.

Alarm messages	
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 Assistance Service
Resonance	
Description	Detection of a potential resonance with a load
Corrective action	The resonance detection function can be activated erroneously in installations with a very high voltage THD. Contact the Technical Assistance Service.
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 Assistance Service
Exxx	
Description	Internal error.
Corrective action	Contact the Technical Assistance Service.
Cxxx	
Description	Internal error.
Corrective action	Contact the Technical Assistance Service.

6.13.- 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 52**, will be displayed and the user will be asked for confirmation to continue with the filter start-up process.

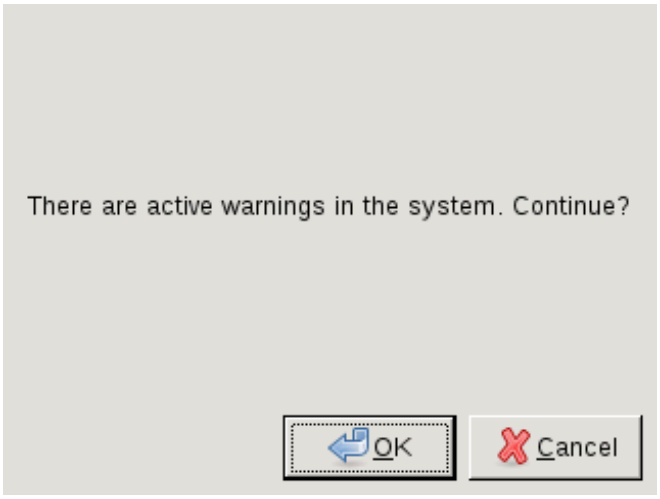


Figure 52: Confirm screen.

This screen, **Figure 53**, shows the active warnings. **Table 23** shows the warnings that can appear on the device's display.

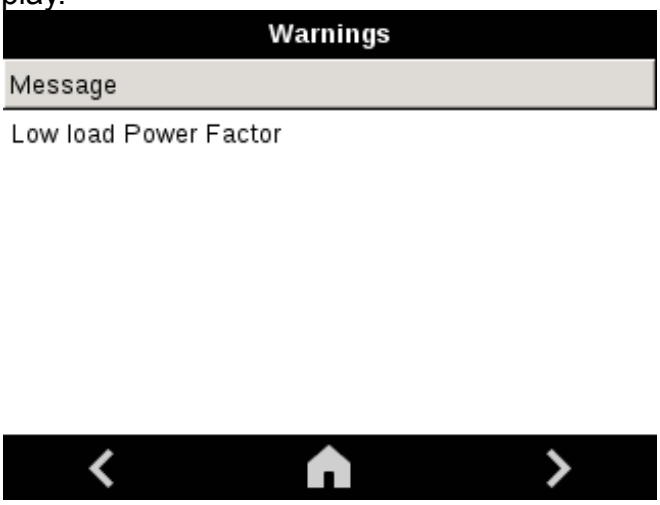


Figure 53: Warnings.

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

Table 23: Warnings messages.

Warnings messages	
Waiting for conditions	
Description	The start-up conditions are not met.
Corrective action	Check the alert messages.

Table 23 (Cont.) : Warnings messages.

Alarm and event messages	
Load polarity	
Description	Detection of an error in the load polarity.
Corrective action	Check the transformer connections. See section ***"7.6.- TRANSFORMER CONFIGURATION"***
Disabled X harmonic	
Description	Harmonic X has been disabled due to resonance.
Corrective action	The resonance detection function can be activated erroneously in installations with a very high voltage THD. Contact the Technical Assistance Service.
Annual maintenance	
Description	A year has passed since the last maintenance procedure was carried out and the maintenance meter was reset.
Corrective action	Perform the annual maintenance procedure and reset the maintenance meter. (see ***"10.- MAINTENANCE"***)
Fan maintenance	
Description	Fans have been operating for over 40,000 hours; they must be replaced and the maintenance meter must be reset.
Corrective action	Replace the fans and reset the maintenance meter. (see "***10.- MAINTENANCE***")
Fan deterioration	
Description	Deterioration in the ventilation capacity of the system has been detected.
Corrective action	Check that the fans are clean. Perform the periodic maintenance tasks. Replace the fans if this does not solve the problem. (see "***10.- MAINTENANCE***")
Mains frequency limits	
Description	Main frequency out of the limits
Corrective action	This alert may be associated with transients and noise in the power supply voltage, or with incorrect main frequency values. Check the configuration. Check the quality of the power supply voltage. If it continues, contact the Technical Assistance Service
Min temperature	
Description	Temperature below the minimum operating value
Corrective action	Wait for the environmental conditions to meet the requirements. If the alarm continues, contact the Technical Assistance Service
Mains frequency limits	
Description	Main frequency out of the limits
Corrective action	This alert may be associated with transients and noise in the power supply voltage, or with incorrect main frequency values. Check the configuration. Check the quality of the power supply voltage. If it continues, contact the Technical Assistance Service
Minimum current	
Description	Main current below the programmed level.
Corrective action	Check the configuration.
Maximum load	
Description	Filter working at full load
Corrective action	No action is necessary.
Low power factor	
Description	The power factor value measured is less than 0.7, which might indicate a connection error in the measuring transformers, where the voltage phases do not correspond to the current phases.

Table 23 (Cont.) : Warnings messages.

Alarm and event messages	
Corrective action	Confirm that the connections are correct.
Negative power	
Description	The power value measured is negative (generated power), which might indicate that the transformers have been connected inversely.
Corrective action	Confirm that the connections are correct.
Wxxx	
Description	Internal error.
Corrective action	Contact the Technical Assistance Service.
Fault in slave	
Description	This is a fault in one or more slaves.
Corrective action	The device does not stop and adjusts its operation to the number of available slaves. On the slave device status screen, "***6.17.- SLAVE DEVICE STATUS***" you can view the status and alarms for each filter. If there is a communications error with any of the slaves, stop the devices and check the communications wiring.

6.14.- TEMPERATURE

In this screen, **Figure 54**, the temperatures of the inductors and IGBTs of the device are shown.

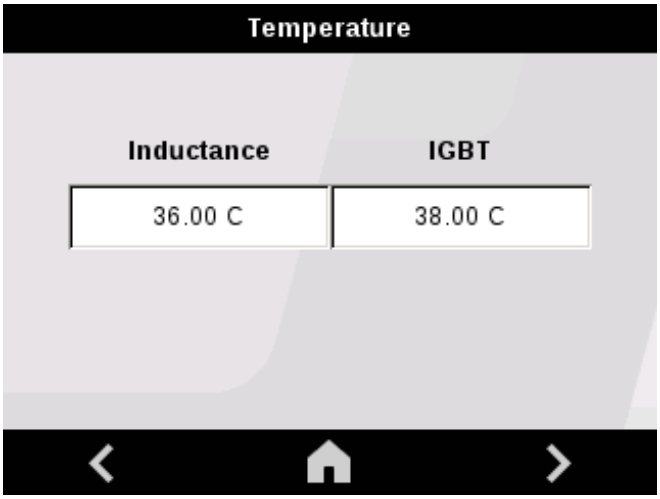


Figure 54: Temperature.

Note: *The temperature of the inductors and IGBTs can be high. The* **SINAF 3.0** *is protected from these temperatures and they do not present any risk for the device.*

Note: *If a system has been configured with devices in parallel,the* ***"master"*** *device's temperature values are displayed on the* ***"master"*** *device's screen. The temperature values of the* ***"slave"*** *devices are displayed on the Slave status screen (see* ***"6.17.- SLAVE DEVICE STATUS"****)*

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

6.15.- COMMUNICATIONS

In this screen, **Figure 55**, the IP address of the device and the netmask are shown.

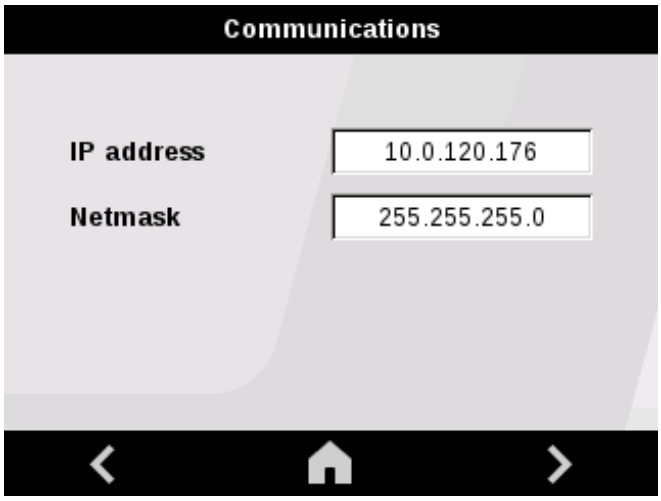


Figure 55: Communications.

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

6.16.- DEVICE INFORMATION

In this screen, **Figure 56**, the serial number, HMI and DSP versions of the device are shown.

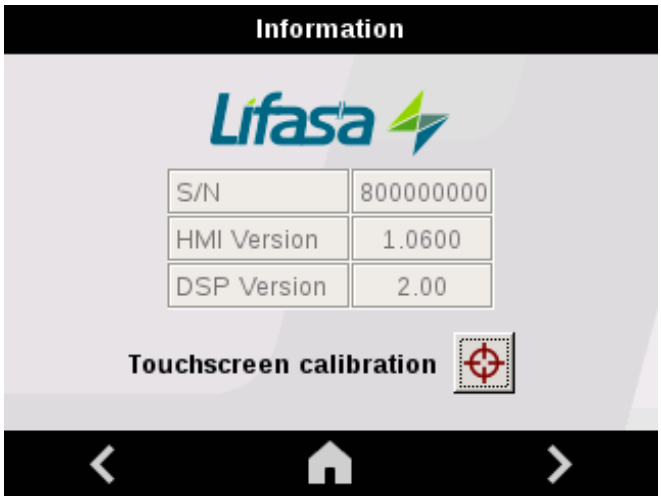


Figure 56: Device information.

The touch panel of the display is calibrated from factory, but depending on the installation conditions, it may be necessary to recalibrate it.

It is recommended to use a soft tip pointer (take care not to damage the display) and press icon  . The calibration screen is shown below, **Figure 57**.

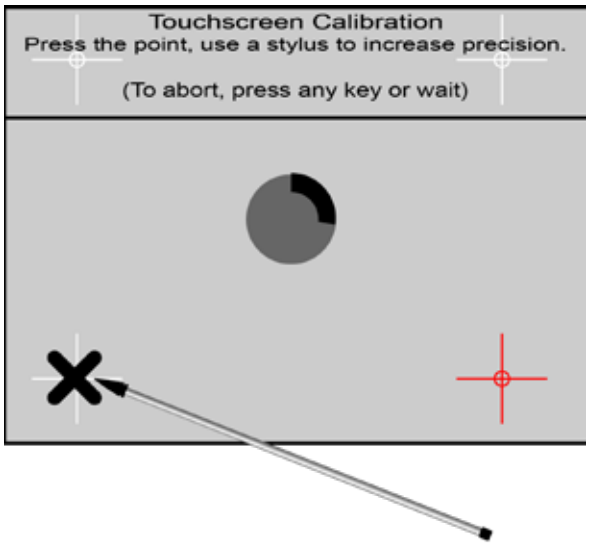


Figure 57: Calibrate touch sensor.

Note: *You have accessed the calibration screen by accident, wait until the line that surrounds the central circle is complete*  *and you will be returned automatically to the information screen of the device (***Figure 56***).*

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

6.17.- SLAVE DEVICE STATUS

Note: *This screen is only displayed if a system has been configured with devices in parallel and the device has been configured as the* ***"master".***

This screen, **Figure 58,** shows the status of each "***slave***" device.

