

Smappee Plus Manual

for Professional Installers



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Welcome to Smappee



Welcome to the world of Smappee.

You will soon notice that Smappee offers nothing but benefits. Immediately after its installation, Smappee will give you clear insight into your energy consumption. This will allow you to achieve savings straight away, without any concessions to comfort. And that's not all: you can now leave the house without any worries. After all, you can simply use the app to check whether or not you have turned off all your appliances.

Smappee will soon become part of your life. You will automatically become more conscious of how you use energy, which will contribute to a better environment for us all. Not only for us, but also for the following generations. And that might just be the biggest benefit of all.



Stefan Grosjean, C.E.O. Smappee

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Safety Instructions

Safety Warning

Installing Smappee Plus requires working with dangerous voltages inside electrical panels and must therefore only be done by a qualified professional. Follow the guidelines below for a safe, code compliant installation:

1. Perform installation in accordance with the applicable National Electric Code (NEC) and other local requirements per the Authority Having Jurisdiction (AHJ) where the system is being installed.
2. Wear appropriate and required personal protective equipment (PPE), and take all necessary precautions to avoid injury.
3. Work safely by disconnecting power upstream from the installation.
4. Install Smappee Plus only in approved breaker panels or enclosures.
5. Mount Smappee Plus inside a junction box when mounted externally in an outdoor location for protection against moisture, direct sunlight or physical damage of conductors.
6. Ensure junction box is grounded if metallic, adequately supported with minimum working clearances, has proper NEMA rating if mounted outdoors, does not exceed fill rating and utilizes proper raceway and fittings.
7. Use properly rated conductors (minimum 250V) for the application and ensure they are protected and secured using code compliant methods.
8. Do not open the equipment or attempt to repair or service any part of the Smappee Plus monitor.
9. Do not use the Smappee Plus monitor, current transformers (CTs) or cables if damaged.
10. Do not expose Smappee Plus to excessive heat or cold (storage temperature: -20°C to 70°C / -4 °F to 158°F), flame, or immerse in water or other liquids.
11. The wires used for the voltage connection must have an insulation suitable for the connected voltages, with sections from 0.75 and 2.5mm². The tightening torque must be between 0.5 and 0.6 Nm.

Safety precautions

Please observe the following safety precautions in order to avoid potential electrical shock, fire or personal injury:

- Do not use this Product for any purpose other than for which it was intended.
- Do not open the equipment or touch any of its electronic circuitry.
- Do not attempt to repair or service any part of the Smappee Plus.
- Only use the cables which were delivered with the Product.
- Do not use the Product if damaged.
- Do not use damaged current transformer or cables.
- Do not immerse the Product in water, or any other liquids.
- Do not expose the Product to heat, flame or extreme cold.

Product Identification

- Product Article Number: monitor-e2

Specifications

- Dimensions: 180x130x35mm (7x5.1x1.38 in)
- Weight: 300g (10.6 oz)
- Operating temperature: -10 - +50°C (14 - 122 °F)
- Storage temperature: -20 - +70°C (-4 - 158 °F)
- Relative humidity: 80% at 0 - +50°C (32 - 104 °F)
- Operating altitude: 0 – 2.000 m (0 - 6561 ft)
- EMC: EN 55022 (Class B)
- Safety: conforms to UL/IEC/EN 61010-1 Ed3 2010, CAT II
- Power supply: 100 – 240 Vrms / 50..60 Hz
- Inputs: Ph1,Ph2,Ph3,N
- Voltage measurement inputs : Ph1,Ph2,Ph3,N
 - Topology and max. ranges:
 - Single phase; 240 Vrms
 - Split phase: 240/480 Vrms
 - 3 phase 3 wire : 277 Vrms
 - 3 phase 4 wire : 277/480 Vrms
 - Frequency: 45..65 Hz
- Power consumption: Max. 5W
- IP rating (IEC 60529) : IP X0
- Impact rating (IEC 62262) : IK 06 (Impact energy level : 1J)

Explanation of symbols related to safety

The table below explains the symbols related to safety.



Class II equipment, does not require a safety connection to electrical grounding.



Device has been tested according to IEC 62262 and complies to impact class 6. (Impact energy : 1 Joule).

Residual safety risk

- The device's housing has IK6 impact immunity level. Therefore, attention needs to be paid during installation not to damage the housing.
- When there is visible damage to the device's housing, it is recommended to have the device replaced in order to prevent any hazardous situation to occur.

Maintenance

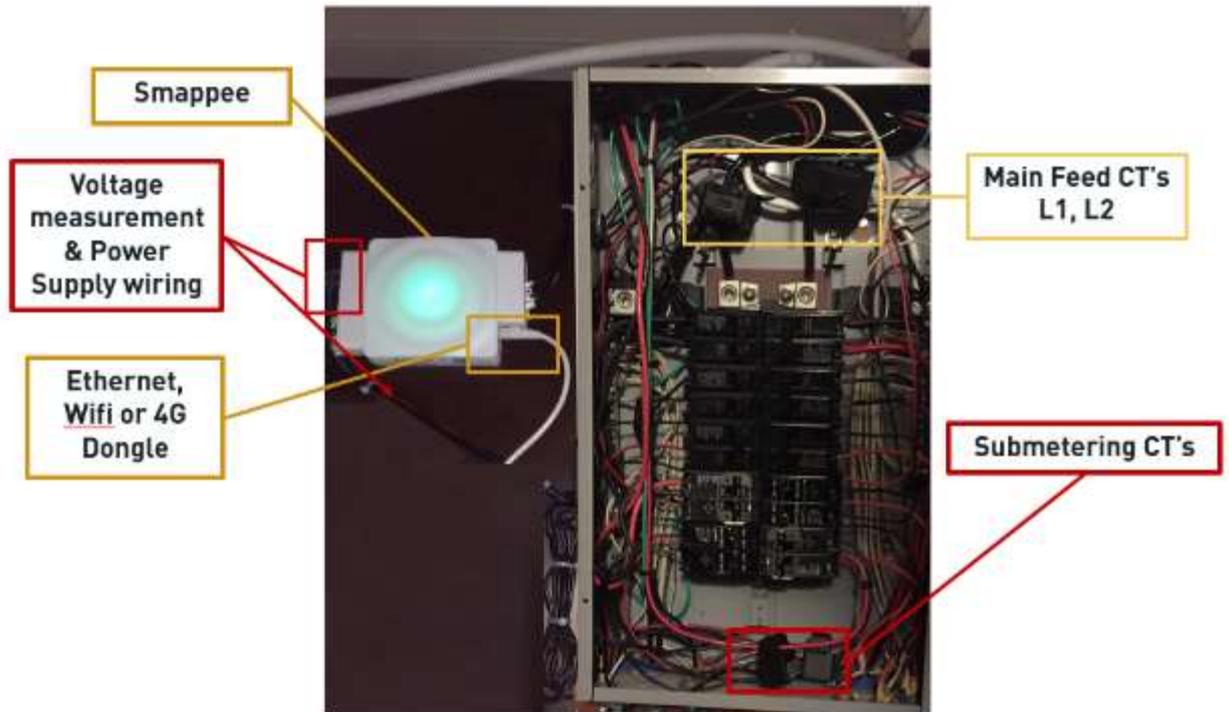
- Clean only the outside with a dry, clean cloth.
- Do not use abrasive agents or solvents.

Support

You can find FAQs, installation videos and full installation manuals on our support webpage: www.smappee.com/be_en/support.

For other support questions, please send an e-mail at support@smappee.com.

Installation overview



Example of a complete Smappee Plus Installation on a US Split phase (240V) installation with solar and a wiring harness used for voltage measurement and power supply. Ethernet used for internet connection.

Smappee Plus components

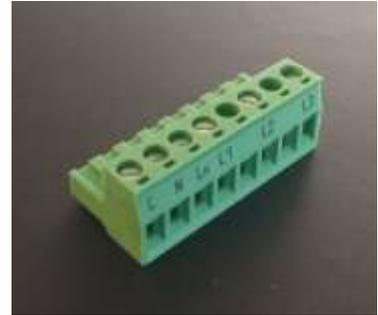
What comes in the box



Smappee Plus monitor
(The brain!)



External Wi-Fi module
(connects Smappee to internet and app)



Voltage Terminal
(power supply, measures voltage of power phases)



Smappee License Key
(unique id for app)



Current Transformer 50A (6x)



Current transformer 200A (2x)

Optional Hardware :



Smappee Switch



Current transformer 100A

Planning and site preparations for Smappee Plus installation

Prior to installing, complete the following items and gather the appropriate tools and supplies necessary to complete the installation:

- Choose which loads to measure (Main Service, Solar, HVAC, Pool Pump, EV charger, etc.) and determine where their circuit breakers are located (main service panel, sub-panel).

Fill in the Configuration template (see Appendix)

Input	Description	Phase	Breaker rating	240V load
1				
2				
3				
4				
5				
6				
7				
8				
9				

- Verify there is space to install CT's on these circuits. (See Appendix for examples and template)
- Verify the service voltage split phase (110-220V) is in place. If not, check the non-US installation manual.
- Complete the configuration table in the appendix section for each load to be measured including description, phase, breaker rating and whether it is a 120V or 240V load.

Note: the power supply of the Smappee may only be between 100V and 240V.

- Determine if there is adequate space to mount Smappee Plus adjacent to the panel.
- Assess existing breakers in the electric panel to determine if there is an available 10A/15A/20A 2-pole breaker or code compliant method to combine with an existing 10A/15A/20A 2-pole breaker.
- Select the best method of connecting to internet and verify signal (ethernet, Wi-Fi...).
- Download the latest Smappee app on smartphone or tablet.

Tools: Multimeter, screwdrivers (mini flathead and phillips), wire strippers, flashlight, needle nose pliers, sharpie and utility knife. (Optional: drill and drill bits, hammer).

Supplies (not included): Zip ties, (Optional: 2-pole 10A/15A breaker, wire nuts, junction box - 8" x 8" x 4" or larger, conduit, fittings). Labels to identify the CT's.

Overview installation - Step-by-Step

1. Turn off Power
2. Remove panel cover
3. Mount Smappee Plus monitor
4. Connect the voltage measurement and power supply wiring
5. Connect current transformers (CT's)
6. Plug in the internet connection
7. Verify and replace covers
8. Turn on Power
9. Smappee account creation and activation
10. Smappee channel input configuration
 - 10.a Configuration – Expert Portal (Recommended)
 - 10.b Configuration – Smappee app
11. Final installation checkup
 - 11.a Final installation checkup – Expert Portal (Recommended)
 - 11.b Final installation checkup – Smappee app
12. Share Smappee with other Smappee user

Step 1: Turn off Power

Open main electrical panel and shut off the main breaker. If you have a solar electric system, shut off the inverter(s) and wait at least 5 minutes. Be sure to have a flashlight, PPE and all tools and supplies readily accessible before starting.



WARNING: Use lock-out tag-out procedures to ensure power remains off until Smappee installation is complete.

Step 2: Remove panel and Smappee covers

Remove the screws that secure the panel cover to reveal the wires going to each breaker and the main feeders from the utility going to the main breaker. If the loads to be measured are in a sub-panel, open that panel instead.

 **WARNING:** Wires and other parts inside the main panel may still be energized upstream from the main breaker even after it is shut off so use caution.

Accessing the Connectors

To get full access to all connectors of the Smappee monitor, you should remove the two covers.

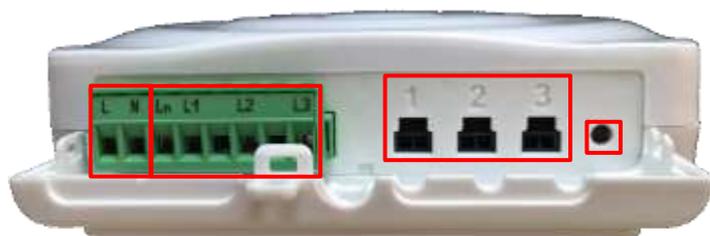
For removing the covers, insert a screwdriver at the sides of the covers and carefully pull up the cover.



Connectors at the Front

The picture shows the connectors at the front.

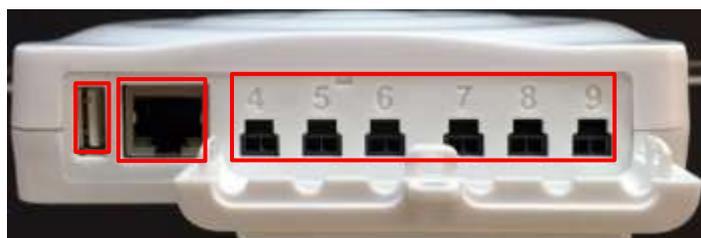
- Power supply
- Voltage terminal
- CT connectors 1 to 3
- Reset button



Connectors at the Back

The picture shows the connectors at the back.

- USB port
- Ethernet port (LAN)
- CT connectors 4 to 9

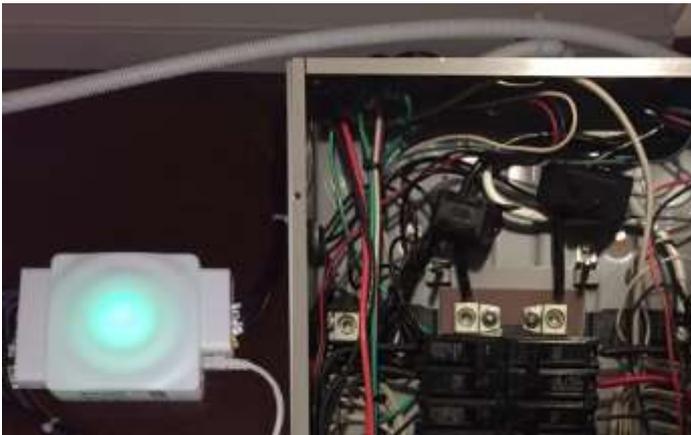


Step 3: Mount Smappee Plus monitor

Find a suitable location just outside of the electrical panel and mount the Smappee Plus monitor to the wall using screws. Note: The Smappee can only be mounted indoors.

