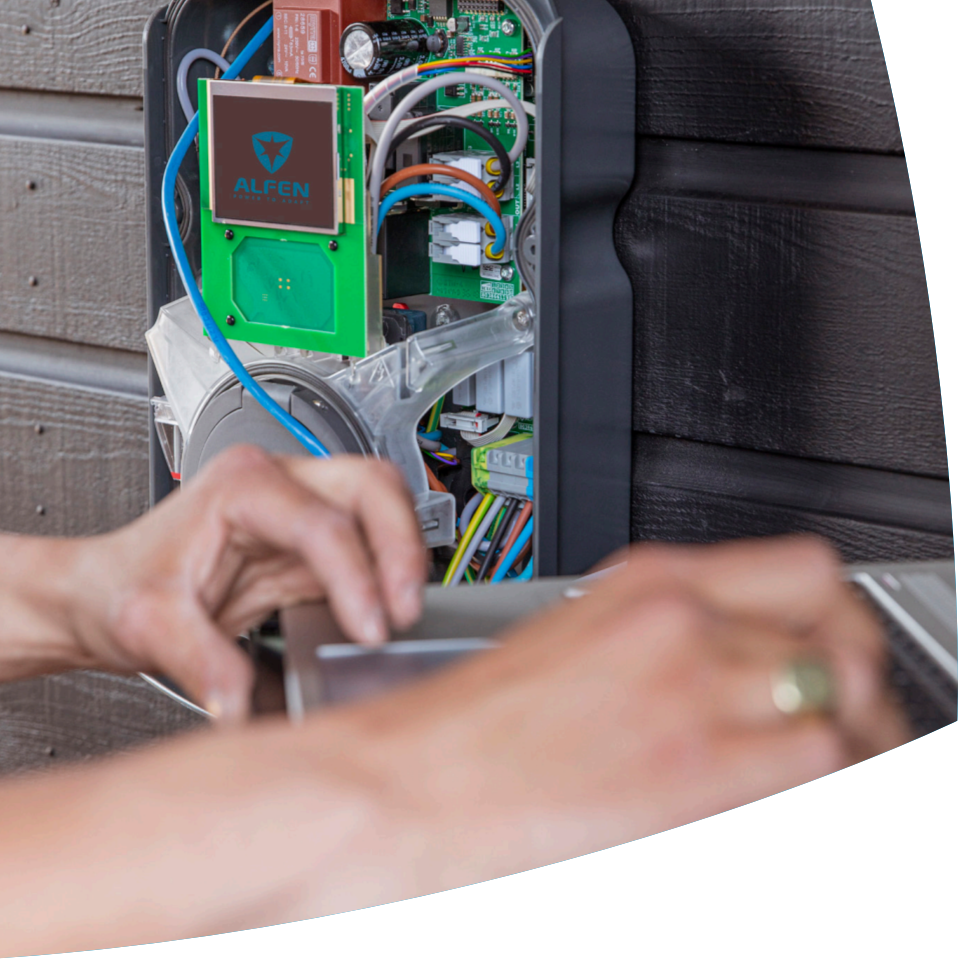

Smart Charging

Eve Single

Configuration Guide

ALFEN
POWER TO ADAPT

TABLE OF CONTENTS

EN

1.1 Purpose and intended audience

This manual applies to charging stations produced by Alfen ICU B.V., Hefbrugweg 28, 1332 AP Almere, the Netherlands, reg. no. 64998363 ("Alfen"). Follow this manual to configure the Smart Charging features.

Configuring charging stations may only be performed by a qualified electrician. It is essential that the qualified electrician has:

- Expertise on all relevant general and specific rules regarding safety and incident prevention
- Comprehensive knowledge of applicable electrical regulations.
- The ability to identify and forsee risks and avoid potential hazards

1.2 Explanation of text instructions used

Safety warnings and precautions are indicated in this document as follows:

DANGER

Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury

CAUTION

Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE

Signal word used to provide additional information or information on possible product damage.

1.3 Disclaimer

This document has been subjected to rigorous technical review before being published. It is revised at regular intervals, and any modifications and amendments are included in the subsequent issues. Although Alfen has made its best efforts to keep the document as precise and up-to-date as possible, Alfen does not assume any liability for defects and damage which results from the use of the information contained herein.

NOTE

This manual is subject to updates and changes. Errors and omissions excepted.

Any deviation to the products as assembled by Alfen including, but not limited to, customer-specific modifications to the product such as the placement of stickers, SIM cards or the usage of different colors (all referred to as 'Customization') may affect the final product, its experience, appearance, quality and / or lifespan (the Customized Product). Alfen is not liable for any damage to, or caused by, the Customized Product if this damage is caused by this applied Customization.

Alfen shall not be liable in any way, for any kind of damage, and the (carry in) warranty for the product and the accessories shall not apply in the following cases:

- Failure to comply with the instructions in this manual in general and with the operating conditions specifically.
- Improper use.
- External damage.
- Installation, commissioning or faulty repair or maintenance by unqualified persons.
- Failures from the grid or the GPS / GPRS provider.
- Modification or configuration of the product or accessories without the knowledge of Alfen.
- Use of spare parts not approved or manufactured by Alfen.
- The charging station is used outside its operating conditions as stated in this manual.
- Situations have occurred that are beyond the control of Alfen (force majeur).
- Malfunction of an open charge point back office.
- Damage to the electrical vehicle.

1.4 Copyright

1.5 Trademarks

Eve®, ICU®, Alfen® are trademarks by Alfen N.V.. Any unauthorized use of the trademarks is therefore illegal.

1.6 Languages

The English version of this document is the original source. Documents in other languages are translations of this source.

2. GETTING STARTED

EN

There are two ways to configure the charging station: via the MyEve app or using the ACE Service Installer.

2.1 Before using the MyEve app

CAUTION

The MyEve app has been designed for the installer / electrician only. Its purpose is to commission and configure Alfen charging stations.

The MyEve is not intended for use by the charging station end users.

1. Download the MyEve app in Google Play, Apple Store or Windows Store to your laptop, tablet or smartphone.

Google Play Store	Apple App Store	Microsoft Store

2. You will be requested to create an account.
3. If you have the MyEve app already installed, make sure you update to the latest version. Use the above QR-codes to see if your app needs to be updated.
4. Make sure the Firewall settings on your laptop, tablet or smartphone are not blocking the MyEve app.

2.2 Before using the ACE Service Installer

1. Download the ACE Service Installer from the Alfen website to your laptop here: https://alfen.com/en-gb/search-downloads
2. Request an account at this e-mail address: ace.aftersales@alfen.com.

   NOTE

   It may take some days until you receive the login-data.

3. If you have the ACE Service Installer already installed, make sure you have the latest version. If updates are available, you will be asked to update when you log in.
4. Make sure the firewall settings on your device are not blocking the ACE Service Installer.

3.1 Abbreviations

The following abbreviations are used in this document:

Abbreviation	Meaning
ALB	Active Load Balancing
DHCP	Dynamic Host Configuration Protocol
DSMR	Dutch Smart Meter Requirements
EMS	Energy Management System
ESMR	European Smart Meter Requirements
EV	Electric Vehicle
L (L1 L2 L3)	Phase (1, 2, 3)
LAN	Local Area Network
Mbps	Megabits per second
mDNS	Multicast Domain Name System
N	Neutral
OCPP	Open Charge Point Protocol
PE	Protective Earth
POI	Point of Interconnection
PV	Photovoltaic
RJ (11/45)	Registered Jack
RS	Recommended Standard
SCN	Smart Charging Network
TCP/IP	Transmission Control Protocol / Internet Protocol
UDP	User Datagram Protocol
UTP	Unshielded Twisted Pair

3.2 Terms used in this document

The following list refers to the terms being used in this document for clarity and consistency reasons. However, the terms on the display, in the app or other documentation regarding the charging stations may be different.

Term	Explanation
ACE Service Installer	A program developed by Alfen for the installer to commission Alfen charging stations and configure the features of Smart Charging. The program is for use on a laptop.
Active Load Balancing	The current consumption of devices is monitored by an EMS and controlled by the charging station via this feature. ALB can be combined with a Smart Charging Network to dynamically manage the power distribution for the SCN.
Alternating (charging)	In case the available current in a charging station or group of charging stations is insufficient to serve all connected EVs, they will be charged one after the other. The available power is divided and communicated to connected EVs, whilst other charging sessions will be resumed for a set period of time (alternating period).
Back office (management system)	A system (in the cloud) provided by Alfen or the grid operator in which the (Smart Charging) features of the charging station(s) are configured.
Charging station	Stationary part of EV supply equipment connected to the supply network. Alfen charging stations have one or two sockets.
Energy Management System	A (usually local) system that connects to solar inverters, heat pumps, energy storage and charging stations in order to monitor and control the available and consumed power of these devices. It displays the consumption and generation of power. It can be can be purchased and used by companies or consumers.
Electrical installation	Complete system including the EV supply equipment and the EV functions that are required to supply electric energy to an EV for the purpose of charging.
External energy meter	Digital energy meter that is added to the control cabinet if it cannot be provided by the grid operator.
Local Area Network	A group of computers and other devices in a limited area, connected by a communications link that enables any device to interact with any other on the network.

3. TECHNICAL BACKGROUND

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Term	Explanation
Maximum current	The maximum charging current a charging station (Station max. current) or socket (max. current socket) is allowed to provide.
Minimum current	when a charging station loses network connection, all charging stations will fall back to using this value. The charging station will continue to charge on this minimum charging current. This is a security setting.
app	An app developed by Alfen for the installer / electrician only to commission and configure features of Alfen charging stations. The app can be used on a laptop or mobile phone.
OCPP	Open Charge Point Protocol, the protocol for communication between a charging station and a backoffice system.
Phase rotation	The order in which the voltage waveforms of a polyphase AC source reach their respective peaks.
Point of interconnection	The connection point where the EV supply equipment and the grid connection come together.
Preset (for an external energy meter)	A set of parameters for a specific external energy meter. This set is necessary for the charging station to be able to read the data of that specific external energy meter. Some external energy meters are available with presets when configuring Active Load Balancing.
Probing current	The test current that is applied during the probing phase.
Probing phase	Every charging session starts with a test phase. In this phase the charging stations detects whether the electric vehicle requires a minimum charging current of 6A (according to the IEC 61851 norm) or 14A. Only if the available power is not sufficient to serve all sockets in use, these will be paused during the probing phase. The socket with the recently connected vehicle will not be paused.
RS-485	A standard defining the electrical characteristics of drivers and receivers for use in serial communications systems.

Term	Explanation
Safe current	The available power reserved for a socket when the charging station loses connection.
Scaling factor	The ratio of the sensor output to the sensor input, which is expressed in degree/sec.
Smart (energy) meter	Digital energy meter that has been placed in the control cabinet by the grid operator.
Smart Charging	Refers to energy consumption optimization within a system of electric vehicles, charging stations and charging operators by means of sharing and controlling data. General (umbrella) term for several features.
Smart Charging Network	Multiple charging stations that are connected within the same network via LAN, exchanging data to manage the current distribution locally. For every socket, the network decides how fast it can charge, taking the total load into account.
Smart Charging profiles	Controlling the charging power or current is based on power transfer limits at specific points in time. Those limits are combined in a charging profile. By the means of these profiles, a central system can control • the charging current of a specific EV, • the total allowed energy consumption on an entire electrical installation, • or a group of charging stations, based on a grid connection, energy availability on the grid or the wiring of a building.
Socket	Part on the charging station for charging the EV at which only one EV at the time can be charged.
1-phase EV	An EV that can only charge with 1-phase.
3-phase EV	An EV that can only charge with 3-phases.

4. PURCHASE AND UNLOCK SMART CHARGING FEATURES

4.1 General information

The Smart Charging features developed by Alfen are paid features.

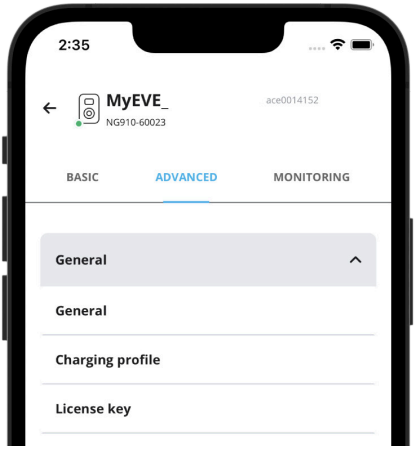
- If your order includes Smart Charging features, these will be accessible (unlocked) for configuration in the ACE Service Installer or the MyEve app.
- If you purchase Smart Charging features later on at Alfen, you will receive a license key. In order to unlock a purchased feature, it must be unlocked by means of this license key, the MyEve app or the ACE Service Installer.

NOTE

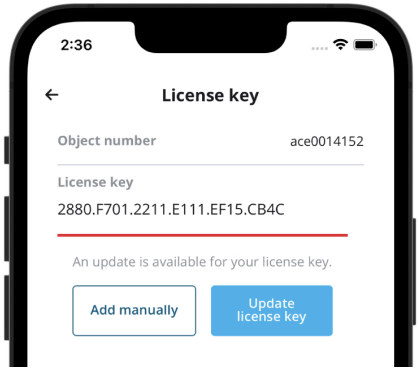
After unlocking / upgrading a feature, this feature will still need to be configured

4.2 Unlock features via the MyEve app

1. Log into the charging station by one of the options:
   a. Enter the provided password manually or
   b. scan the provided QR-code.
2. Select the charging station.
3. Click the *Advanced* tab and select *General*



4. Select *License key*
   a. Select *Update license key* to activate the purchased feature.
   b. Or select *Add manually* to enter the purchased license key manually.