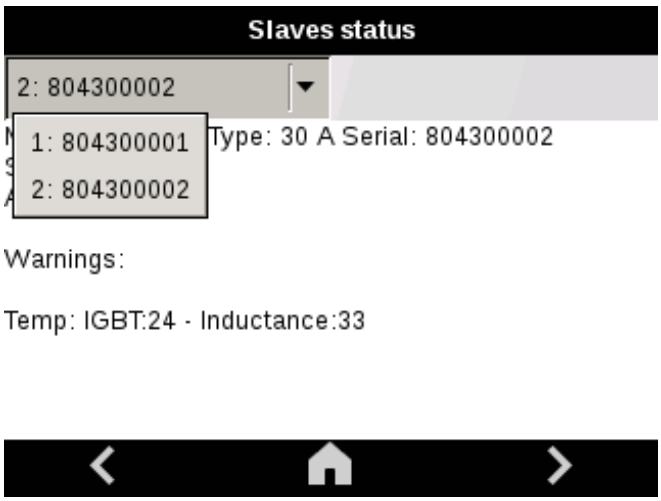


Figure 58: Slave device status screen (1).

The "***slave***" to be checked can be selected from the top tab, by serial number.

Select the "***slave***"; the screen shown in **Figure 59** will be displayed. This screen shows the Model, Type and Serial number of the device, as well as its status, active alarms and the temperature of the IGBTs and inductors.

Figure 59: Slave device status screen (2).

Note: *If there is a communication error, the message "**Communication error**" will appear when you select the affected device.*

7.- CONFIGURATION

Figure 60 shows the main configuration screen.

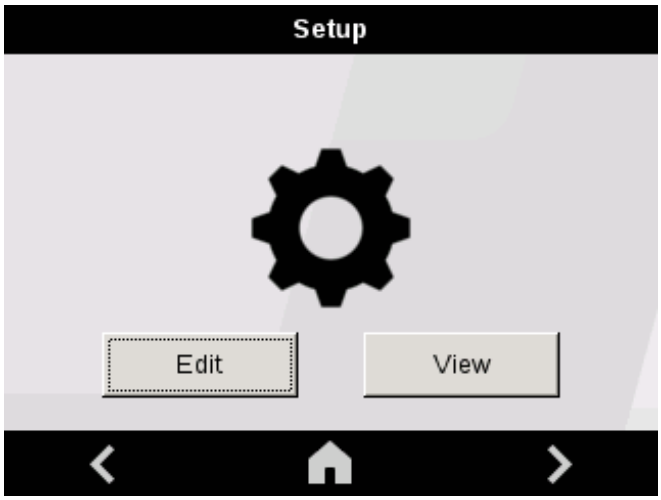


Figure 60: Main configuration screen.

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 61**

Password: 1234

Figure 61: Password to access the setup menu in edit mode.

7.1.- LANGUAGE

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

In this screen, **Figure 62**, the language of the display is selected.

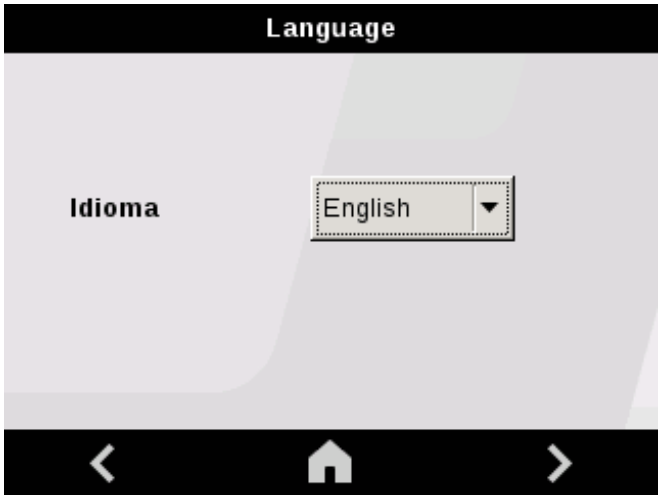


Figure 62: Configuration screen: Language.

● **Language**, display language, the options are:

- ✓ Spanish
- ✓ English

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.

7.2.- DEVICE SPECIFICATIONS

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*
In this screen, **Figure 63**, the features of the device are displayed and configured.

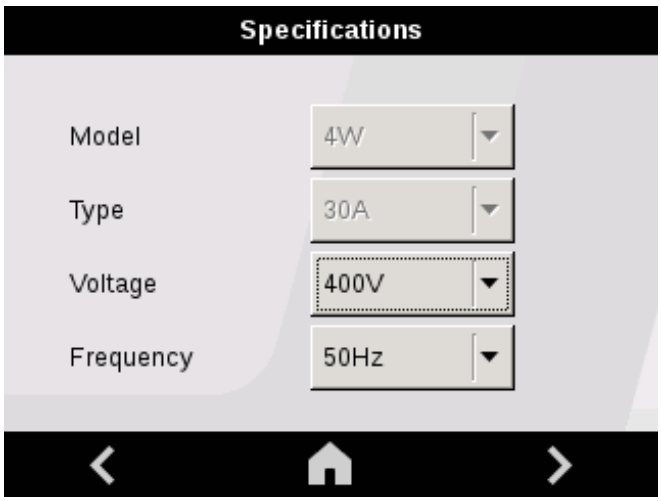


Figure 63: Configuration screen: Device specifications.

- **Model**, device model, the options are:
  Note: *This parameter cannot be modified.*

  ✓ **3W** : 3-wire model, **SINAF3348xxxxx**
  ✓ **4W** : 4-wire model, **SINAF3440xxxxx**

- **Type,** device range:
  Note: *This parameter cannot be modified.*

  ✓ **30A** : 30 A model.
  ✓ **100A** : 100 A model.

- **Voltage,** rated voltage of the device, the options are:

  ✓ **230V**
  ✓ **400V**
  ✓ **480V** (only for the 3-wire model: **SINAF3348xxxxx**)

- **Frequency**, main frequency, the options are:

  ✓ **50 Hz**
  ✓ **60 Hz**

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.

7.3.- WORKING MODE

Note: *This screen does not have to be configured if the device is going to operate as a **slave**.*

In this screen, **Figure 64**, the following parameters of the device's operating mode are configured:

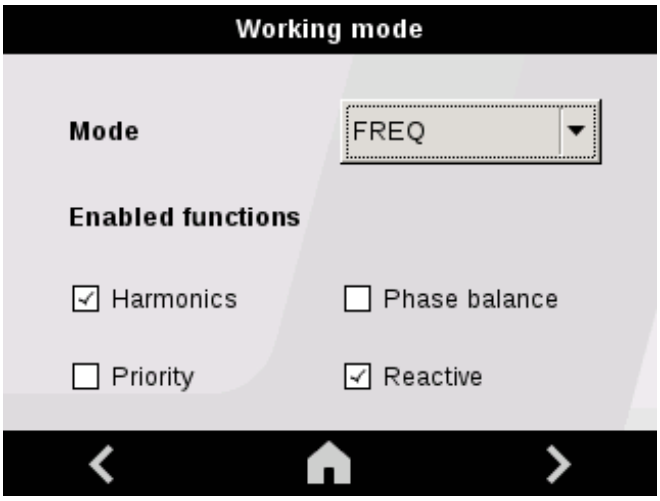


Figure 64: Configuration screen: Operation mode.

• Mode

In this parameter, the control algorithm that the device will use for harmonic filtering is selected, the options are:

✓ **TEMP: Temporary Mode,** Harmonic filtering based on the instantaneous neutralisation of all harmonics.
✓ **FREQ: Frequency Mode,** Harmonic filtering based on the selection of harmonics to be neutralised from 3 to 25.

	Do not use **Temporary mode** if the supplier has not recommended this for their installation. This method can cause resonance in certain installations.

• Enabled Functions

In this parameter, you can select the operating mode of the device, i.e., the functions that the device performs during operation:

✓Harmonics

Enable this function so that the device performs the filtering of the current harmonics.

✓ Phase balance

Enable this function so that the device performs the current balancing between phases.

	The phase balancing option in **SINAF3348xxxxx** works in unbalances produced by loads connected between phases in three-phase mains without neutral. The **SINAF3348xxxxx** does not compensate unbalances produced by single-phase loads connected between phase and neutral.

✓Priority

Enable this option so that the device prioritises the functions in case of filter current saturation due to overload:

With the function **enabled**, the current balancing between phases and the reactive current compensation is prioritised over the harmonic filtering.

With the function **disabled**, priority is given to the current harmonic filtering and power factor correction and overload balancing are penalised.

Table 24: Order of priorities

Priority	Order of priorities function	
	Disabled	**Enabled**
+	Harmonic filtering	Phase balancing Power factor correction
-	Phase balancing Power factor correction	Harmonic filtering

✓ **Reactive**

Enable this function so that the device compensates the reactive energy or corrects the displacement power factor, cos Φ.

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

7.4.- HARMONICS SELECTION

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

Note: *The screen that appears if you have selected the operating mode* ***FREQ: Frequency mode ("7.3.- WORKING MODE")***

The harmonics to be filtered are selected in this screen, **Figure 65**.

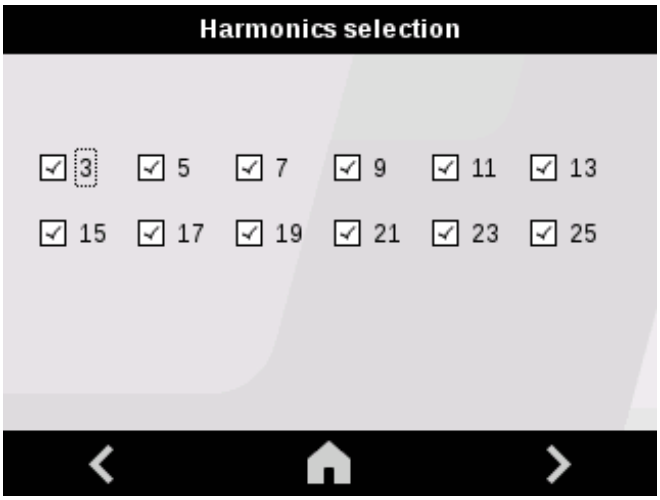


Figure 65: Configuration screen: Harmonic selection.

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.

7.5.- OPERATING LIMITS

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

In this screen, **Figure 66**, the operating limits of the device are configured:

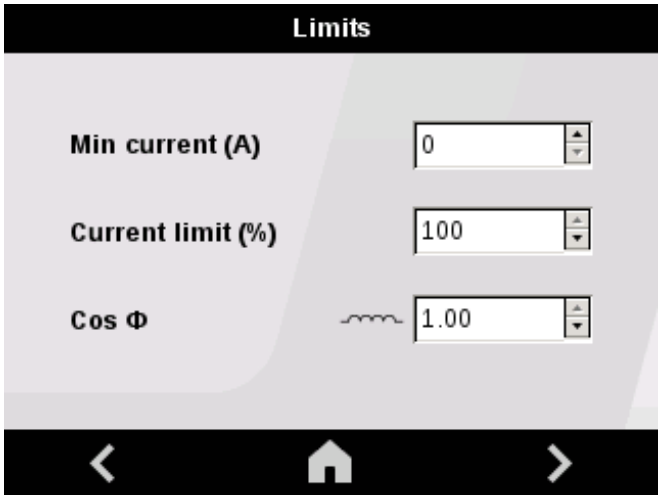


Figure 66: Configuration screen: Operating limits.

● Min current

The minimum load current to start the active filter is configured with this parameter. The **SINAF 3.0** will stop when the load current is below the entered value and will start when it is higher. Range of values:

Minimum value: 0 A
Maximum value: 5000 A

● Current limit

This parameter allows the maximum power of the active filter to be limited. The value is configured as a percentage with respect to the device's nominal power.

Range of values:

Minimum value: 20%
Maximum value: 100%

● Cos ϕ

This parameter allows select the cos ϕ that the active filter must obtain.

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.