Hint:

- If the Smappee is mounted inside a metal box, use only Ethernet Connection. Wi-Fi or 4G can be disturbed.
- Take a photo of the serial number on the side of the monitor prior or write it down to mounting for easy scanning later when configuring the system.



Monitor mounted on wall electric panel



Monitor positioned on top of electric panel

Step 4: Connect the voltage measurement and power supply wiring

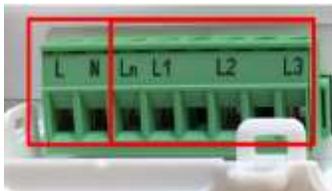
Remove the Smappee Plus monitor covers with a flathead screwdriver and locate the wiring harness unit (green 8-pin connector block)



Locate an appropriate breaker to mount the voltage wiring. If possible, mount an additional breaker for the Smappee Monitor.

All wires used should have a diameter between 0.75 and 2.5mm².

Smappee measures the various voltages and individual phases and the Neutral wire of the electrical installation if present. These wires need to be connected to the inputs of the green 8-pin connector block.



Input overview:

- L - N: Power supply (**between 100V and 240V**)
- L1 - L3: Measurement inputs for the voltage and phase of each phase wire.
- Ln: Measurement input for the Neutral reference.

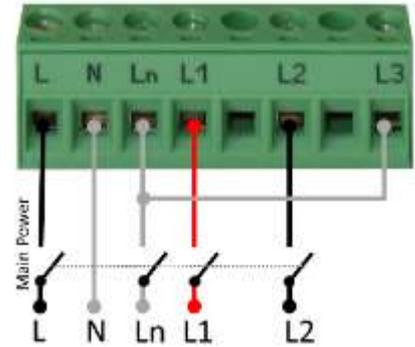
Notes:

- To measure the Neutral reference correctly, always connect the Input Ln explicitly to the Neutral wire. There is NO internal link with the Neutral line of the main power supply.
- A circuit breaker should always be used for the power supply. The circuit breaker should be located close to the monitor and be easily reachable.
- The circuit breaker should always be the disconnecting device for the Smappee monitor.

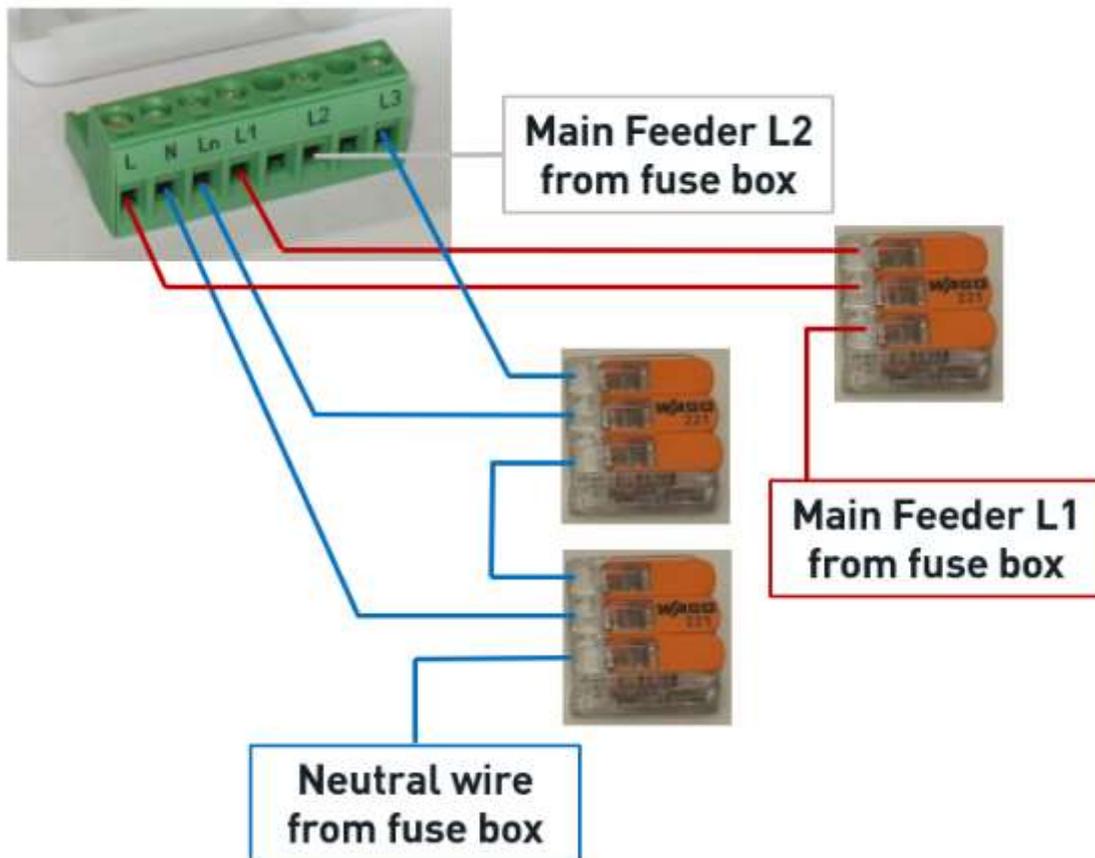
- All wires used should have a diameter between 0.75 and 2.5mm².

US Split phase (180°)

1. Identify the two phase wires L1 and L2 and the Neutral wire.
2. Connect the Neutral wire to the Ln and L3 connector of the voltage measure terminal.
3. Connect the phase cables to the corresponding inputs:
 - Phase cable L1 to the connector L1
 - Phase cable L2 to the connector L2



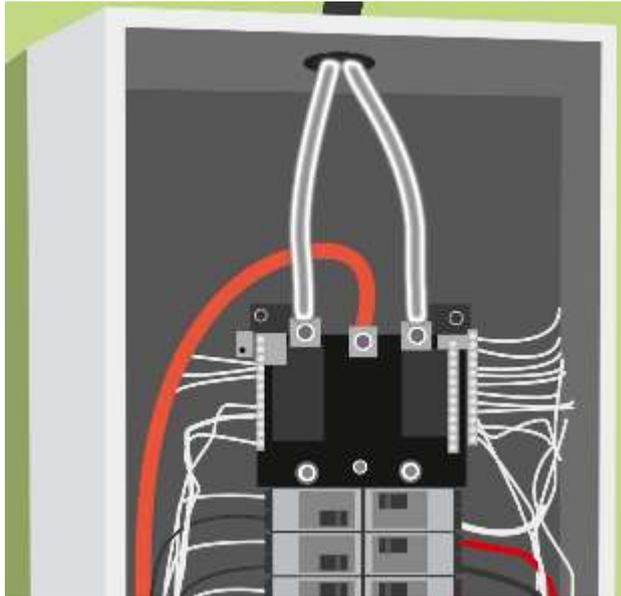
Hints: When no auxiliary power supply is used, you can create branches using wagos for voltage wiring.



Step 5: Connect current transformers (CT's)

Attach the Smappee current transformers (CT's) around the circuits that were selected to be measured during the planning stage. Refer to the configuration table (appendix) that was completed at the planning stage to ensure you are connecting the correct CT's on the correct phases.

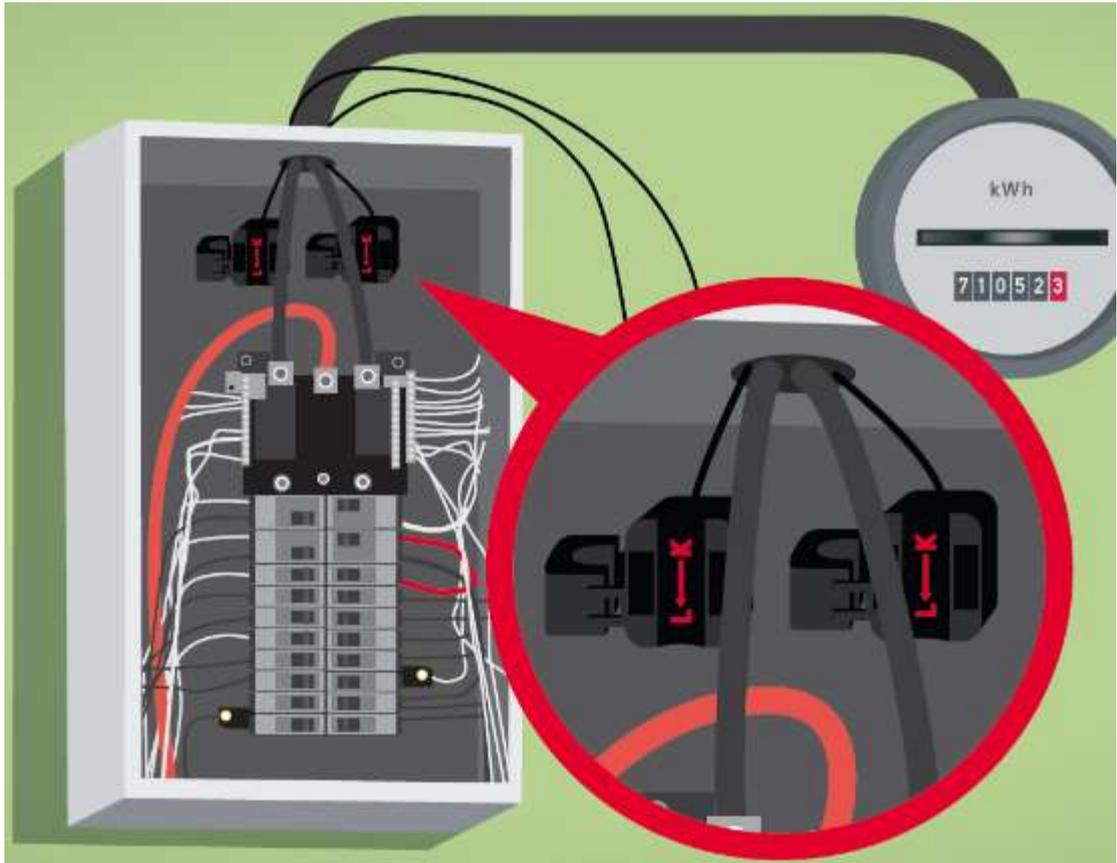
1. Identify the power cables



Hint: Label both ends of the CT's with the included labels, so it is easy to identify which load and phase they correspond to when plugging into the Smappee Plus monitor and later when configuring on the Smappee app.



2. Mount the current clamps in correct direction around the power cables



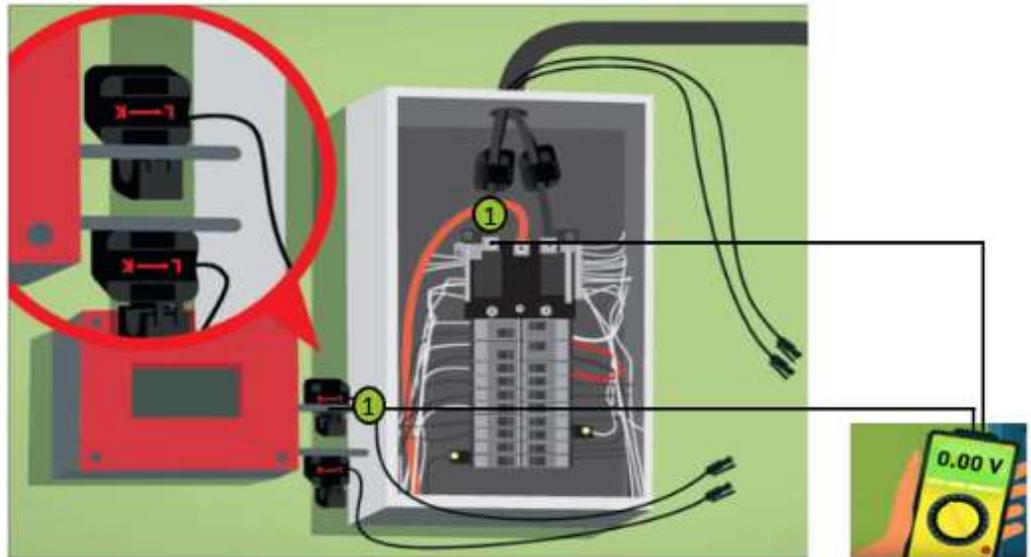
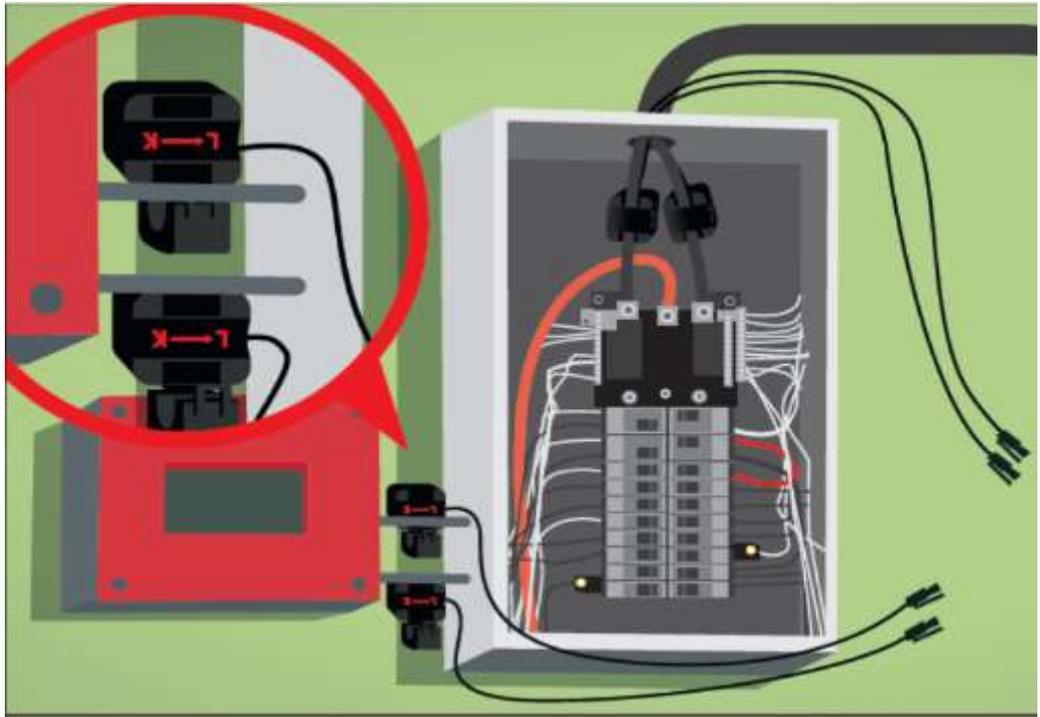
Open the CT, wrap it around the circuit and then close it tight.