The charging station will reboot automatically after the update of the license key.

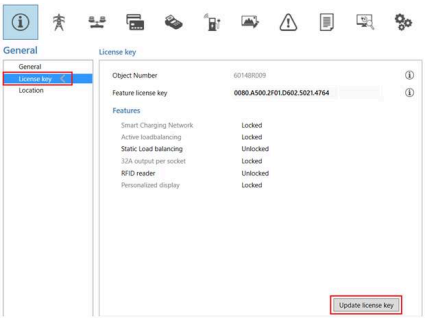
4.3 Unlock features via the ACE Service Installer

1. Log into the ACE Service Installer.
2. Select the charging station on the left and log in by entering the provided password.

NOTE

The number 1 and the characters I (as in letter or Iron) may not always be recognizable. If you cannot login try one of the indicated possibilities.

3. Click the *General info* tab and select *License key*

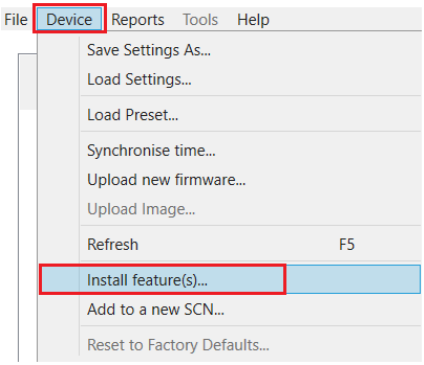


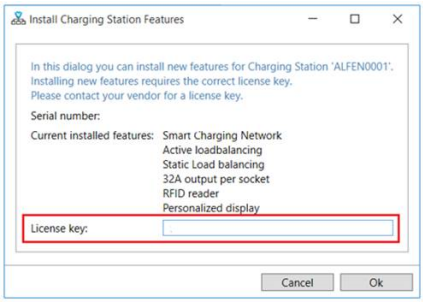
4. PURCHASE AND UNLOCK SMART CHARGING FEATURES

4. Click *Update license key* to activate the purchased feature. The charging station will reboot after the update of the license key.

In case the location has a slow internet connection, follow the steps below to unlock the desired feature:

1. Open the ACE Service Installer
2. Select *Device* in the top menu
3. Select *Install feature(s)*





4. Enter the license key and click *Ok*. The charging station will reboot automatically after the update of the license key.

4.4 Unlock features via a back office

NOTE

The description given here of configuring via the back office may differ from the real situation in the back office.

1. Log in to the back office
2. Go to the Configuration management page of the desired charging station
3. Load current configuration (execute OCPP GetConfiguration)
4. Find the key *FeatureLicenseKey* and change the value to the license key provided by Alfen
5. Save/send the value to the charging station (execute OCPP ChangeConfiguration)
6. Reboot the charging station

4.5 Registering the Eve Single to a backoffice management system

When using a non-Alfen management system, it is essential that you register the charging station model. The Eve Single model will send a ChargePointModel in accordance with OCPP specifications when logging in. The table below indicates available options:

Article no.	Description	ChargePoint-Model
904460003	Eve Single Pro-line 1PH T2	NG910-60003
904460005	Eve Single Pro-line 1PH T2S	NG910-60005
904460007	Eve Single Pro-line 1PH Cable	NG910-60007
904460023	Eve Single Pro-line 3PH T2	NG910-60023
904460025	Eve Single Pro-line 3PH T2S	NG910-60025
904460027	Eve Single Pro-line 3PH Cable	NG910-60027
904460123	Eve Single Pro-line DE 3PH T2	NG910-60123
904460127	Eve Single Pro-line DE 3PH Cable	NG910-60127
904460503	Eve Single Pro-line 1PH T2	NG910-60503
904460505	Eve Single Pro-line 1PH T2S	NG910-60505
904460507	Eve Single Pro-line 1PH Cable	NG910-60507

4. PURCHASE AND UNLOCK SMART CHARGING FEATURES

Article no.	Description	ChargePoint-Model
904460523	Eve Single Pro-line 3PH T2	NG910-60523
904460525	Eve Single Pro-line 3PH T2S	NG910-60525
904460527	Eve Single Pro-line 3PH Cable	NG910-60527
904460553	Eve Single Pro-line 1PH T2 RFID	NG910-60553
904460555	Eve Single Pro-line 1PH T2S RFID	NG910-60555
904460557	Eve Single Pro-line 1PH Cable RFID	NG910-60557
904460573	Eve Single Pro-line 1PH T2 Mobile	NG910-60573
904460575	Eve Single Pro-line 1PH T2S Mobile	NG910-60575
904460577	Eve Single Pro-line 1PH Cable Mobile	NG910-60577
904460583	Eve Single Pro-line 3PH T2 RFID	NG910-60583
904460585	Eve Single Pro-line 3PH T2S RFID	NG910-60585
904460587	Eve Single Pro-line 3PH Cable RFID	NG910-60587
904460593	Eve Single Pro-line 3PH T2 Mobile	NG910-60593
904460595	Eve Single Pro-line 3PH T2S Mobile	NG910-60595
904460597	Eve Single Pro-line 3PH Cable Mobile	NG910-60597

5. ACTIVE LOAD BALANCING

EN

5.1 General information

Active Load Balancing (ALB) meaures the current used by the entire electrical installation of a location to prevent overload. To use this feature the electrical installation must include a smart meter or an external energy meter.

A charging station with activated ALB has the following features:

- The maximum current is dynamic.
- The charging station and the external data source communicate with each other. Actual consumption and current demand data are regularly exchanged.
- If the available power is limited, the charging station is programmed to decrease the charging current to prevent overloading the grid capacity.
- The maximum current can be controlled via a Client-Server set-up with data connection or via an Internet connection (back office).
- The current usage and maximum capacity of the electrical installation are taken into account.
- ALB allows a charging station to respond to all other electrical devices connected to the same electrical installation.

5.2 Identify your situation

This manual describes three scenarios for ALB configuration.

Links to the relevant chapters are under the scenario summaries.

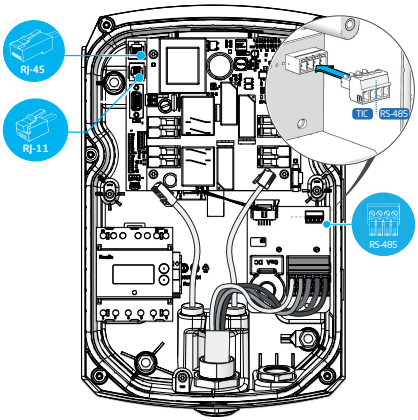


Figure 5.1: Connector ports on the charging station.

Your electrical installation will communicate with the charging station by one of the following data sources:

1. Smart energy meter:

Connector	Port	Protocol used	Remark
RJ-11	P1	DSMR	Belgium and Netherlands only
RS-485	female port	TIC	France only

Proceed with chapter ALB Using Smart Energy Meter (DSMR / TIC) on page 10.

2. External energy meter:

Connector	Port	Protocol	Remark
RS-485	female port	Modbus RTU	(called Modbus RS485 in the MyEve app)
RJ-45	LAN (network)	Modbus TCP/IP	(called TCP/IP meter in the MyEve app)

Proceed with chapter ALB Using External Energy Meter (Modbus RTU) on page 16 or ALB Using External Energy Meter (Modbus TCP/IP) on page 25.

3. Energy Management System (EMS):

Connector	Port	Protocol used	Remark
RJ-45	LAN (network)	Modbus TCP/IP	

Proceed with chapter ALB Using EMS on page 28.

5.3 ALB Using Smart Energy Meter (DSMR / TIC)

5.3.1 Overview

The smart energy meter is (usually) installed and connected to the power supply by the grid operator.

NOTE

If no smart energy meter is installed by the grid operator, an external energy meter has to be added to the electrical installation. This meter must be installed by a certified electrician.

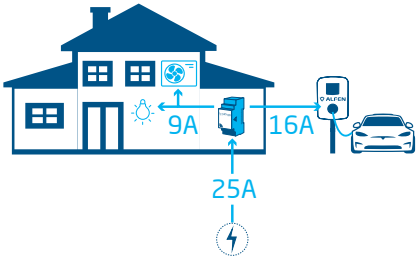


Figure 5.2: Scenario ALB using a smart energy meter

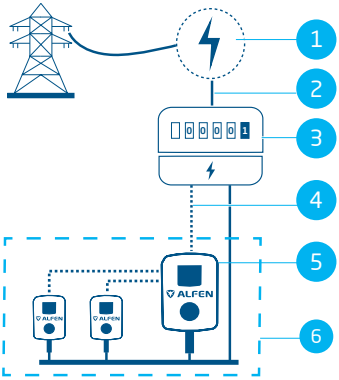


Figure 5.3: ALB using a smart energy meter (via P1 port - RJ-11 connector)

Pos.	Description
1	Grid connection
2	Power supply
3	Smart energy meter
4	Data connection (DSMR / TIC protocol)
5	Charging station functioning as the server
6	Smart Charging Network

5.3.2 Requirements

Each situation has specific requirements that must be met before configuration:

- When using the P1 port / DSMR protocol:
  - The UTP (Ethernet) cable with RJ-11 connector (using the pin positions 2-5) must be connected.
  - If the P1 port of the smart energy meter is already being used by another device, use a splitter.

NOTE

When using the P1 port / DSMR protocol: Not all splitters are compatible. Using splitters with 2 cables may prevent the charging station from being able to communicate with the smart energy meter.

- When using the P1 port / DSMR protocol:
  - The maximum distance between the smart energy meter and the charging station is 20 m.

NOTE

When using the P1 port / DSMR protocol: Alfen is not liable in any way if a P1 signal amplifier or P1 signal converter is used to transfer the P1 signal over more than 20 m. Alfen cannot guarantee a proper working of the P1 signal.

- When using the RS-485 connector / TIC protocol:
  - The maximum distance between the smart energy meter and the charging station is approx. 35 m.
- Not more than one Smart energy meter must be connected to one charging station.
- A minimum charging current of 14 A must be provided.

5. ACTIVE LOAD BALANCING

- The charging station must be updated with the latest firmware version.

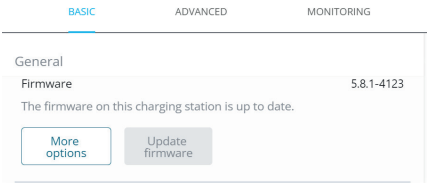


Figure 5.4: Updating charging station to latest Firmware via the ACE Service Installer app

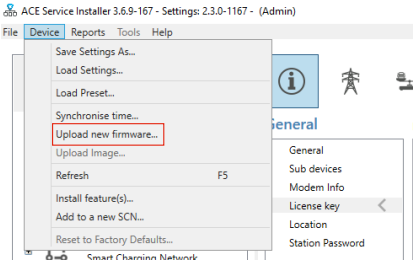
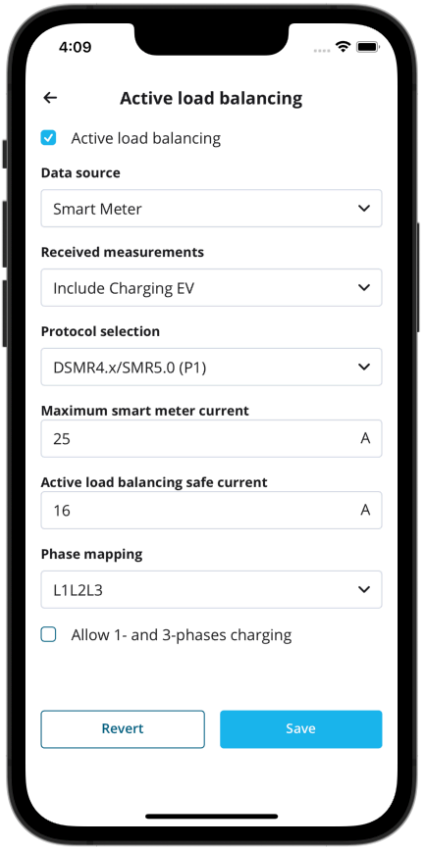


Figure 5.5: Updating charging station to latest Firmware via the ACE Service Installer

- You have a configuration device (laptop, tablet or smartphone).
- The firewalls on your laptop, tablet or smartphone must be disabled.
- If you are working with the MyEve app:
  - You must have a valid account.
- If you are working with the ACE Service Installer:
  - it must be updated to the latest version.
  - You must have a valid account.
  - The network adapter laptop must be set to automatic IP.
- When using the P1 port / DSMR protocol:
  a. The smart energy meter must support (D)SMR 4.0 (and higher) or eSMR 4.0 (and higher) over a P1 port.
- An open Internet connection must be available;
  a. The Alfen server must be accessible for receiving updates and license keys.
- The ALB license key on the charging station must be unlocked.

5.3.3 Configuring ALB via the MyEve app

1. Use one of the options to log into the charging station:
   a. Enter the provided password manually or
   b. scan the provided QR-code.
2. Select the charging station.
3. Tap the *Advanced* tab and select **Smart Charging / Active Load Balancing**.
4. Check the box **Active Load Balancing**.