7.6.- TRANSFORMER CONFIGURATION

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

The transformers that will be installed with the device are configured in this screen, **Figure 67**:

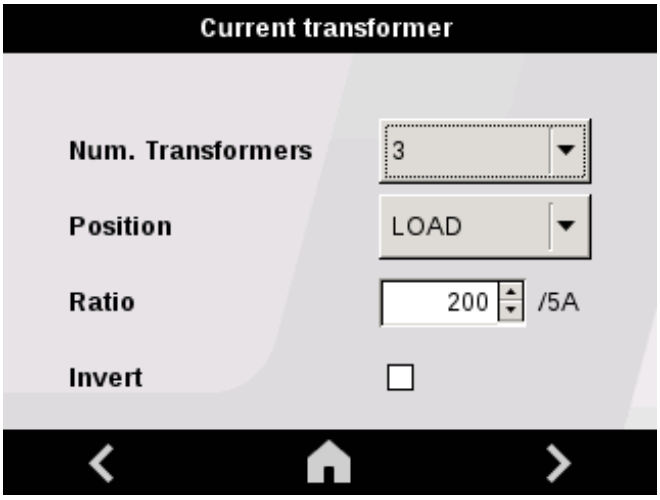


Figure 67: Configuration screen: Transformer configuration.

- **Num transformers**

The number of transformers that will be installed is configured with this parameter, the options are:

✓ **2.** This option can only be used on the 3-wire model, **SINAF3348xxxxx**
✓ **3.**

	With the option of **2** transformers, you should install a transformer measuring the L1 phase and another measuring the L2 phase. The L3 phase is left without a measuring transformer.
	In three-phase mains with neutral, 3 transformers are needed to ensure the correct operation of the device.

- **Position**

The location of the transformers is configured with this parameter, the options are:

✓ **LOAD**: If the transformers are installed in the load area, downstream from the **SINAF 3.0**.
✓ **MAIN**: If the transformers are installed in the main area, upstream from the **SINAF 3.0**.

- **Ratio**

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

Range of values:

Minimum value: 5 A
Maximum value: 5000 A

● **Invert**

If you activate the **Invert** option, the active filter changes the direction of the current of the load measuring transformers, with the purpose of solving installation errors.

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.

7.7.- INSTALLED DEVICES

The type of device are configured in this screen, **Figure 68**.

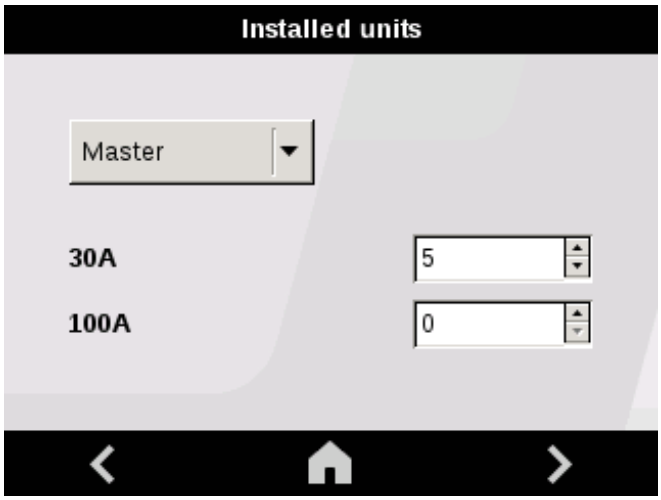


Figure 68: Configuration screen: Installed units

● **Type of device: Master / Single / Slave**

The type of device is the first parameter that must be selected, with the following possible options:

✓ **Single:** select this option if the **SINAF 3.0** does not have filters connected in parallel.

✓ **Master:** select this option if the filter is going to be used as the "***master***" of a group of devices in parallel.

✓ **Slave:** select this option if the device is going to be used as the "***slave***" of a group of devices in parallel.

Note: *After the device has been configured as the "**slave**", its remaining parameters do not have to be configured, since they will be configured automatically by the **"master"**.*

***Note:** In the case of "**slave**" devices, the* RUN *key will be disabled. Devices will be started from the "**master**" device. However, in the event of an emergency, the "**slave**" device can be stopped by pressing the* STOP *key.*

- **30A**

In this parameter, the number of 30A devices, **SINAF3xxx030x,** connected in parallel with the same load is configured.

- **100A**

In this parameter, the number of 100A devices, **SINAF3xxx100xR,** connected in parallel with the same load is configured.

Range of values:

Minimum value: 0
Maximum value: 100

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.

7.8.- ALARMS

***Note:** This screen does not have to be configured if the device is going to operate as a **slave**.*

The following alarms are enabled or not in this screen, **Figure 69**:

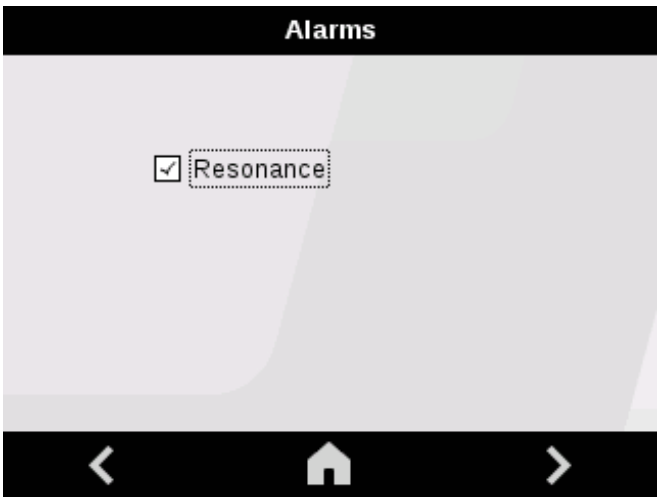


Figure 69: Configuration screen: Alarms.

- **Resonance**

If the control algorithm was selected in the **Frequency mode** and this alarm is **enabled**, when the device detects a potential resonance on an harmonic, it disables said harmonic and gener-

ates an alarm, but it continues filtering the rest of the harmonics.
If the alarm is **disabled**, the device may interpret a resonance as an overload and continue filtering the harmonic.

	This option is **enabled** by default and it is recommended not to disable it.
	Before **disabling** the resonance alarm, it is essential to make sure there is no resonating current between the active filter and the load. Resonating currents can damage the active filter and other devices connected to the installation.

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.

7.9.- COMMUNICATIONS

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

The communication parameters are configured in this screen, **Figure 70**:

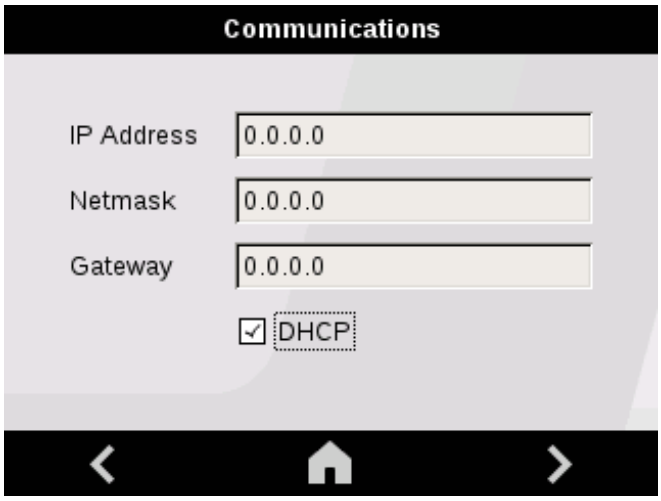


Figure 70: Configuration screen: Communications.

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.

7.10.- RS-485 COMMUNICATIONS

The RS-485 communication parameters are configured in this screen, **Figure 71**:

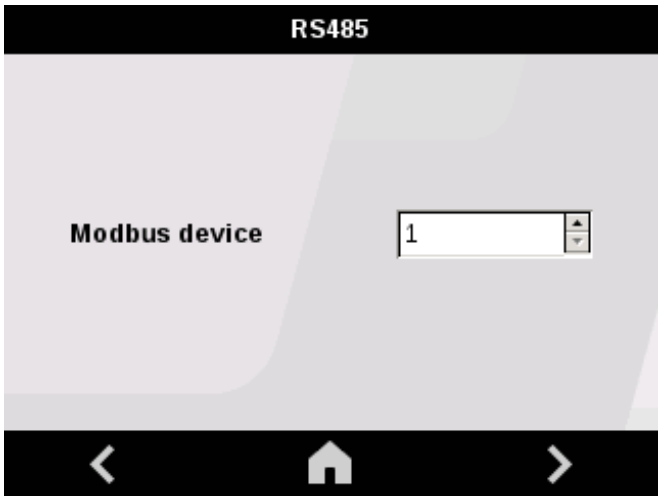


Figure 71: Configuration screen: RS-485 communications.

- **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.

7.11.- DATE / TIME

Note: *This screen does not have to be configured if the device is going to operate as a* ***slave****.*

The time parameters are configured in this screen, **Figure 72**:

Figure 72: Configuration screen: Date / Time

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

By activating the **Internet time** option, the device synchronises with the time of the Web server to which it is connected.

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.

7.12.- SAVE DATA

The modified configuration values are saved in the final setup menu screen, **Figure 73**.

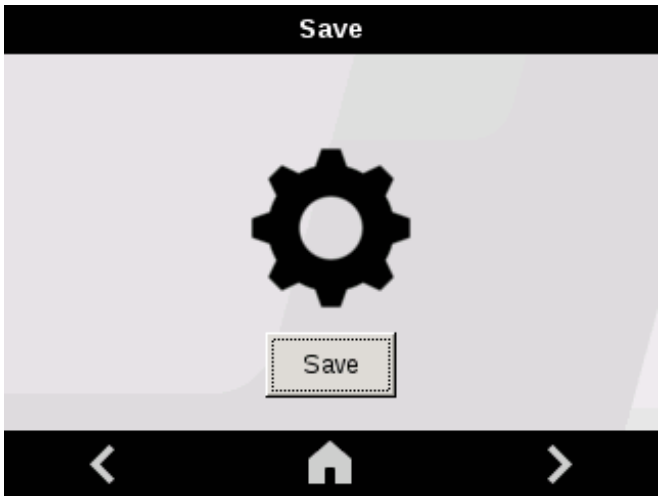


Figure 73: Final setup menu screen.

Press the  key to save the modified data.

Press the  key to exit the setup menu.

8.- RS-485 COMMUNICATIONS

SINAF 3.0 devices have an RS-485 serial communication output with the **MODBUS RTU** ® communications protocol.

For an installation with devices in parallel, the RS-485 connection can be made on any device.

8.1.- CONNECTIONS

The RS-485 cable must be wired with twisted pair cable with mesh shield (minimum 3 wires), with a maximum distance between the **SINAF 3.0** and the master device of **1200 metres.**
A maximum of 32 **SINAF 3.0** filters can be connected to this bus.

To establish communications with the master device, use an RS-485 intelligent converter.