Note: Pay close attention to the direction of the arrow on the CT. The arrow always points towards the electrical load (i.e. in the direction of the energy flow).

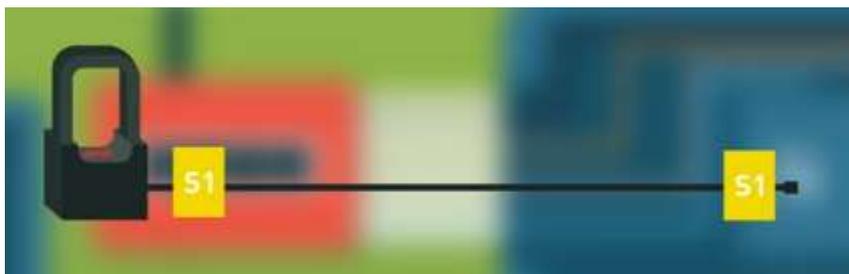


Use one CT on each phase of the load and ensure it has a rating equal to or greater than the breaker rating protecting the circuit (i.e. 200A CT for a main circuit with a 200A breaker rating). Then plug the other end of the CT into the corresponding inputs (1-9) on the Smappee Plus monitor.

3. If Solar is present: Identify the phases of the Solar inverter: Phase one of the Main Feeder needs to be corresponding with the phase one of the solar inverter (Phase Mapping). Validate using a Multimeter:



Hint: also Label the CT's of the solar Inverter.



- To apply Submetering, a CT needs to be mounted on the phase wire (one with Single-Phase (120V), 2 when on (240V). The configuration of the CT as total load or as submetering is done in the configuration (see later).

Hints:

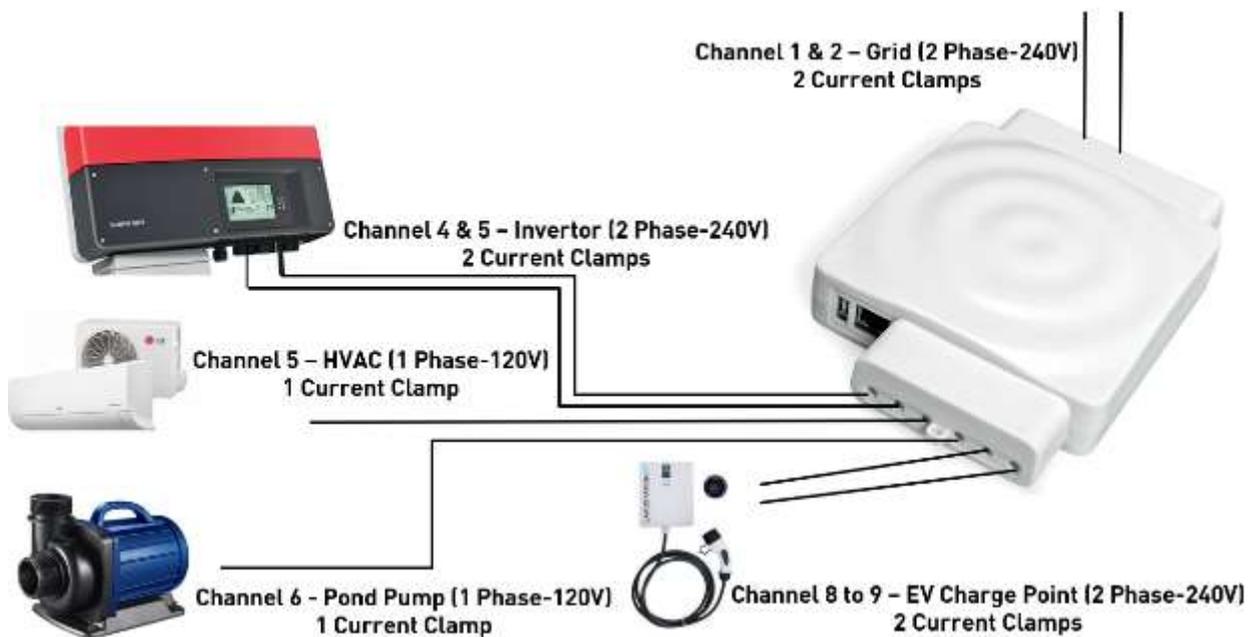
- Label each CT with a name and the corresponding phase on which it is measuring
- Number each Main Feed Phase on the differential switch with a label.
- To check on which phase number of the Submeter are in comparison with Main Feeder, using the Multimeter to check (see Solar)

IMPORTANT

- When submetering in 240V configuration, always mount a CT around **each** phase.
- Smappee only supports CT's that are or can be supplied. No other CT's should be used.



Example of submetering on a Single-Phase 120V circuit



Example of Smappee Setup with CT connection with a 2-Phase (240V) solar circuit, EV charge point and a 1-Phase (120V) pond pump, HVAC installation and submetering.

Step 6: Plug in the internet connection

Choose the best method of connecting the Smappee Plus monitor to the internet from the following options:

- a) Ethernet cable
- b) External Wi-Fi module (USB): This option requires a strong Wi-Fi signal from a local network at the monitor. Plug the antenna into the USB port of the monitor and follow the prompts on the Smappee app to establish connection.
- c) 4G Dongle

Notes:

- The Wi-Fi dongle is only included with the Smappee Plus package, not with the Smappee Pro (has to purchased separately)
- Ethernet is the preferred connection method, followed by Wi-Fi. 4G Dongle only advised when no internet connection is available on the location.
- **All network cables and USB devices must be inserted or removed while power is OFF.**



Smappee using Ethernet Connection



Smappee using Wi-Fi Connection

Step 7: Verify and replace covers

Verify all connections are properly made and are secure

- Electrical connections must be properly tightened and secured at the breakers, 8-pin connector block and at the Smappee Plus monitor CT inputs
- CT's must be fully closed around circuits and snapped tight
- Wi-Fi antenna USB or ethernet cable must be plugged into the monitor (before power ON)

Replace the cover on the electrical panel and label the Smappee breaker(s). Then mount the cover caps on the monitor to cover all electrical connections and use zip ties to secure conductors together. If the monitor was installed inside a breaker panel, keep the cover open during the next two steps to observe the status lights.



Step 8: Turn on Power

Switch on the main breaker. Then switch on the power to the Smappee Plus monitor at the breaker.

Smappee Plus will take at least 3 minutes to fully initiate once powered on for the first time. It is advised to wait 5 minutes to review.

After this initiation, you should see either:

- **Ethernet:** Green steady light
- **Wi-fi:** Blue flashing light
- **4G dongle:** Steady (Blue, Green, Cyan): Successfully connected. The dongle is successfully connected to the cellular network.

If you see one of these colors, proceed to the next page of this manual.

If, however, Smappee shows a different color, please refer to section "Troubleshooting Internet and Cloud Access"

Either of these light patterns indicate that Smappee is ready to be installed by the Smappee app. If you don't see either of these light patterns, visit https://www.smappee.com/be_en/support/to_troubleshoot.

Colors of the Smappee Light

The table below provides an overview over all colors that may be shown during the installation.

Color		Description
Green Breathing		All good. The monitor is working correctly. You can continue the next steps for installation and configuration.
Blue Steady		The monitor is starting up. This may take up to 3 minutes. The light may briefly go dark during that time.
Green Steady		Network connectivity successful, but Smappee not yet connected to a user account. <ul style="list-style-type: none"> Ethernet: Connected to the local network. Wi-Fi: Connected to the Wi-Fi and the local network (i.e. the Wi-Fi password is correct) 4G dongle: Connected to the 4G network.
Blue Flashing		The monitor is ready to be connected to the local Wi-Fi network and to be installed on the App.
Red Steady		The monitor is missing connectivity with internet during startup. Connection issue.
Red Flashing		The monitor had a previous working internet connection but has now lost connectivity to the internet.
Orange Steady		The Wi-Fi hotspot access point has been activated, in order to allow the Smappee to receive a new Wi-Fi password.
Orange Flashing		Smappee is trying to open an Wi-Fi hotspot access point. Please wait a few seconds. The light will turn Orange Steady in a few moments.

Colors of 4G dongle

Any steady (Blue, Green, Cyan)	Successfully connected. The dongle is successfully connected to the cellular network.
Any slow blinking (Blue, Green, Cyan)	The dongle is registering with a cellular network.
Green fast blinking (1 per second)	Stick is powered on. No connection.

Wi-Fi connection details

In case of Wi-Fi connection problems, check the following points:

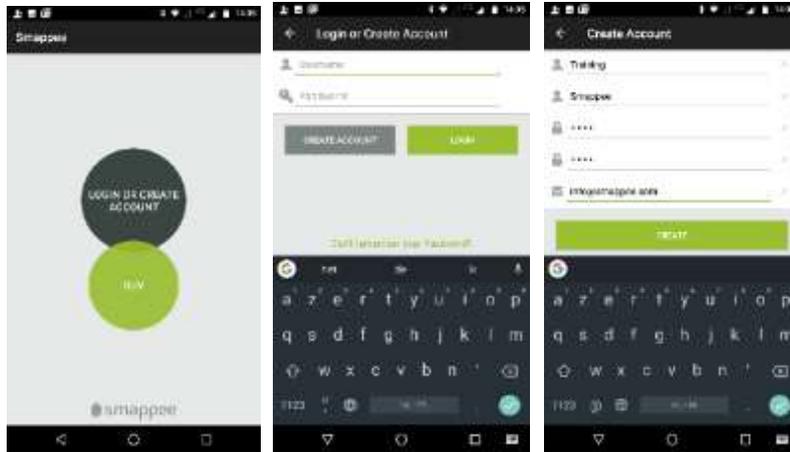
- a. 2.4 GHz Wi-Fi required, preferably with automatic channel selection
- b. WPA or WPA2 encryption mandatory
- c. Networks without security are not supported
- d. SSID needs to be visible and may not be hidden during install
- e. Make sure that your SSID does NOT contain one of the following characters:
é,ç,è,ä,/, ", à î ô ï
- f. Allow special characters for the Wi-Fi password: # \$ % @ ? / \
- g. Double-check your password
- h. Double-check that your smart phone is connected to the correct Wi-Fi network, not to a hotspot or other networks where you have your password configured
- i. If you use WPS, check that it is active on the router
- j. Make sure that MAC filtering is not active
- k. Your firewall should allow Smappee to create https outbound connections (port 443)
- l. Parental control also might prevent internet access based on time of day
- m. The maximum number of characters for the WPA2/PSK when using an iOS device during installation is 20.

Note: The IP address of Smappee is assigned by the DHCP of your router.

Step 9: Smappee account creation and activation

The Smappee account creation and activation is done in the Smappee app.

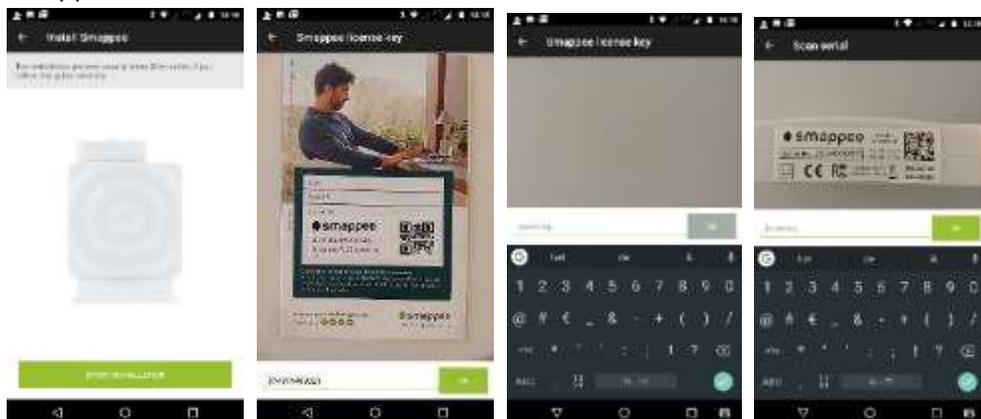
1. Create an account.



2. Select “Install a new Smappee monitor” then select “Smappee Plus”.



3. Start the installation and follow the instructions in the app for activation of your Smappee.



- Select which color the Smappee is showing and follow the instructions in the app.



- Proceed to "Configuration" once the Smappee Plus monitor has successfully connected to the network.



- Select home electrical configuration: North America, Split Phase



7. Select the number of dials on the meter and then save.



Step 10: Smappee channel input configuration

For the channel input configuration, 2 methods can be used:

- Expert Portal (10.a)
- Smappee mobile app (10.b)

Using the **Expert Portal is recommended** as it displays more values in real-time which enables better and faster validation of the installation and configuration. The usage of the expert portal is not suited for small mobile devices. Best option is a tablet or using a laptop.

The following parameters can be configured for each input are equal for both Expert Portal or Smappee app. This is a critical step and you should refer to the configuration table created during the planning stage (see Appendix):

This table shows the settings for the configuration of each CT.