5. Choose the type of *Data source*: **Smart Meter**. Fill in the value on which the charging station will increase or decrease the power on the socket output.

NOTE

If an external meter is used, select **Modbus RTU** as Data source.

See Configuring ALB via the ACE Service Installer on page 13 for the external Modbus RTU energy meter configuration instructions.

6. *Received Measurements*: Fill in whether the connected smart energy meter includes or excludes the currents of the charging station:
   a. **include Charging EV**: the charging station is connected to the same smart energy meter as the other loads (e.g. household equipment).
   b. **exclude Charging EV**: the charging station is connected to another smart energy meter then the other loads.

7. *Protocol selection*: Select the protocol needed to communicate with the smart energy meter:
   a. **DSMR4.x/SMR5.0 (P1)** (Belgium and Netherlands only) or
   b. **TIC/Linky** (France only)

8. *Maximum smart energy meter current*: Fill in the maximum current the charging stations may distribute if no other appliances draw current from the electrical installation. The actual limit is based on the measurements from the smart energy meter.

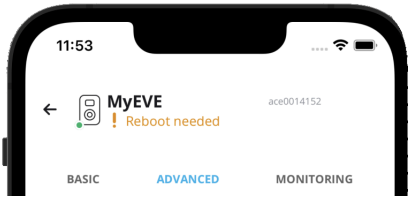
9. *Active Load Balancing Safe current*: Fill in the current limit that is used by the charging station when the connection between the charging station and the smart energy meter is lost.

10. *Phase mapping*: Fill in if applicable. This is the sequence of the phases of the feeder cable (to the charging station). There are multiple options depending on the type of charging station and connection.

11. **Allow 1- and 3-phases charging**: Check this box if the charging station is allowed to switch between 1-phase or 3-phase charging.

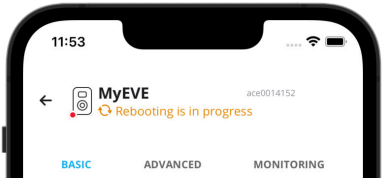
12. Tap **Save**

13. Reboot the charging station by tapping the *Basic* tab and scroll downwards to the **Reboot** button



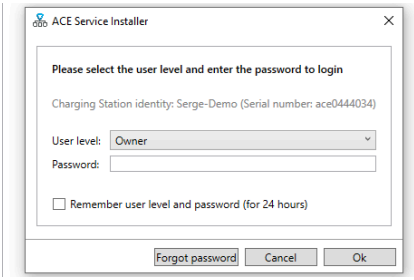
NOTE

Please wait until rebooting of the charging station is completed. This may take up to 1 minute. As long as this text is shown it is still in progress:



5.3.4 Configuring ALB via the ACE Service Installer

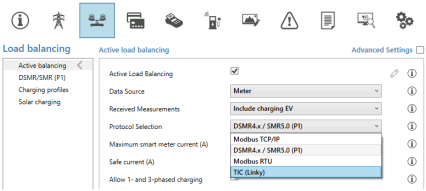
1. Log into the ACE Service Installer.



2. Select the charging station on the left and log in by entering the provided password.

3. Click the **Load balancing** symbol in the above ribbon.

4. Check the box **Active Load Balancing**.



5. ACTIVE LOAD BALANCING

5. Choose the type of *Data source*:**Meter** or **Meter + EMS monitoring**, according to your requirements.

6. *Received Measurements*: Fill in whether the connected smart energy meter includes or excludes the currents of the charging station:
   a. **include Charging EV**: the charging station is connected to the same smart energy meter as the other loads (e.g. household equipment).
   b. **exclude Charging EV**: the charging station is connected to another smart energy meter then the other loads.

7. *Protocol selection*: Select the protocol needed to communicate with the smart energy meter:
   a. **DSMR4.x/SMR5.0 (P1)**(Belgium and Netherlands only) or
   b. **TIC/Linky** (France only)

8. *Maximum smart energy meter current (A)*: Fill in the maximum current the charging stations may distribute if no other appliances draw current from the electrical installation. The actual limit is based on the measurements from the smart energy meter.

9. *Safe current*: Fill in the current limit that is used by the charging station when the connection between the charging station and the smart energy meter is lost.

10. **Allow 1- and 3-phased charging**: Check this box if the charging station is allowed to switch between 1-phase or 3-phase charging.

11. Click **Save**

12. Reboot the charging station.

5.3.5 Configuring ALB via a back office

When using a smart energy meter in the setup, the following settings must be set correctly:

Parameter (key)	Possible values
RJ11-Mode / DirectExternalSuspendSignal	DSMR P1 Suspend when an external circuit is closed Suspend when an external circuit is opened
ALB-ProtocolSelection	DSMR4.x/SMR5.0 (P1) Modbus TCP/IP Modbus RTU TIC protocol

1. Fill in **DSMR P1** at *RJ11-Mode/ DirectExternalSuspendSignal*

2. Fill in **DSMR4.x/SMR5.0 (P1)**at *ALB-ProtocolSelection*

3. Reboot the charging station.

5.3.6 Verifying ABL via the MyEve app

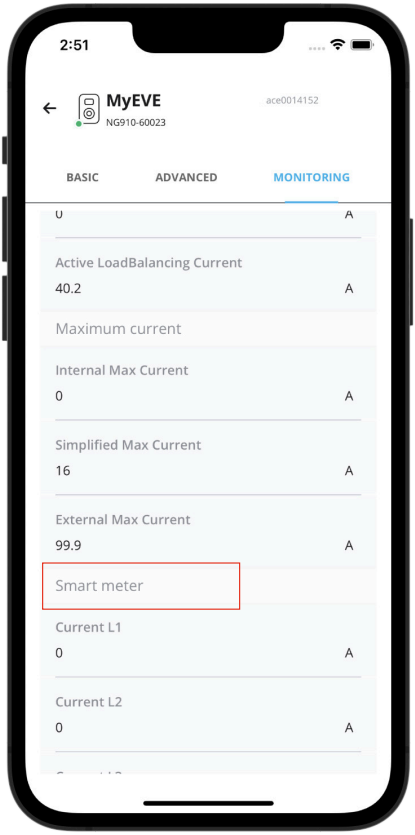
In this section we want to test the proper working of ALB. In order to do so, the following settings have to be done, otherwise ALB will not work.

1. For test purposes, set the maximum external energy meter current lower than the sum of the maximum current for the vehicle and the current for other devices connected to the electrical energy meter. Make use of this example:
   a. Determine the actual energy consumption (current in A) of the household by using a clamp meter (e.g. 10 A).
   b. Use a hair dryer as load with (e.g.) 9 A.
   c. Set the maximum external energy meter current in the charging station lower than 10 A + 9 A = 19 A.

2. Tap the *Monitoring* tab, select **currents** and verify if the displayed external energy meter currents under *Smart Meter* are correct by using a clamp meter. Select and check:
   a. **Voltages** / **Smart Meter**
   b. **Currents** / **Smart Meter**
   c. **Power** / **Smart Meter**
   d. **Net quality** / **Smart Meter**

NOTE

Make sure you check the values stated under *Smart Meter*. You can easily confuse with checking values of the charging station (*Socket*)



NOTE

To refresh the actual values, scroll back and forth.

If the displayed values are 0, but the clamp meter registers different values, check the electrical installation and/or check the Troubleshooting section on https://knowledge.alfen.com for more information.

3. Connect one vehicle or a test plug and start a charging session.

4. Tap the *Monitoring* tab, select **Currents** and observe the drawn currents.

5. After the probing stage (approx. 1 minute), the currents from the external energy meter and the electric vehicle are shown. If the external energy meter measurements are excluded from the setup 'EV charging'; the sum of the external energy meter and socket current(s) will amount to the maximum total external energy meter current.

6. Switch on the connected hair dryer to monitor if the external energy meter current values increase and the power drawn by the EV decreases.

   The hair dryer might stop working or blow with less intensity when ALB is working.

7. Set the maximum smart meter current back to the correct values after testing.

NOTE

With this test it is possible to verify if the phase rotation is as expected.

If the EV draws power from L1 but the smart energy meter or external energy meter registers an increase on one of the other phases, this might be an indication for a fault in the electrical installation.

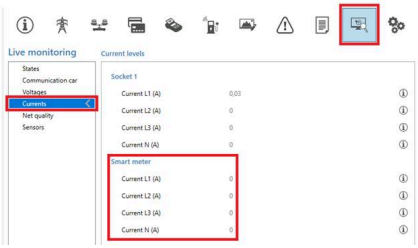
Refer to the Troubleshooting section on https://knowledge.alfen.comfor more information.

5.3.7 Verifying ABL via the ACE Service Installer

In this section we want to test the proper working of ALB. In order to do so, the following settings have to be done, otherwise ALB will not work.

1. For test purposes, set the maximum smart energy meter current lower than the sum of the maximum current for the EV and the current for other devices connected to the smart energy meter. Use the following example:
   a. Determine the actual energy consumption (current in A) of the household by using a clamp meter (e.g. 10 A).
   b. Use a hair dryer as load with (e.g.) 9 A.
   c. Set the maximum smart energy meter current in the charging station lower than 10 A + 9 A = 19 A.

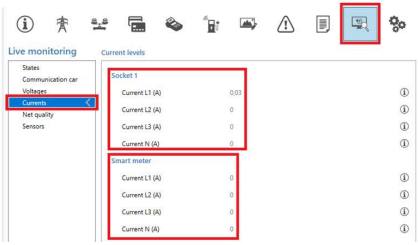
2. Click the **Live monitoring** symbol in the top ribbon. Use a clamp meter to verify if the displayed smart energy meter currents are correct.



If the displayed values are 0, but the clamp meter registers different values, check the electrical installation and/or check the Troubleshooting section on https://knowledge.alfen.com for more information.

3. Connect one EV or a test plug and start a charging session.

4. Click the **Live monitoring** symbol in the top ribbon, select **Currents** and check the drawn currents shown below:



5. After the probing stage (approx. 1 minute), the currents from the smart energy meter and the EV are shown. If the smart energy meter measurements are excluded from the setup 'EV charging', the sum of the smart energy meter and socket current(s) will amount to the maximum total smart energy meter current.

6. Switch on the connected hair dryer to monitor if the smart energy meter current values increase and the power drawn by the EV decreases.

   The hair dryer might stop working or blow with less intensity when ALB is working.

7. Set the maximum smart energy meter current back to the correct values after testing.

NOTE

With this test it is possible to verify if the phase rotation is as expected.

If the EV draws power from L1 but the smart energy meter or external energy meter registers an increase on one of the other phases, this might be an indication for a fault in the electrical installation.

Refer to the Troubleshooting section on https://knowledge.alfen.comfor more information.

5.4 ALB Using External Energy Meter (Modbus RTU)

5.4.1 Overview

NOTE

If no smart energy meter is installed by the grid operator, an external energy meter has to be added to the electrical installation. This meter must be installed by a certified electrician.

Alfen charging stations can be configured to work with Modbus RTU energy meters.

The following Modbus RTU meters are available for Eve Single products as accessories:

- Direct meters:
  - Eastron SDM230 (1 phase) (104002094-ICU)
  - Eastron SDM72D (3 phase) (104002074-ICU)
- Indirect meters that use current transformers:
  - Eastron SDM120CT (1 phase) (803873260-ICU)
  - Eastron SDM72CT (3 phase) (803873261-ICU)

Pretsets are available in the MyEve app and ACE Service Installer to make configuring Alfen supplied external meters to work with Alfen charging stations easy.

To install another type of meter, you must know all meter-specific settings needed for configuration.

The external energy meter must be installed on the power supply. See Making connection to an external energy meter via the MyEve app with presets on page 17 or Making connection to a external energy meter via the ACE Service Installer with presets on page 20

The charging station uses the Modbus RTU protocol over the RS485 connection to communicat with the energy meter.

See also Identify your situation for the different data connection options.

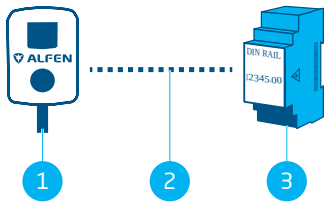


Figure 5.6: Active Load Balancing with an external energy meter via Modbus RTU

Pos.	Description
1	Charging station
2	Serial data connection (RS485 interface)
3	External energy meter

5.4.2 Requirements

Make sure the following software requirements are met:

- The charging station must be updated to the latest firmware version.
- You must have a configuration device (laptop, tablet or smartphone).
- The firewalls on your device must be disabled.
- If you are working with the MyEve app:
- - The app must be updated to the lastest version.
  - You must have a valid account.
- If you are working with the ACE Service Installer:
  - The installer must be updated to the latest version.
  - You must have a valid account.
  - The network adapter laptop must be set to automatic IP.
- The external energy meter must support Modbus RTU.

  When fully configured, the charging station functions as the Modbus Server with the external energy meter as the Client.
- An open Internet connection. During the installation you will need to access the Alfen server for updates and license keys.
- The ALB license key on the charging station must be unlocked.
- When configuring a Modbus RTU external energy meter for which no presets are available in the ACE Service Installer, the following Modbus register data must be specified manually using the ACE Service Installer:
  - Real power per phase L1, L2 and L3.

