Technical Manual

SG4000/SG4000G

Manual version number: 2.9

Version date: 25 July 2023

NOTE OF SAFETY

1. The installation of the *Geyser Gecko SG4000* should strictly be performed by a registered *Geyser Gecko* installer. Installations by anybody else will automatically void the warranty.
2. The *Geyser Gecko SG4000* is only designed to be used with 2-4kW geysers (resistive load), do not attempt to use it to power anything else.
3. The solar panels produce high DC voltage and it is dangerous to work with the live wires. Do not assume that the panels won't produce voltage under low lighting conditions.
4. Ensure that all AC installation wiring is at least 2.5mm2.
5. Avoid excessive long cabling. For the DC wiring, do not exceed a cable length of 50m with 4mm2 cable.
6. Do NOT open the *Geyser Gecko SG4000* if you are not a registered installer. No modifications to the PCB may be done (will void warranty).
7. Install the *Gecko* in a cool, dry and well ventilated place.
8. Always ensure that the *Gecko* is fully turned OFF before installation – even if it is just installing the temperature sensor.

Table of Contents

User Manual

Introduction

Congratulations on your purchase of the *Geyser Gecko* solar controller system! Thank you for taking a step towards a greener earth and a reduced carbon footprint.

Technical specifications

Description	Symbol	Value	Unit
Electrical data			
Input Max AC Voltage (Grid)	AC_{IN}^{MAX}	230	V_{RMS}
Input DC Voltage (Solar)	DC_{IN}^{MAX}	250	V_{DC}
Input DC Power (Solar)	P^{MAX_IN}	1800	W
Max Output Power	P^{MAX}	4	kW
Max Current AC	I^{MAXac}	18	A
Max Current DC	I^{MAXdc}	15	A
Input Frequency (AC)	F^{AC}	50	Hz
DC polarity protection	-	Yes, max 10A	-
Output voltage (minimum)	AC_{OUT}^{MIN}	80	V_{RMS}
Output voltage (maximum)	AC_{OUT}^{MAX}	230	V_{RMS}
Output frequency	F^{OUT}	125	Hz
Output duty cycle	D^{OUT}	40-80	%
Mechanical data			
Dimensions		122(W) x 131(L) x 45(H)	mm
Weight		0.5	kg
Enclosure material		Anodized aluminium	-
Ambient conditions			
Operating temperature range	T^{OP}	0-40	°C
Operating humidity range	H	0-80	%
Safety Certification	IEC 60730-1:2013 / SANS 60730-1:2016		

Table 1: Technical Specifications

System overview

The *Geyser Gecko SG4000* is a water-heating controller system that turns your geyser into a smart-controlled device. It can operate completely stand-alone (off grid) or connect to your existing grid setup.

The controller takes both normal grid AC and solar PV input as power sources. The system can convert the DC signal from the solar panels into a pulsed DC signal that is suitable for a geyser element. The controller also automatically switches between PV and AC when required.

The *Geyser Gecko* can be controlled and monitored remotely by using the **Geyser Gecko Mobile App.**

Notice: The *Geyser Gecko* does not feed back any electricity back into the grid.

Figure 1: System Overview

The *Geyser Gecko* is connected to an array of solar panels and the grid electricity. The geyser element is connected to the *Geyser Gecko* output. A digital temperature probe sensor is connected from the *Geyser Gecko* to the hot output of the geyser covered with lagging.

Advantages

- Easy installation, no plumbing required.
- Converts any geyser with 2-4 kW AC element into a solar geyser.
- Photovoltaic panels have a 15+ year output guarantee compared to maximum 5 years of thermal collectors.
- AC can be used for backup (to avoid cold water in bad weather).
- No maintenance required.
- Can be used off grid.
- No replacement of existing geyser element required.
- Accurate temperature control with digital sensor.

Accessories

The following components form part of the *Geyser Gecko* kit:

- *Geyser Gecko* controller
- Digital temperature sensor
- Mobile App
- Change over, 20A AC 2-pole breaker and DC circuit breaker (with latest SANS switching certification).

Installation kit required

Part
Geyser Gecko controller (1x Geyser Gecko per geyser)
Distribution Board (Type depending on location of installation) NOT IN ROOF. We recommend as close as possible to main DB board
Solar PV panels recommended max input: 1800W max. For optimal results, use at least 1600W of combined PV power.
Rails according to panel size
Tile Brackets (Depending on qty panels/roof type)
Anti-Theft Clips (Depending on qty panels 4 x clips per panel)
4mm PV Cable Black (Length depending on location)
4mm PV Cable Red (Length depending on location)
Earth Cable (Length depending on location of geyser)
AC Cable (Length depending on location of DB)
Lagging (Qty depending on location) and cable ties to secure digital temperature probe
Conduit (Depending on location)
Sprag (Depending on location)
MC4 Male/Female connector
CAT5E/CAT6 -FTP/S-FTP Shielded cable (Depending on location of installation to extend digital temperature probe)
Ventilation plug (Depending on location of installation)
Confirm client has a reliable Wi-Fi reception in the location that installation is being done

Table 2: Part list for installation

App Interface

The *Geyser Gecko* App serves as an interface for the user (and installer) to check the exact temperature and the state of all inputs and outputs. The user can also select the mode of operation for the unit.

Pairing the Geyser Gecko with the App

To control your *Geyser Gecko* from the app, it has to be paired to your user account first. Pairing also connects the *Gecko* to your house Wi-Fi.

1. To get started, download the *Geyser Gecko* app by scanning the QR code on the *Geyser Gecko* or by visiting https://geysergecko.co.za/download (Play Store / App Store / AppGallery).

Figure 2: Example of the QR code that can be found on the Gecko controller

2. After downloading and installing the app, click on the app to open. You will be prompted to enter your email address.
3. Click on the **Log In** button. You will now be prompted to create a password of at least 5 characters. Once entered, click **Next**.
4. After reading the Privacy Policy and accepting it, click on **Accept and Register**. You will be logged in automatically.
5. Go to your *Geyser Gecko* unit and ensure that you are not more than 2 meters away from the unit.
6. On the *Geyser Gecko* app, click on the Add New Gecko button. You can now fill in the *Friendly* Name field to give your *Gecko* a more friendly name, for example “Main house geyser”. This is the name that will be displayed on your *Geyser Gecko* app.
7. Click on the *Click to Scan* button and scan the QR code, located on the Gecko controller or the packaging box. Alternatively, enter the *Gecko* serial number that is found under the QR code and click on the *Connect* button.

8. After scanning the QR code or clicking on the **Connect** button, a dialogue will pop up to ask you to either choose **Connect to WiFi** or **Add to Profile**. Click on the **Connect to WiFi** option. The Add to Profile is only to add a Gecko to your profile that has already been paired to a Wi-Fi access point previously.