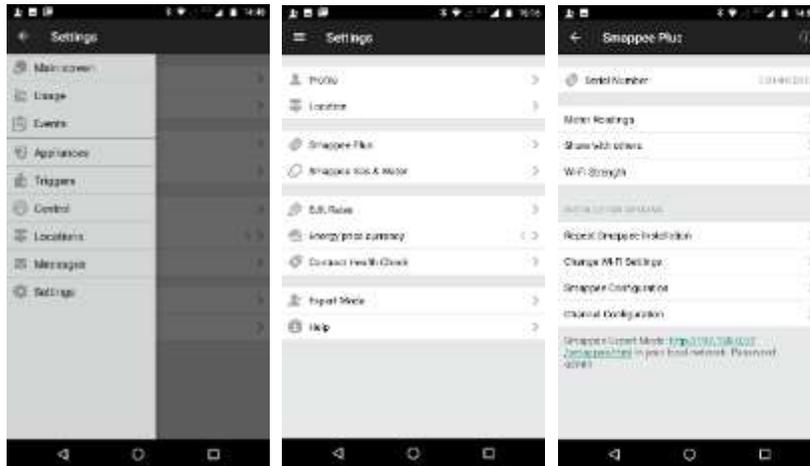
Setting	Description
Input	Number of the Input connector on the Smappee.
Name	Provide a name for this specific input. Note: You should carefully select an unmistakable name, since it is used in many user-facing locations on the websites and the App.
Phase	Configure the phase that the CT of this specific input is measuring.
Type	In the type menu, you can choose between 3 options: <ul style="list-style-type: none"> • Consumption • Production • Unused For more information regarding this choice please see page 72.
Connection	Here you can choose what connection type the CT is: <ul style="list-style-type: none"> • Grid - CT measures the total consumption of the installation • Off-Grid - CT measurements are added on top of the total • Submeter - CT measurements are sub-sets within the total
Reversed	Select this checkbox to invert the 'direction' of the current transformer. This option is equivalent to physically re-install the CT with the arrow pointing in the other direction. Note: This option should only be used if it is physically impossible to install the CT correctly.
NILM (Appliance Detection)	Select this checkbox to activate the automatic appliance detection on that particular input.
Balanced 3x	When selected, the CT measures (only) one phase of a three-phase line, and extrapolates the total power over the three phases. This setting is useful for submetering of three-phase load with a single Current Transformer. It yields good results as long as the load over the three phases is "balanced".

Step 10.a: Configuration – Expert Portal (Recommended)

Using the Expert Portal is recommended as it displays more values in real time which enables better and faster validation of the installation and configuration. The usage of the expert portal is not suited for small mobile devices. Best option is a tablet or using a laptop.

Note: The tablet or laptop needs to be connected to the same network as the Smappee monitor to be able to use the Expert Portal.

1. Go to the Smappee Plus using ‘Settings’ – select Smappee Plus



2. Fill in the URL mentioned in Smappee Expert Mode:

Smappee Expert Mode: <http://192.168.0.52/smappee.html> in your local network. Password: admin

3. Click on  and fill in password (see password in previous screenshot)



4. Wifi-connection only: click on **system info** and review the Signal strength:
- -100 to -65 is poor
 - -65 to -35 is good (normal)
 - -35 to 0 is excellent

The screenshot shows the 'Statistics...' section of the smappee interface. A table lists various system metrics. The 'Signal strength' row is highlighted with a red box, and a red arrow points to it from a text box on the right. The text box contains the following information:

Check Wi-Fi signal Strength
 -100 to -65 is poor
 -35 - 0 is excellent

Key	Value
WiFi & networking	
IPV4 quality	55/100
Signal strength	-33 dBm (better: (-20 excellent) (-35 -30 good) (-60 poor)
SSID	AGH10101

If the signal strength is poor, please take action in order to increase the Wi-Fi signal quality. The value updates in real time.

5. Actual installation validation: click on **configuration**
- Review the Config Parameter is set to Star (N)

Config parameter	Setting
3 phase configuration	<input checked="" type="radio"/> Star (3+N) <input type="radio"/> Delta (3)

- Review if voltages are displayed and correct (displayed in real-time)

Phase	voltage
1	121.8 V
2	121.5 V
3	0 V

- Review if all channels to that are used are displayed as 'connected'

CT1 connected	CT2 connected	CT3 connected
CT4 connected	CT5 connected	CT6 connected
CT7 connected	CT8 N/A	CT9 N/A

6. Click on **channel configuration** and setup each channel (1-9):
- Enter the Name from the configuration table (i.e. Main Feed, Solar, EV, Submeter).
 - Select the phase of the channel (load) (i.e. 1, 2, 3) => **Later on, the phase-mapping will be validated using the process description later on.**
 - Choose Consumption type, whether it is a Consumption load, Production (solar/wind/battery) or Unused load.
 - Select the Connection load type:
 - Grid - CT measures the total consumption of the installation
 - Off-Grid - CT measurements are added on top of the total
 - Submeter - CT measurements are sub-sets within the total
 - Select Reversed if the direction of the CT (channel) is inverted and you are unable to install the CT correctly.
 - Select NILM to activate automatic appliance detection on an aggregated load (i.e. Main Service).
 - Select Balanced if the CT measures only one phase of a 3-Phase line (Software will multiply the measurement by 3).
 - Select Channel type to indicate current rating of the CT used (50A, 100A, 200A or others (Smappee Pro only)).



Monitor channel configuration

Input	Name	Phase	Type	Connection	Reversed	Nilm	Balanced [x3]	CT type
CT 1	main GRID phase 1	phase 1	Consumption (load)	Grid (total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 2	main GRID phase 2	phase 2	Consumption (load)	Grid (total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 3	Solar production phase 1	phase 1	Production (Solar/Wind/Bat)	Grid (total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 4	Solar production phase 2	phase 2	Production (Solar/Wind/Bat)	Grid (total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 5	Pool (CT 6)	phase 1	Consumption (load)	Submeter (not in total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 6	Pool (CT 6)	phase 1	Consumption (load)	Submeter (not in total)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 7	Evcar (CT 7)	phase 1	Consumption (load)	Submeter (not in total)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 8	Green (CT 8)	phase 2	Consumption (load)	Submeter (not in total)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT 9		phase 1	Unused		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A

Update and restart meter engine

Note:

- After each change, click **Update and restart meter engine** to store and activate changes

7. Click **configuration** to review the channel inputs and validate that the measurements are visible and updated in real time.
- For single-phase installations where you are sure that the location and direction of the current clamps is correct, all values should be correct.
 - For three-phase installations, the values could be incorrect. Please see the next point (8).

Note: Repeat **Update and restart meter engine** after each change.

Info	Channel	Current	Active power	Reactive power	Cos fi
consumption1	1	0.326 A	8.434 W	78.026 var	10 %
consumption2	2	0.141 A	11.377 W	32.199 var	32 %
consumption3	3	0.589 A	99.865 W	101.183 var	69 %
consumption4	4	0.333 A	1.826 W	80.29 var	1 %
consumption5	5	0.032 A	0.201 W	7.855 var	0 %
consumption6	6	0.044 A	0.249 W	10.65 var	0 %
consumption7	7	0.135 A	10.387 W	31.063 var	30 %
unused8	8	0 A	0 W	0 var	0 %
unused9	9	0 A	0 W	0 var	0 %

8. **IMPORTANT: Phase-mapping setup:** The phase-mapping needs to be correct to have accurate measurements. The phase-mapping as setup in Smappee needs to correspond with real phase mapping from the grid. This procedure explains how to validate and correct the phase-mapping.

Note: The screenshots below show the Active Power and Cos Fi are from an actual residential environment. Other installation could and will in most cases show other results.

PROCESS

1. Engage active power loads in the installation:
 - Residential installations: Engage multiple appliances in the house have a power consumption **greater than 200W on each of the phases**. This is done by illuminating multiple lights, activate electric heater, electric oven, coffee maker, hair dryer (resistive loads).
 - Commercial & Industrial installations: if possible to engage loads which have large active power consumption (and low reactive power).
2. If you were not able to mount the CT in the correction direction, Click channel configuration and reverse the appropriate channel(s). See Point 6 above – Channel Configuration Overview.

3. Click channel configuration :
 - **Setup both grid channels to phase 1**
 - Set Connection temporarily to “Off Grid (excl from total)”
 - Click Update and restart meter engine

Input	Name	Phase	Type	Connection
CT 1	Grid	phase 1	Consumption (load)	Off Grid (excl from total)
CT 2	Grid	phase 1	Consumption (load)	Off Grid (excl from total)

4. Click configuration :
 - Review which channel has the correct active power value with cos fi > 80%
 - Remember channel number which is correct.

Example:

Info	Channel	Current	Active power	Reactive power	Cos fi
consumption1	1	2.699 A	326.262 W	33.721 var	99 %
consumption2	2	1.425 A	-101.705 W	140.175 var	58 %

Channel 1 shows the correct Active Power value (positive and absolute) and Cos Fi is > 80% => Remember Channel 1 = phase 1

5. Click channel configuration - change the other Grid channel to phase 2 - click Update and restart meter engine

6. Click **configuration** : review if all grid channels have correct (absolute and positive) values with Cos Fi > 80%.

Example:

Info	Channel	Current	Active power	Reactive power
consumption1	1	2.709 A	328.483 W	35.549 var
consumption2	2	1.25 A	101.139 W	113.578 var

7. Set Grid channel back to “Grid (total)” and rename the channel accordingly.

Input	Name	Phase	Type	Connection
CT1	main GRID phase 1	phase 1	Consumption (load)	Grid (total)
CT2	main GRID phase 2	phase 2	Consumption (load)	Grid (total)

9. If Submetering or solar is applicable, make sure that the phase-mapping Submeter/solar – Grid connection corresponds with each other. Utilize a multimeter to do so.

Input	Name	Phase	Type	Connection
CT1	main GRID phase 1	phase 1	Consumption (load)	Grid (total)
CT2	main GRID phase 2	phase 2	Consumption (load)	Grid (total)
CT3	Solar production phase 1	phase 1	Production (Solar/Wind/Ba	Grid (total)
CT4	Solar production phase 2	phase 2	Production (Solar/Wind/Ba	Grid (total)
CT5	Pool (CT 5)	phase 1	Consumption (load)	Submeter (incl in total)
CT6	Pool (CT 6)	phase 2	Consumption (load)	Submeter (incl in total)
CT7	Oven (CT 7)	phase 1	Consumption (load)	Submeter (incl in total)
CT8	Oven (CT 8)	phase 2	Consumption (load)	Submeter (incl in total)



10. Before leaving the premises, make sure the **voltage measurements are accurate** and **all channel inputs that have a CT connected to display 'Connected' state:**

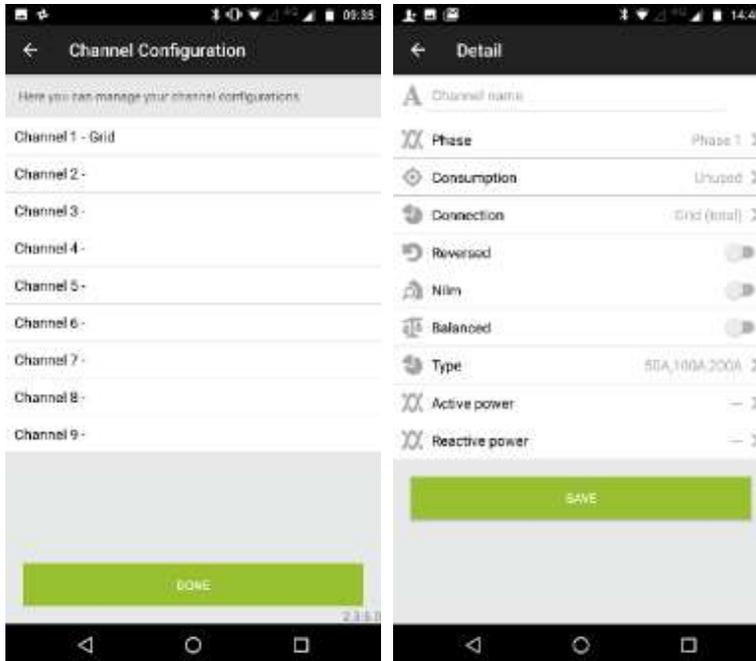
Phase	voltage
1	121.8 V
2	121.5 V
3	0 V

⇒ measured between phase and neutral – Star & Delta = **120Volts**

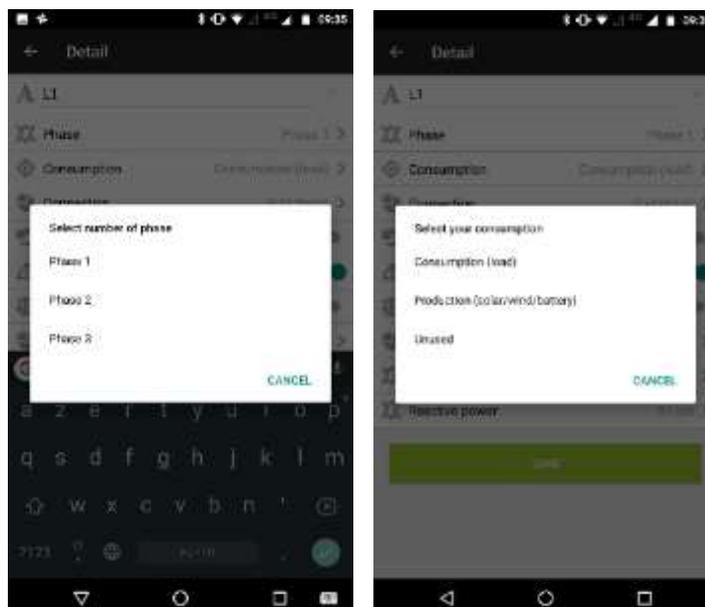
CT1 connected	CT2 connected	CT3 connected
CT4 connected	CT5 connected	CT6 connected
CT7 connected	CT8 N/A	CT9 N/A

Step 10.b: Configuration – Smappee app

- a) Configure the CT channels and then save. This is a critical step and you should refer to the configuration table created during the planning stage:



- For each input channel being used (1-9), enter the Name from the configuration table (i.e. Main Feed, Solar, EV, Submeter).
- Select the phase of the channel (load) (i.e. 1, 2, 3). The phase-mapping needs to be correct to have accurate measurements. The phase-mapping as setup in Smappee needs to correspond with real phase mapping from the grid.
- Choose Consumption type, whether it is a Consumption load, Production (solar/wind/battery) or Unused load.