5.4.3 Making connection to an external energy meter via the MyEve app with presets

The MyEve is programmed with presets for the Alfen Modbus RTU energy meter acessories you can add to your order. See Overview on page 16 for specific article numers and meter types.

Log into the charging station and select one of the options:

- Enter the provided password manually or
- scan the provided QR-code.

1. Use the MyEve setup wizard to configure your external energy meter.

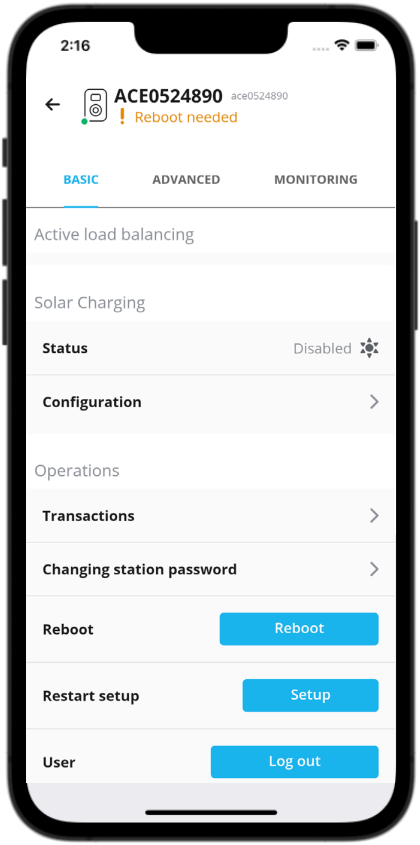
   If you are configuring the charging station for the first time, the setup wizard will start automatically when you turn on the charging station for the first time.

   If your charging station is already configured, or you have started the charging station before, you can restart the wizard opening the app, scrolling down to the *Operations* section and using the **Setup** button in the *Restart setup* section.

   You will be prompted to confirm you want to start the configuration wizard.

   The MyEve app will prompt you to specify the name of the charging station, date and time, charging station maximum current and phase mapping.

5. ACTIVE LOAD BALANCING



2. When the basic charging station setup is completed (after phase mapping is specified), the *Active load balancing* screen is displayed.
   a. On the *Active load balancing* screen, tap the **Update the current settings** option.
   b. Tap **Next**.

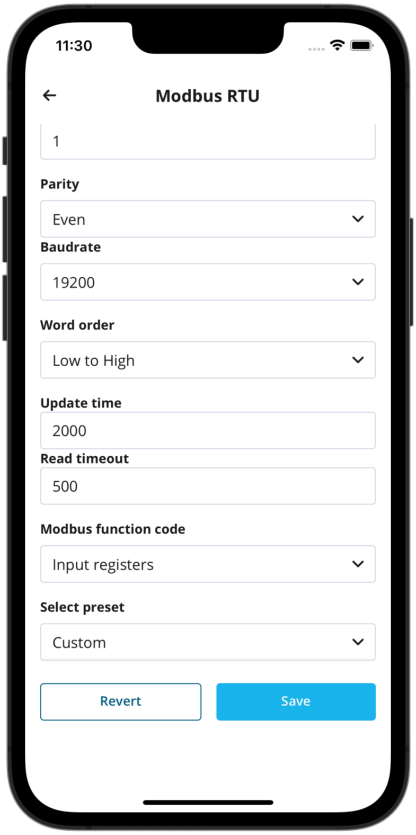
3. On the *Active load balancing setup* screen, tap **Next** to start the active load balancing setup.

4. On the *Active load balancing safe current* screen specify the ALB safe current in the **Active load balancing safe current** field.
   a. Tap **Next**.

5. On the *Active load balancing max current* screen specify the ALB maximum current in the **Active load balancing maximum current** field.
   a. Tap **Next**.

6. On the *Protocol* screen specify Modbus RTU in **Protocol selection**.
   a. Tap **Next**.

7. On the *Modbus RTU* screen, in the *Communication settings* section, specify 1 in the **Address** field.



8. Select **Input registers** from the *Modbus function code* dropdown menu.

NOTE All other default values should be correct communication settings as shown in the image.

a. Tap **Next**.

9. On the *Cutom register map* screen select the correct external Modbus RTU meter (e.g. *Eastron SDM230*) from the *Select preset* dropdown menu.

   Once you select your external meter, the right settings are automatically filled in.

   You can view the details in the *Show preset configuration* dropdown.

   If you are usining an external meter accessories that has no presets in the MyEve app, select **Custom** from the *Select preset* menu and use the *Show preset configuration* dropdown to specify the configuration data.
   a. Tap **Next**.

10. On the *Solar Charging* screen, select the preferred mode in the *Charging mode* dropdown menu.
    a. Tap **Next**.

11. An overview of all settings is displayed. Tap **Next** if all settings are correct.

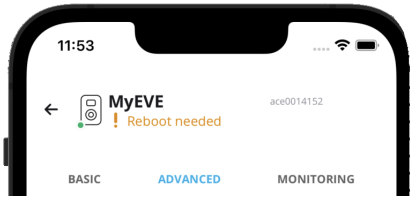
12. The charging station will set up as configured.

13. Once the message *Setting up charging station was successful* is displayed in the MyEve, tap **Next**.

14. The warranty information for the charging station is displayed.

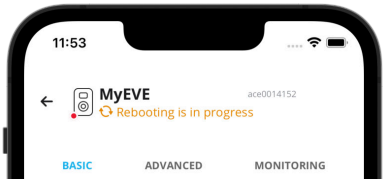
15. Tap *Finish setup*.

16. To finish setup a reboot is necessary.
    a. Tap **Reboot**.
    b. After the reboot the charging station is ready for use.



NOTE

Please wait until rebooting of the charging station is completed. This may take up to 1 minute. As long as this text is shown it is still in progress:



5.4.3.1 Configuring the energy meter display on external energy meters

NOTE

The presets in the MyEve app for external energy meters SDM120CT and SDM72CT use a scaling factor of 100 for Current, Real Power, Apparent Power, and Reactive Power to avoid changing settings on the energy meter.

Because of the scaling factor on the energy meter display, values on the energy meter are shown 100 times smaller than used by the charging station or displayed in the MyEve or the ACE Service Installer.

The charging station processes the measured values for ALB correctly regardless of the displayed values on the energy meter due to the preset correction.

You can configure the display on the SDM120CT meter by:

- Set the default value of CT1 to 500 **Ct 500** instead of the defalt 5 **Ct 005**.
- Chang the scaling factor of 100 for the Current, Real Power, Apparent Power, and Reactive power to 1 in the detailed preset configuration in the MyEve app.

You can configure the display on the SDM72CT meter by:

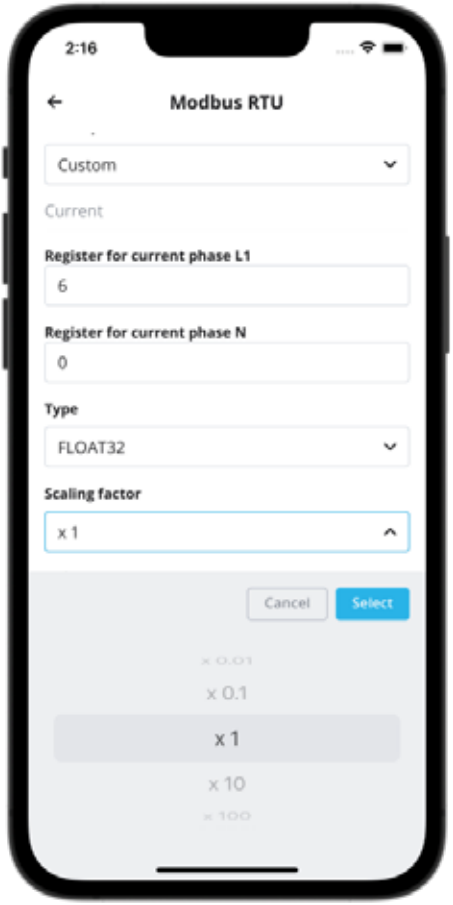
- Setting the default value of CT1 to 100 **Ct 0100** instead of the default 1 **Ct 0001**.
- Changing the scaling factor of 100 for the Current, Real Power, Apparent Power, and Reactive power to 1 in the MyEve app.

NOTE

The settings for Current, Real Power, Apparent Power and Reactive Power can only be set once.

Any changes to the settings of the Current, Real Power, Apparent Power, and Reactive Power cannot be reversed due to MID.

5. ACTIVE LOAD BALANCING



5.4.4 Making connection to a external energy meter via the ACE Service Installer with presets

There are preset external energy meters available. Proceed as follows to select one of them:

1. **NOTE**

   The example is based on the functionality of an external meter supplied by Alfen.

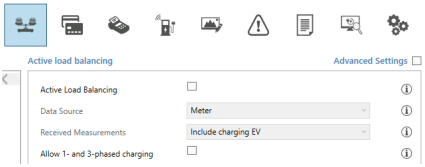
   Log into the ACE Service Installer.

2. Select the charging station on the left and log in by entering the provided password.

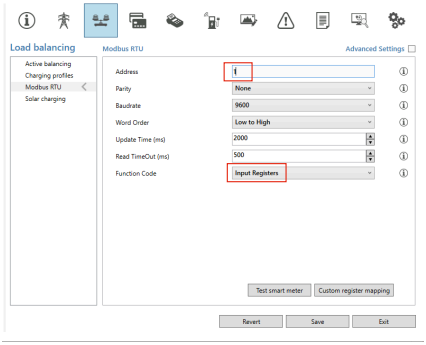
NOTE

The number 1 and the characters l (as in letter or Iron) may not always be recognizable. If you cannot login try one of the indicated possibilities.

3. Check the **Active Load Balancing** box.
4. Select **Meter** in the *Data source* menu.
5. Select **Modbus RTU** in *Protocol selection*.

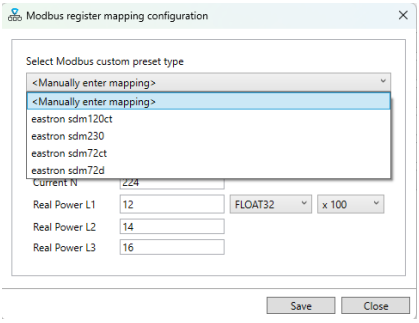


6. In the next menu, under *Modbus RTU* enter the value **1** in the *Address* menu.



7. Under *Function code* select **Input registers**.

   In the next menu *Custom register mapping* you will get the option to select a preset external energy meter:



8. Select the external energy meter you need (e.g. *Eastron SDM230*) and continue the setup.

9. After completing the setup click the **Active Load Balancing** tab and click **Save**.

10. Reboot the charging station.

5.4.5 Configuring via the MyEve app

To change the preset configuration of the external energy meter follow the steps below:

1. Log into the charging station by one of the options:
   a. Enter the provided password manually or
   b. scan the provided QR-code.

2. Tap *Advanced* and *Smart Charging* and select the *Active Load Balancing* tab.

3. Check the **Yes, enable active load balancing** checkbox.
   Active load balancing setup will be started.

4. Tap *Source type* and select **Smart Meter**.

5. Select **Modbus RTU** in *Protocol selection*.

6. Tap *Custom* and fill in the register for the current phase 1, current phase 2, current phase 3 (Can be found in the user manual of the external energy meter.)

NOTE

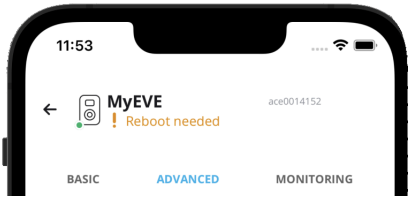
If you have a 1-phase charging station, only the registers for phase 1 will be shown.

7. Fill in the register for the real power phase 1, real power phase 2, real power phase 3 (these data can be found in the user manual of your external energy meter.)

8. Select the appropriate data type and scaling factor

9. Tap **Save**

10. After completing the setup tap the *Basic* tab and click the **Reboot** to reboot the charging station.



NOTE

Please wait until rebooting of the charging station is completed. This may take up to 1 minute. As long as this text is shown it is still in progress:

5.4.6 Configuring ABL via the ACE Service Installer

To configure the external energy meter differently from the presets offered, proceed as follows:

1. Log into the ACE Service Installer.

2. Select the charging station on the left and log in by entering the provided password.

3. Click the **Load balancing** symbol in the above ribbon.

4. Check the box **Active Load Balancing**.

5. Choose the type of *Data source*:**Meter** or **Meter + EMS monitoring**, according to your requirements.

5. ACTIVE LOAD BALANCING

6. *Received Measurements*: Fill in whether the connected external energy meter includes or excludes the currents of the charging station:
   a. **include Charging EV**: the charging station is connected to the same external energy meter as the other loads (e.g. household equipment).
   b. **exclude Charging EV**: the charging station is connected to another external energy meter then the other loads.

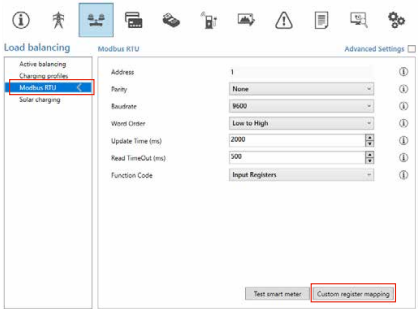
7. *Protocol selection*: Select the protocol needed to communicate with the external energy meter: **Modbus RTU**

8. *Maximum smart energy meter current (A)*: Fill in the maximum current the charging stations may distribute if no other appliances draw current from the electrical installation. The actual limit is based on the measurements from the external energy meter.