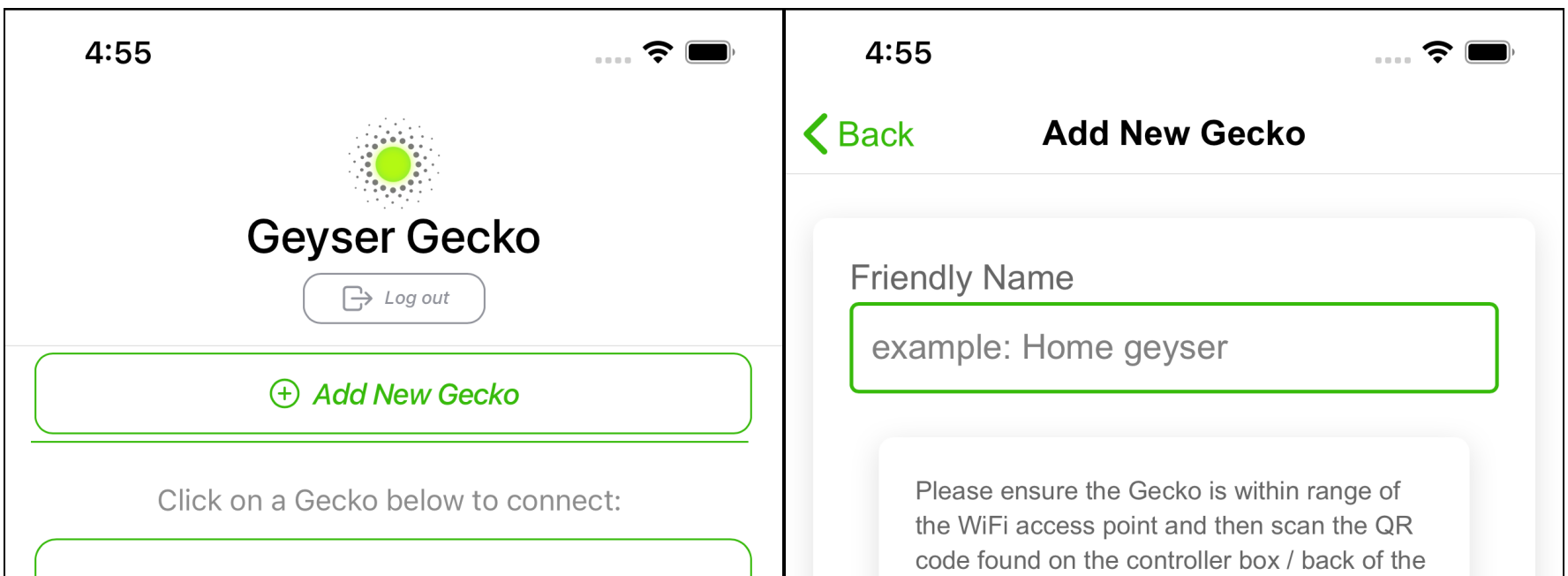


Figure 3: Adding a new Gecko

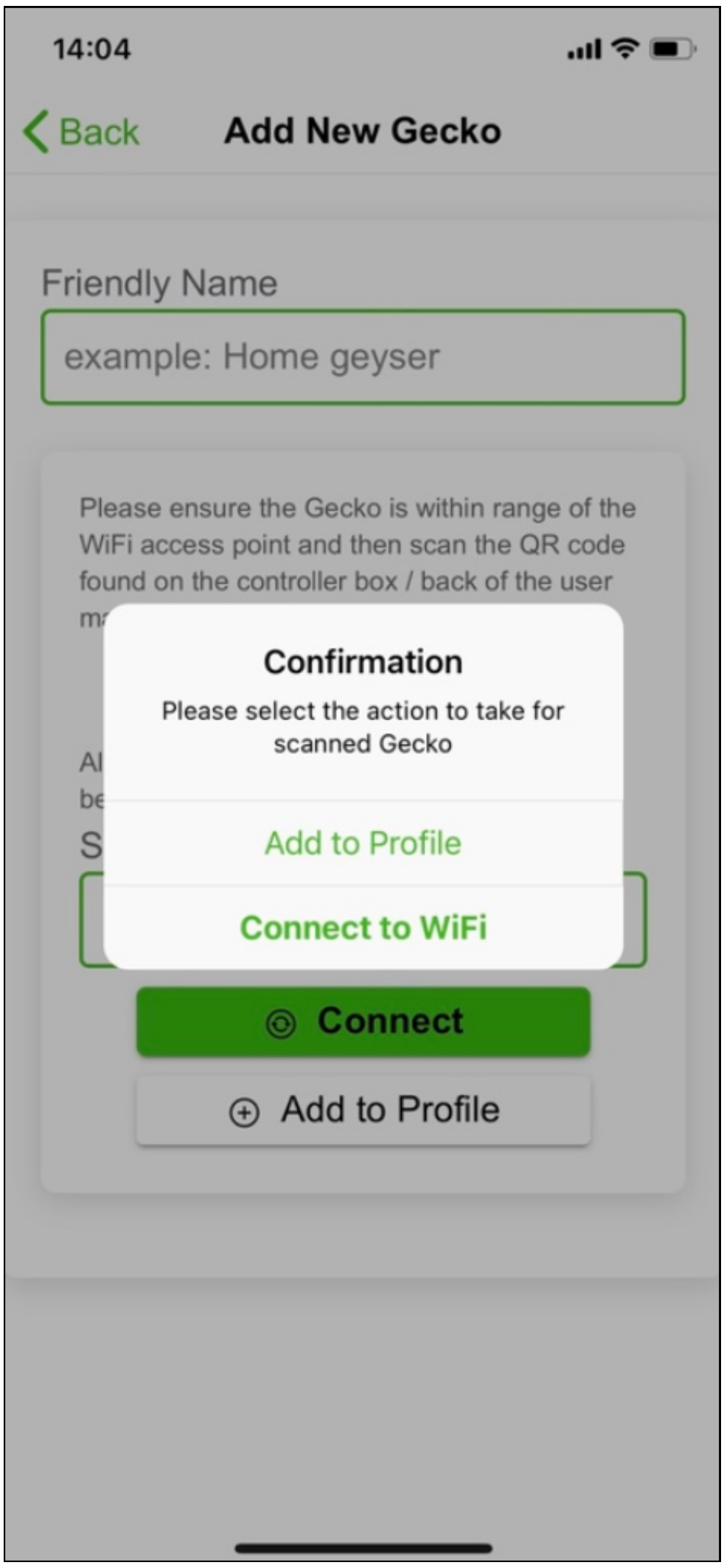


Figure 4: Confirmation after scanning QR code or clicking the Connect button

9. If a dialogue pops up to ask if you would like to join the access point Gecko_xxxxxxxxxxx_AP, confirm to join the network (the xxxxxxxxxxx will be the serial number of your Gecko).
10. A menu will now show up with all found Wi-Fi networks that the Gecko can pick up. Click on the network that you want the Gecko to connect to and click on the **CONNECT** button. A dialogue will pop up to enter the Wi-Fi password of the network you want to connect to.

Figure 5: Wi-Fi Access Point Selection Screen

11. Enter the Wi-Fi password and click on **OK**. The paired *Gecko* will now show up on the home screen. You can now click on it to view and control the *Gecko*.

NOTE: The *Geyser Gecko* can be paired to more than one user's account. The same pairing steps can be followed on that user's account. Instead of connecting the unit to Wi-Fi, just click on the **Add to Profile** button after scanning the QR code or entering the serial number and clicking on the **Connect** button.

How to pair the Geyser Gecko to a Wi-Fi access point if it is not possible or giving issues on the mobile app.

To connect to the *Geyser Gecko*, use a mobile or smart device and connect to the Wi-Fi hotspot created by the *Gecko*. The SSID will be gecko_XXXXXXXXXXXX_AP, where the XXXXXXXXXXXX is the serial number found on the *Gecko* label.
NOTE: If a prompt pops up to ask if the mobile device should still use this hotspot even though there is no Internet, click on the option to continue connecting to the *Gecko* Wi-Fi hotspot.

Once connected, navigate to the following web page in your browser:
http://192.168.4.1/settings.html
You should now see the following page:

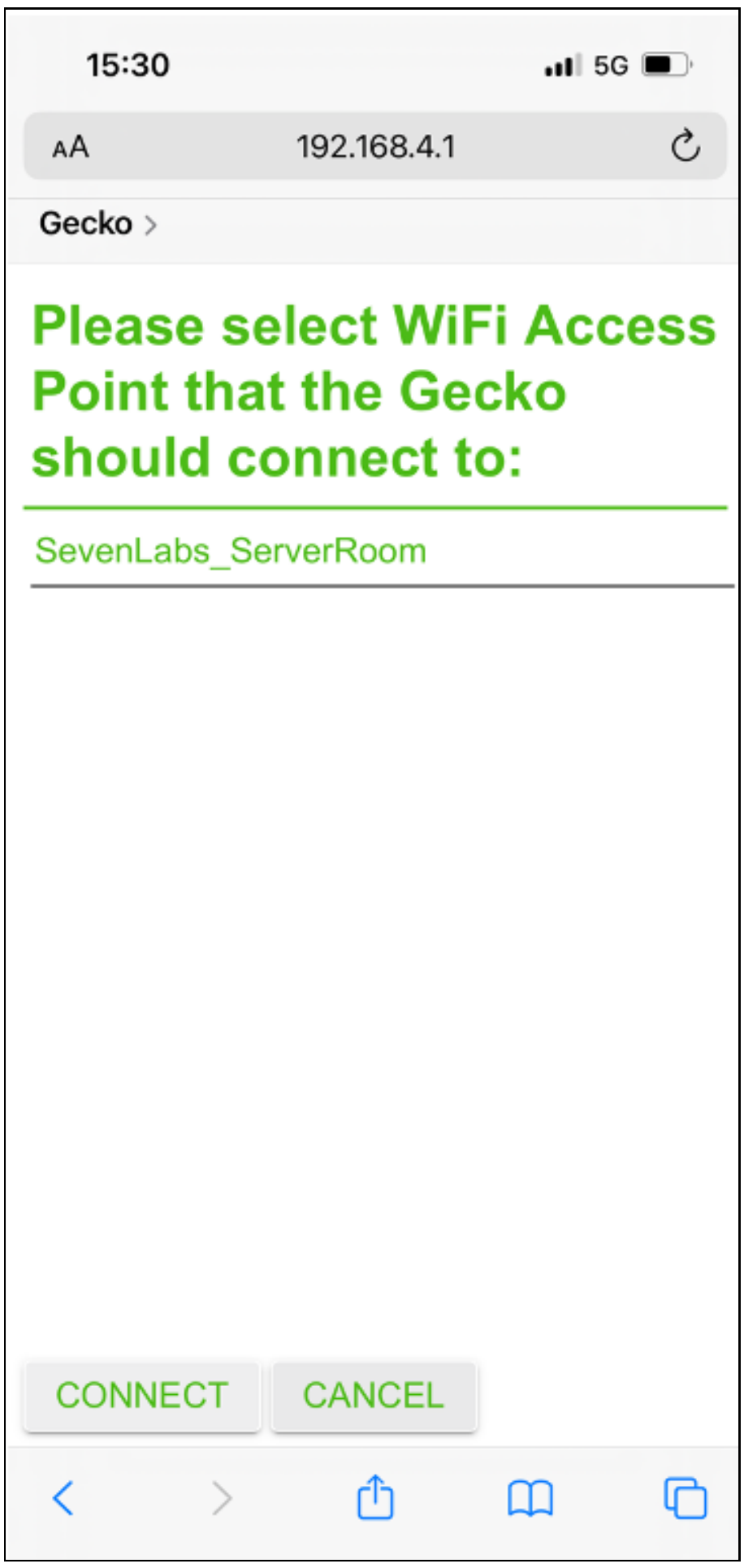


Figure 6: Wifi Access Screen on Browser

1. Select the Wi-Fi hotspot that the *Geyser Gecko* must connect to and click on the **CONNECT** button.
2. Enter the Wi-Fi password and follow the on-screen steps to pair the Gecko to the hotspot.
3. Once the *Geyser Gecko* has successfully connected, the following page will be displayed:

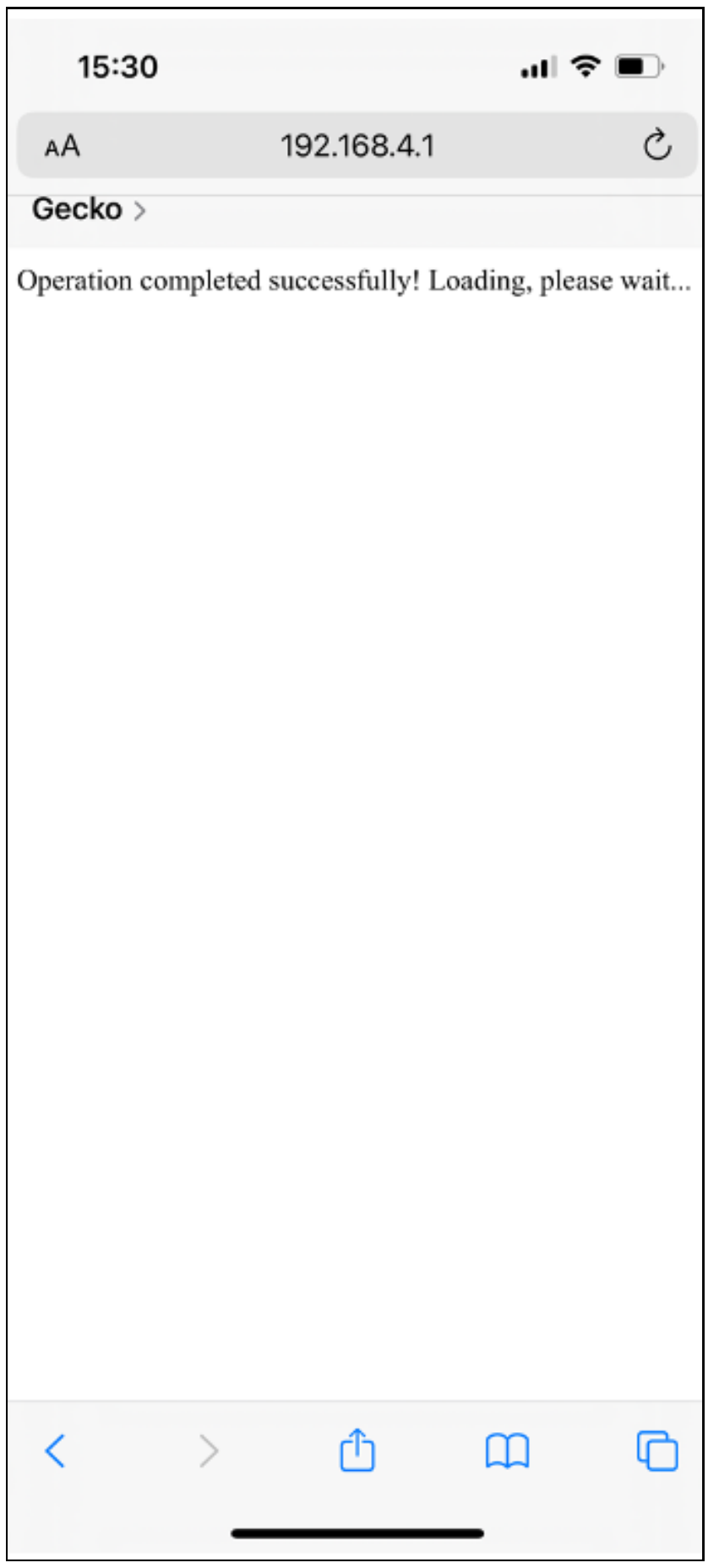


Figure 7: Successful Connection Page on Browser

The *Geyser Gecko* app can now be used to add the unit to the user / installer profile. The user must log into the app and click on **Add New Gecko** and then scan the QR code of the unit to add to their profile – use **Add to Profile** button. You can now also reconnect to your previous Wi-Fi access point.

Troubleshooting

If the *Geyser Gecko* gives an error, confirm / try the following:

- Ensure that you are withing 2m of the *Geyser Gecko* when pairing the hotspot.
- Ensure that the Wi-Fi password is correct.
- Try a different / closer Wi-Fi hotspot.

Interface Description

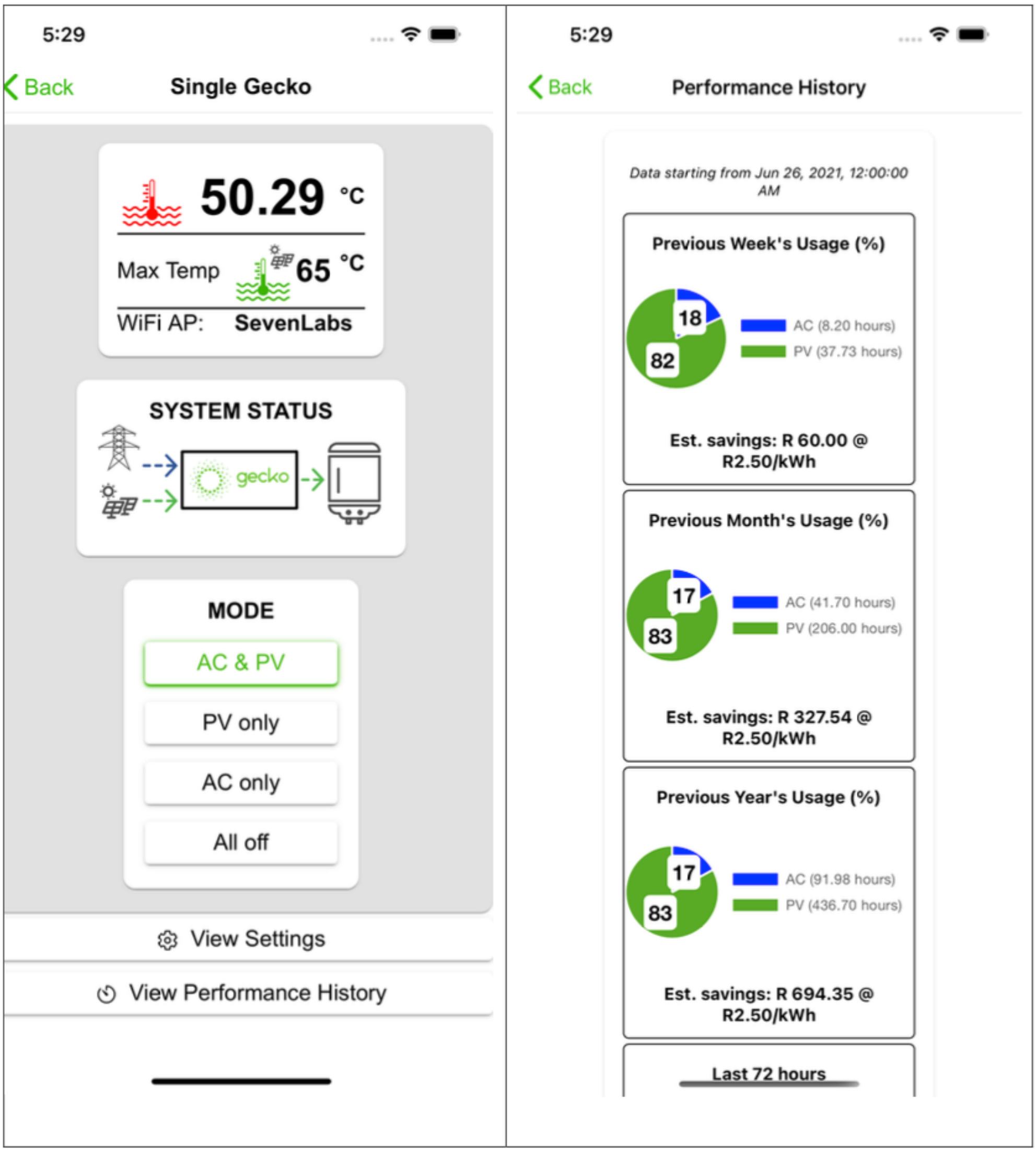
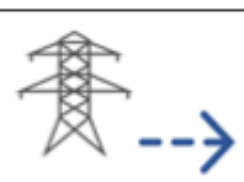
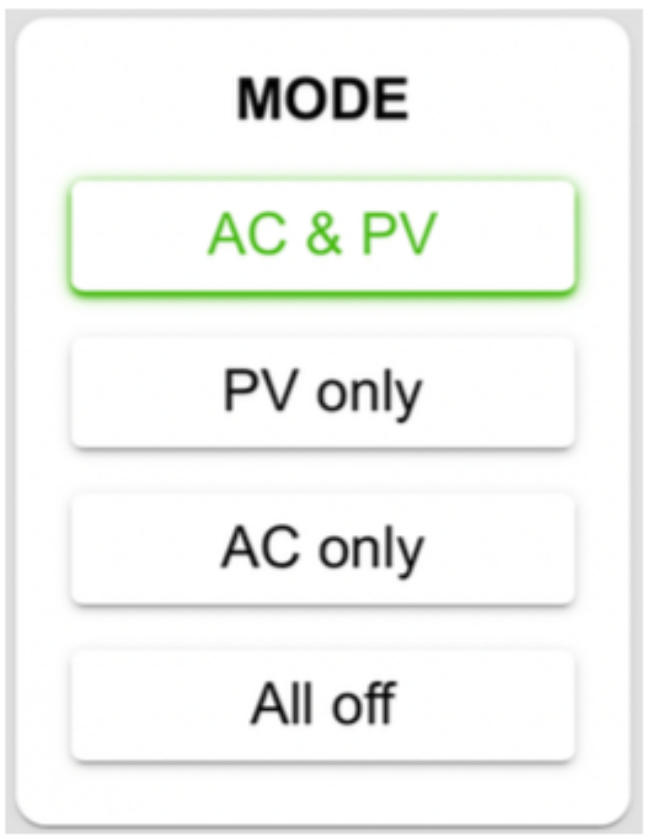


Figure 8: Geyser Gecko control interface (left) and utility bill savings (right)

Icon	Description
	Current geyser temperature.
	Maximum temperature that the geyser will heat up to. If the temperature falls 3 ºC below this temperature, **PV** power will be turned on. Once the geyser reaches this temperature, the **PV** will switch off. If ***AC only* mode** is selected, the geyser will be heated up to this temperature by using only AC power.
	Wi-Fi access point that the *Gecko* is currently connected to.
	The blue arrow indicates that **AC** power is present. If the arrow flashes, it means that the geyser is being powered by **AC**.
	The green arrow indicates that **PV** power is present. If the arrow flashes, it means that the geyser is being powered by **PV**.
	Sets the operation mode. The *Gecko* can operate in the following modes: **Modes:** There are four modes for the *Geyser Gecko* controller: **a. *AC & PV* mode** This is the default operation mode. The AC grid power is used when the water temperature is below 48 °C. The PV power is used when the temperature is hotter than or equal to 48 °C. The supply to the geyser is switched off if the temperature reaches the *Max Temp* setting and

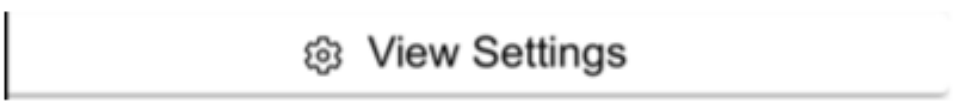
	switched back on if the temperature drops by 3 °C. **b. *PV only* mode** This is the off-grid mode, no AC power is used. The PV power is used for any value colder than the *Max Temp* (default 65 °C). The water will take longer to heat up than the combined mode. The supply to the geyser is switched off if the temperature reaches the *Max Temp* value. **c. *AC only* mode** The AC grid power is used when the water temperature is at least 3 °C below the *Max Temp* value. The power to the geyser is switched off upon reaching the *Max Temp* value. **d. *All off* mode** No power is let through to the geyser, regardless of the temperature.
	This is displayed in the temperature block when no temperature sensor is picked up or it has a bad connection.
	Click on this button to change *Gecko* settings, such as electricity rate and the name of the *Gecko*.
	Click on this button to view the estimated savings on the geyser utility bill. This page displays the amount of hours that the *Geyser* was powered by either AC (utility) or PV (solar panels). It also displays the estimated savings, based on the electricity rate that can be set in the settings.