- Select the Connection load type: Grid (total), Off grid (excl. from total), Submeter (incl. in total).

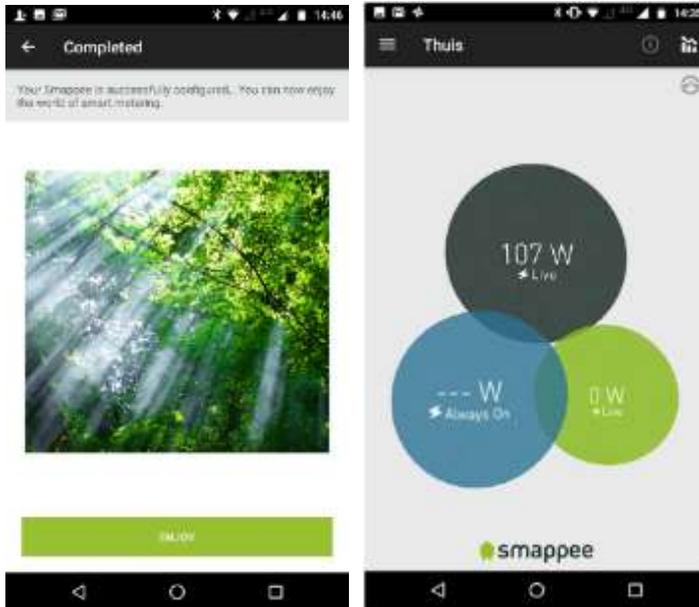


- Select Reversed if the direction of the CT is inverted (if Active Power is negative) and you are physically unable to install the CT correctly.
- Select NILM to activate automatic appliance detection on an aggregated load (i.e. Main Service).
- Select Balanced if the CT measures only one phase of a 3-Phase line (Software will multiply the measurement by 3).
- Select Channel type to indicate current rating of the CT used (50A, 100A, 200A or others (Smappee Pro only)).

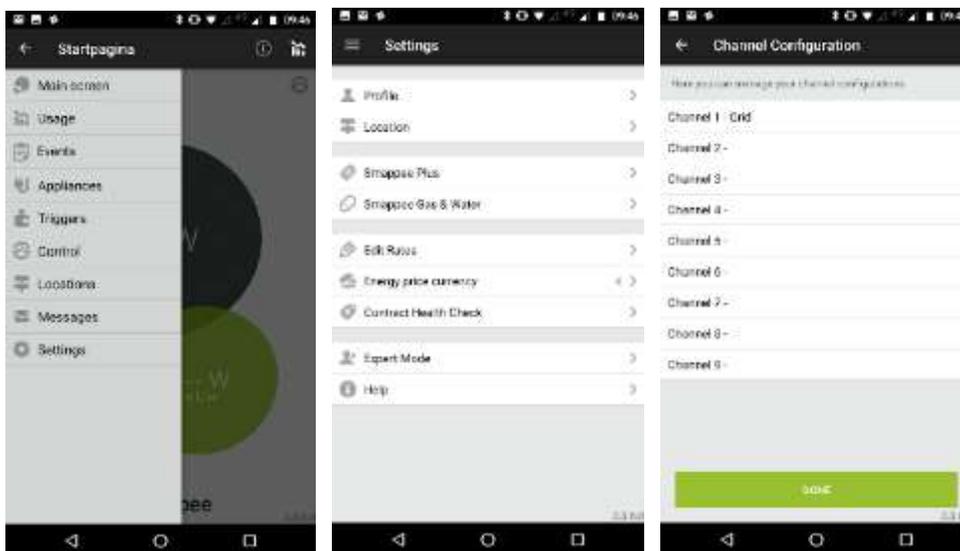


b) Save and go to Home Page

- c) Verify that the bubble values on the home page of the app are accurate. Test by plugging in a known appliance (i.e. toaster, vacuum) and watch the values on the associated bubble increase. If the values do not appear to be accurate, visit https://www.smappee.com/be_en/support/ for troubleshooting assistance.



- d) It is always possible to check and adjust the channel configuration.
(Settings – Smappee Plus – Channel Configuration)



Hint: After a channel is saved, the Active Power and Reactive Power values are viewed in real time.

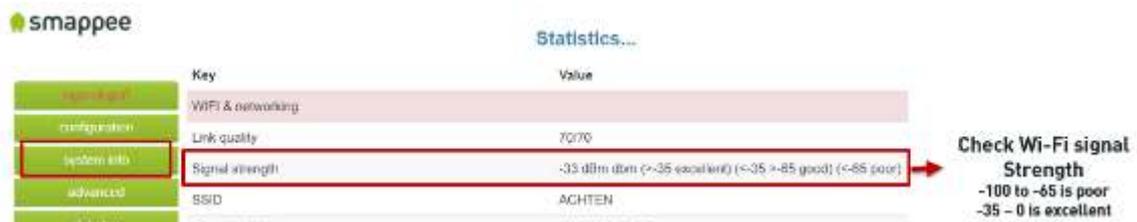
Step 11a: Final installation check-up – Expert Portal (Recommended)

Before leaving the premises, please check the following items. The preferred method is with the Expert Portal:

1. Check Light on the Smappee → Breathing green (<https://support.smappee.com/hc/en-us/articles/203075777-What-Smappee-s-Colors-tell-you->)
2. Log in or Refresh Export Portal:
 - a. Click on  and fill in password
 - b. Click on 
3. In case of Wi-Fi connection problems, check the following points:
 - a. 2.4 GHz Wi-Fi required, preferably with automatic channel selection
 - b. WPA or WPA2 encryption mandatory
 - c. Networks without security are not supported (!)
 - d. SSID needs to be visible and may not be hidden during install
 - e. Make sure that your SSID does NOT contain one of the following characters: é, ç, è, ä, /, \, ", à, î, ô, ï
 - f. Allow special characters for the Wi-Fi password: # \$ % @ ? / \
 - g. Double-check your password
 - h. Double-check that your smart phone is connected to the correct Wi-Fi network, not to a hotspot or other networks where you have your password configured
 - i. If you use WPS, check that it is active on the router
 - j. Make sure that MAC filtering is not active
 - k. Your firewall should allow Smappee to create https outbound connections (port 443)
 - l. Parental control also might prevent internet access based on time of day
 - m. The maximum number of characters for the WPA2/PSK when using an iOS device during installation is 20.

Note: The IP address of Smappee is assigned by the DHCP of your router.

4. Click on  and review the Signal strength:
 - a. -100 to -65 is poor
 - b. -65 to -35 is good (normal)
 - c. -35 to 0 is excellent



Key	Value
WiFi & networking	
Link quality	70/70
Signal strength	-33 dBm (dBm) (>-35 excellent) (<-35 >-85 good) (<-85 poor)
SSID	ACHTEN

If the signal strength is poor, please take action in order to increase the Wi-Fi signal quality. The value updates in real time.

5. Review Smappee Operation

- a. Click on configuration
- b. Review the Config Parameter (Star or Delta)

Config parameter	Setting
3 phase configuration	<input checked="" type="radio"/> Star (3+N) <input type="radio"/> Delta (3)

- c. Review if voltages are displayed and correct (displayed in real-time)

Phase	voltage
1	121.8 V
2	121.5 V
3	0 V

⇒ measured between phase and neutral – Star & Delta = **120Volts**

- d. Review if all channels to that are used are displayed as ‘connected’

CT1 connected	CT2 connected	CT3 connected
CT4 connected	CT5 connected	CT6 connected
CT7 connected	CT8 N/A	CT9 N/A

- 6. To check the phase mapping of the submetering and solar channels, engage a known appliance in that circuit, review the channels of the submetering and solar. Validate that the power usage increase corresponds with the power increase on Main Feeder Phase. The phase of the submeter and solar have to correspond with main feeder phase.

7. Check if the values consumption and production (solar) are correct. If the values look like they are incorrect or Cos Fi is low, see point Configuration using Expert Portal - Phase-mapping setup:
 - a. Consumption: turn high consumer appliance on and check if power increase is correct on corresponding Main Phase and Submeter Channel.
 - b. Production: validate production value of solar installation with the Smappee measurement (value could be negative when there is no sun (and production is 0) and the inverter consumes small amount of energy).

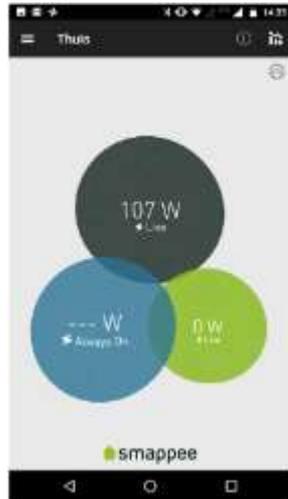
Info	Channel	Current	Active power	Reactive power	Cos fi
channel1	1	0.794 A	72.275 W	176.105 var	37 %
channel2	2	1.129 A	76.189 W	263.053 var	27 %
channel3	3	0.876 A	68.1 W	198.841 var	32 %
channel4	4	10.321 A	2500.125 W	107.358 var	99 %
channel5	5	0.621 A	2.191 W	148.807 var	1 %
channel6	6	0.673 A	23.47 W	161.529 var	14 %
channel7	7	0.68 A	2.729 W	162.968 var	1 %
channel8	8	0 A	0 W	0 var	0 %
channel9	9	0 A	0 W	0 var	0 %

Hint: Solar Production needs to be positive.

If needed contact support by phone (for Smappee Certified Installers) or by mail support@smappee.com

Step 11.b: Final installation check-up – Smappee app

1. Check Light on the Smappee → Breathing Green (<https://support.smappee.com/hc/en-us/articles/203075777-What-Smappee-s-Colors-tell-you->)
2. Go to Home Screen of the app are updated (Grey is Consumption, Green is Production).
 - a. Verify that the bubble values on the home page of the app are accurate. Test by plugging in a known appliance (ie toaster, vacuum) and watch the values on the associated bubble increase.



3. Check Phase Mapping of the submetering channels:
 - a. Go the Channel Configuration window and check if the power values of the submetering channel phase indication corresponds with the main feeder phase number. The channel of the Submeter needs to correspond with the Main Feeder Phase on which the power increase takes place.



If needed contact support by phone (for Smappee Certified Installers) or by mail support@smappee.com

Step 12 (Optional): Share Smappee with other Smappee user

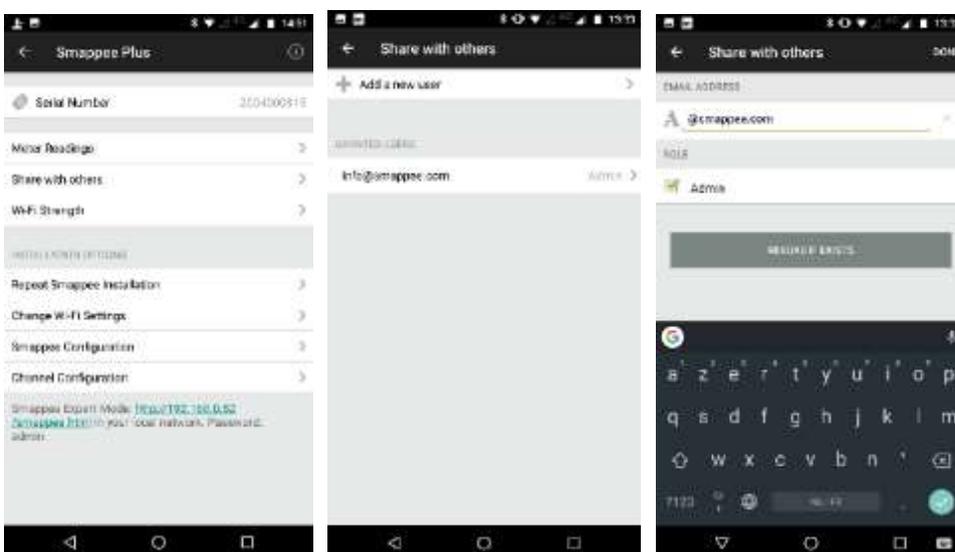
A Smappee monitor can be shared with multiple Smappee user accounts.

Android

Starting at the home page, expand dropdown menu (top left) - Select "Settings" - Select the Smappee monitor:

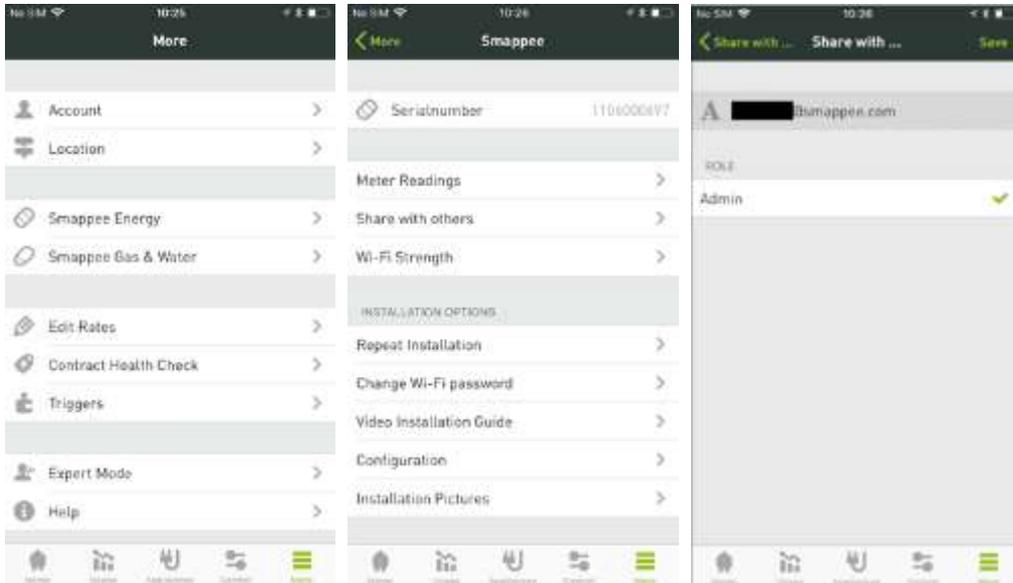


Click "Share with others". Add a new user using his email address attached to his Smappee Account and select "Done" to complete. Make sure the person you are trying to share the data with already has a Smappee account.



iOS

Starting at the home page, – starting at the home page, select “More” at the bottom and select the Smappee monitor > Share with others. Then select add a new user and follow the prompts. Make sure the person you are trying to share the data with already has a Smappee account. Click Save (Right top corner).