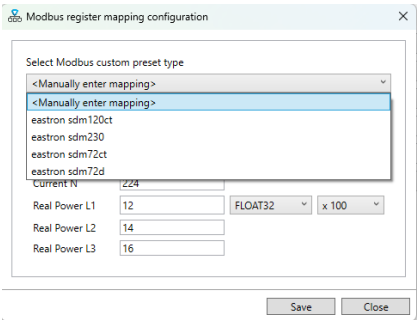
9. *Safe current*: Fill in the current limit that is used by the charging station when the connection between the charging station and the external energy meter is lost.

10. **Allow 1- and 3-phased charging**: Check this box if the charging station is allowed to switch between 1-phase or 3-phase charging.

11. Click on **Modbus RTU** on the left and enter the following settings:



12. Click *Custom register mapping*, select **Manually enter mapping** and fill in the register for the current phase 1, current phase 2, current phase 3 (these can be found in the user manual of the external energy meter.)

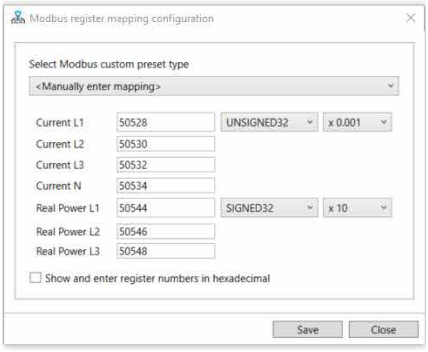


NOTE

If you have a 1-phase charging station, only the registers for phase 1 will be shown.

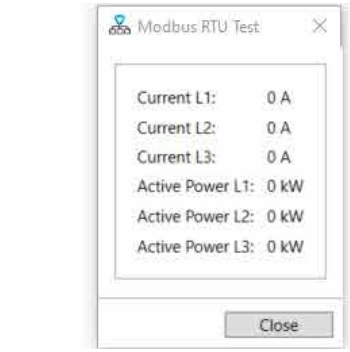
13. Fill in the register for the real power phase 1, real power phase 2, real power phase 3 (these can be found in the user manual of your external energy meter.)

14. Select the appropriate data type and scaling factor



15. Click **Save**

16. When the external energy meter is configured correctly a test can be run by clicking on the button **Test Smart Meter**. If configured correctly a screen will pop up and show the actual current per phase.



17. Reboot the charging station.

5.4.7 Configuring via a back office

To configure an external energy meter supporting the Modbus TCP/IP protocol via a back office, configure the following settings:

Parameter (key)	Possible values
ALB-ProtocolSelection	Modbus TCP/IP DSMR4.x/SMR5.0 (P1) Modbus RTU TIC protocol
MBTCPSmart-IsEnabled	True False (default)
MBTCPSmart-SlaveMeterModel	None Socomec (default)
MBTCPSmart-ConnectionType	- TCP master (default) - RTU master - UDP master
MBTCPSmart-IPAddress	192.168.000.005 (default)
MBTCPSmart-SlaveUnitID	From 0 to 65535 5 (default)

1. Enable the external energy meter functionality by setting the *MBTCPSmart-IsEnabled* setting to **True**
2. Fill in the right external energy meter type at *MBTCPSmart-SlaveMeterModel.*
3. Fill in the right connection type at *MBTCPSmart-ConnectionType*
4. Fill in the Modbus address of the external energy meter at *MBTCPSmart-IPAddress*
5. Fill in the Unit ID at *MBTCPSmart-SlaveUnitID*
6. Reboot the charging station

5.4.8 Verifying via the MyEve app

The final step in the configuration of the external meter is verifying all the settings are correct and ALB is ready for use.

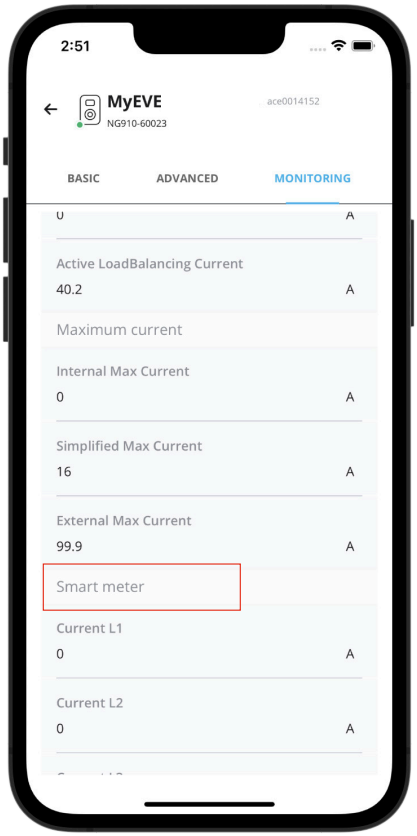
You can test the configuration by following these steps:

1. For test purposes, set the maximum external energy meter current lower than the sum of the maximum current for the vehicle and the current for other devices connected to the electrical energy meter. Make use of this example:
   a. Use a clamp meter to determine the actual energy consumption (current in A) of the household (e.g. you measure 10 A).
   b. Use a hair dryer as load with (e.g.) 9 A.
   c. Set the maximum external energy meter current in the charging station lower than 10 A + 9 A = 19 A.
2. In the MyEve app, tap the *Monitoring* tab, select **Currents** and verify the displayed external energy meter currents under *Smart Meter* are correct. Use a clamp meter to verify the readings. Select and check:
   a. **Voltages** / **Smart Meter**
   b. **Currents** / **Smart Meter**
   c. **Power** / **Smart Meter**
   d. **Net quality** / **Smart Meter**

NOTE

Make sure you check the values stated under *Smart Meter*. You can easily confuse with checking values of the charging station (*Socket*)

5. ACTIVE LOAD BALANCING



NOTE

To refresh the actual values, scroll back and forth.

If the displayed values are 0, but the clamp meter registers different values, check the electrical installation or the Troubleshooting section on https://knowledge.alfen.com for more information.

3. Connect one vehicle or a test plug and start a charging session.

4. On the MyEve app, tap the *Monitoring* tab, select **Currents** and observe the drawn currents.

5. After the probing stage of about one minute is completed, the currents from the external energy meter and the electric vehicle are displayed. If the setup excludes the EV charging within the external energy meter measurements, the sum of the external energy meter and socket current(s) will amount to the maximum external energy meter current in total.

6. Switch on the connected device used for testing purposes, such as a hairdryer, to monitor whether the external energy meter current values increase and the power drawn by the EV decreases.

   If ALB is working the hair dryer might stop working or blow with less performance.

7. After testing, set the maximum smart meter current in the charging station back to the correct values.

NOTE

With this test it is possible to verify if the phase rotation is as expected.

If the EV draws power from L1 but the smart energy meter or external energy meter registers an increase on one of the other phases, this might be an indication for a fault in the electrical installation.

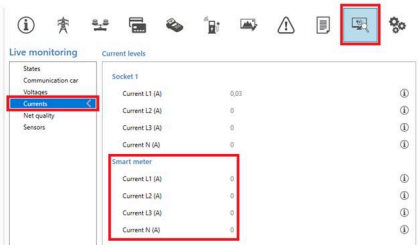
Refer to the Troubleshooting section on https://knowledge.alfen.comfor more information.

5.4.9 Verifying via the ACE Service Installer

In this section we want to test the proper working of ALB. In order to do so, the following settings have to be done, otherwise ALB will not work.

1. For test purposes, set the maximum smart meter current lower than the sum of the maximum current for the vehicle and the current for other devices connected to the smart energy meter. Make use of this example:
   a. Determine the actual energy consumption (current in A) of the household by using a clamp meter (e.g. 10 A).
   b. Use a hair dryer as load with (e.g.) 9 A.
   c. Set the maximum smart meter current in the charging station lower than 10 A + 9 A = 19 A.

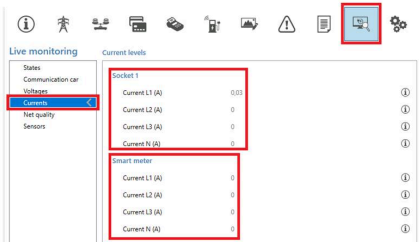
2. Click the **Live monitoring** symbol in the above ribbon and verify if the displayed smart energy meter currents (as shown in the image below) are correct by using a clamp meter.



If the displayed values are 0, but the clamp meter registers different values, check the electrical installation and/or check the Troubleshooting section on https://knowledge.alfen.com for more information.

3. Connect one vehicle or a test plug and start a charging session.

4. Click the **Live monitoring** symbol in the above ribbon, select **Currents** and observe the drawn currents as shown below:



5. After the probing stage during one minute, the currents from the smart energy meter and the electric vehicle are shown. If the setup excludes the EV charging within the smart energy meter measurements, the sum of the smart meter and socket current(s) will amount to the maximum smart meter current in total.

6. Switch on the connected hair dryer to monitor whether the smart energy meter current values increase and the power drawn by the EV decreases.

   When ALB is working the hair dryer might stop working or blow with less performance.

7. After testing set maximum smart meter current in the charging station back to the correct values.

NOTE

With this test it is possible to verify if the phase rotation is as expected.

If the EV draws power from L1 but the smart energy meter or external energy meter registers an increase on one of the other phases, this might be an indication for a fault in the electrical installation.

Refer to the Troubleshooting section on https://knowledge.alfen.comfor more information.

5.5 ALB Using External Energy Meter (Modbus TCP/IP)

5.5.1 Overview

NOTE

If no smart energy meter is installed by the grid operator, an external energy meter has to be added to the electrical installation. This meter must be installed by a certified electrician.

Specific external energy meters are supported. The external energy meter must be installed to the power supply. Communication between the external energy meter and the charging station is established via:

- LAN network port via Modbus TCP/IP protocol

See also "identify your situation" for the different data connection options.

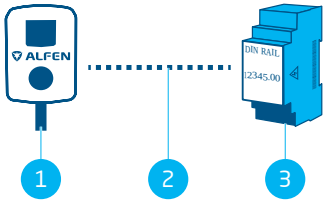


Figure 5.7: Active Load Balancing with an external energy meter via Modbus TCP/IP

Pos.	Description
1	Charging station
2	Data connection (Modbus TCP/IP protocol)
3	External energy meter

5. ACTIVE LOAD BALANCING

5.5.2 Requirements

Make sure the following software requirements are met:

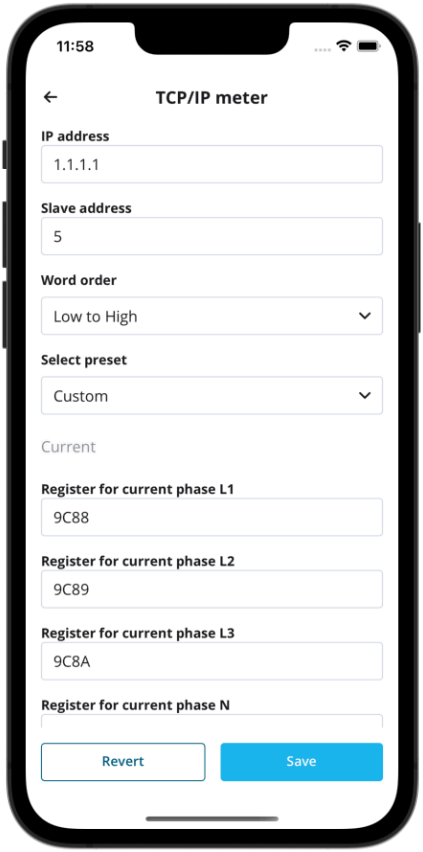
- The charging station must be updated with the latest firmware version.
- You must have a configuration device (laptop, tablet or smartphone).
- The firewalls on your laptop, tablet or smartphone must be disabled.
- If you are working with the MyEve app:
  - You must have a valid account.
- If you are working with the ACE Service Installer:
  - it must be updated to the latest version.
  - You must have a valid account.
  - The network adapter laptop must be set to automatic IP.
- The external energy meter must support Modbus TCP/IP;
  a. the charging station will assume the role of the Modbus Client (previous: Master) in this configuration. The external energy meter must be the Server (previous: Slave).
- An open Internet connection is available;
  a. The Alfen server must be accessible for receiving updates and license keys.
- The charging station must be located in the same local area network (LAN) as the external energy meter:
  a. The network must have a minimum speed of 10 Mbps.
  b. There must be no power over Ethernet
  c. There must be a fixed IP address for the external energy meter, assigned by the network operator of the local network. Refer to the manual of the external energy meter on how to configure a fixed IP-address.
  d. The charging station must be in the same IP range as the external energy meter.
  e. The IP address must meet the requirements of the IPv4 protocol. IPv6 address are not supported by the Alfen charging station.
  f. Access must be available to settings of the LAN for the purpose of configuration of the external energy meter and charging station (IPv4 address, Subnet Mask, Default Gateway).
- The ALB feature on the charging station must be unlocked.
- If configuring a Modbus TCP/IP external energy meter that is not pre-configured in the ACE Service Installer, it must be known which registers are used in the external energy meter for the actual currents phase L1, L2 and L3.