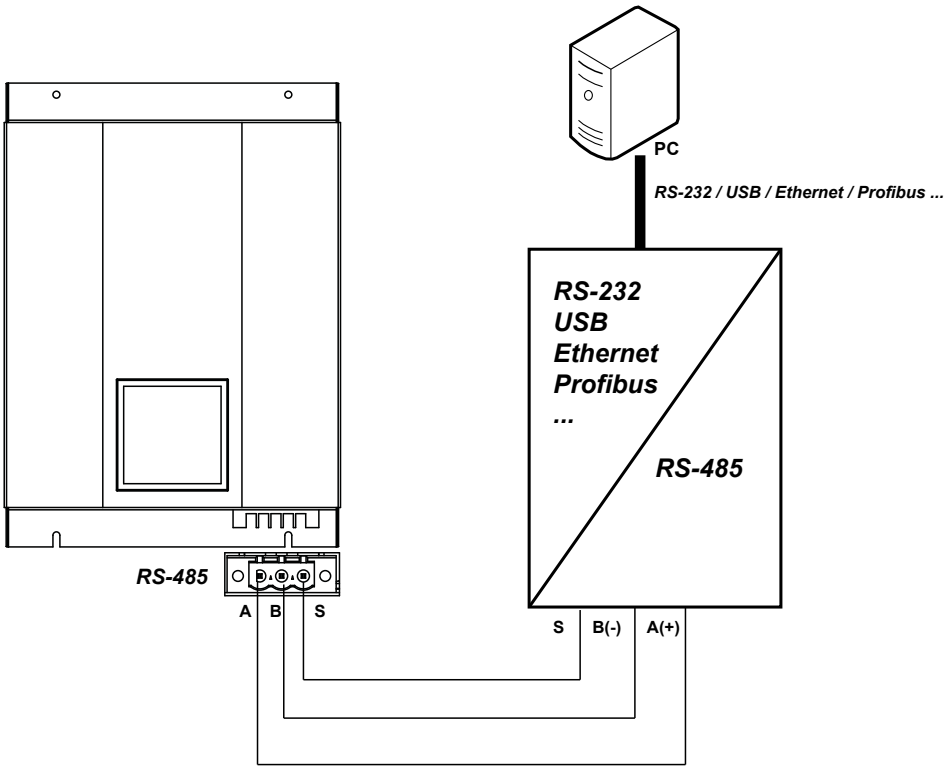


Figure 74: RS-485 Connection diagram.

8.2.- PROTOCOL

In the Modbus protocol, the **SINAF 3.0** uses the RTU (Remote Terminal Unit) mode.

The Modbus functions implemented in the device are as follows:

Functions 03 and 04. Reading of n Words (2 bytes).

8.2.1.- EXAMPLE OF MODBUS QUERY

Query: Value of the Load current of L1

Address	Function	Initial register	No. of registers	CRC
0 A	03	C8	0001	xxxx

Address: 0A, Peripheral number: 10 in decimal.
Function: 03, Read function.
Initial Register: C8, register from which to start reading.
No. of registers: 0001, number of registers to be read.
CRC: xxxx, CRC character.

Response:

Address	Function	No. of Bytes	Register no. 1	CRC
0 A	03	02	0000	xxxx

Address: 0A, Responding peripheral number: 10 in decimal.
Function: 03, Read function.
No. of bytes: 02, No. of bytes received.
Register: 00FA, value of load current L1, with 1 decimal: 0xFA = 25.0 A
CRC: xxxx, CRC character.

8.2.2.- MODBUS MAP

All Modbus map variables are in hexadecimal format.
For these variables, **Functions 03** and **04** are implemented.

8.2.2.1.- Load Measurements

Table 25:Modbus memory map: Measurements with Load (Table 1).

Parameter	L1	L2	L3	LN	Units
Current with Load	93 - 92	95 - 94	97 - 96	99 - 98	A with 1 decimal
Active power with Load	AD - AE	AF - B0	B1 - B2	-	kW with 2 decimal places and sign.
Reactive power with Load	B3 - B4	B5 - B6	B7 - B8	-	kVar with 2 decimal places and sign.
Apparent power with Load	B9 - BA	BB - BC	BD - BE	-	kVA with 2 decimal places and sign.
cos ϕ with Load	D1	D2	D3	-	With 1 decimal
Current THD with Load	8C	8D	8E	-	% with 1 decimal

Table 26:Modbus memory map: Measurements with Load (Table 2).

Parameter	Current L1	Current L2	Current L3	Units
Fundamental harmonic	64	71	7E	%
3rd order harmonic	65	72	7F	%
5th order harmonic	66	73	80	%
7th order harmonic	67	74	81	%
9th order harmonic	68	75	82	%
11th order harmonic	69	76	83	%
13th order harmonic	6 A	77	84	%

Table 26 (Cont.) : Modbus memory map: Measurements with Load (Table 2).

Parameter	Current L1	Current L2	Current L3	Units
15th order harmonic	6B	78	85	%
17th order harmonic	6C	79	86	%
19th order harmonic	6D	7 A	87	%
21st order harmonic	6E	7B	88	%
23rd order harmonic	6F	7C	89	%
25th order harmonic	70	7D	8 A	%

Table 27:Modbus memory map: Measurements with Load (Table 3).

Parameter	Current L1	Current L2	Current L3	Units
Fundamental harmonic phase	154	161	16E	0.001 x radians
3rd order harmonic phase	155	162	16F	0.001 x radians
5th order harmonic phase	156	163	170	0.001 x radians
7th order harmonic phase	157	164	171	0.001 x radians
9th order harmonic phase	158	165	172	0.001 x radians
11th order harmonic phase	159	166	173	0.001 x radians
13th order harmonic phase	15 A	167	174	0.001 x radians
15th order harmonic phase	15B	168	175	0.001 x radians
17th order harmonic phase	15C	169	176	0.001 x radians
19th order harmonic phase	15D	16 A	177	0.001 x radians
21st order harmonic phase	15E	16B	178	0.001 x radians
23rd order harmonic phase	15F	16C	179	0.001 x radians
25th order harmonic phase	160	16D	17A	0.001 x radians

8.2.2.2.- Main Measurements

Table 28:Modbus memory map: Measurements in the Main (Table 1).

Parameter	L1	L2	L3	LN	Units
Current in Main	9B - 9A	9D - 9C	9F - 9E	A1 - A0	A with 1 decimal
Active power in Main	BF - C0	C1 - C2	C3 - C4	-	kW with 2 decimal places and sign.
Reactive power in Main	C5 - C6	C7 - C8	C9 - CA	-	kVar with 2 decimal places and sign.
Apparent power in Main	CB - CC	CD - CE	CF - D0	-	kVA with 2 decimal places and sign.
cos ϕ in Main	D4	D5	D6	-	With 1 decimal
Current THD in Main	8F	90	91	-	% with 1 decimal
Main frequency	D7			-	Hz with 1 decimal

Table 29:Modbus memory map: Measurements in the Main (Table 2).

Parameter	Current L1	Current L2	Current L3	Units
Fundamental harmonic	3C	49	56	%
3rd order harmonic	3D	4 A	57	%
5th order harmonic	3E	4B	58	%
7th order harmonic	3F	4C	59	%
9th order harmonic	40	4D	5 A	%
11th order harmonic	41	4E	5B	%
13th order harmonic	42	4F	5C	%
15th order harmonic	43	50	5D	%
17th order harmonic	44	51	5E	%

Table 29 (Cont.) : Modbus memory map: Measurements in the Main (Table 2).

Parameter	Current L1	Current L2	Current L3	Units
19th order harmonic	45	52	5F	%
21st order harmonic	46	53	60	%
23rd order harmonic	47	54	61	%
25th order harmonic	48	55	62	%

Table 30:Modbus memory map: Measurements in the Main (Table 3).

Parameter	Current L1	Current L2	Current L3	Units
Fundamental harmonic phase	12C	139	146	0.001 x radians
3rd order harmonic phase	12D	13 A	147	0.001 x radians
5th order harmonic phase	12E	13B	148	0.001 x radians
7th order harmonic phase	12F	13C	149	0.001 x radians
9th order harmonic phase	130	13D	14A	0.001 x radians
11th order harmonic phase	131	13E	14B	0.001 x radians
13th order harmonic phase	132	13F	14C	0.001 x radians
15th order harmonic phase	133	140	14D	0.001 x radians
17th order harmonic phase	134	141	14E	0.001 x radians
19th order harmonic phase	135	142	14F	0.001 x radians
21st order harmonic phase	136	143	150	0.001 x radians
23rd order harmonic phase	137	144	151	0.001 x radians
25th order harmonic phase	138	145	152	0.001 x radians

8.2.2.3.- Other parameters of the SINAF 3.0 filter

Table 31:Modbus memory map: Filter parameters (Table 1).

Parameter	Address	Units
Inductor Temperature (1)	C9	ºC with 1 decimal
Temperature of IGBTs (1)	CA	ºC with 1 decimal
Phase L1 - L2 voltage	CD	V with 1 decimal
Phase L2 - L3 voltage	CD	V with 1 decimal
Phase L3 - L1 voltage	CE	V with 1 decimal
Positive DC bus voltage	CF	V with 1 decimal
Negative DC bus voltage	D0	V with 1 decimal

(1) For a system with devices in parallel, the parameter value is that of the device connected with RS-485.

Table 32:Modbus memory map: Filter parameters (Table 2).

Parameter	L1	L2	L3	LN	Units
Current in the filter	A3 - A2	A5 - A4	A7 - A6	A9 - A8	[Hi] + [Low] A with 1 decimal
Phase – neutral voltage	AA	AB	AC	-	V with 1 decimal
% of filter power used	C6	C7	C8	-	%

Table 33:Modbus memory map: Filter parameters (Table 3).

Parameter	Address	Description
SINAF 3.0 serial no. (2)	2710 - 2711	Hi [10] + Low [11] serial no.
DSP software version	10C	-

(2) For a system with devices in parallel, the parameter value is that of the device connected with RS-485.

8.2.2.4.- SINAF 3.0 filter messages

Table 34:Modbus memory map: Filter messages (Table 1).

Parameter	Address	
Device status [3]	110	
Bit	**Description**	**Status**
0x0001	Stop	**1**: ON **0**: OFF
0x0002	Start	
0x0004	Reset alarms	

[3] For a system with devices in parallel, the parameter value is that of the device connected with RS-485.

Table 35:Modbus memory map: Filter messages (Table 2).

Parameter	Address
Alarm messages	105 (Hi value), 106 (Low value)
Bit	**Description**
0x00000000	There are no alarms
0x00000001	DC bus overvoltage alarm
0x00000002	L1 overcurrent alarm
0x00000004	L2 overcurrent alarm
0x00000008	L3 overcurrent alarm
0x00000010	L1 overvoltage alarm
0x00000020	L2 overvoltage alarm
0x00000040	L3 overvoltage alarm
0x00000080	DC bus positive overvoltage alarm
0x00000100	DC bus negative overvoltage alarm
0x00000200	Desaturation alarm
0x00000400	L1 desaturation alarm
0x00000800	L2 desaturation alarm
0x00001000	L3 desaturation alarm
0x00002000	N desaturation alarm
0x00004000	NTC 1 probe temperature alarm
0x00008000	NTC 2 probe temperature alarm
0x00010000	Initial Conditions Error
0x00020000	Resonance Alarm
0x00040000	Inductor temperature alarm
0x00080000	DC bus load error
0x00100000	Contactor faults
0x00200000	NTC 3 probe temperature alarm

Table 36:Modbus memory map: Filter messages (Table 3).

Parameter	Address
Initial Conditions for which the device does not start up.	108
Bit	**Description**
0x0001	Discharging DC bus
0x0002	Minimum Main Voltage
0x0004	Minimum temperature value
0x0008	Frequency error

Table 36 (Cont.) : Modbus memory map: Filter messages (Table 3).

Parameter	Address
Initial Conditions for which the device does not start up [4].	108
Bit	**Description**
0x0010	Charging DC bus
0x0020	Minimum DC bus voltage
0x0040	DC Bus imbalance
0x0080	The device does not communicate
0x0100	Polarity Error
0x0200	Minimum load current
0x0400	Maximum charge current

[4] For a system with devices in parallel, the parameter value is that of the device connected with RS-485.

Table 37:Modbus memory map: Filter messages (Table 4).

Parameter	Address
SINAF 3.0 status [5]	104
Status (Decimal value)	**Description**
0	Start-up
10, 20, 30	Calibration
35	Relay test
40	Configuration
100	Start
200	Initial conditions
300	Stop
400	Synchronising
500	DC bus load
600	Operation
666	Power off
700	Alarm
950	Test

[5] For a system with devices in parallel, the parameter value is that of the device connected with RS-485.

Table 38:Modbus memory map: Filter messages (Table 5).