Table 3: Interface Description

Timer Functionality

1. Update your Geyser Gecko App to the latest version from the App / Play store.
2. Open the Geyser Gecko App and click on the Gecko.
3. In the monitor page, scroll down to the bottom and click on the “Timers” button.
4. The page below shows the list of active timers. Click on the “Add Timer” button to add a timer:

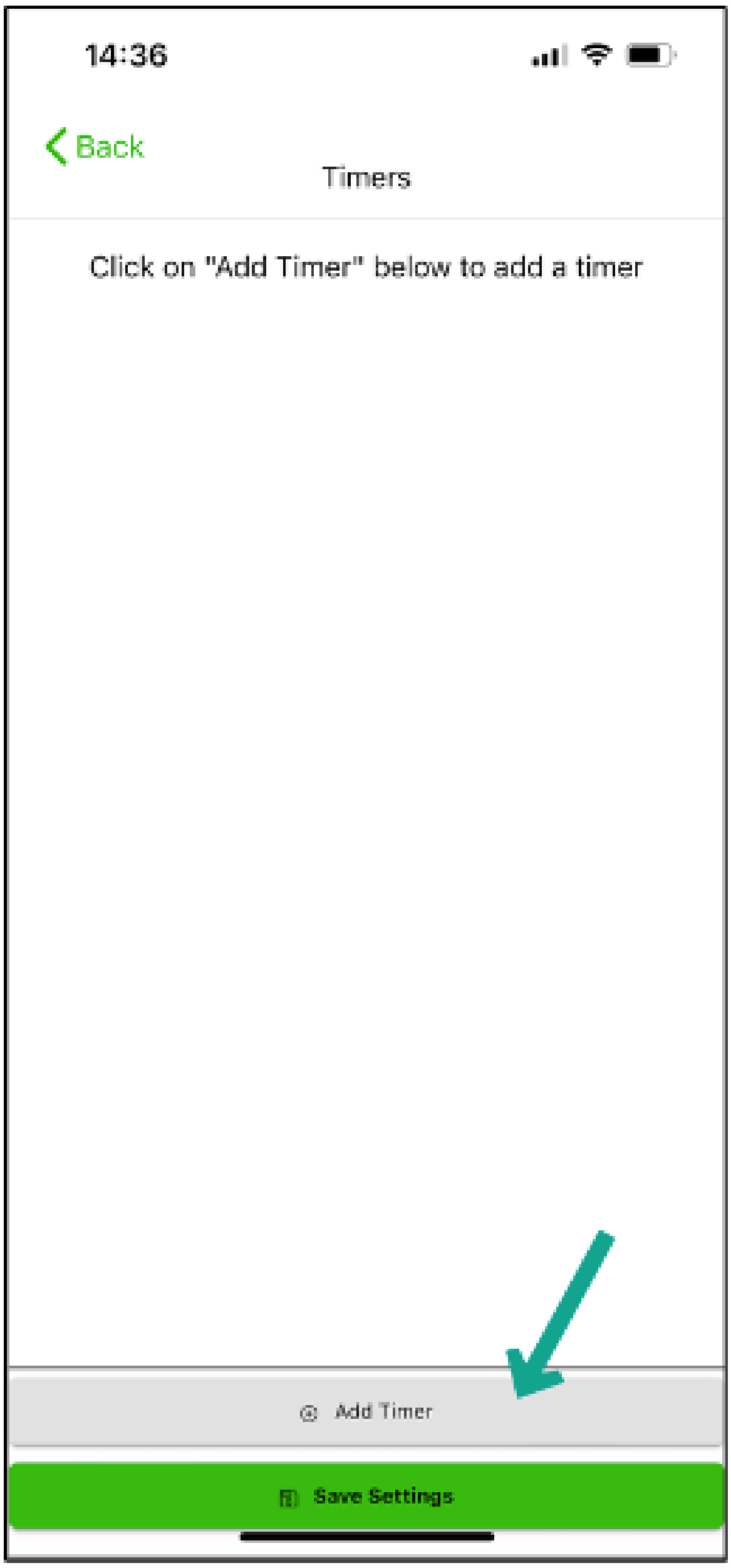


Figure 9: Adding a New Timer

5. This will open up the page below to set the timer:

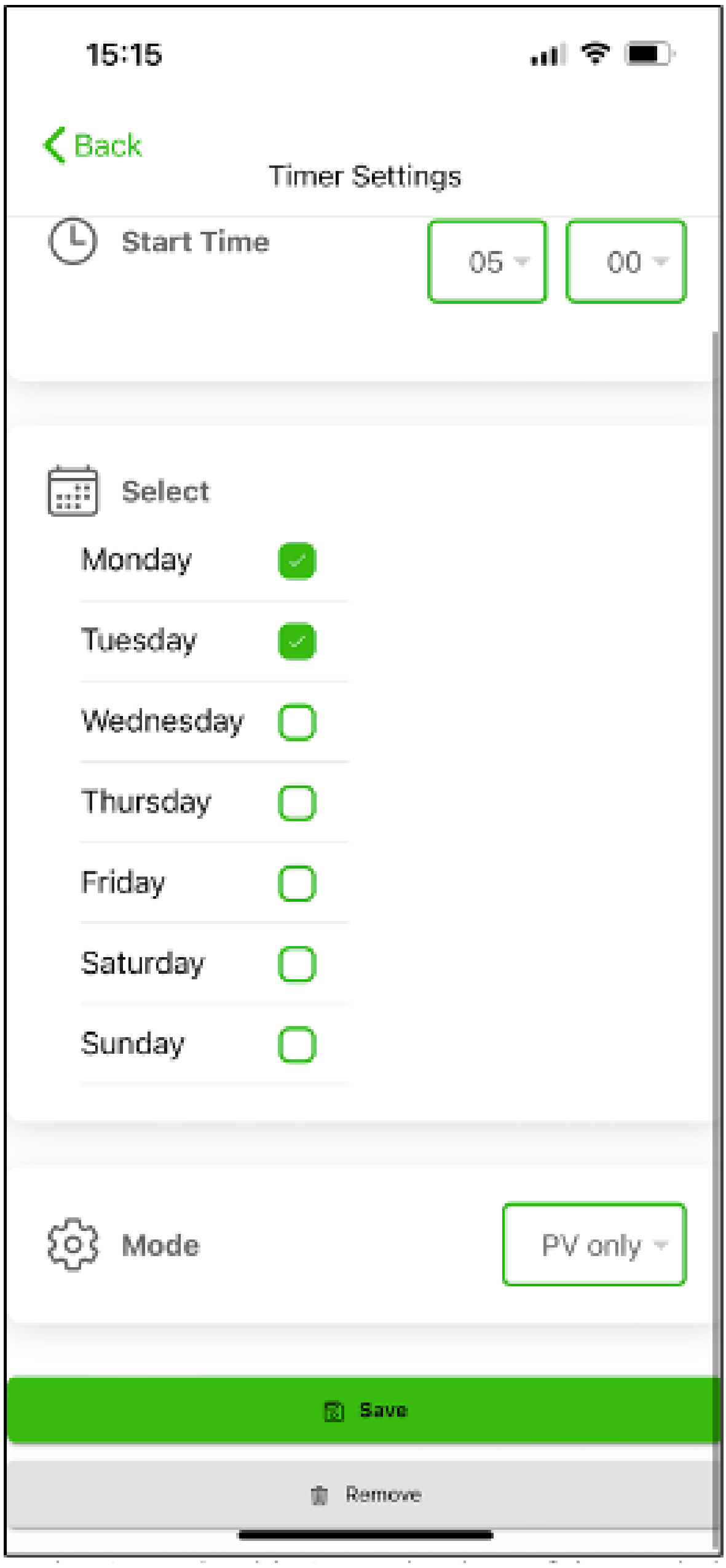


Figure 10: Setting Up a New Timer

6. Set the time that the timer should trigger, the days of the week that it should trigger and the mode that it should trigger in the screen shown above. For “AC only” mode, the target temperature can also be set. After the geyser reaches this setpoint, the *Gecko* will automatically switch to “AC and PV” mode.
7. After setting the timer, click on the **Save** button.

8. The list of active timers will be shown as in the example below (notice that here an “AC only” timer was set for 50 degrees Celsius). This means that at 05:00 every Monday, the *Gecko* will switch to “AC only” mode until the water reaches 50 degrees Celsius, then switch back to “AC and PV” mode.