Smappee Product Manual

This part of the document explains the detailed features of the product that are needed to install the device.

The connectors and Inputs of the Smappee

Overview

This section explains the connectors of the Smappee Plus.

Accessing the Connectors

To get full access to all connectors of the Smappee monitor, you should remove the two covers.

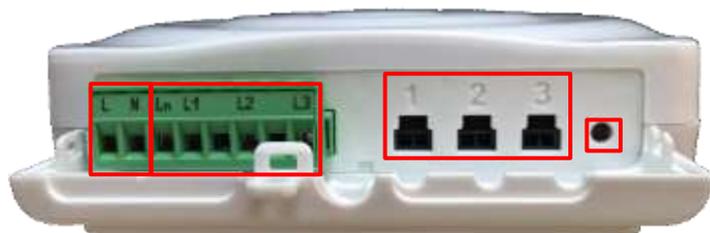
For removing the covers, insert a screwdriver at the sides of the covers and carefully pull up the cover.



Connectors at the Front

The picture shows the connectors at the front.

- Power supply
- Voltage terminal
- CT connectors 1 to 3
- Reset button



Connectors at the Back

The picture shows the connectors at the back.

- USB port
- Ethernet port (LAN)
- CT connectors 4 to 9



The Green 8-Pin Connector Block

The Smappee is delivered with a green 8-Pin connector block. It is used to:

- connect the Smappee power supply
- measure the voltage of the power phases



You can find more details in the following sections.

Connecting the Power Supply

Overview

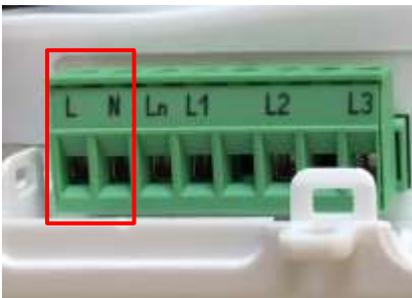
The Smappee is powered by the green 8-pin connector block.

**Important: Always turn the main power off before performing the next steps!
Do NOT power-on the Smappee unless this manual specifically asks you to do so.**

Connecting the wires

Instructions:

1. Connect the **Phase wire** of the power supply to the connector marked **L**.
2. Connect the **Neutral** of the power supply to the connector marked **N**.



Important Requirements

Important requirements for the installation:

- The voltage of the power circuit should be in the range of 100-240 Vrms.
- A circuit breaker should always be used for the power supply. The circuit breaker should be located close to the monitor and be easily reachable.
- The circuit breaker should always be the disconnecting device for the Smappee monitor.
- All wires used should have a diameter between 0.75 and 2.5mm².
- Note: None of the power connectors are used for any type of measurement.

Remember

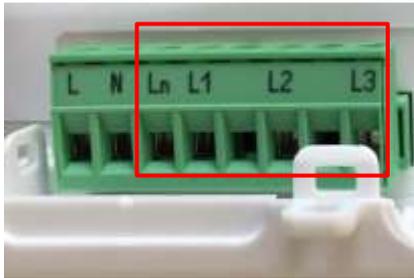
Do NOT power-on the Smappee yet. This manual will specifically ask you to power-on the Smappee in one of the installation steps later on.

Connecting the Voltage Measurement Wires

Overview!

Smappee measures the various voltages and phases of the individual Phase wires and the Neutral wire of the electrical installation. These wires need to be connected to the inputs of the green 8-pin connector block.

This section explains how to connect the measured wires to the respective inputs of the connector block.



Separated Power Supply

Please be aware that the measurement lines are fully separated from the lines of the power supply. Consequently, the power lines may be connected to circuits on an UPS or any other source without impacting the measurements.

However, this also results in the need to connect all lines to the measurement inputs. This is particularly true for the input Ln, which always needs to be connected to the Neutral line.

Inputs for Phase and Neutral

There are four inputs:

Input	Description
L1 - L3	Measurement inputs for the voltage and phase of each phase wire.
Ln	Measurement input for the Neutral reference. Note: To measure the Neutral reference correctly, always connect the Input Ln explicitly to the Neutral wire. There is NO internal link with the Neutral line of the main power supply.

Installation Variants

The wiring of the voltage measurement inputs on the green 8-pin connector block depends on the type of electrical installation.

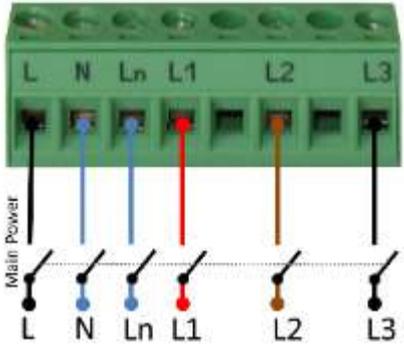
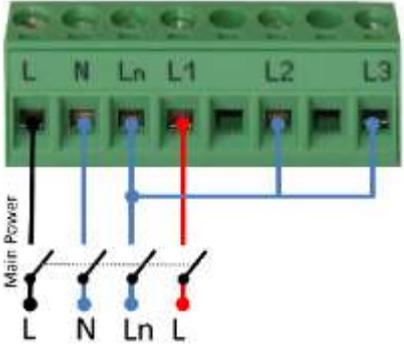
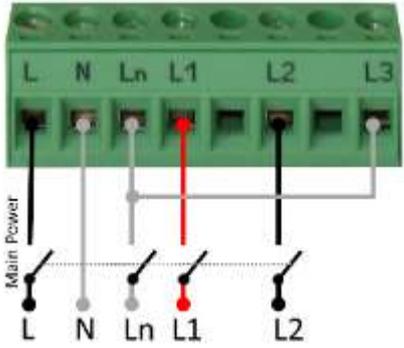
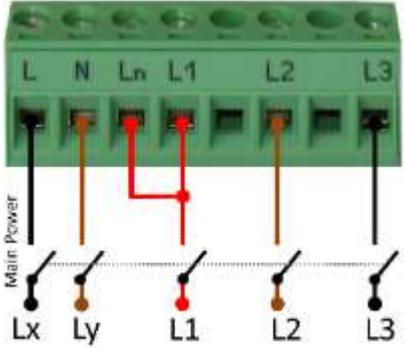
There are four different Installation Variants:

- Three-phase with Neutral ("Star")
- Single phase
- US Split phase (180°)
- Three-phase without Neutral ("Delta")

On the next page, you find detailed instructions for the wiring.

Installation Variants

The table below shows the wiring for the various installation variants.

Installation Variant	Wiring Schema
<p>Three-Phase with Neutral ("Star")</p> <ol style="list-style-type: none"> 1. Identify the three phase cables L1, L2 and L3 as well as the Neutral cable. 2. Connect the Neutral to the Ln. 3. Connect the phase cables to the correct input of the voltage measure terminal: <ul style="list-style-type: none"> • Phase cable L1 to input L1 • Phase cable L2 to input L2 • Phase cable L3 to input L3 	
<p>Single Phase</p> <ol style="list-style-type: none"> 1. Identify the phase cable L1 and the Neutral cable. 2. Connect the Neutral cable to the Ln, L2 and L3 input. 3. Connect the phase cable L1 to the L1 input. 	
<p>US Split phase (180°)</p> <ol style="list-style-type: none"> 4. Identify the two phase wires L1 and L2 and the Neutral wire. 5. Connect the Neutral wire to the Ln and L3 connector of the voltage measure terminal. 6. Connect the phase cables to the corresponding inputs: <ul style="list-style-type: none"> • Phase cable L1 to the connector L1 • Phase cable L2 to the connector L2 	
<p>Three-Phase Without Neutral ("Delta")</p> <ol style="list-style-type: none"> 1. Identify the three phase cables L1, L2 and L3. 2. Connect the first phase cable L1 to the Neutral input Ln. 3. Then connect the phase cables to the corresponding connectors of the voltage measure terminal: <ul style="list-style-type: none"> • Phase cable L1 to the input L1 • Phase cable L2 to the input L2 • Phase cable L3 to the input L3 	

Verify the Correctness of Installation

After finalizing the full Smappee installation, and while testing the Smappee measurements, you should specifically verify the correct wiring of the 8-pin connector block.

These checks will be explained at a later step during the installation, at section "Checklist for Correct Configuration", on page 78.

Connecting the Current Transformers (CT's)

Overview

The next step is to connect the CT's to the monitor.

Each current transformer (CT) consists of a sensor and a plug. The sensor needs to be attached on the cable and the plug needs to be inserted in one of the Inputs 1-9 of the Smappee monitor.

Please note that each CT has an arrow inside. The correct direction of the arrow is very important when installing the CT.

Configuration

The newly installed CT's **always require an update of the configuration pages** of the Smappee.

For details, please see section "Configure the Current Transformers" on page 69.

Technical details

The Smappee Plus has inputs for 9 current transformers.

The transformers are available in different sizes. For all the different sizes, please see section "Current Transformer Variants" on page 57.



Instructions

First, start by attaching the Current Transformers (CT) around the cables you wish to measure. (These can be main incoming cables, sub-feeds, feeds from solar, etc.), just put the CT around the cable and then close it.

Important: Pay attention to the direction of the arrow on the CT. The arrow always points towards the electrical load, i.e. in the direction of the energy flow.

We strongly recommend labeling the CT's so it is easier to route them back to your monitor afterwards (for example oven phase 1). Once the current transformers have been installed around the cables, now route them back to the Smappee Plus.

Current Transformer Variants

The table shows the current transformers that can be used with the Smappee Plus.

Smappee supports only the CT's listed below. No other CT's should be used!

Name/type	Picture	Specs
Current Transformer SCT01-T10/50A		MC: 50A MAX OV : 333 mV MAX cable Ø: 10 mm (0.39 in)
Current Transformer SCT01-T16/100A		MC: 100A MAX OV : 666 mV MAX cable Ø: 16mm, (0.63 in)
Current Transformer SCT01-T24/200A		MC: 200A MAX OV : 1332 mV MAX cable Ø: 24mm, (0.94 in)
Current Transformer SCT01-T36/400A (*Pro Only)		MC: 400A MAX OV : 666 mV MAX cable Ø: 36mm, (1.41 in)
Current Transformer SCT01-T50/800A (*Pro Only)		MC: 800A MAX OV : 1332 mV MAX cable DIA: 50mm, (1.96 in)
Y-cable AC-YC		Y-cable for combining two current transformers (CT) measuring on the same phase. Measurements will be summed up and reported as one value. Compatible with 50A and 100A CT's only

CT-Extender
 AC-EXT-4
 (comes with 3x 50A CT)



Extension unit for combining up to 4x 50A transformers (CT) measuring on the same phase. Measurements will be summed up and reported as one value. Compatible with 50A CT only

The length of a CT cable is 1.5 m (4.9 ft).

Legend:

- MC: maximum current
- MAX OV: Maximum output voltage
- MAX cable Ø: Maximum phase cable diameter

Preparing the Internet Connection

Overview

Now you should choose the method to connect the Smappee to the internet. There are three alternative connection methods available:

- Ethernet cable (recommended)
- external Wi-Fi USB module
- external 3G/4G internet USB dongle

This section will prepare the Smappee for connecting to the Internet at a later point during the installation steps.

Important: You can only use the modules that are supplied by Smappee. Other devices are not supported.

NO Hot-Plugging

All network cables and dongles need to be inserted or removed while the power is OFF.

Ethernet cable (recommended)

The Smappee Plus monitor should be connected to the network by an RJ-45 Ethernet cable.

The Ethernet cable should be connected to the Ethernet port of your monitor. When using Ethernet, you should not connect a USB Wi-Fi or 4G dongle.

External Wi-Fi module (USB)

The external Wi-Fi module connects the Smappee Plus to a local Wi-Fi network. It should be plugged in the USB port of the Smappee.

If you experience problems with the Wi-Fi connectivity, please consult the Wi-Fi checklist. You can find the checklist at <http://support.smappee.com>. Search for "checklist".



External 3G/4G Dongle (USB)

The external 3G/4G dongle directly connects your Smappee monitor to the internet through an 3G/4G connection.

Smappee ships the dongle preconfigured with a SIM card, as part of your data subscription option.



Please note this device requires a stable 3G/4G network signal. Please check this before buying this device.

Connect the cable or USB module

Once you have selected the connection method, please insert the selected cable or module in the respective Smappee port, while the Smappee **is still turned off**.

Initial Power-On of the Smappee Monitor

Introduction

Your Smappee Plus monitor is now nearly ready for the first power-on. Please complete a number of checks, before you power-on the Smappee.

Important: The Smappee Plus is not yet completely installed and insulated. Perform the actions of section "Mounting and Enclosing", on page 80, before leaving the installation place.

Check Before First Power-On

Please do a final check:

ID	Check	More info
1.	Smappee is connected by a circuit breaker.	page 52
2.	The 8-pin connector block is correctly wired for both the main power supply as well as the measuring wires.	page 53
3.	The current transformers are connected at your electrical installation and to the inputs at the Smappee.	page 56
4.	The hardware for the network (Ethernet cable or USB dongle) is connected to the Smappee.	page 59
5.	You understand that the Smappee Plus is not yet completely installed and properly insulated. Do not leave the place of installation before completing the installation.	page 80

Power On

Now use the circuit breaker to turn on the power.

Lights for Network Status

Smappee indicates the progress of the power-on and the network status by the light.

Light	Description
Blue Steady 	The Smappee is powering on. Please wait for about 3 minutes. Hint: The light may briefly go dark during that time.
Green Steady 	The Smappee is connected to the local network and ready to be installed by the App. The Smappee should show this color when it is connected by Ethernet or a 3G/4G dongle.
Blue Flashing 	The Smappee monitor is ready to be connected to the local network and to be installed by the App. The Smappee should show this color when it is connected by a Wi-Fi dongle.