Parameter	Address	
Harmonics status	109	
Bit	**Description**	**Status**
0x0001	Harmonic 3	**1**: Harmonic filtering **0**: Harmonic disabled due to resonance
0x0002	Harmonic 5	
0x0004	Harmonic 7	
0x0008	Harmonic 9	
0x0010	Harmonic 11	
0x0020	Harmonic 13	
0x0040	Harmonic 15	
0x0080	Harmonic 17	
0x0100	Harmonic 19	
0x0200	Harmonic 21	
0x0400	Harmonic 23	
0x0800	Harmonic 25	

9.- ETHERNET COMMUNICATIONS

For an installation with devices in parallel, the Ethernet connection can be made on any device.

9.1.- CONNECTION

The **SINAF 3.0** has an ethernet port.
This type of communication creates an intranet with IP communications.

If the device that connects to this port is a computer, the network cable must be a crossover Ethernet cable, as shown in **Figure 75**.

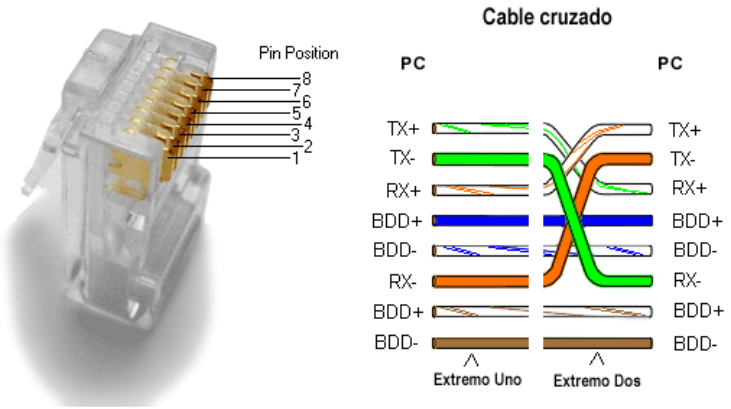


Figure 75:RJ-45 connector: Crossover Ethernet connection diagram.

9.2.- WEB SITE

The device has a web site for viewing and configuring the parameters.

Figure 76 shows the main web server screen, from where you can access all of the information of the **SINAF 3.0**.

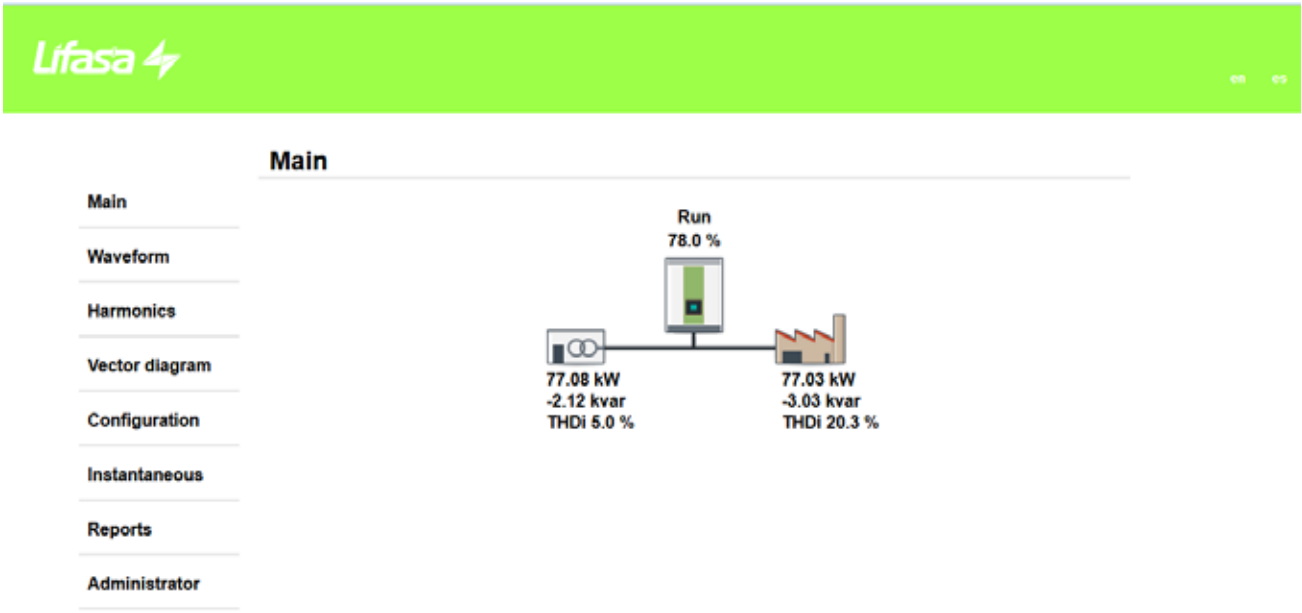


Figure 76: Main screen of the web site.

The language of the web site can be modified using the buttons that appear on the upper right part of the page.

To modify the **Configuration** parameters, it is necessary to enter the ***User*** and ***Password*** in the **Administrator** section.

There are two types of user:

1.- User with write access, **admin**:

Table 39: Default username and password for a user with write access.

Default User and Password	
User name	admin
Password	admin

2.- User with read access, **user**:

Table 40: Default username and password for a user with read access.

Default User and Password	
User name	user
Password	user

For security purposes, change the passwords for accessing the web site.

10.- MAINTENANCE

The **SINAF 3.0** active filter 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 41 shows the maintenance jobs with their respective time intervals.

Table 41: Active filter 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, "***6.13.- 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 **SINAF 3.0** filters. **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.**

10.1.- 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 **SINAF 3.0** 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.- If there is a lot of dirt, remove the upper and lower fan covers and clean, removing the dust from the fans and the heatsink.
5.- Check the status and torque of the electrical connections, as well as the mechanical attachment to the wall.
6.- Reset the standard maintenance meter, to do so:

Access the main setup screen.

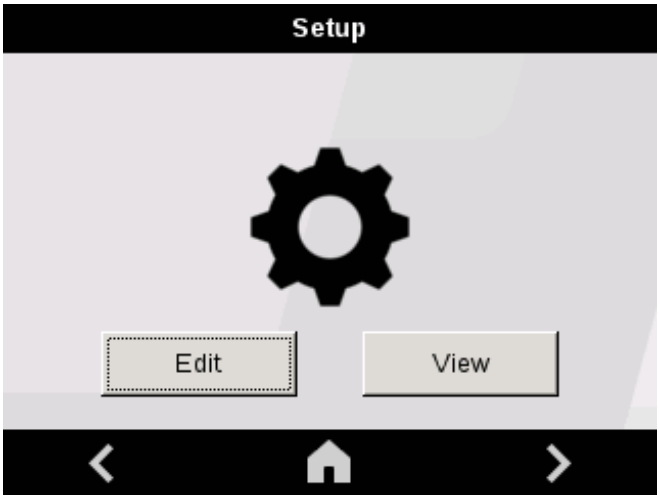


Figure 77: Main configuration screen.

Press the 

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

The screen shown in **Figure 78** will be displayed.

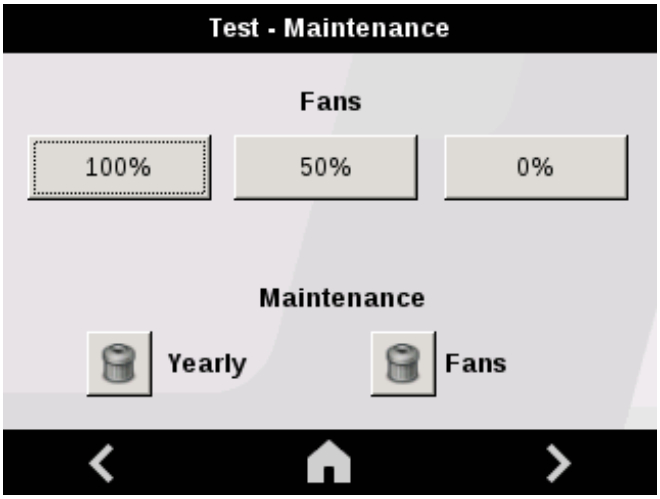


Figure 78: Maintenance screen.

Press the 

key to reset the maintenance meter.

10.2.- COOLING FANS

	The cooling fans must operate correctly to avoid overheating in the active filter components.

The device has high-speed cooling fans, with an estimated useful life of 40000 hours.

Nevertheless, this useful life can be shortened depending on the conditions of use (temperature, humidity, environmental pollution). In the event that the fans lose their efficiency, the device's performance will deteriorate.

The following symptoms in the filter behaviour could indicate a deterioration of the fans:

- ✓ Increase in fan noise.
- ✓ Increase in temperature of the device under the same environmental conditions and load.
- ✓ The **SINAF 3.0** regularly indicates a temperature alarm.
- ✓ Reduction in the filtering capacity.

The set of fans must be replaced if they have exceeded their useful life or show signs of deterioration. In such cases, **LIFASA** will provide a spare part that consists of a set of fans so that the device can be repaired quickly and easily.

Table 42: Spare part code, fan set

Description	Code
SINAF3xxx030x spare part fan set	920021
SINAF3xxx100x Rspare part fan set	920024

	For an installation with devices in parallel, all of the fans must be changed at the same time.

10.2.1.- 30 A SINAF 3.0 : SINAF3xxx030x

To change the fan set:

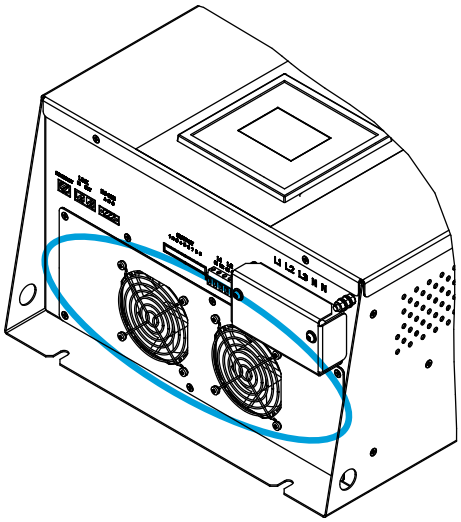


Figure 79: Location of the cooling fans.

1.- Put the **SINAF 3.0** in **STOP** mode and open the main switch (**OFF** position).

2.- Wait 1 minute for the capacitors to discharge

3.- Loosen the 6 fixing screws of the fan grille (Phillips screwdriver).

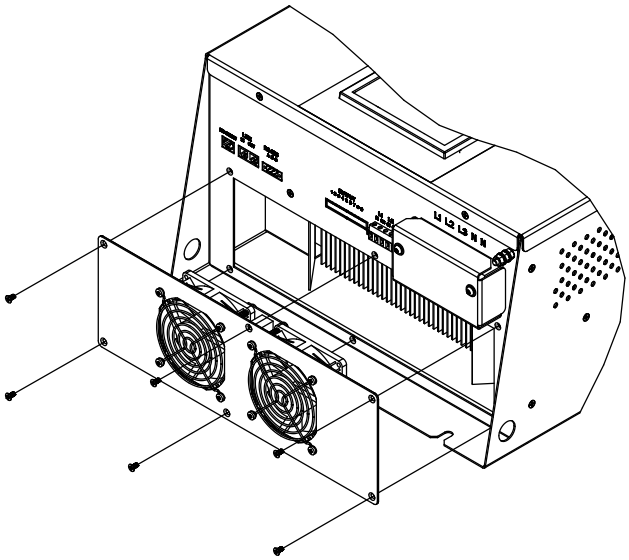


Figure 80: Loosen the 6 fixing screws.

4.- Carefully remove the fan set and disconnect the power supply cable.

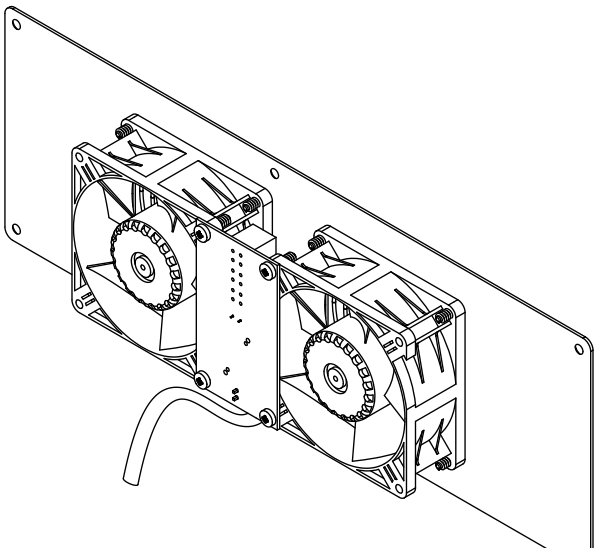


Figure 81: Fan set.