Make sure the following physical requirements are met:

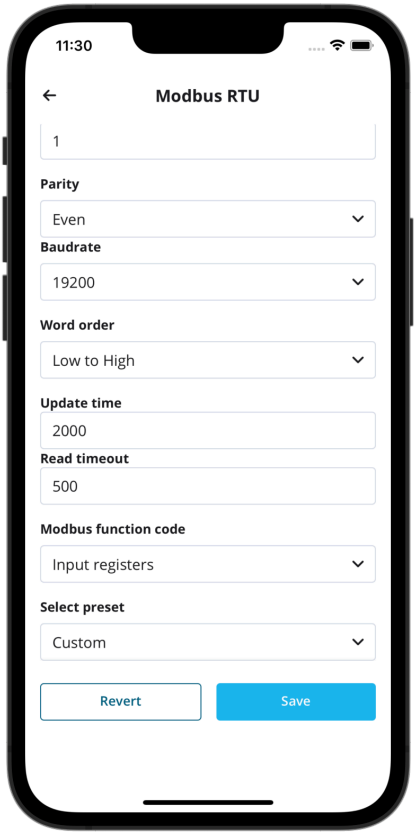
- Not more than one single external energy meter is connected to a charging station.
- The communication cable must be a CAT5e or CAT6 UTP/Ethernet RJ-45 cable and the cable trajectory must have a max. length of 100 m.
- A minimum charging current of 14 A must be provided.
- Modbus messages:
  a. Modbus master must connect to IP of the Modbus slave's wired Ethernet connection on port 502.
  b. All communication must be in Big Endian format.
- Keep alive timeout of 60 second before the connection with a Modbus master is closed when no new read or write message is received.

5.5.3 Configuring via the MyEve app

1. Select a Modbus TCP/IP.



2. Fill in the IP address of the external energy meter
3. Fill in the Server Address (default:1)
4. Select the appropriate word order (High to Low).
5. Search and select your external energy meter in the menu.
6. Check the register mapping by clicking **Show preset configuration** and select the preset. Steps 7-12 can be skipped.



If a preset could not be found select **Custom** and fill in the registers manually as described in step 7-12.

7. Fill in the register for the current phase 1, current phase 2, current phase 3 (Can be found in the user manual of the external energy meter.)

NOTE

If you have a 1-phase charging station, only the registers for phase 1 will be shown.

8. Select the appropriate data type and scaling factor.
9. Fill in the register for the real power phase 1, real power phase 2, real power phase 3 (Can be found in the user manual of the external energy meter.)
10. Select the appropriate data type and scaling factor.

5. ACTIVE LOAD BALANCING

11. Press **Save**.

12. Option to upload a Modbus TCP/IP preset from your system.

5.5.4 Configuring via the ACE Service Installer

1. Log into the ACE Service Installer.

2. Select the charging station on the left and log in by entering the provided password.

3. Click the **Load balancing** symbol in the above ribbon.

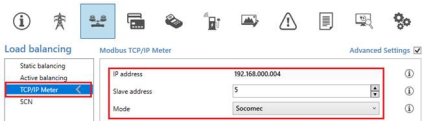
4. Check the box **Active Load Balancing**.

5. Choose the type of *Data source*: **Meter** or **Meter + EMS monitoring**, according to your requirements.

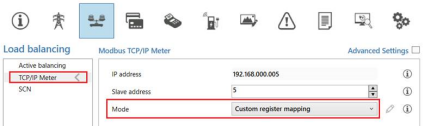
6. *Received Measurements*: Fill in whether the connected external energy meter includes or excludes the currents of the charging station:
   a. **include Charging EV**: the charging station is connected to the same external energy meter as the other loads (e.g. household equipment).
   b. **exclude Charging EV**: the charging station is connected to another external energy meter then the other loads.

7. *Protocol selection*: Select the protocol needed to communicate with the external energy meter: **Modbus TCP/IP**

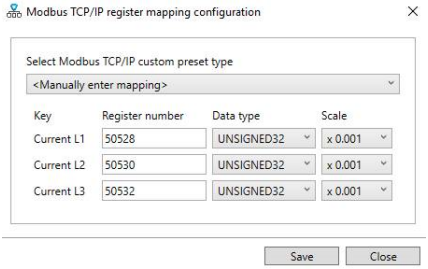
8. Fill in the IP address, Server (previous: Slave) address (external energy meter address) and select the external energy meter brand.



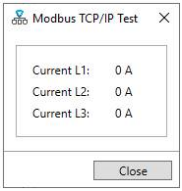
9. Select **Custom register mapping** in the drop down and click on **Save**.



10. The configuration pop-up screen will show. Configure the required external energy meter by filling in the register numbers, type (unsigned or signed), size (32 or 64 bit) and scaling factor per phase. Click on **Save**.



11. When the external energy meter is configured correctly a test can be run by clicking on the button **Test Smart Meter**. If configured correctly a screen will pop up and show the actual current per phase.



5.6 ALB Using EMS

5.6.1 Overview

When connecting a charging station to an EMS, there is no external energy meter necessary in the electrical installation. The charging station acts as a Modbus "Client" device, while the EMS acts as the "Server" device. The EMS therefore can inquire the charging station(s) connected, and provide the available power according to the requests.

NOTE

The user is responsible for integrating and configuring the charging station with an EMS. If you need help in doing so, contact your EMS supplier.

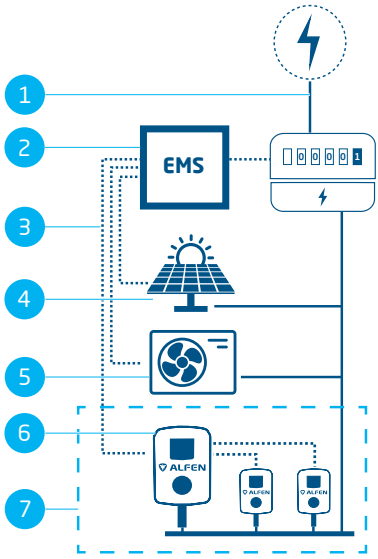


Figure 5.8: Active Load Balancing with EMS including PV and heat pump

Pos.	Description
1	Grid connection
2	EMS
3	Data connection (Modbus)
4	Photovoltaic
5	Heat pump
6	Charging station
7	SCN

5.6.2 Requirements

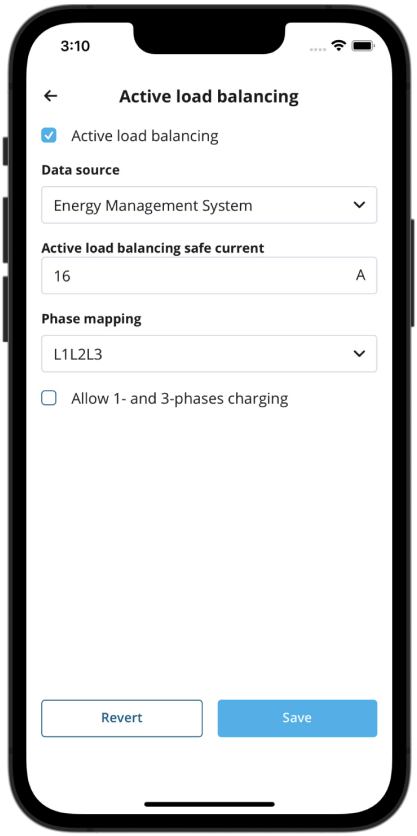
To ensure a proper working of the Active Load Balancing feature via an EMS, the following requirements must be met:

- The ALB feature on the charging station must be unlocked.
- The communication cable must be a CAT5e or CAT6 UTP/Ethernet RJ45 cable with a maximum length of 100 m.
- The EMS must support Modbus;
  a. the EMS will assume the role of the Modbus 'master' in this configuration. The charging station must act as a 'slave'
- The charging station must be located in the same local area network (LAN) as the smart meter or EMS:
  a. The network must have a minimum speed of 10 Mbps.
  b. There must be no power over Ethernet.
  c. The EMS must be able to find the IP-address of the charging station via the mDNS protocol or the charging station must be set to a fixed IP-address.
  d. The IP address must meet the requirements of the IPv4 protocol. IPv6 address are not supported by the Alfen charging station.
  e. Access must be available to settings of the LAN for the purpose of configuration of the energy meter and the charging station (IPv4 address, Subnet Mask, Default Gateway).
- The network adapter laptop must be set to automatic IP.
- An open Internet connection must be available;
  a. The Alfen server must be accessible for receiving updates and license keys.
- You must have a valid account for the MyEve app.
- The firewall on your laptop, tablet or smartphone must be disabled.
- Modbus messages:
  a. Modbus master must connect to IP of the Modbus slave's wired Ethernet connection on port 502.
  b. Requests with certain slave addresses must be accepted, where charging station related Modbus registers require slave address 200 and socket related Modbus registers require slave address 1 or 2, depending on the socket.
  c. All communication must be in Big Endian format.
- Validity time of 60 seconds (configurable) before the charging station will be set back to safe current. The EMS must update the socket current/SCN total current set point within the validity time, otherwise the charging station(s) will be set back to the set safe current.
- The EMS must integrate the charging station. Please use the document *Implementation of Modbus Slave TCP/IP for Alfen NG9xx platform* with applicable registers for this implementation.
- A minimum charging current of 14 A must be provided.

5.6.3 Configuring via the MyEve app

1. Select **Energy Management System** in the *Data source* menu.

5. ACTIVE LOAD BALANCING

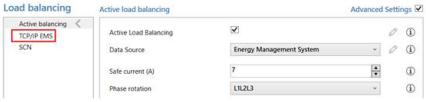


2. Fill in the Mode. Select whether the EMS is managing every single socket or a complete Smart Charging Network.

3. Fill in the validity time (default 60s). When the charging station has not received any updates from the EMS within the configured validity time, the charging station will interpret this as a disconnect and will fall back to the configured safe current.

5.6.4 Configuring via the ACE Service Installer

1. If the **Energy Management System** is selected as the data source (see paragraph *Configuration of ALB via the ACE Service Installer*) an additional page is shown on the screen. Double click to open the screen. Select **TCP/IP EMS** in the menu.



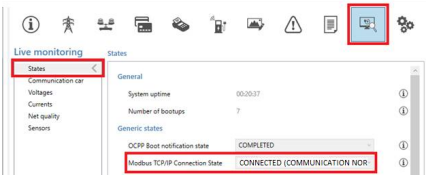
2. Fill in the Mode. Select whether the EMS is managing every single socket or a complete Smart Charging Network).

3. Fill in the validity time (default 60s). When the charging station has not received any updates from the EMS within the configured validity time, the charging station will interpret this as a disconnect and will fall back to the configured safe current.

5.6.5 Verifying: ALB using an EMS

1. Set up the installation configuration as instructed in this document.

2. Select the **Live monitoring** tab, select **States** and observe the status of the Modbus Connection State as shown below:



If this state shows *Not in use (communication idle)*, there is a communication loss. Please check your installation or check paragraph *General error handling* for more information.

3. Connect a vehicle and start a charging session.

4. Use the EMS to change the maximum available power. The way to do this differs per EMS. Refer to the manufacturer manual of the EMS for more information.

5. Select the **Live monitoring** tab, select **Currents** and observe the drawn currents.

5.7 ALB Using Back office

5.7.1 Configuring via a back office

NOTE

The ALB feature can be configured via a back office. In addition to configuring the settings as described in the steps below, the external data source (external energy meter or EMS) has to be configured. Please refer to the corresponding sections in this document.

1. Log in to the back office and select the charging station
2. Go to the *Configuration settings* (refresh if needed)
3. Configure the following settings:

Parameter (key)	Possible values
Active-LoadBalancing	On Off (default)
SmartCharging-Mode	None (unless the charging station is connected based on OCPP1.5, then this value should be OCPP1.5+)
Station-MaxCurrent	Varies per location
Connector1-MaxCurrent	Depending on the type of charging station
Connector2-MaxCurrent	Depending on the type of charging station
SmartMeter-MaxCurrent	Varies per location *This is the current limit of the installation. The charging station will make sure not to exceed this limit to avoid an overload situation.*
SmartMeterIncludesCharger	True False
Safe-MaxCurrent	Float
Phase-Connected	L1, L2, L3, L1L2L3, L1L3L2, L2L3L1, L2L1L3, L3L1L2, L3L2L1

4. Reboot the charging station.

6. SMART CHARGING NETWORK

EN

6.1 General information

The Smart Charging Network (SCN) is a solution where multiple charging stations are connected to each other via a LAN to manage the power distribution locally. All charging stations align their charging speed among each other. For every socket used, the SCN decides how fast it can charge taking into account what the total power consumption is. To achieve this, all connected charging stations exchange data on the current charging capacity for all vehicles. When a vehicle is fully charged, the other connected vehicles will automatically be supplied with more power.

If one charging station in an SCN loses connection with the other charging stations, the respective charging station will fall back to the configured safe current.

The total amount of power at the point of interconnection (POI), which is the point in the electrical system to protect from overload, is divided over the connected sockets based on the configured settings.

The SCN decides, how the total power is divided over the connected EVs in the SCN. When charging stations with two sockets are applied to the SCN, the SCN takes into account that the total amount of charging current on the charging station will never exceed the maximum charging station current.