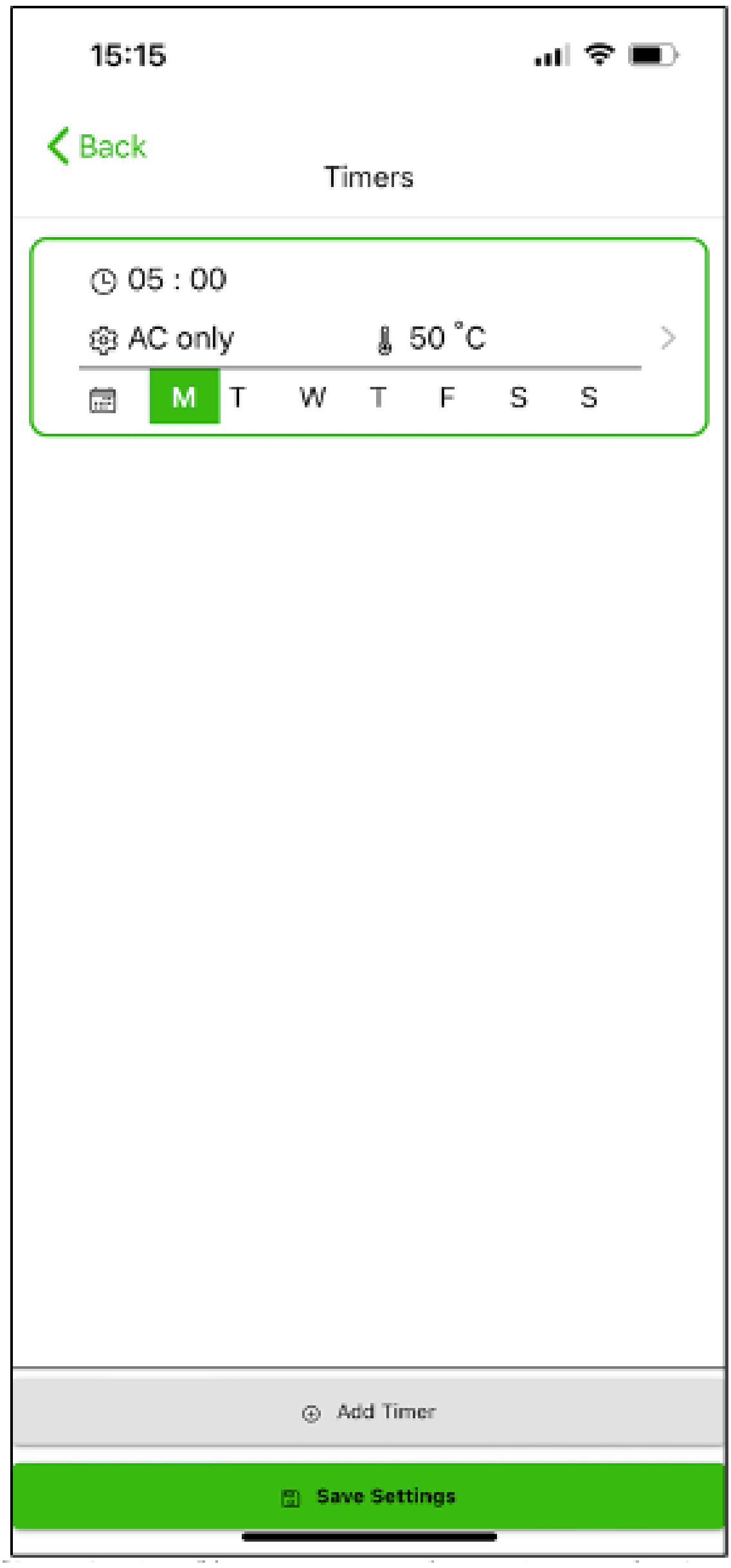


Figure 11: Timers Set

9. Click on the **Save Settings** button to save the settings to the *Gecko*.

10. To edit a timer, click on the timer to be modified in the list screen above. To remove a timer, open the timer and click on the **Remove** button on the bottom.

Hardware interface

The *Geyser Gecko* unit has onboard LEDs to indicate which inputs are detected and which outputs are currently used. The unit will run through the LEDs twice on start-up. There is also a “TEMP” LED which flashes out the temperature every 5 seconds. The first count of flashes is for the 10s and the second count is for the 1s. So 52 degrees would look like: O O O O O ___ O O and 60 degrees will be O O O O O O.

When the temperature LED is on constantly and not flashing, this indicates a temperature probe error. Refer to the troubleshooting table for more information.

Manual override / operation if not connected to WiFi

If you want to override the *Geyser Gecko* unit and connect the geyser to AC permanently, push the change over (refer to the yellow breaker in Figure on page 19) switch to the top position.

Push this breaker back to the down position to give control back to the *Geyser Gecko* unit.

Troubleshooting

Do NOT attempt to open the controller unit under any circumstance if you are not an approved installer of the *Geyser Gecko*.

Problem	Possible causes	Possible solution
Unit off (no lights)	1. No AC and no PV power coming in. 2. Unit malfunctioned.	1. Check the voltages on the AC and PV inputs. 2. Send the unit back to the installer.
Water temperature too low	1. Mode is **PV Only** and the sun on the panels is not sufficient or the panels are dirty or shaded. 2. The AC power is not connected.	1. Check if weather is not cloudy, clean the solar panels. 2. Check the mode of the controller and check if the AC power is connected and grid power is available. Set the unit to ***AC & PV mode*** to supplement the PV power.
Water temperature too high	1. The temperature probe is not fixed to the geyser correctly.	1. Fix the temperature probe properly to the output of the geyser (Call an electrician for

		inspection). Turn on the tap so the hot water can flow through the system.
AC power in not detected	1. There is no power coming from the grid. 2. The circuit breaker has tripped.	1. Reset the circuit breaker by switching it to the top position. 2. Call the installer for inspection.
PV power in not detected	1. The solar radiation levels are too low. 2. The cables from the solar panels are not connected or wrongly connected. 3. The DC circuit breaker has tripped.	1. Wait for clear sky. 2. Check the wiring from the solar panels. 3. Reset the circuit breaker by switching it to the top position.
Temperature LED not flashing / constantly on	Temperature probe error.	1. Ensure the temperature probe is plugged into the *Gecko* controller. 2. Ensure the temperature probe wires are making proper contact and that there are no broken wires between the probe and the *Gecko*.

Table 4: Troubleshooting the Gecko

Warranty

1) The *Geyser Gecko* unit has a warranty of one year ONLY if it is installed by a registered Geyser Gecko installer.

2) In the case of a legitimate claim, the cost for installation and transport of the replacement unit is for the account of the client.

3) The warranty is voided if the unit has been tampered with.

Exclusion of liability

• Dark Line (Pty) Ltd assumes no responsibility and will not be liable for any loss, damage or costs which may result from or are in any way related to incorrect installation, improper operation, incorrect execution of installation work and incorrect usage and maintenance or any consequential loss as a result of a faulty or damaged unit.

• The manufacturer reserves the right to make changes to the product, technical data or assembly and operating instructions without prior notice.

Installer Manual

Solar panel installation

For best performance, the solar panels should be installed facing north. North-east or north- west facing is also acceptable with a slightly reduced performance. A suitable roof area that is free from shadows should be selected, nearby trees could be problematic. Appropriate roof covering has to be specified so that the correct roof hooks can be supplied. The frames of the PV modules have to securely bond to earth. The max combined power of the solar panels that the *Geyser Gecko* supports is 1800W. All panels should be connected in series. Ensure that all DC installation wiring is at least 4mm2. This includes the wires from the solar panels to the Geyser Gecko.

Geyser Gecko installation

The unit should be mounted close to the DB board in a cool and dry place.

DO NOT install the *Gecko* controller box in a roof or duct, since this will void the warranty. The *Geyser Gecko* unit can be mounted in any of the following distribution boards:

- Surface mounted 12 way DIN rail distribution board
- Flush mounted 14 way DIN rail distribution board

Notes:

• The installation must be performed by a suitably competent person.

• A COC certificate must be issued to verify correctness of the system installation if required by client.

• It is the customer's responsibility to ensure that there is adequate Wi-Fi reception in the location where the *Geyser Gecko* unit will be installed.

• Ensure that the power to the *Geyser Gecko* is turned off (PV and AC), before attempting installation – even if just wiring the temperature sensor.

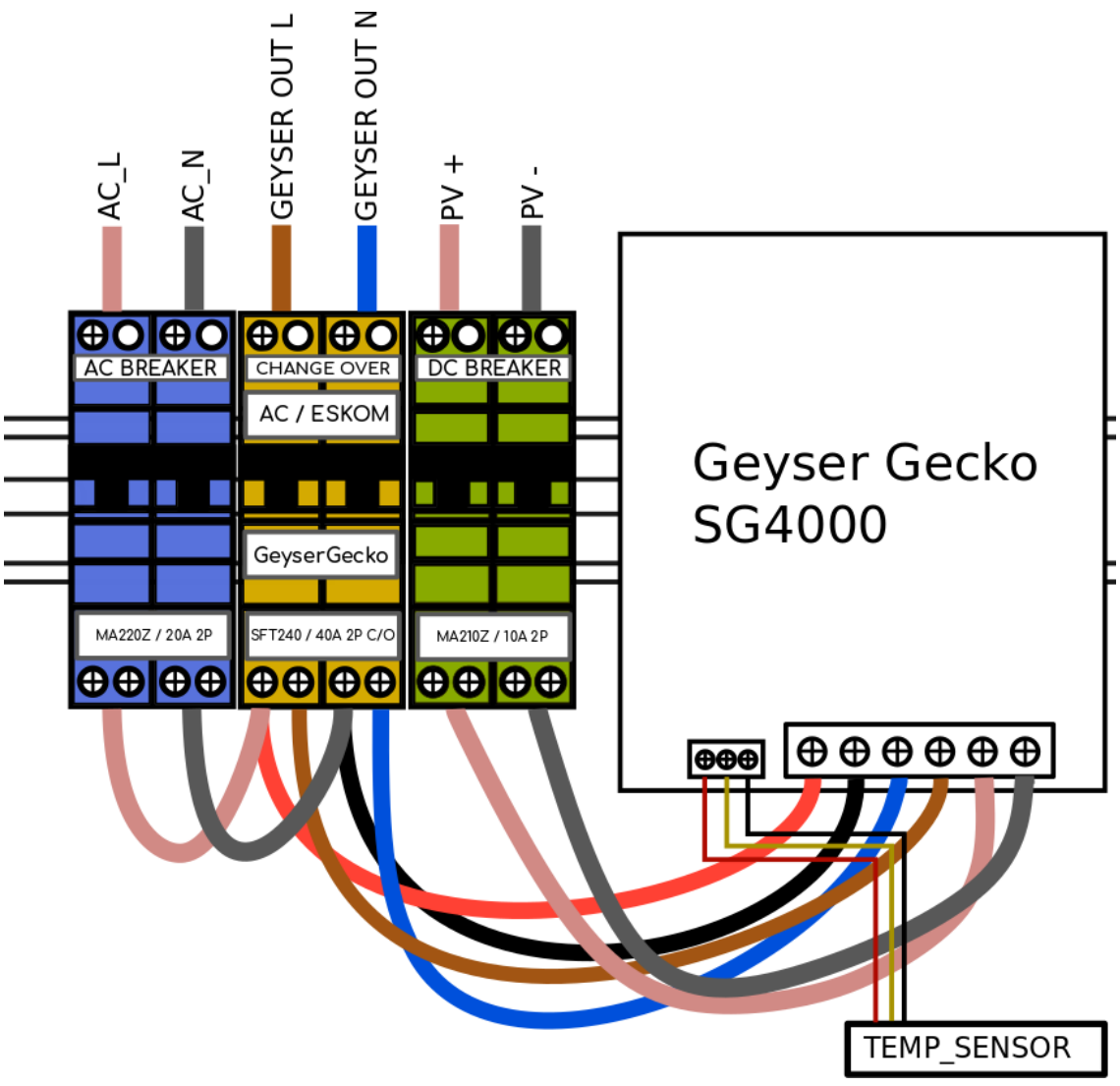
Wiring

• Ensure that all AC installation wiring is at least 2.5mm2.