5.- Connect the power supply cable in the spare set, insert the set carefully so as not to nip any cable and retighten the 6 screws.

Note: *recommended torque:* **1.5 Nm**

6.- Power up and start the **SINAF 3.0**. Check the correct operation of the fans.

7.- Check the correct operation of the fans.

To do so, access the maintenance screen through the setup screen by pressing the Edit key and entering the password used to access the maintenance screen (***Maintenance password***: *8888*).

The screen shown in **Figure 82** will be displayed.

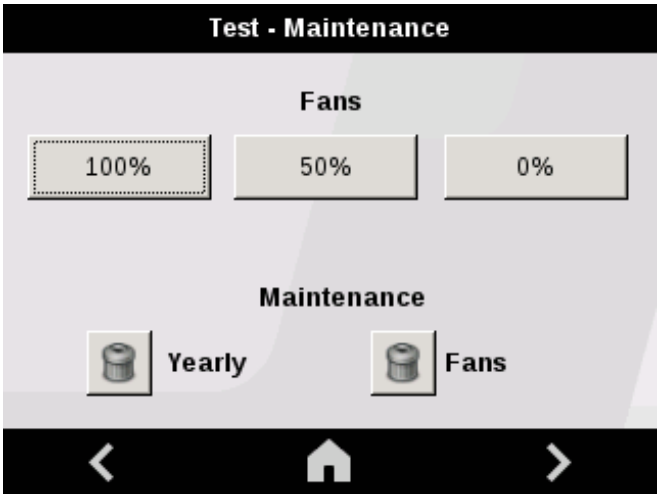


Figure 82: Maintenance screen.

Check the operation of the fans:

A.- Press the 50% key, the fan will start working at 50% of its speed of rotation; check that it is working properly.

Press the 0% key to stop the fan.

B.- Press the 100% key, the fan will start working at 100% of its speed of rotation; check that it is working properly.

Press the 0% key to stop the fan.

Note: *The fans will stop after 1 minute if the* 0% *key is not pressed.*

8.- Reset the maintenance meter of the fans by pressing the Fans key.

10.2.2.- 100 A SINAF 3.0 RACK-TYPE: SINAF3xxx100xR

To replace the fan assembly:

1.- Put the **SINAF 3.0** in **STOP** mode and open the main switch (**OFF** position).

2.- Wait 1 minute for the capacitors to discharge

3.- Loosen the 6 fixing screws in the upper cover and remove the cover, **Figure 83**.
Note: *Torx 25 screws*

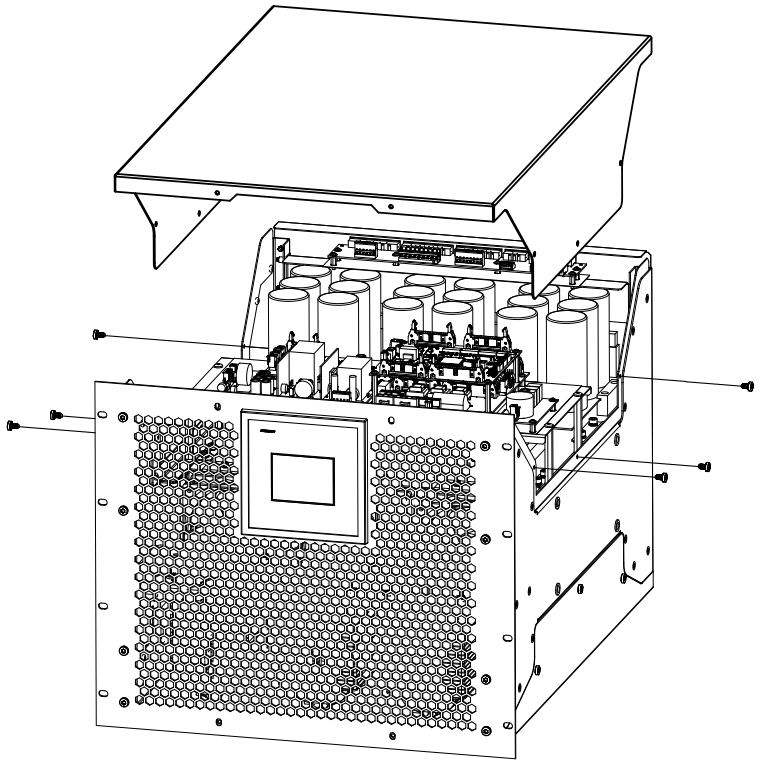


Figure 83: Loosen the 6 fixing screws and remove the back cover.

4.- Remove the screen's cables from their guide and disconnect the fans' cables, **Figure 84**.

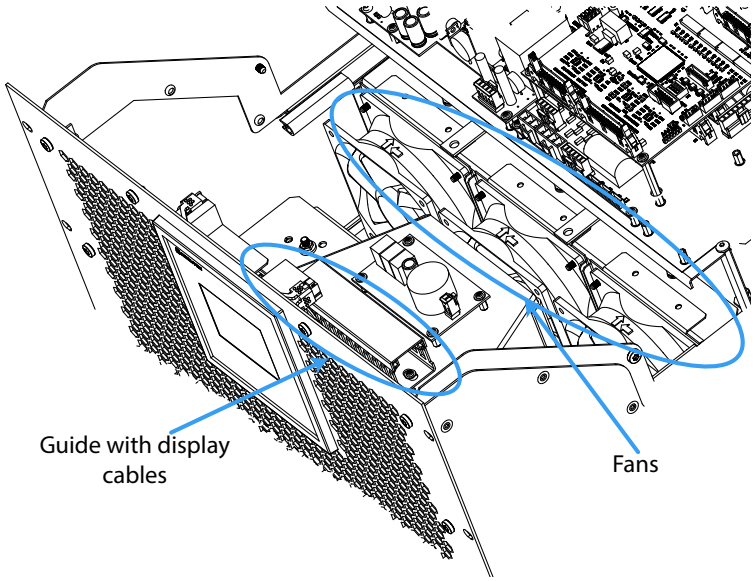


Figure 84: Position of the guide with the cables from the screen and fans.

5.- Loosen the 2 fixing screws in the ventilation nozzle and remove the nozzle, **Figure 85**
Note: *8 mm hex screws*

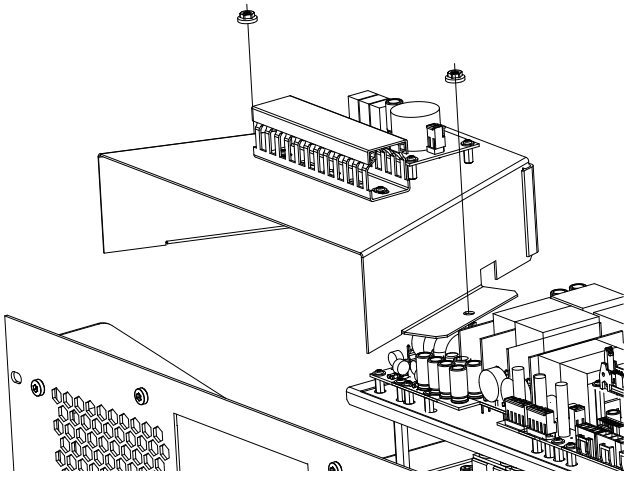


Figure 85: Remove the ventilation nozzle.

6.- Loosen the fan's 2 fixing screws (3 mm allen screws) and tilt it forwards to remove the fan, gently pull the cable away from the fan **Figure 86**.

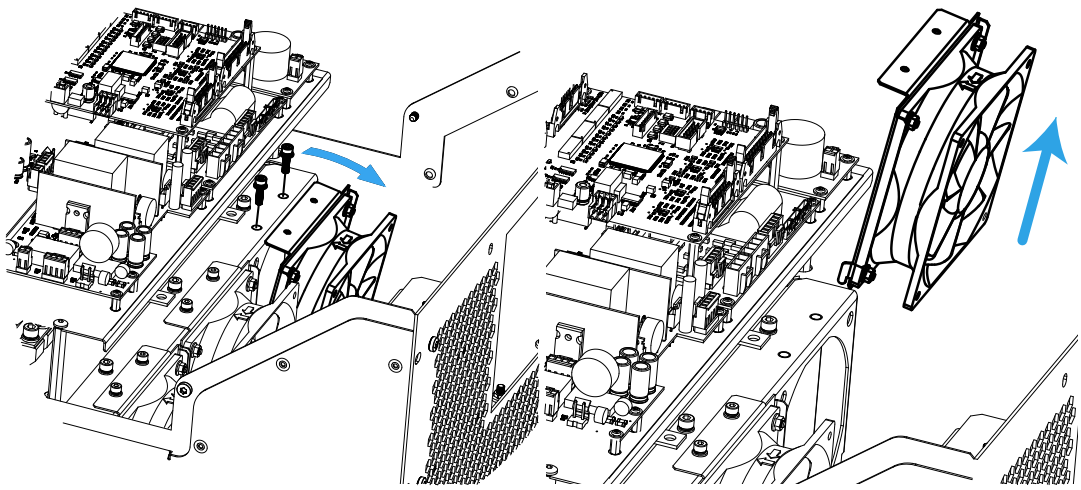


Figure 86: Remove the fan.

7.- Remove the remaining fans by repeating step **6**.

8.- Insert the fan, taking care not to pinch any cable, and re-tighten the 2 screws. Repeat this process for the remaining fans. Connect the fans' cables to the connector.

9.- Install the device's upper cover by tightening the 6 fixing screws.
Note: *Recommended tightening torque:* **1.5 Nm**

10.- Re-connect to the electrical network and start up the **SINAF 3.0**.

11.- Check that the fans are working properly.

To do this, go to the maintenance screen, via the configuration screen, by pressing the Edit key and entering the password to log into the maintenance screen (***Maintenance password :*** 8888).

The screen in **Figure 87** is displayed.

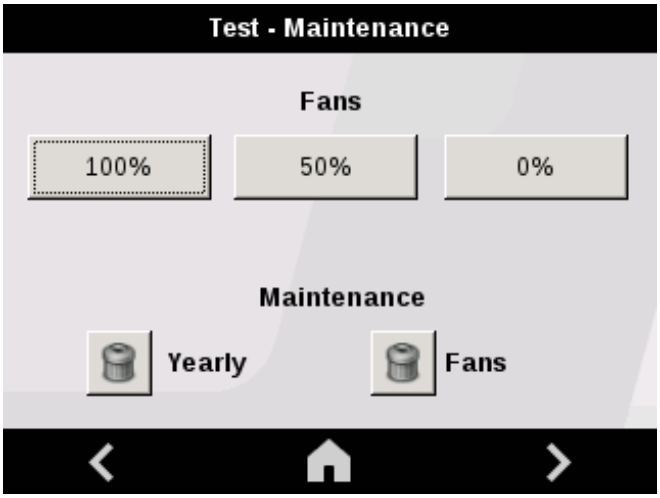


Figure 87: Maintenance screen.

Checking the operation of the fans:

A.- Press the key 50%, the fan starts to operate at a rotation speed of 50%; check that it is working properly.
Press the key 0%, to stop the fan.

B.- Press the key 100%, the fan starts to operate at a rotation speed of 100%; check that it is working properly.
Press the key 0%, to stop the fan.
Note: *The fans will stop if the key* 0% *is not pressed after 1 minute.*

12.- Reset the fans' maintenance meter by pressing the Fans key.