The parameters to configure before use are:

- Maximum current value grid connection
- Maximum current value of the charging station
- Maximum current value per socket (applicable for multi socket charging stations)
- Safe current value
- Alternating period

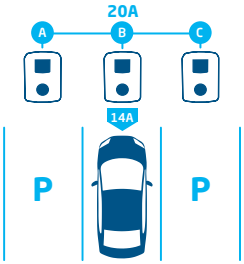
6.2 Functioning of a 1-phase SCN (or 3-phase in specific situations only)

This is a schematic representation of the power distribution within a 1-phase SCN. In this example, a standard situation at a parking spot (charging plaza) is described. However, the indicated value of 20 A is an approach and depends on many factors, such as maximum current value per charging station or socket, safe current value. The values 6 A and 14 A are fixed values for EVs. For an explanation of the terms used in this section refer to Terms used in this document on page 5.

NOTE

The sequences explained in the following illustrations are also applicable for 3-phase charging, but only if all charging EVs are 3-phase EVs.

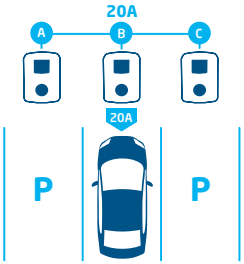
More information see Functioning of a 3-phase SCN with applied phase rotation on page 34.



1.

An EV connects to socket B:

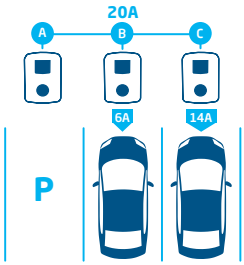
- Charging station starts probing phase during 1 minute on socket B (14 A)



2.

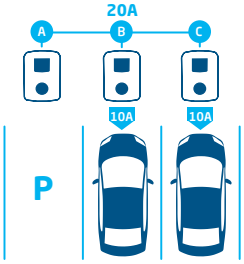
EV on socket B has been detected as EV that requires a minimum charging current of 6 A:

- The maximum power (4.6 kW=20 A) is allocated to socket B



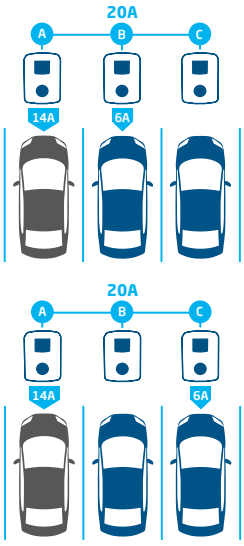
3.

An EV connects to socket C:
- Charging station starts probing phase during 1 minute on socket C (14 A)
- Remaining power (6 A) is allocated to socket B



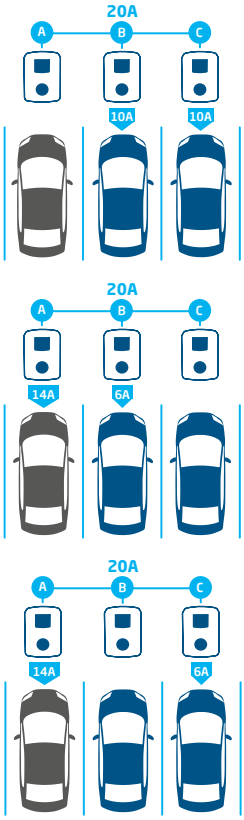
4.

EV on socket C has been detected as EV that requires a minimum charging current of 6 A:
- The available power is equally divided over socket B and C (2.3 kW=10 A each)



5.

An EV connects to socket A:
- Charging station starts probing phase during 1 minute on socket A (14 A)
- The remaining power is not enough to divide over the other two sockets (B and C). These sockets will be powered alternately.



6.

EV on socket A has been detected as EV that requires a minimum charging current of 14 A:

- All connected EVs will be charged alternately
- Every time the EVs on socket B and C are charged, the total charging current will be divided equally between them as they both require only 6 A as minimum charging current.
- Every time the EV on socket A is charged, the total charging current will be divided in 14 A (for the EV on socket A) and the remaining charging current (6 A) is allocated to one of the other EVs based on the alternating principle.

6.3 Functioning of a 3-phase SCN with applied phase rotation

The following examples explain how the power will be divided over the sockets when a specific phase rotation is applied.

Case 1:

Only 1-phase EVs are connected to the SCN. Due to the phase rotation in the SCN the charging current for every EV is the optimum (in this example 20 A).

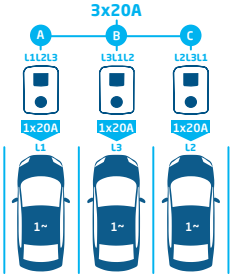


Figure 6.1: 1-phase EVs connected to SCN, optimum charging current

Case 2:

A 1-phase and a 2-phase EV are connected to the SCN. Due to the phase rotation in the SCN the charging current for every EV is the optimum (in this example 20 A per phase).

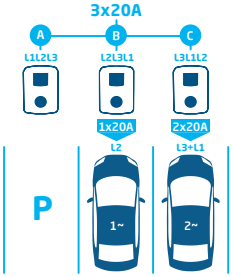


Figure 6.2: 1-phase and 2-phase EV connected to a SCN, optimum charging current

Case 3:

A 1-phase and a 2-phase EV are connected to the SCN. However, both EVs charge on the same phase (L1 in this example). Due to the overlapping phase, the charging current is divided over the two EVs. This means the charging current for every EV is reduced.

If the charging current is not sufficient to serve both EVs, the EVs will be charged alternately.

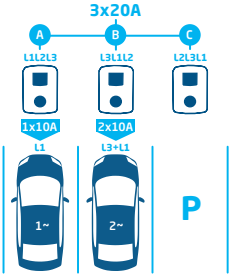


Figure 6.3: 1-phase and 2-phase EV connected to a SCN, reduced charging current

Case 4:

A 1-phase and a 3-phase EV are connected to the SCN. However, both EVs charge on the same phase (L1 in this example). Due to the overlapping phase, the charging current is divided over the two EVs. This means the charging current for every EV is reduced.

If the charging current is not sufficient to serve both EVs, the EVs will be charged alternately.

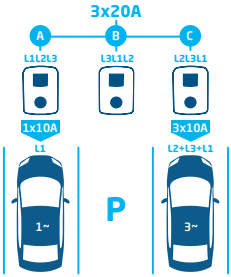


Figure 6.4: 1-phase and 3-phase EV connected to a SCN, reduced charging current

6.4 Recommendations on configuring phase rotation in a SCN

When configuring a SCN, different phase rotations per socket should be applied. Phase mapping is used by the SCN algorithm to determine the available power in the electrical installation. This will benefit the maximum power available per socket.

Based on the phase mapping, the SCN calculates and allocates the amount of power to each socket in the SCN. Applying different phase rotations also prevents uneven load distribution when 1-phase EVs are charging on the SCN. The load is divided equally over the separate phases.

Refer to the table for the recommended phase rotation:

NOTE

The recommendations in the table below are based on known parameters and can be used as a guideline. You as an installer should be able to select the most optimum connection for the different locations, based on this guideline.

Setup	No. of sockets	Internal phase rotation	Recommendation
Smart Charging Network 1-phase (grid) connection, 1-phase charging station	Single socket charging station	n.a.	No phase rotation applicable for 1-phase connections.
Smart Charging Network 3-phase (grid) connection, 1-phase charging station	Single socket charging station	n.a.	Socket 1 on L1, socket 2 on L2, socket 3 on L3, socket 4 on L1, etc.
Smart Charging Network 3-phase (grid) connection, 3-phase charging station	Single socket charging station	n.a.	Charging station 1: L1L2L3, charging station 2: L3L1L2, charging station 3: L2L3L1 -> continue in this order (charging station 4 starts again with L1L2L3, etc.).

6.5 Functioning Active Load Balancing and SCN

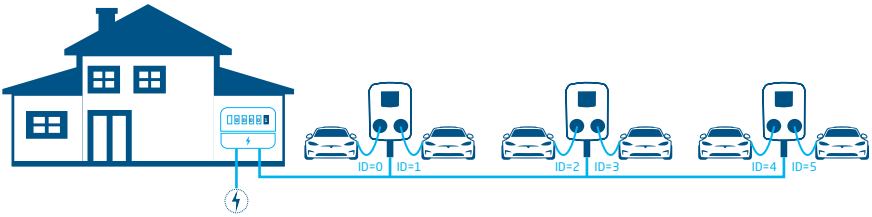


Figure 6.5: Active Load Balancing in a Smart Charging Network

- The smart energy meter calculates the available charging current for the SCN (in this case 24 A).
- The available charging current in the shown example is not sufficient to serve all occupied sockets, as the minimum charging current is 6 A per socket.
- The SCN will start charging alternately:
  a. The occupied sockets with the lowest ID numbers will be paused first, which means: socket ID0 and ID1 will be paused (for the length of the alternating period).
  b. The remaining sockets will get 6 A each (24 A divided over 4 sockets).
  c. When the alternating period is expired, socket ID2 and ID3 will be paused and socket ID0 and ID1 will get 6 A charging current.

6.6 Functioning ALB and OCPP Smart Charging

An OCPP 1.6 back office can send a smart charging profile in any scenario described in this document.

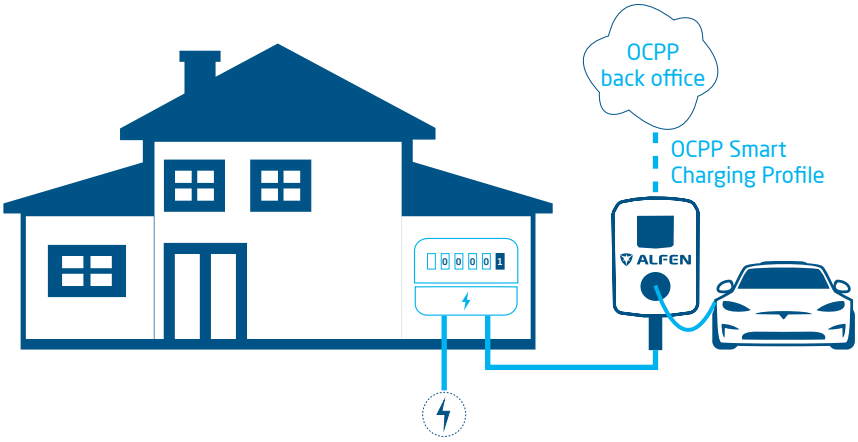


Figure 6.6: Scenario ALB and OCPP Smart Charging

- If a charging station calculates an available charging current higher than the charging current specified in the OCPP smart charging profile, the value in the smart charging profile will be leading.

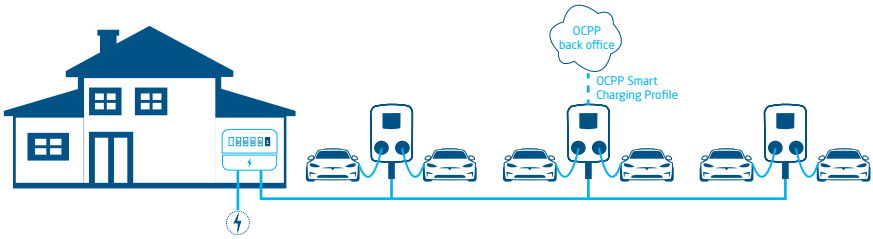


Figure 6.7: Scenario OCPP Smart Charging in a SCN

- If an OCPP smart charging profile is sent to a SCN, the profile will be sent to an individual charging station.
  - If the charging current set in the profile is lower than the charging current allocated by the SCN for this individual charging station, the lowest value will be leading.

6.7 Requirements

6.7.1 Hardware requirements

Make sure the following requirements are met:

- The charging stations must have been installed according to the instructions in the installation manual and the local requirements.
- All charging stations must be fed from the same POI.
- The charging stations must be protected by one of the following options:
  a. Each charging station must be fitted with an individual fuse
  b. Each charging station must be fitted with a residual current device (RCD) (if it is not provided in the charging station)

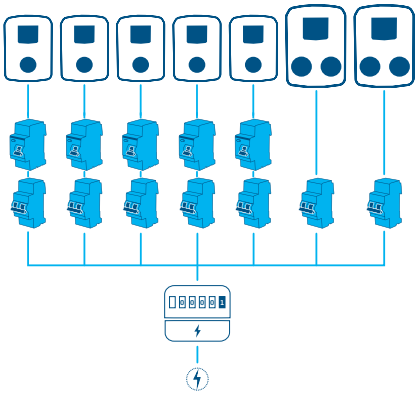


Figure 6.8: Example of a power connection scheme

- The communication cable must be a CAT5e or CAT6 UTP/ Ethernet cable and the cable trajectory is max. 100 m each. The range can be extended with another 100 m by using a switch.
- A maximum of 1 smart energy meter/ external energy meter or EMS must be connected to one or multiple charging stations in the SCN.