• Ensure that all DC installation wiring is at least 4mm2.

Geyser Gecko installation steps

1. Cover the solar panels to ensure that there is no voltage present while installing the *Gecko*.
2. Switch off the circuit breaker to the geyser on the distribution board and switch the geyser isolator off at the geyser and confirm with a multi meter that there is no voltage on the geyser terminals.
3. Switch the DC breaker to the off position (bottom).
4. Set the thermostat to a setting of about 60°C, the Geyser Gecko will take over most of its functionality but it is still an extra safety feature if the temperature reaches such extreme levels.
5. Install the change over switch, AC breaker and DC circuit breaker.
6. Do NOT earth the DC wires, they need to be completely isolated from earth.
7. Take care that the DC wires are not too long or coiled, this could cause damaging inductive spikes to the *Geyser Gecko* unit.
8. The recommended wire size for the solar input is 4mm2 for up to 50 meters of cable length.
9. Install the *Geyser Gecko* unit according to the wiring diagram on page 31 and make sure that it is shielded from the elements. The enclosure in which it is installed should provide sufficient protection.



	20 @ 400VAC 2-pole AC Breaker (supplied with the *Gecko*)
	40A @ 250VAC Change Over Switch (supplied with the *Gecko*)
	10A 500VDC DC Miniature Circuit Breaker (supplied with the *Gecko*)

Figure 12: Gecko Wiring Diagram

10. Install the temperature probe by fixing it to the hot-out pipe of the geyser. The temperature probe should then be covered with lagging and the lagging must be secured with cable ties. This will ensure that the temperature probe gets the most accurate temperature reading.

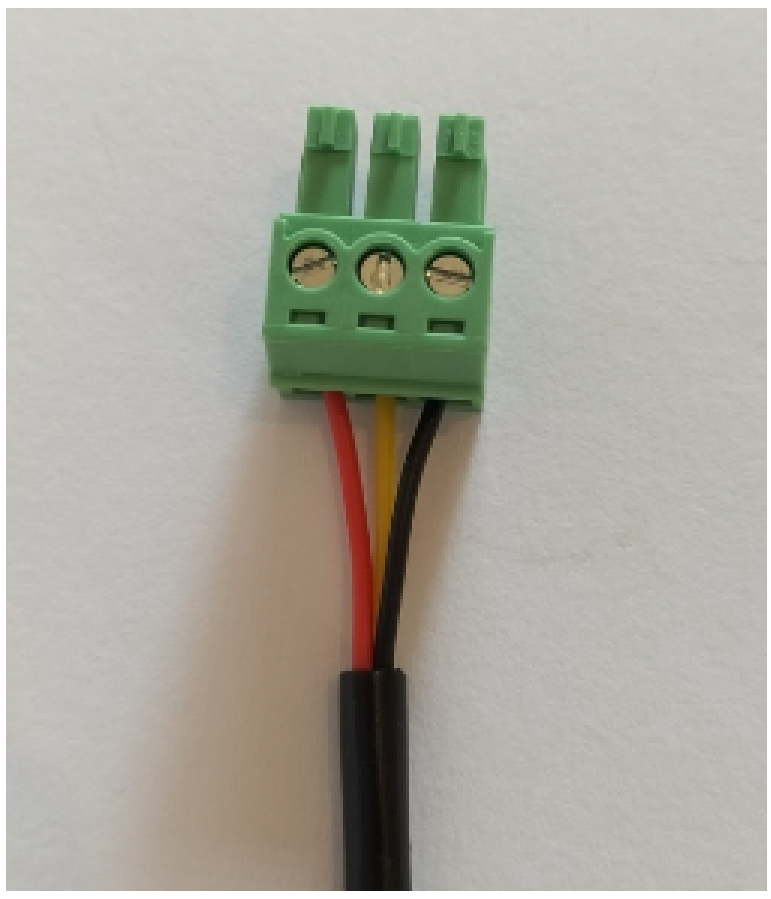


Figure 13: Temperature probe connection (connected in exact order shown: red, yellow, black)

Figure 14: Temperature sensor placement

If the unit is installed 1 meter or less from geyser, the provided digital temperature probe can be used without any extension or special cable.

If the unit is installed more than 1 meter from geyser the digital temperature probe sensor must be extended with CAT5e Shielded FTP/S-FTP or CAT6 Shielded FTP/S-FTP cable. It has 4 twisted pairs inside with a foil shielding covering all wires and a bare copper wire connected to the shielding. This is to avoid interference with temperature reading.
It is important to keep the CAT5e/CAT6 cable as far away from AC lines as possible when installing the extension cable.

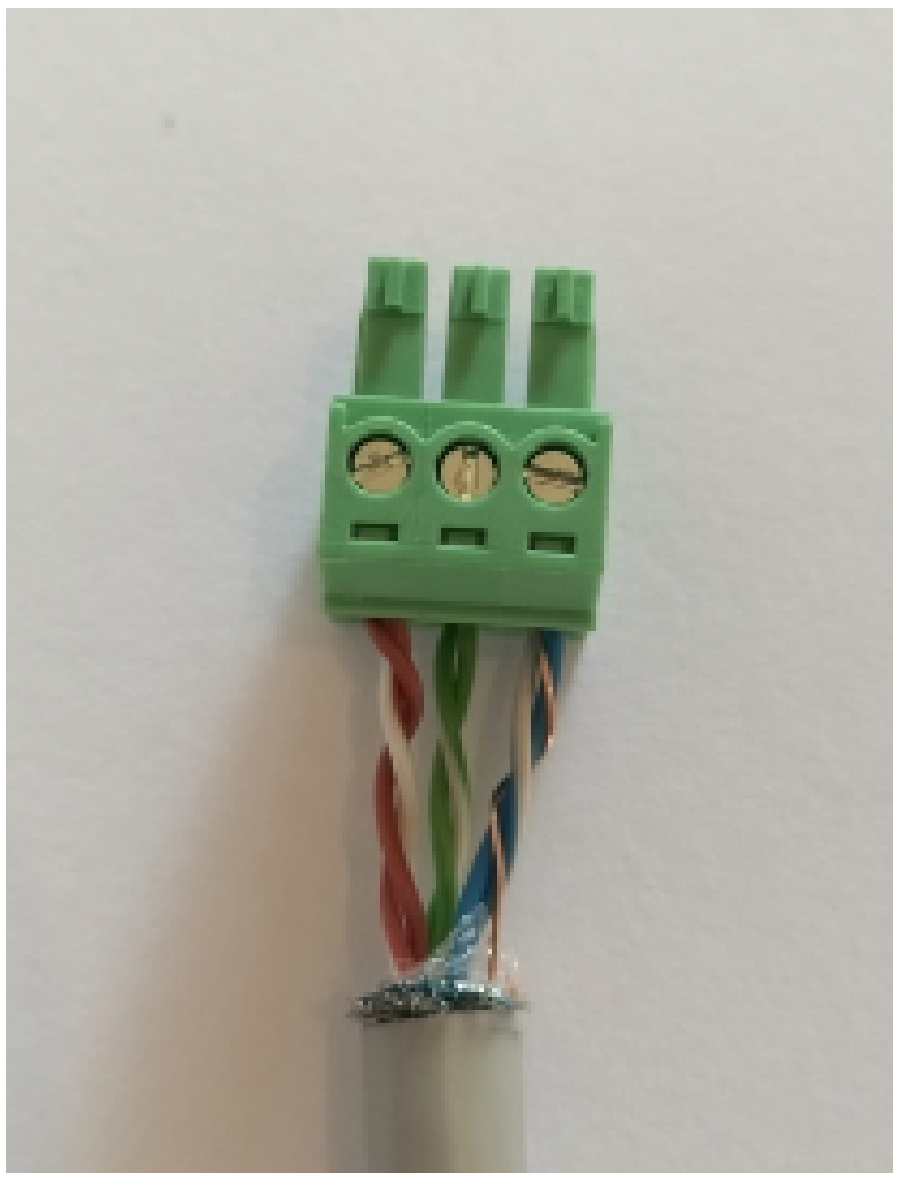


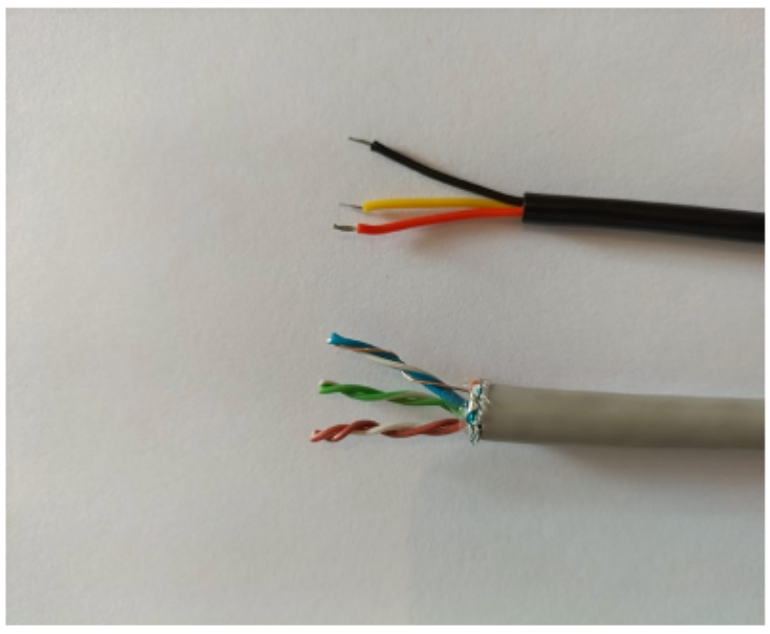
Figure 15: CAT5e / CAT6 cable temperature probe wiring