10.2.3.- 100 A AND 200 A SINAF 3.0 cabinet-type : SINAF3xxx100 AND SINAF3xxx200

To replace the fan assembly:

1.- Put the **SINAF 3.0** in **STOP** mode and open the main switch (**OFF** position).

2.- Wait 1 minute for the capacitors to discharge

3.- Access the 100 A modules via the front panel. To do this, loosen the screws in the front panel (Torx 30 and 25). Carefully remove the front panel and disconnect the screen's connectors. The torque of the front panel's screws is 1.5 Nm.

4.- Continue from point **4,** section ***"10.2.2.- 100 A SINAF 3.0 RACK-TYPE: SINAF3xxx100xR"***

Note : *When you check the fans in the master device, the slave devices' fans will automatically be activated*

10.3.- FUSES (Models **SINAF3xxx100** and **SINAF3xxx200**)

Each 100 A module has a fuse to protect against short circuits.

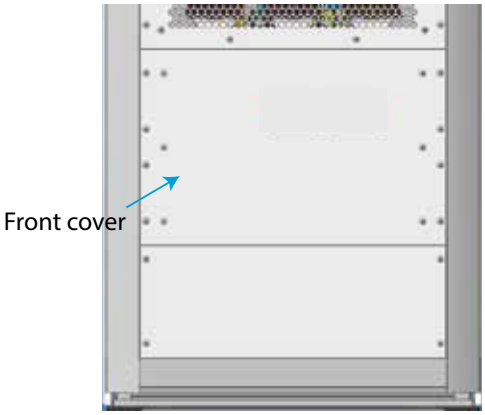


Figure 88: Front cover.

Fuse type **NH00 125A gG 120kA 500Vac I2t 136kA2/s**
If the device fails to come on, check the condition of the fuse, open the front cover. The opening must be done with the device disconnected from the electrical network.

11.- TECHNICAL FEATURES

Mains voltage		
Rated voltage Un	**SINAF3348xxxxx**	**SINAF3440xxxxx**
	230 ... 480 Vac F-F ± 10%	230 ... 400 Vac F-F ± 10%
Frequency Fn	50 / 60 Hz ± 5%	
Maximum THD V	25 %	
Earthing system	TN, TT	

Power: SINAF3xxx030x	
Maximum consumption	1050 W
Maximum power	20700 VA
Maximum current (phase)	30 A RMS
Maximum current (neutral)	90 A RMS
Crest factor (current)	2:1

Power: SINAF3xxx100xR	
Maximum consumption	4000 W
Maximum power	69000 VA
Maximum current (phase)	100 A RMS
Maximum current (neutral)	300 A RMS
Crest factor (current)	2:1

Power: SINAF3xxx100 and SINAF3xxx200		
Rated insulation voltage Ui	480 V	
Impulse withstand voltage Uimp	4kV, CAT III Clase 1	
Rated current (phase) Ina phase	**SINAF3xxx100**	**SINAF3xxx200**
	100 A	200 A
Rated current (neutral) Ina neutral	300 A	600 A
Short-time withstand current Icw	3.5 kA 1 second	
Peak current Ipk	80 kA peak	
Rated conditional short-circuit current Icc	40 kA	
Simultaneity RDF	1	
Maximum consumption	**SINAF3xxx100**	**SINAF3xxx200**
	4000 W	8000 W
Maximum power	69000 VA	138000 VA
Maximum current (phase)	100 A RMS	200 A RMS
Maximum current (neutral)	300 A RMS	600 A RMS
Crest factor (current)	2:1	

Current measurement	
Type	Transformer: 5/5A ... 5000/5A
Frequency response	up to 2500 Hz / 3000 Hz (60 Hz)
Consumption	1.5 VA per transformer

Filter specifications	
Filtering	2 ... 50 harmonic (adjustable)
Response time	< 100 µs
Phase compensation	Adjustable
Power factor correction	Adjustable
Programming of priorities	Adjustable

(cont.) Filter specifications	
Parallel connection	Up to 100 devices of different calibres Connection of the transformers only in the Master device

Protective component against short circuits (SINAF3xxx100 and SINAF3xxx200)	
Fuse	NH00 125A gG 120kA 500Vac I2t 136kA2/s

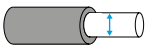
RS-485 Communications	
Field bus	RS-485
Communications protocol	Modbus RTU
Baud rate	9600
Stop bits	1
Parity	none

Ethernet communications	
Network protocol	TCP/IP, Modbus TCP

User interface	
Display	3.5” TFT colour touch screen Web server and datalogger

Environmental features	
Environmental conditions	**Indoor conditioned IEC 60721-3-3**
Operating temperature	-10ºC ... +45ºC
Storage temperature	-20ºC... +50ºC
Relative humidity (with no condensation)	0 ... 95%
Maximum altitude	2,000 m
Protection degree	IP20
Overvoltage category	OVC III 300V
SINAF3xxx100 and SINAF3xxx200	
Pollution degree	2
Impact resistance	IK 10
Electromagnetic compatibility	Installation in type-A environments

Standards	
Electromagnetic compatibility (CEM). Part 6-4: Generic standards. Emissions standard for industrial environments. (IEC 61000-6-4:2006).	UNE-EN 61000-6-4:2007
Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	UNE-EN 55011:2011
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	UNE-EN 61000-6-2:2006
Safety requirements for power electronic converter systems and equipment - Part 1: General (Endorsed by AENOR in November of 2012.)	EN 62477-1:2012
Low-voltage switchgear and controlgear assemblies - Part 1: General rules	IEC 61439-1:2011

Mechanical features: SINAF3xxx030				
Dimensions (mm)	**Figure 89**			
Weight	31 kg			
Enclosure	Galvanised steel 1.5 mm			
Noise	65 dBA			
Connections	**Type**			
Main	M6 ring terminal	12 mm	2.2 ... 2.4 Nm	PH2
Earth	M6 ring terminal	16 mm	2.2 ... 2.4 Nm	PH2
Connections	**Type**			
Current	6-pole connector	2.5 mm²	0.5 ... 0.6 Nm	Flat 3 mm
RS-485	3-pole connector	2.5 mm²	0.5 ... 0.6 Nm	Flat 3 mm
Ethernet	RJ-45	-	-	-

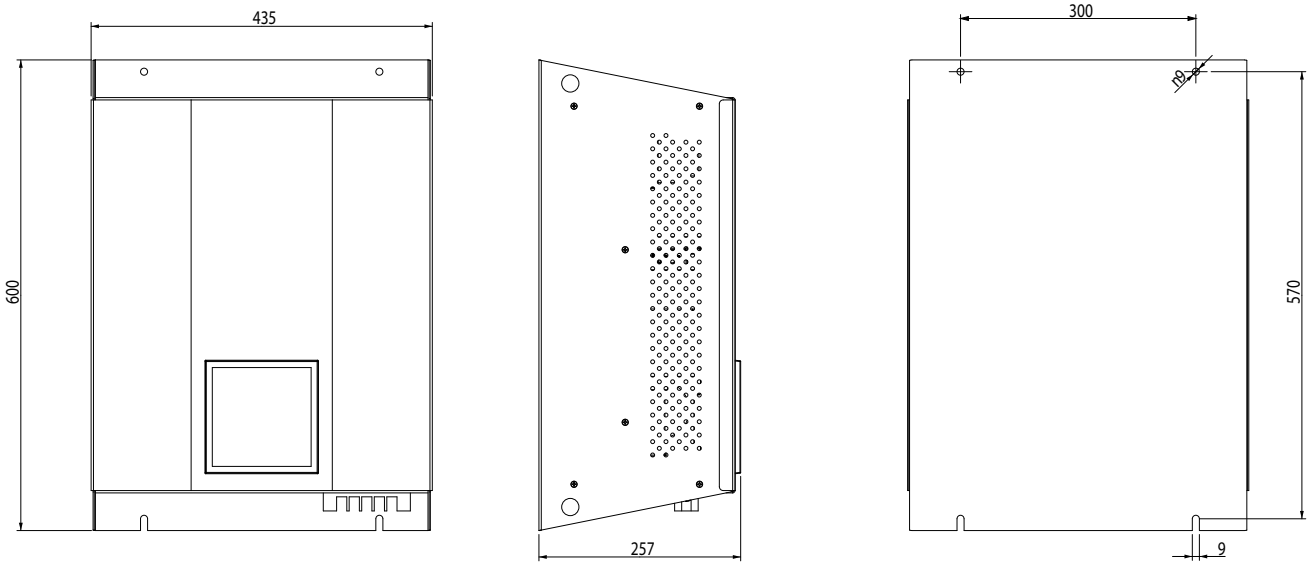
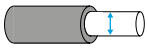


Figure 89: Dimensions : SINAF3xxx030 without EMI filters.

Mechanical features: SINAF3xxx030F				
Dimensions (mm)	**Figure 90**			
Weight	31 kg			
Enclosure	Galvanised steel 1.5 mm			
Noise	65 dBA			
Connections	**Type**			
Earth	M6 ring terminal	-	2.2 ... 2.4 Nm	Hex 10 mm
Connections	**Type**			
Main	End cap	5 mm²	1.5 ... 1.8 Nm	PH2
Current	6-pole connector	2.5 mm²	0.5 ... 0.6 Nm	Flat 3 mm
RS-485	3-pole connector	2.5 mm²	0.5 ... 0.6 Nm	Flat 3 mm
Ethernet	RJ-45	-	-	-

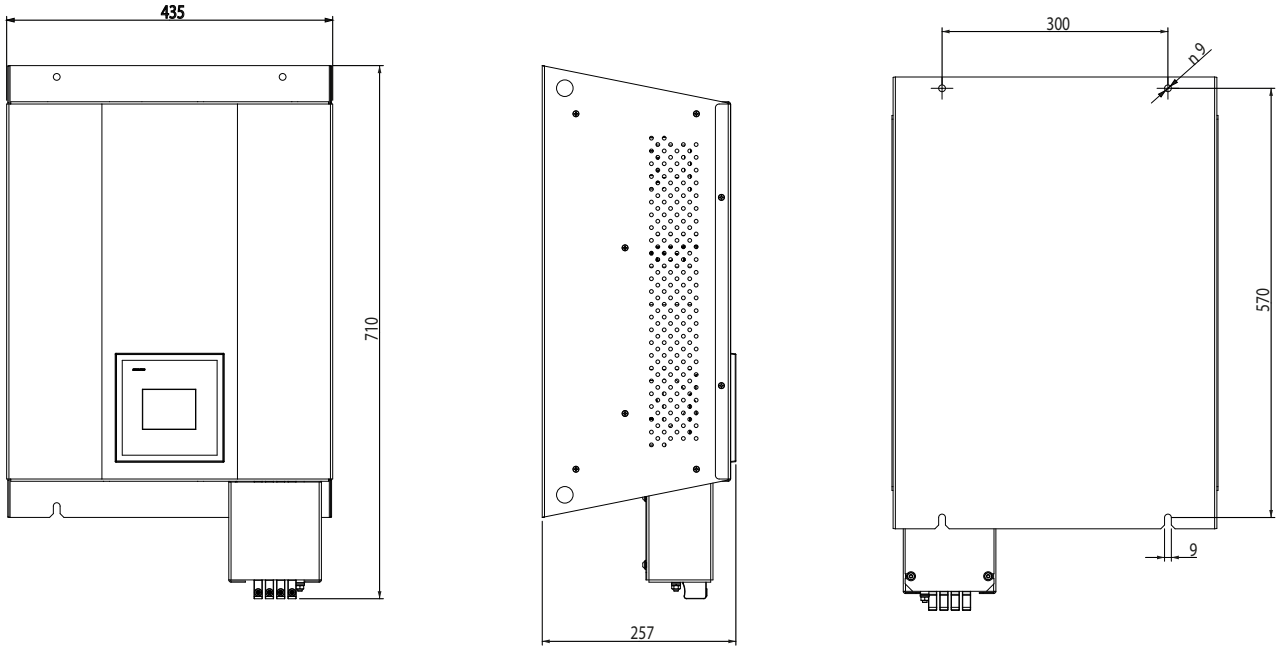
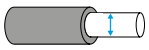


Figure 90: Dimensions : SINAF3xxx030F with EMI filters.