If you see one of these colors, proceed to the next page of this manual.

If, however, Smappee shows a different color, please refer to section "Troubleshooting Internet and Cloud Access" on page 67.

Login to the Smappee App

Overview

The Smappee App is required to activate your monitor and link it to your user account in the Smappee cloud.

Before you continue the installation, make sure you are logged in correctly:

- with a correct **user name**
- at a correct **service location**.

Installing the Smappee App

The App is available on Android and iOS. It can be downloaded from the Apple store or the Android marketplace.

Note: The App is not available for Windows smartphones or Windows operating systems.

Create User Account, then Login

Once installed, open the App and login to your user account, or create a new user account.

Your First Installation and first Service Location

When you use your new user login to install your first Smappee, the system automatically creates a new Service Location and connects the new Smappee to it. Your user login has automatically access to that Service Location that you just created.



To start with your first installation, please continue with section "Use the App to Connect Smappee to the Cloud" on page 65.

Working with Multiple Sites

If you plan to install devices on multiple sites, make sure you read the instructions on the next page.

Watch out! If this information is ignored, you may corrupt new and existing installations.

Working with Multiple Sites

Overview

Large multi-site businesses may wish to work with multiple Smappee devices that are installed on multiple locations.

Similarly, an installer may wish to install multiple Smappee devices at different sites of different customers.

In addition, there may be multiple user accounts that need to get shared access to the data.

This section explains how to use the app in these scenarios.

Important

If you install a new Smappee device in an environment with multiple sites or multiple users, make sure that you are logged in with the correct user name. Also make sure, that you have activated the correct service location.

Watch out! If you use the wrong user name or service location, you may corrupt the new and the existing installations.

Understanding Service Locations

For understanding the multi-site installations, you need to understand the concept of Service Location.

The Service Location represents the place that is measured by a Smappee. In most cases, the Service Location is identical with the house or site that is connected to a particular utility electricity meter.

Basic Principles

The multi-site, multi-user configurations follow these principles:

Measurements

- When measuring, a Smappee device is always connected to a single service location.
- All measurements (consumption etc.) are linked to a particular service location.

User Access

- For viewing and modifying the data of a service location, you need to have a user login (user name + password) with access rights to that service location.
- When you create a new service location (during installation) your user login automatically has access to that service location.
- You may share the access rights of your service locations with other users. They then have the same access rights as you have.
- A user may have access to multiple service locations.

Replace Hardware

- Consequently, when replacing a defect Smappee with a new device, the service location remains the same. Thus, the new device gets connected to the same service location. All previous and new measurements remain available at the service location.

Perform Installations on Multiple Sites

After your first installation, you may want to use your user login to perform more installations on other sites.

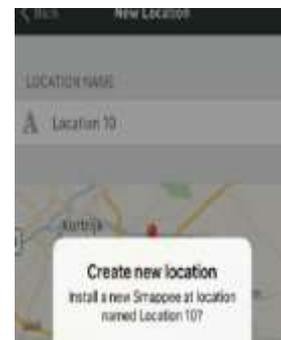
In these cases, the steps differ from the first installation:

1. First, create a new service location in the app (see below)
2. Then, immediately install the Smappee on that service location.
3. Please note, if the installation fails, the (still empty) service location is removed from the app. Only after a successful initial installation of a Smappee device, the service location will be saved permanently.

Create a new service location (iOS App)

Follow these steps:

- Tap the top of the screen which says 'Home' or any given name of that location.
- A drop-down will appear showing you the different locations.
- At the bottom of this drop-down, you'll find 'Add a new location'.
- Please observe naming conventions of your organization



Create a new service location (Android App)

Follow these steps:

- First select the menu item 'Settings' > 'Expert Mode' and enable 'Multiple Locations'. You have to do this only once.
- Open the menu item 'Locations'. At the bottom there's the option to create a new location.



Switching Between multiple Service Locations

For switching between service locations, use the same screen as described above.

Renaming Service Locations

You can modify the name of the service location. To change the name, just press the name in the screens that were described above.

Your customer or your central administration may require you to name the service location according to a particular naming convention.

Sharing a Service Location

You may share your service locations with other users. Similarly, other users may share their service locations with you.

Your customer or your central administration may require you to share the service locations on which you installed the Smappee devices.

To share your current service location, perform these steps:

- Select the menu 'More' (iOS app) or 'Settings'(Android app).
- Select 'Share with Others'.



- Enter the **e-mailaddress** that is linked to the Smappee user account with which you want to share.
- This service location will appear in the list of service locations of the other user.

Use the App to Connect Smappee to the Cloud

Overview

Now, you connect your Smappee Plus to your account on the App/Smappee cloud. If you use Wi-Fi as the network connection method, you also provide the Wi-Fi network name (SSID) and Wi-Fi password.

The installation process is largely guided by the Smappee App. You should follow the instructions on the screen.

Check Before You Start

Please do a final check:

ID	Check	More info
1.	Your Smappee Plus is powered on. (It will take about 3 minutes.)	page 60
2.	Your Smappee Plus is showing a Green Steady (Ethernet, 3G/4G dongle) or Blue Flashing (Wi-Fi) light.	page 60
3.	Your App is installed on your smartphone.	page 61
4.	In the App, you are logged in with the correct user name and, if applicable, at the correct service location.	page 61

Starting the App-Installation

If you install your first Smappee (i.e. with a new login name), you should see a screen with a grey Smappee icon.

In that case, click on the icon "Install a new Smappee monitor".

Continue by following the instructions on the screen.



Starting the App-Installation in a Multi-Site Environment

If you install Smappee devices in a multi-site environment, please first consult the previous section "Working with Multiple Sites" on page 62.

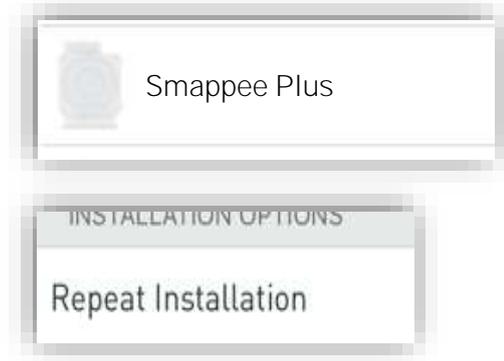
In that case, create a new service location, and then click on the icon "Install a new Smappee monitor".

Continue by following the instructions on the screen.

Starting the Installation of a Replacement Device

In the special case that you want to install a new device to replace an (defective) Smappee follow these steps.

1. Select the menu item "Settings"
2. and/or select " Smappee Plus"
3. and/or "Repeat installation"



Follow the Instructions on the Screen

After starting the installation (see previous paragraphs), continue with these steps:

1. Follow the instructions, until you reach the screen "We will now configure your Smappee by asking you a few questions about your installation".
2. Once you reach this step, please hold for a moment and perform a check. Make sure that the Smappee shows a **Green Breathing Light**.



Check: Green Breathing Light

If this check is OK, please continue at section "Configure the Current Transformers" on page 69.

If this check is NOT OK, consult the section "Troubleshooting Internet and Cloud Access" on the next page.

Troubleshooting Internet and Cloud Access

Introduction

This section provides help in case of problems during the connection step.

Note: The connection to the Internet and the Cloud needs to be fully functional before you can continue the installation (i.e. configuring the Smappee for accurate measurement).

Understanding the milestones

The connection to the Internet and Cloud has the following main milestones. Please refer to them in case of problems.

Step	Milestone	Success Indicator
1.	Connect to Wi-Fi network (if applicable) and/or local network.	Green steady light
2.	Smappee contacts the Smappee cloud.	-
3.	The App and the Smappee monitor "meet" in the cloud and connect to each other.	App shows screen with "jumping" Smappee logo
4.	The Smappee monitor starts measuring the power signals (even if the configuration is not yet correct). It is important that at least one current transformer is connected.	-
5.	The App receives real-time measurements from the monitor and displays them in the main screen. Note: The actual values are not yet necessarily correct.	Some values in the App main screen, like "1 W"

Issues with Local Network (Ethernet or Wi-Fi)

If your Smappee Plus is connected by Ethernet or Wi-Fi make sure that the site system administrator is aware of the installation. They may need to change settings in the network and firewalls.

Hint: Experience shows that you should contact the IT responsible of the installation site long before the installation date.

Wi-Fi Checklist

If you experience problems with the Wi-Fi connectivity, please consult the Wi-Fi checklist. You can find the checklist at <http://support.smappee.com>. Search for "checklist".

<https://support.smappee.com/hc/en-us/articles/201618739-Wi-Fi-checklist>

Remember: The dongle needs to be inserted BEFORE you power-on the Smappee Plus.

Colors of the Smappee Light

The table below provides an overview over all colors that may be shown during the installation.

Color		Description
Green Breathing		All good. The monitor is working correctly. You can continue the next steps for installation and configuration.
Blue Steady		The monitor is starting up. This may take up to 3 minutes. The light may briefly go dark during that time.
Green Steady		Network connectivity successful, but Smappee not yet connected to a user account. <ul style="list-style-type: none"> Ethernet: Connected to the local network. Wi-Fi: Connected to the Wi-Fi and the local network (i.e. the Wi-Fi password is correct) 4G dongle: Connected to the 4G network.
Blue Flashing		The monitor is ready to be connected to the local Wi-Fi network and to be installed on the App.
Red Steady		The monitor is missing connectivity with internet during startup. Connection issue.
Red Flashing		The monitor had a previous working internet connection but has now lost connectivity to the internet.
Orange Steady		The Wi-Fi hotspot access point has been activated, in order to allow the Smappee to receive a new Wi-Fi password.
Orange Flashing		Smappee is trying to open an Wi-Fi hotspot access point. Please wait a few seconds. The light will turn Orange Steady in a few moments.

Colors of 4G dongle

If your Smappee Plus is connected by 4G dongle, please check the colors of the dongle.

Color	Description
Any steady (Blue, Green, Cyan)	Successfully connected. The dongle is successfully connected to the cellular network.
Any slow blinking (Blue, Green, Cyan)	The dongle is registering with a cellular network.
Green fast blinking (1 per second)	Stick is powered on. No connection.

Remember: The dongle needs to be inserted BEFORE you power-on the Smappee Plus.

Configure the Current Transformers

Overview

The current transformers of your Smappee need to be carefully configured in order to get correct measurements.

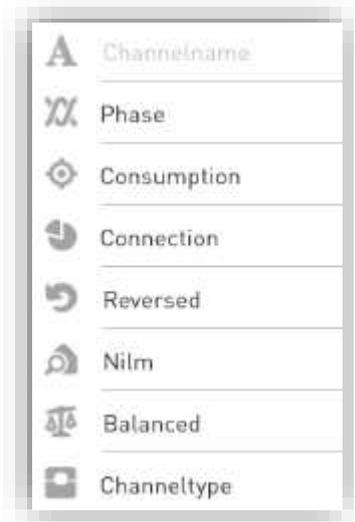
The following sections explain:

- what configuration settings you need to configure
- where you can modify the configuration

Configuration Settings for CT's

Each current transformer has a number of settings that need to be configured. These include the name of channel, the electrical phase, and other electrical parameters.

A correct configuration is essential for correct measurements.



For a detailed explanation of these settings, please see section "Configuration Settings for CT's", on page 72.

Where to Modify the Configuration

There are three locations where the configuration can be changed

1. in the App, during the first installation
2. in the App, any time after the installation
3. in the Expert Portal website

For simple and straightforward installations, you may use the method 1.

For more complex installation, you may need the method 2 or 3. Please see section "Where to Modify the CT configuration", on page 70, for more information about how to use these methods.

Where to Modify the CT configuration

Overview

As mentioned before, there are various methods for modifying the CT configuration:

1. in the App, during the installation steps
2. in the App, after the installation steps
3. in the Expert Portal website

This section explains the benefits of each method, as well as how to use it.

Naturally, all those methods modify the same set of configuration parameters. These parameters are explained in detail in "Configuration Settings for CT's" on page 72.

Using the Configuration Methods

The table explains in which situations each of the configuration methods can be usefully applied.

	Method	When to use	Expertise level	More information
1	App, during installation	As a first quick configuration during an installation, for simple settings.	Medium	See paragraph below
2	App, after installation	To repeat or modify the configuration after the initial installation.	Medium	See paragraph below
3	In the Expert Portal website	For advanced installations and error diagnostics.	Expert	See page 74

App, during installation

This method will be automatically started as part of each installation in the App. Once you have successfully connected Smappee to your account, the App will automatically start the configuration steps.

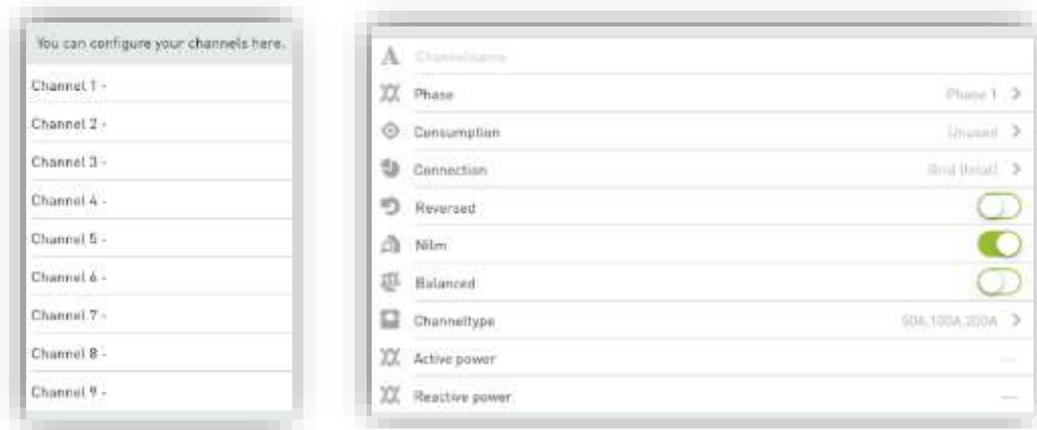
App, after installation

Once you have completed the initial installation, you can still change the configuration of the current transformers at any time.