The following twisted pairs will be used:
- brown and brown & white (+5V),
- green and green & white (Data),
- blue and blue & white and exposed copper wire (GND)

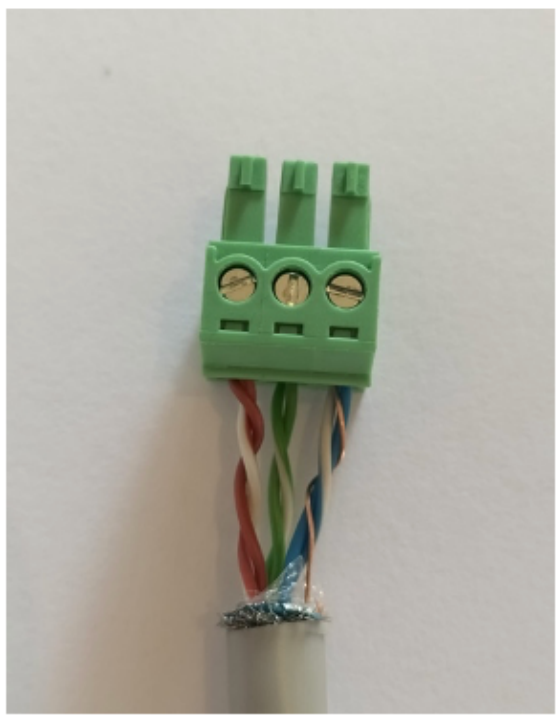
The orange and orange & white wires can be cut off.

NOTE: The sensor should be mounted at the hot out of geyser and covered with lagging.

The wires should be joined as follows:

<table>
<tr><th colspan="2">Step 1</th></tr>
<tr><td>  </td><td>

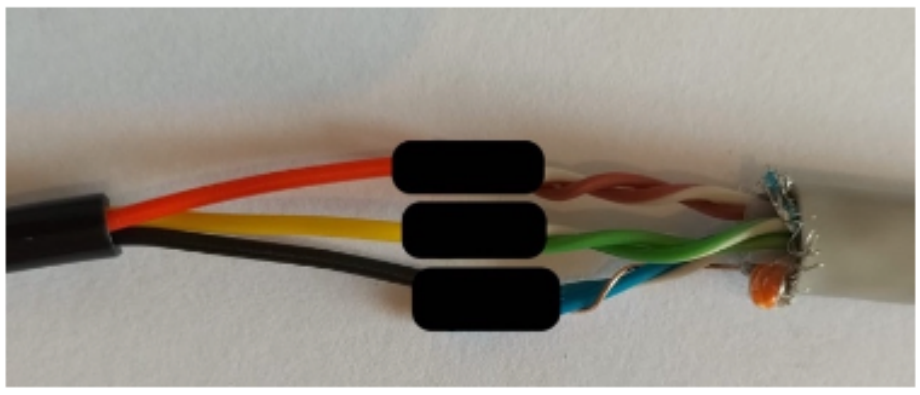
Measure the length of cable required to connect the Gecko to the terminal probe on the geyser and cut the wire to this length.
Strip the CAT5e/CAT6 cable on both ends and separate the wires as shown, while keeping the twisted pairs twisted.
The orange and orange & white wires can be cut off.
Strip 8mm of each wire, exposing 8mm of conductor (on both ends of the CAT5e/CAT6 cable).
The exposed copper wire should twist around the blue and blue & white wires (if there is no exposed copper wire available in the cable, the shielding can be twisted around the blue and blue & white wires).

</td></tr>
<tr><th colspan="2">Step 2</th></tr>
<tr><td>  </td><td>
Connect the wires to the screw terminal plug as shown on the left (on one end of the CAT5e / CAT6 cable). This screw terminal will plug into the Gecko controller.

IMPORTANT: Measure the resistance between the GND and 5V and GND and Temp contacts to ensure there are no shorts (resistance should show OL / high impedance).

If there is a short here, it will damage the Geyser Gecko.

<table>
<tr><td>Left (5V)</td><td>Brown and brown & white</td></tr>
<tr><td>Center (Temp)</td><td>Green and green & white</td></tr>
<tr><td>Right (GND)</td><td>Blue and blue & white and exposed copper wire</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Step 3</th></tr>
<tr><td>


The other end of the CAT5e / CAT6 wires must be connected in the exact order as indicated on the left and table below.
Wires can be crimped together with a ferrule or soldered together and covered with heat shrink or a splicing connector can be used (like the Wago 222 series).

Note: If this connection is not properly done, a temperature reading will not be picked up (Temperature probe error on Geyser Gecko app).

<table>
<tr><th>Temperature Probe</th><th>CAT5e / CAT 6 Cable</th></tr>
<tr><td>Red</td><td>Brown and brown & white</td></tr>
<tr><td>Yellow</td><td>Green and green & white</td></tr>
<tr><td>Black</td><td>Blue and blue & white and exposed copper wire</td></tr>
</table>
</td></tr>
</table>

Table 5: Joining the temperature probe wire

11. Once the installation is successfully completed, switch on the circuit breaker to the geyser in the distribution board and remove the covering from the solar panels. Switch the change over switch to the *Gecko* (bottom position).
12. Switch the AC and DC circuit breaker to the on position (top).
13. Verify that the *Geyser Gecko* controller unit is functional:

a) Confirm that the start-up LED sequence ran through all the lights 3 times.

b) Confirm that the temperature is flashed out at the TEMP LED every 5-10 seconds.

14. Use the *Geyser Gecko* app to register the installation (refer to Installer App Interface below).
15. Assist the client to install the app and connect to their *Geyser Gecko* (refer to App Interface below).

Installer App Interface

The *Geyser Gecko* App serves as an interface for the user (and installer) to check the exact temperature and the state of all inputs and outputs. The app is also used to register and configure a new installation.

Becoming a registered installer

To become registered installer, please follow the steps below:

1. Complete the online installer test by visiting: https://form.jotform.com/230924270592052
2. Upon passing the test, you will receive an email confirmation with your account details and installer certificate.
3. Download the *Geyser Gecko* app by scanning the QR code on the Geyser Gecko or by visiting https://geysergecko.co.za/download (Play Store / App Store / AppGallery).
4. Open the app.
5. Log in using your new installer credentials. You can now use the app to register Geckos that you install to activate the warranty.

Registering a new installation on the Geyser Gecko App

After you have successfully installed the *Geyser Gecko*, you must register the installation on the system by opening the *Geyser Gecko* app following the steps below:

1. Click on Register *Gecko* Installation.
2. You will be presented with a screen to enter all the installation information. In the Serial Number field, enter the serial number found underneath the QR code on the *Geyser Gecko* or scan it with the app to auto-populate the field. The Friendly Name field is the name that will be displayed on the client's app. All fields MUST be filled in. The Installer Friendly Name is to identify the installation for the *Geyser Gecko* back office and for you as the installer. This can be something like: John Smit Gecko Complex.

3. Ensure that the installation City is correctly filled in, as this will determine the UV index that will be displayed on the app.

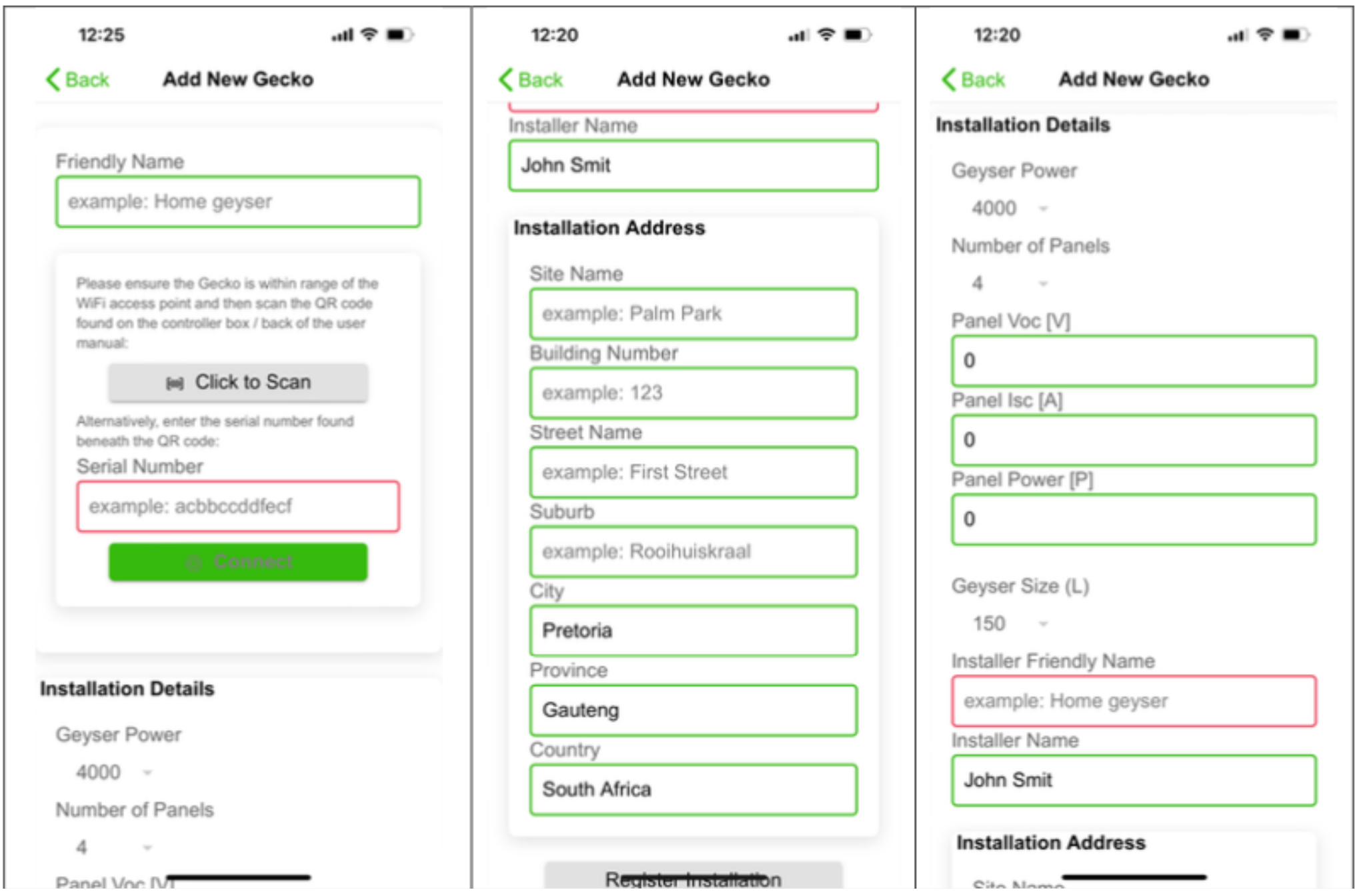


Figure 16: Installation details on the app

4. After filling in all the required details, click on the **Register Installation** button to register the installation on the system and activate the warranty.