Mechanical features: SINAF3xxx100xR				
Dimensions (mm)	**Figure 91**			
Weight	70 kg			
Enclosure	Galvanised steel 1.5 mm			
Noise	< 65 dBA			
Connections	**Type**			
Main	M8 ring terminal	23 mm	8 ... 10 Nm	PH2
Earth	M6 ring terminal	-	10 ... 14 Nm	Hex 17 mm
Connections	**Type**			
Current	6-pole connector	2.5 mm^2	0.5 ... 0.6 Nm	Flat 3 mm
RS-485	3-pole connector	2.5 mm^2	0.5 ... 0.6 Nm	Flat 3 mm
Ethernet	RJ-45	-	-	-

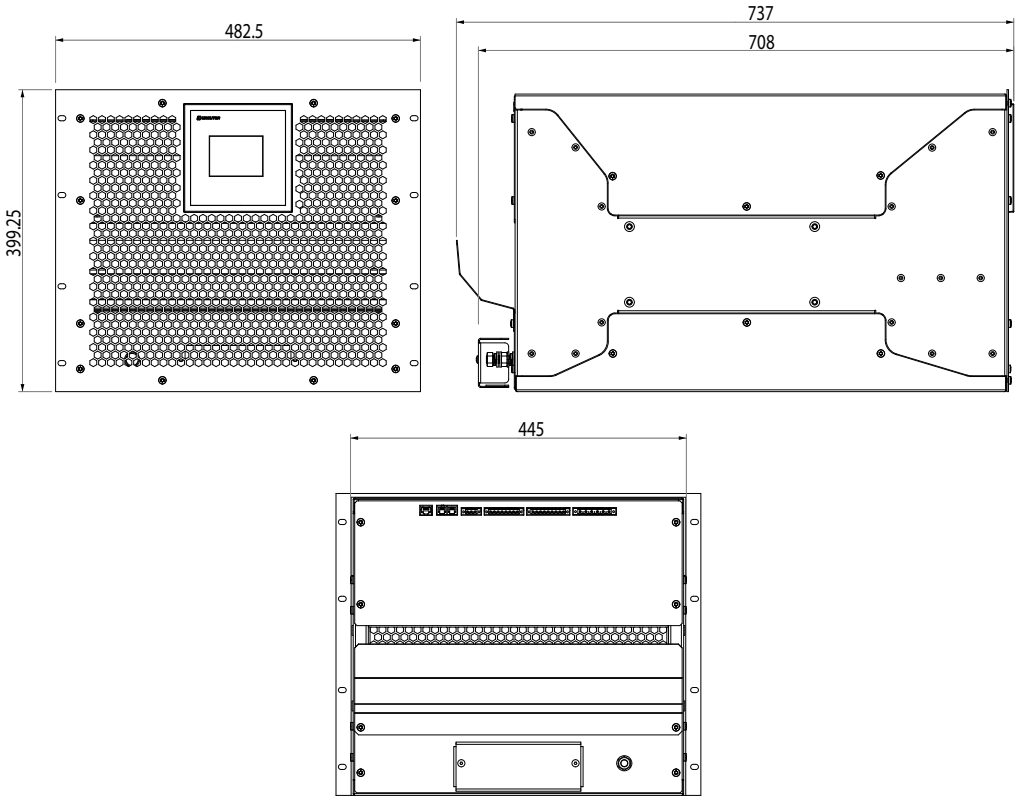
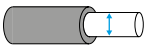


Figure 91: Dimensions : SINAF3xxx100xR.

Mechanical features: SINAF3xxx100				
Dimensions (mm)	**Figure 92**			
Weight	206 kg			
Enclosure	Free-standing sheet steel cabinet, for installation indoors, without removable parts.			
Noise	< 65 dBA			
Connections	**Type**			
Neutral	Ring terminal	12 mm	35 Nm	Hex 13 mm
Earth	Ring terminal	12 mm	35 Nm	Hex 13 mm
Connections	**Type**			
Main	Terminal strip with cover	35 mm^2	6 Nm	Allen 6 mm
Current	6-pole connector	2.5 mm^2	< 0.8 Nm	Flat
RS-485	3-pole connector	2.5 mm^2	0.5 ... 0.6 Nm	Flat 3 mm
Ethernet	RJ-45	-	-	-

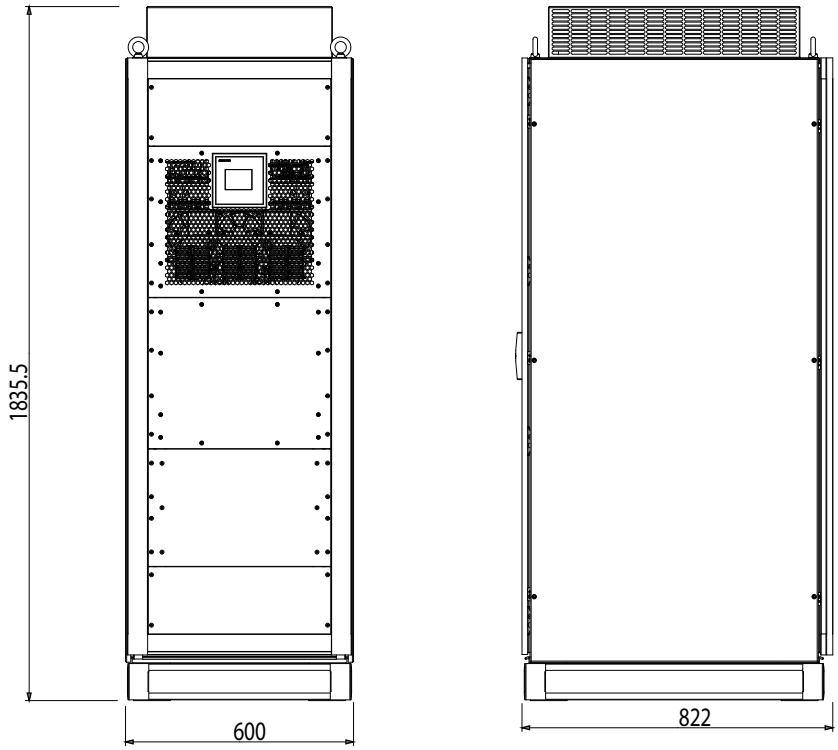
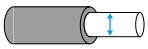


Figure 92: Dimensions: SINAF3xxx100.

Mechanical features: SINAF3xxx200				
Dimensions (mm)	**Figure 93**			
Weight	276 kg			
Enclosure	Free-standing sheet steel cabinet, for installation indoors, without removable parts.			
Noise	< 65 dBA			
Connections	**Type**			
Neutral	Ring terminal	12 mm	35 Nm	Hex 13 mm
Earth	Ring terminal	12 mm	35 Nm	Hex 13 mm
Connections	**Type**			
Main	Terminal strip with cover	35 mm^2	6 Nm	Allen 6 mm
Current	6-pole connector	2.5 mm^2	< 0.8 Nm	Flat
RS-485	3-pole connector	2.5 mm^2	0.5 ... 0.6 Nm	Flat 3 mm
Ethernet	RJ-45	-	-	-

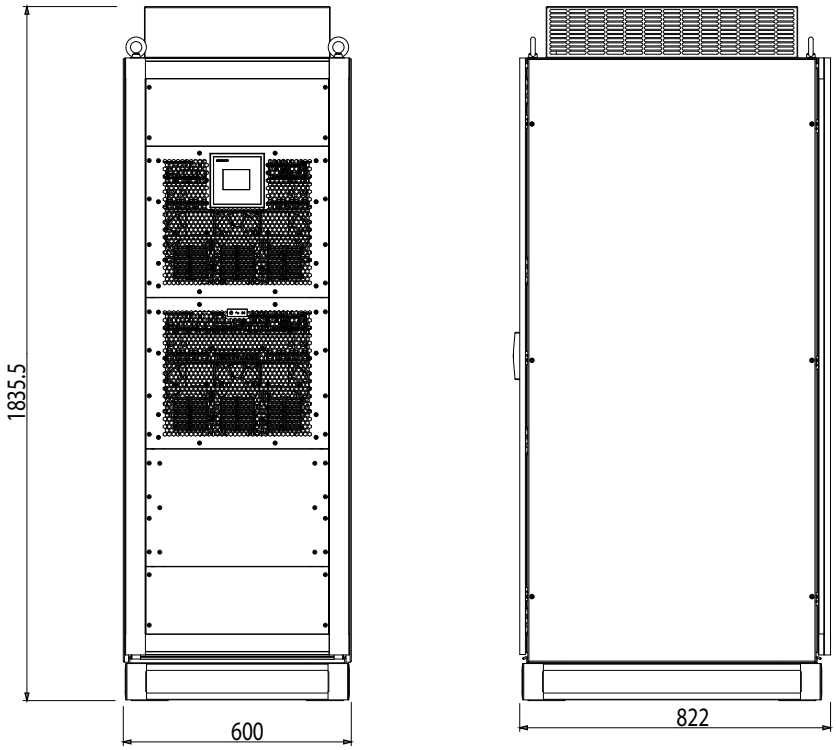


Figure 93:Dimensions: SINAF3xxx200.

12.- TECHNICAL SERVICE

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

Technical Assistance Service
C/Vallès, 32 - Pol. Ind. Can Bernades
08130 Santa Perpètua de Mogoda (Barcelona)
Tel: (+34) 935 747 017

13.- GUARANTEE

LIFASA guarantees its products against any manufacturing defect for two years after the delivery of the devices.

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

• No returns will be accepted and no device 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 devices 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.
• **LIFASA** accepts no liability due to the possible damage to the device 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 device. 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.

14.- CE CERTIFICATE

INTERNATIONAL CAPACITORS, S.A.
C/. Valles 32 - Pol. Ind. Can Bernades
08130 Santa Perpètua de Mogoda (Barcelona) Spain
Tel.: +34 935 747 017 - Fax: +34 935 448 433
E-mail: intc@lifasa.com | Web: www.lifasa.com

DECLARACION DE CONFORMIDAD

DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE

Por la presente
We hereby
Par le présent

INTERNATIONAL CAPACITORS, S.A.

con dirección en:
with address in:
avec adresse à:

Polígono Industrial Can Bernades
Calle Vallés nº 32
08130 Santa Perpètua de Mogoda (Barcelona)
ESPAÑA

declaramos bajo nuestra responsabilidad que el producto:
we declare under our responsibility that the product:
nous déclarons sous notre responsabilité que le produit:

Filtro activo multifunción **Serie SINAF 3.0**

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,
Provided that it is installed, maintained and used in application for which it was made, in accordance with relevant installation standards and manufacturer's instructions,
Toujours qu'il soit installé, maintenu et utilisé pour l'application par lequelle il a été fabriqué, d'accord avec les normes d'installation applicables et suivant les instructions du fabricant,

cumple con las prescripciones de la(s) Directiva(s) :
complies with the provisions of Directive(s) :
accomplie avec les prescriptions de la (les) Directive(s) :

2014/35/ UE
2014/30/ UE
2011/65/ UE

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativo(s) :
It is in conformity with the following standard(s) or other normative document(s) :
Il est en conformité avec la (les) norme(s) suivante(s) ou autre(s) document(s) normatif (ves) :

IEC 61000-6-4-:2006+amd.2010
IEC 61000-6-2-:2016
EN 62477-1:2012
EN 61439-1:2011

Año de colocación del marcado "CE" :
Year of affixing "CE" marking:
An de mise en application du marquage "CE":

2015

Santa Perpètua, 04 /10 /2017

Nombre y Firma : J.J. Gallego
Name and signature :
Nom et signature :

INTERNATIONAL CAPACITORS, S.A.

lifasa.com

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