Please use menu item "Settings", select Smappee Plus, then "Channel Configuration".



The app allows you to change the configuration.

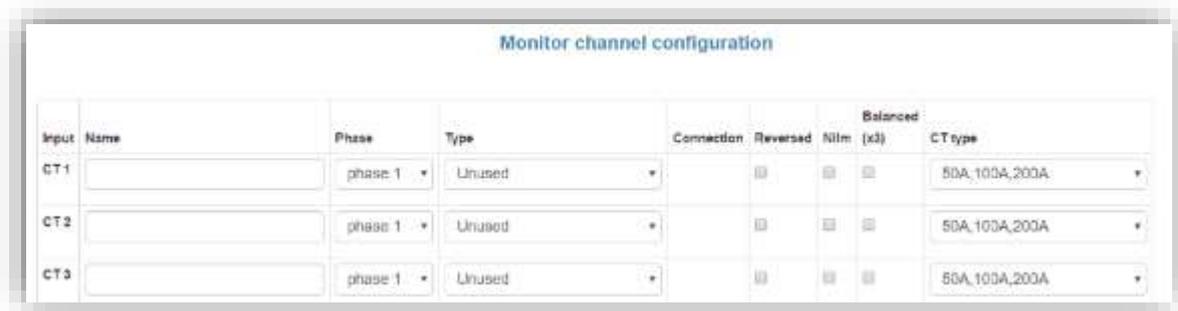


Expert Portal

The Expert Portal is a website on the Smappee device that is intended for advanced installers.

Within the expert portal, you can find a menu item "Channel Configuration", where you can configure the current transformers.

For more details, please see section "Configure the Smappee in the Expert Portal", on page 74.



Input	Name	Phase	Type	Connection	Reversed	Nlm	Balanced	CT type
CT1		phase 1	Unused		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT2		phase 1	Unused		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A
CT3		phase 1	Unused		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	50A,100A,200A

Configuration Settings for CT's

Overview

Each current transformer has a number of configuration settings. Please configure the current transformers carefully.

A correct configuration is essential for correct measurements.

Settings

The table shows the settings for the configuration of each CT.

Setting	Description
Input	Number of the Input connector on the Smappee.
Name	Provide a name for this specific input. Note: You should carefully select an unmistakable name, since it is used in many user-facing locations on the websites and the App.
Phase	Configure the phase that the CT of this specific input is measuring.
Type	In the type menu, you can choose between 3 options: <ul style="list-style-type: none"> • Consumption • Production • Unused For more information regarding this choice please see page 72.
Connection	Here you can choose what type of connection the CT is: <ul style="list-style-type: none"> • Grid - CT measures the total consumption of the installation • Off-Grid - CT measurements are added on top of the total • Submeter - CT measurements are sub-sets within the total For more information regarding this choice please see page 73.
Reversed	Select this checkbox to invert the 'direction' of the current transformer. This option is equivalent to physically re-install the CT with the arrow pointing in the other direction. Note: This option should only be used if it is physically impossible to install the CT correctly.
NILM (Appliance Detection)	Select this checkbox to activate the automatic appliance detection on that particular input.
Balanced 3x	When selected, the CT measures (only) one phase of a three-phase line, and extrapolates the total power over the three phases. This setting is useful for submetering of three-phase load with a single Current Transformer. It yields good results as long as the load over the three phases is "balanced".

Type: Consumption, Production or Unused?

The type menu, you can choose between 3 options:

Option	Description
Consumption (Load)	This input measures an appliance (which is a consumer of energy).
Production (Solar/Wind)	This input measures an energy producer, such as a photovoltaic installation.
Unused	You choose this option if the CT entry is not used.

Connection: Grid, Off-Grid or Sub-Meter?

The table shows the three connection types for the inputs.

Connection type	Description
Grid	<p>Measures Total Consumption on the Main Circuit Board</p> <p>Indicates that this CT is connected directly to the main circuit board, and thus measures the Grid Total.</p> <p>Note: For each phase (L1, L2, L3) there can be only ONE input configured as GRID.</p> <p>The values of these CT's will be displayed in the grey Consumption-Bubble in the App or the Dashboard.</p>
Off-grid	<p>Measures Extra Power on a separate Circuit Board</p> <p>Indicates that the CT is connected to a separate circuit board that is not connected to the main circuit board.</p> <p>The value is ADDED to the total of GRID. Consequently, the measurements will be added to the grey Consumption-Bubble.</p>
Submeter	<p>Measures a sub-circuit of the Grid</p> <p>Indicates that the CT is connected to a sub-circuit, that is connected to the Main Circuit Board.</p> <p>The values of these CT's will NOT be added to the total GRID.</p>

Display of Active and Reactive Power

During the configuration it is helpful to view the real-time values of the active and reactive power. The app displays these values the configuration settings screen.

 Active power

 Reactive power

Configure the Smappee in the Expert Portal

Overview

In the Expert Portal, you can diagnose and configure the electrical parameters of the individual Current Transformers.

Expert Portal for Advanced Users

The expert portal is intended to be used by advanced users. We recommend not to change any setting in the expert mode unless you know what you are doing.

Before you can Start

Your smartphone or tablet must be connected to the same local network ("subnet") as the Smappee Plus.

Before you can connect, at least one Current Transformer needs to be connected to the Smappee Plus.

Connecting to the Expert Portal

The Expert Portal is a web page that is accessible in the local network at the local IP address of the Smappee.

Example:

`http://192.168.0.1/smappee.html`

You can open the Export Portal through your App. Please follow the instructions below:

- Go to the main menu of your App and select "Settings"
- Select "Smappee Energy"
- Select the serial number of your monitor
- Note the link (incl. the local IP address)

Smappee Expert Mode: <http://192.168.0.36/smappee.html>

- Open the link in a web browser. You will see the login page of the Expert Portal.

Login to the Expert Portal

You can now log-in to the expert portal with the admin password.

- In the menu on the left, select "logon/logoff"
- In the logon field on the right, please log-in with the password (the password is "admin" by default)



Understanding the Menu Items

Please find below a brief explanation of the menus on the left side of the Expert portal. For more information please refer to the page mentioned on the right.

Menu Item	Description	More Details
Configuration	View and change the main electrical parameters and settings.	page 76
Channel Configuration	Detailed configuration of the nine inputs of the Current Transformers.	page 72
System Info	View various settings of the monitor such as Wi-fi connection, the signal strength, serial number, etc.	-
Advanced	Advanced settings and operations.	-
Networking	Network connection settings.	-
Data Log	Log of instantaneous values.	-
Home Control	Not used in the Smappee Plus.	-

Configuration menu

In the Configuration menu, select the type of electrical network.

In most cases, "Star" is the correct selection:

- three phase networks with neutral ("Star")
- US Split Phase (180°, 110 V)

Only in the rare case of three-phase networks WITHOUT neutral, you need to select "Delta".

Config parameter	Setting
3 phase configuration	<input checked="" type="radio"/> Star (3+N) <input type="radio"/> Delta (3)

Channel Configuration menu

The menu item "Channel configuration" allows you to configure the Current Transformers.

For details, please refer to the previous section "Configuration Settings for CT's" on page 72.

Diagnose the Smappee in the Expert Portal

Overview

In case of complex installation or incorrect measurements, the Expert Portal provides real-time information about specific electrical parameters of the measurements. This information can be used to verify the installation and diagnose problems.

All information can be found in the Configuration menu. It shows three blocks of information:

- Voltage display per phase
- Real-Time Measurements
- Connected Current Transformers

Voltage Display per Phase

This block displays the voltage that is measured at each phase input. For details, see section "Connecting the Voltage Measurement Wires" on page 53.

Important: The voltage values should be approximately the same for each phase.

voltage
228.6 V
227.8 V
227.7 V

Real-Time Measurements

This block displays the real-time measurements and electrical parameters for each input.

Info	Channel	Current	Active power	Reactive power	Cos fi
channel1	1	0.019 A	2.322 W	3.914 var	43 %
channel2	2	0 A	0 W	0 var	0 %

The next paragraph explains these parameters in more detail.

Details for Parameters

The following table explains the parameters of the Real-Time Data.

Parameter	Explanation
Info	Input on the Smappee.
Channel	Measured channel. In Smappee Plus, this is identical to the Info column.
Current	Current measured on that CT (Ampere).
Active power	Active Power (Watt).
Reactive power	Reactive Power (var).
Cos phi	Power Factor. Note: A "Cos phi" of less than 60% is visually emphasized by yellow highlighting.

Connected Current Transformers

This block shows on which inputs there is a Current Transformers connected. It helps to detect bad connections.

CT1 connected	CT2 connected	CT3 connected
CT4 connected	CT5 connected	CT6 connected
CT7 connected	CT8 connected	CT9 connected

Checklist for Correct Configuration

Overview

Once you reached this step, the installation is nearly complete. Before you finish work you should carefully check the correctness of the configuration steps and of the actual measurement values.

You need to verify that the measurements are correct. Do that before you finish the installation.

Please perform three checks:

1. Quick Check
2. Checklist for Electrical Parameters
3. Checklist for Total Measurements

Quick Check

At this stage, the installation should meet the following criteria:

Check	Description	Details on
1.	The Smappee has been correctly powered on, according to the instructions and checks.	page 60
2.	The Smappee is connected to the Internet and the Smappee cloud. This is indicated by a BREATHING GREEN light.	page 65
3.	You see (some) real-time power values in the Bubbles of the App or the Dashboard.	page 65
4.	You have configured the individual CT's, either in the App or in the Expert Portal.	page 69
5.	Your customer or central administration may require a particular naming convention of the service location, you have assigned the correct name to the service location.	page 62
6.	Your customer or central administration may require the sharing of the created service location with a central user account. Make sure you have done so.	page 62

Checklist for Electrical Parameters

In the menu item Configuration, please check the following parameters.

Check	Description
1.	The Star-Delta parameter in the "Configuration menu" panel should match the electrical installation.
2.	The three voltage values should be approximately the same for each phase.
3.	The current measurement value of each CT should show plausible values.
4.	The Cos fi should be above 80%. This check should be done during periods of high consumption.

Checklist for Total Measurements

Please view the real-time measurements in the Bubble-screen of the App or the Dashboard. Run the following checks:

Check	Description
1.	The total consumption-bubble (grey) should display plausible values. Compare the results with the main utility meter.
2.	The total production bubble (green) should display plausible values. Compare the results with the solar inverter or batteries.
3.	When appliances are turned on or off, the consumption-bubble should change accordingly.
4.	When appliances in the sub-meter circuits are turned on or off, the consumption-bubble should change accordingly. (Make sure it does not display the double power value).
5.	When appliances in the sub-meter circuits turn on or off, the correct name should be displayed in the App.
6.	Perform the checks above for appliances on all three phases.

Troubleshooting

If the checks above show unexpected results, please verify the following installation steps:

Check	Description	See
1.	The wiring of the green 8-pin connector.	page 53
2.	The installation of the Current Transformers.	page 56
3.	The correct configuration in the "Configuration" menu.	page 76
4.	The correct configuration in the "Channel Configuration" menu.	page 72

Once all checks are successfully completed, you may finish up the installation work. Please see the next page for the final steps.

Mounting and Enclosing

Overview

Now that the voltage measure terminal and the CT cables have been installed and connected according to local electrical regulations, you can now finish up the physical installation.

Important: The installer is responsible to ensure proper insulation of all wires. Wires can be routed via the breakout area in the cover cap!

Mounting

If you have found a suitable location to mount the Smappee Plus monitor to the wall, please remove the cover caps on each side of the Smappee Plus monitor.

You will see the mounting holes provided on each side to facilitate mounting your monitor to the wall.

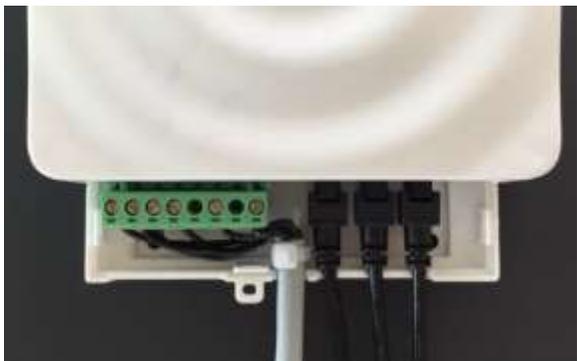


Cover

Mount the cover cap on the Smappee Plus to cover all electrical connections.

If you used a voltage-rated multicore cable, you can also use an internal wire strap to fix the cable under the covering cap.

Optionally you can use a strap or a lead seal to seal the cover cap in order to avoid any contact with the wires.



Final Remarks

Gain insights

You have now successfully completed the installation. You can now gain more and more insight in the energy consumption and production of the premises.

Support During Installation

In case of problems during performing an installation, please read this user manual carefully. If this does not resolve the problem, you should contact the Smappee Support team.

Non-Urgent support

Please send an email to support@smappee.com.

Urgent Support

For Smappee Partners we offer a hotline specifically for installation support while the partner is on the premises:

+32 56 38 02 56 (Europe) or +1 408 479 3748 (US).

This service is available during business hours (Central European Time), 6AM -11PM (Eastern Time) and 6AM - 8AM (Pacific Time).

Training

Smappee offers various training courses for installers. These can be done by video conference or in the Smappee offices.

Feedback

We always strive to improve our products and simplify the installation. We are happy to hear your feedback.

support@smappee.com

Appendix

Sample Configuration Table (Split Phase config)

Input	Description	Phase	Breaker rating	240V load
1	Main Service	1	200A	y
2	Main Service	2	200A	y
3	Solar	1	30A	y
4	Solar	2	30A	y
5	HVAC	1	30A	y
6	HVAC	2	30A	y
7	Lights Main Floor	2	15A	n
8	Lights Basement	2	15A	n
9	Pool Pump	1	30A	n

Configuration Table Template

Input	Description	Phase	Breaker rating	240V load
1				
2				
3				
4				
5				
6				
7				
8				
9				