For the next installation, you will only have to click on the **Register Gecko installation** and follow the steps.

Installation Checklist

The checklist below should be used to verify correct installation of a *Geyser Gecko*.

GEYSER GECKO SOLAR INSTALLATION	RESULT
AC Volt (220 – 240)	
DC Volt (80 - 250V DC)	
AC Amp (8 – 18)	
DC Amp (<10A)	
Earth wire connected from panels to DB earth	YES / NO
Digital temperature probe connected to screw terminal Red/Yellow/Black (If extended with CAT5 shielded wire)	YES / NO
Sensor placed at hot out fitting of geyser covered with lagging	YES / NO
Geyser Gecko barcode scanned to register installation on Mobile App	YES / NO
DB Closed	YES / NO
Labels	YES / NO
AC ON	YES / NO
DC ON	YES / NO
Set change over to bottom position (Solar)	YES / NO
Thermostat set 70 degrees Celsius	YES / NO
Element cover closed	YES / NO

Table 6: Installation checklist

System Wiring Summary

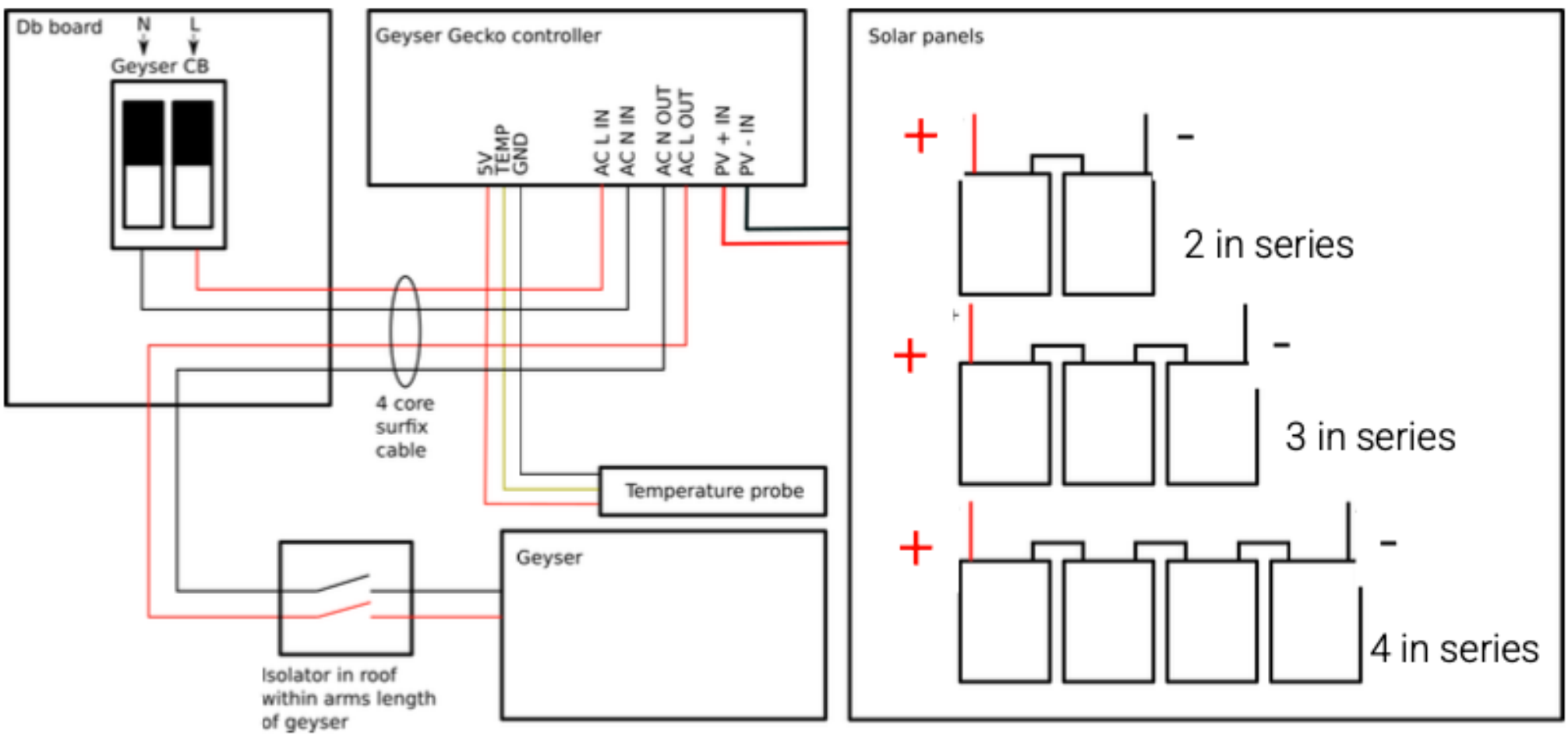


Figure 17: System Wiring for Gecko

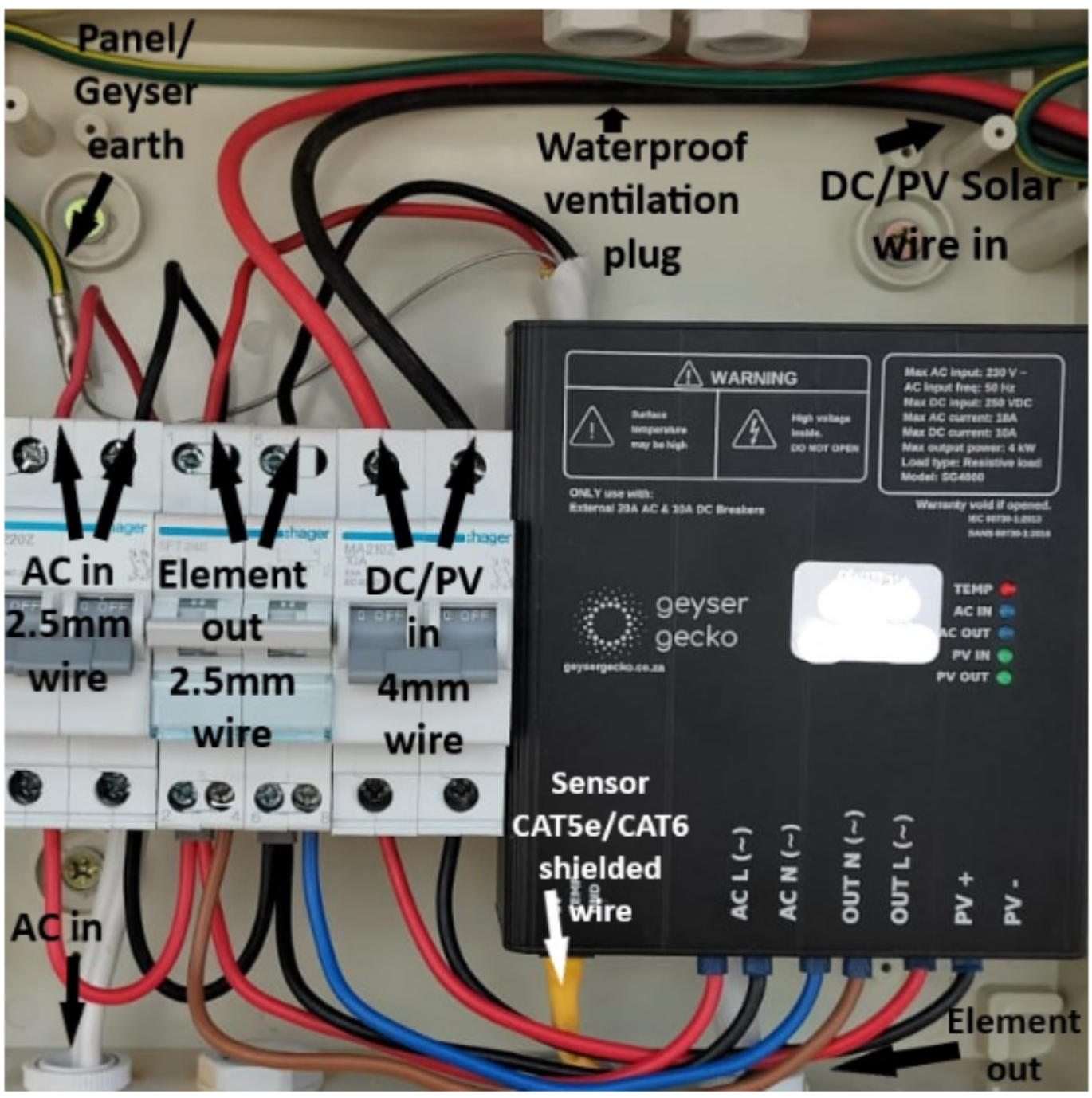


Figure 18: Example installation