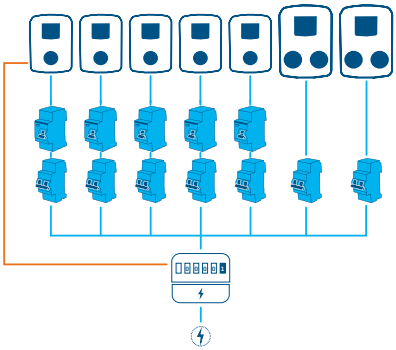


Figure 6.9: Multiple charging stations connected to a smart energy meter / external energy meter

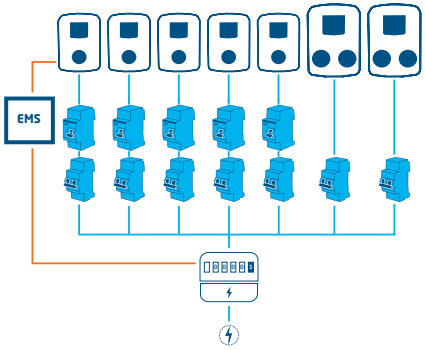


Figure 6.10: Multiple charging stations connected to a smart energy meter and an EMS

- An (existing) switch or router with a sufficient amount of connection points must be available to connect all charging stations.

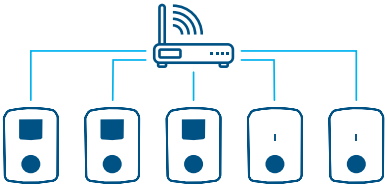


Figure 6.11: Charging stations in SCN connected to a switch/router

6.7.2 Software requirements

Make sure the following requirements are met:

- The charging stations must have the *Smart Charging Network* feature unlocked.
- The charging stations must be operating on the same firmware version.
- You must have a configuration device (laptop, tablet or smartphone).
- The network adapter laptop must be set to automatic IP.
- The firewalls on your laptop, tablet or smartphone must be disabled.
  a. If you are working with the app: You must have a valid account.
  b. If you are working with the : it must be updated to the latest version. You must have a valid account.
  c. An open Internet connection must be available; The Alfen server is accessible for receiving updates and license keys.
- The smart charging network name is identical on all charging stations. It must not contain special characters. Only use A-Z and 0-9, with a maximum of 7 characters.
  a. There is a minimum of 2 charging stations in one SCN.
  b. There is a maximum of 128 sockets in one SCN.
- The phase rotation is applied as recommended in chapter Phase sequence in a SCN.
- The charging stations are located in the same network (subnet, IP range); by default, this is 169.254.x.x
  a. The network has a minimum speed of 10 Mbps.
  b. There is no power over Ethernet.
- A LAN (preferably DHCP) should be available with at least the amount of ports available to connect with all the charging stations in the SCN.

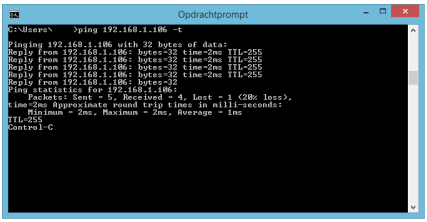
NOTE

Make use of a DHCP server (router) otherwise the charging stations will obtain an IP address via Auto-IP.

  a. Use the star network topology: When the connection with one charging station is lost, the other stations will still be working.
  b. Looping through of the feeder cables and data cables from one charging station to another is not possible.
  c. Settings UDP port: 36549, inbound-outbound
- The LAN must have been tested by pinging the charging stations via the CMD console on the computer. Incorrect wiring can be identified by high latency / latency fluctuations (time = Xms should be consistent).

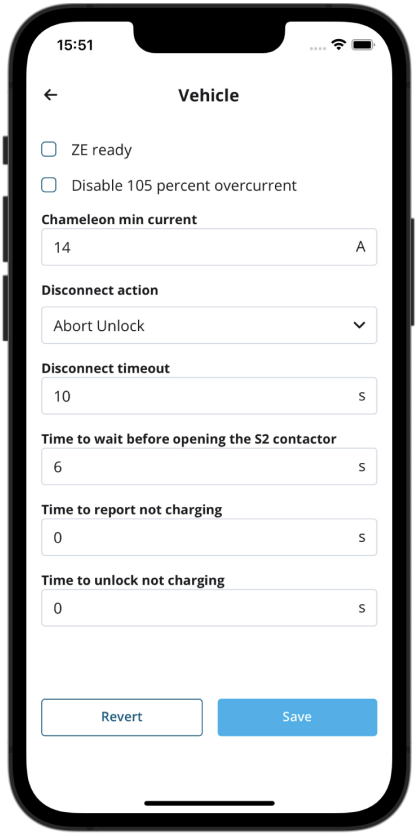
NOTE

You can stress the network cable (especially close to the RJ-45 connectors) during an ongoing ping session (ping xxx.xxx.x.x.-t and press Ctrl + c to stop).



6.8 Configuring probing current via the MyEve app

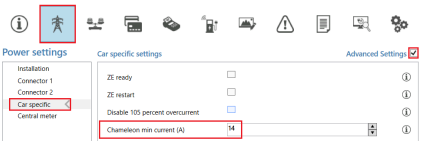
1. Go to the *Advanced* tab and select *Power settings / Vehicle specific*



2. Configure the required value (>6A) at *Chameleon min current (A)*

6.9 Configuring probing current via the ACE Service Installer

1. Go to the *Power settings* tab and select *Car specific*



2. Configure the required value (>6A) at *Chameleon min current (A)*

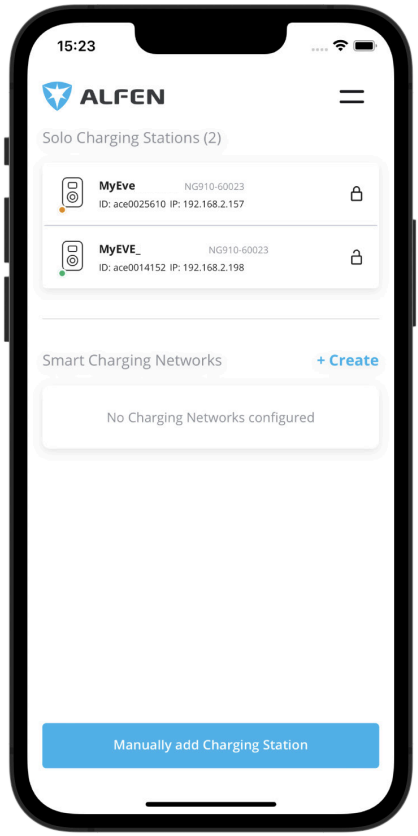
6.10 Configuring: probing current via a back office

1. Log in to the back office and select the charging station.
2. Go to the configuration settings (refresh if needed)
3. Go to the setting *Chameleon-MinCurrent* and set to the required value (>6A).

6.11 Creating a SCN via the MyEve app

There are 2 options to create a SCN: manually or by scanning the QR-codes. We describe the manual option here. With both options you will be guided through the set-up.

1. Click on *+Create*



2. Select the charging stations you want to add to the SCN.

3. Give the SCN a name.
4. Specify the *Socket safe current* (usually 6 A)
5. Specify the total current of the electrical installation (usually 18 A)
6. Specify the alternating period (pre-defined 900 s, otherwise fault message)
7. Select whether you wish to add ALB or not

6.12 Creating a SCN via the ACE Service Installer

With the ACE Service Installer, all charging stations in the SCN will be set up at the same time. All charging stations within the same subnet will be identified by the ACE Service Installer. You can initialize the SCN via the ACE Service Installer. Select the charging station, navigate through the 'Device' menu to 'Add to new SCN'. Next, follow these steps:

1. Name your SCN.
2. Click on another charging station and click '+'.
   - The charging station will be added to the desired SCN.
3. The charging station will assume the network settings.
4. Repeat step 2 until all charging stations are added to the SCN.

NOTE

It is possible that a charging station cannot be added to the SCN. In that case, check the charging stations firmware. SCN is a supported feature from versions 3.3.

NOTE

Reboot each charging station after adding to a SCN. After rebooting, the charging stations will log in to the SCN.

6.13 Settings SCN Eve Single

As soon as the communication for the charging stations has been installed, the charging plaza will at least have the following settings:

- Total capacity for all charging stations combined.
- Maximum charging current per socket: this is determined by the group in the electrical installation and the maximum charging current of the charging station.
- Minimum charging current per socket; This setting is:
  a. a security setting; when a charging station loses network connection, all charging stations will use this value. The charging station that lost connection will continue to charge on this minimum charging current while the other charging stations reserve this value, and will temporarily not use this.
  b. Minimum speed as a preferred setting; as soon as an extra socket is used for charging and the remaining capacity is not enough to supply the minimum, the sockets used will alternate; one will charge while the other pauses, in 15 minute intervals.
- Alternation period (pause) in the event of insufficient capacity; by default, this is 15 minutes. The administrator can change this, if desired.

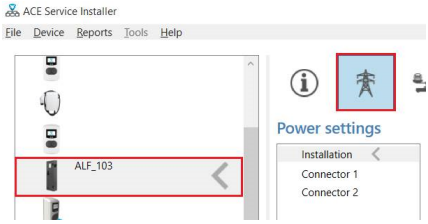
If network components like a switch or router are to be installed outdoors, we strongly advise purchasing the components accordingly and installing them in a suitable installation cabinet.

6.14 Configuring the charging station for SCN via ACE Service Installer

NOTE

The SCN will calculate the *SCN-SocketCount* based on the configuration settings of the added charging stations. It is very important to set all specified settings correctly.

1. Open the ACE Service Installer
2. Select the charging station to be configured and click on the *Power settings* button



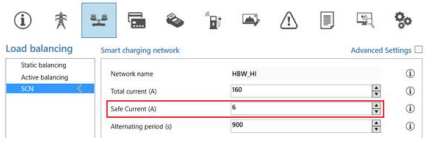
3. Select the option *Installation* and fill in the *Station maximum current (A)*. This is the maximum current that the entire charging station is allowed to provide, this is also used for Standard Load Balancing in double socket charging stations.

NOTE

A double socket charging station is shown in this example. Configuring a single socket charging station, some of the configuration items will not be shown as they are not applicable.

4. Select the *Connector* option and fill in the Max current (A). This is the maximum allowed current the socket can provide based on the type of charging station and the maximum available current. Repeat this step for the second connector if applicable.

5. Select the *Load balancing* tab and select *SCN*. Fill in the *Safe Current (A)* value. This is the available power reserved for a socket when the charging station loses connection with the SCN. The recommended value is > 6 A.



NOTE

The safe current does not have to be set for each charging station when connected to a LAN while configuring. In that case the *Socket Safe Current* (SCN setting) will be applied to all sockets in the SCN when initialized.

6.15 Configuring SCN and charging station via back office

NOTE

Configuration of an SCN via a back office is prone to errors, but theoretically possible. Alfen recommends to configure the SCN and charging stations via the app or the .

NOTE

When adding a charging station to an existing SCN at a later stage, the *SCN-SocketCount* setting on all charging stations has to be updated to the new amount of sockets in the SCN. Reboot each charging station after the update.

To configure an SCN and related charging stations via a back office, do the following:

1. Log in to the back office and select the desired charging station
2. Go to the configuration settings. Verify if the SCN feature is unlocked via the setting *UnlockedFeatures*. Refer to paragraph *Unlock features via a back office* for the unlock procedure.
3. Go to *SCN-IsEnabled* and configure the value *True*.
4. Go to *SCN-NetworkName* and configure the desired name for the SCN. The network name can contain characters A-Z and 0-9 with a maximum of 7 characters. The network name needs to be identical for all charging stations in one SCN.
5. Go to *SCN-SocketID* and configure the correct ID value. This is the number of the socket in the site setup. Always start with value '0', than '1', and so on. The socket ID value is used when the *SCN-TotalSafeCurrent* is activated. The occupied charging station with the lowest ID number will get priority. Each socket in an SCN should have a unique ID value. Range 0-128.
6. Go to *SCN-TotalStaticCurrent*. This is the available static power for the whole SCN. Configure the correct value.
7. Go to *SCN-SocketSafeCurrent*. This is the available power reserved for a socket when the charging station loses connection with the SCN. Configure the correct value (default 6A).
8. Go to *SCN-AlternatingPeriod*. In case the available power in an SCN is insufficient to serve all sockets in use, the charging EVs will be charged alternately. Part of the charging sessions will be paused for the length of a set alternating period, whilst other charging sessions will be resumed. Configure the desired value (default 900s). Possible range 60-36000s).
9. Configure the following settings:

Setting	Description	Value
Station-Max-Current	The maximum current that the entire charging station is allowed to provide, this is also used for Standard load balancing in double socket charging stations	Depending on the type of charging station
Connector1-MaxCurrent	Maximum current allowed on this socket	Depending on the type of charging station
Connector2-MaxCurrent	Maximum current allowed on this socket. Only applicable for double socket charging stations.	Depending on the type of charging station
SCN-PhaseMapping-1	Phase sequence of socket 1 (feeder cable). For single feeder cable double socket charging stations 'SCN-PhaseMapping-1' (left socket) is identical to 'SCN-PhaseMapping-2' (right socket).	1=L1 2=L2 3=L3 4=L1L2L3 5=L1L3L2 6=L2L1L3 7=L2L3L1 8=L3L1L2 9=L3L2L1
SCN-PhaseMapping-2	Phase sequence of socket 2 (feeder cable)	0= no socket (for single socket charging stations) 1=L1 2=L2 3=L3 4=L1L2L3 5=L1L3L2 6=L2L1L3 7=L2L3L1 8=L3L1L2 9=L3L2L1

10. Go to *SCN-SocketCount*. This is the total amount of sockets in the SCN. Configure the correct value.

NOTE

When adding a charging station to an existing SCN at a later stage, the *SCN-SocketCount* setting on all charging stations has to be updated to the new amount of sockets in the SCN. Via a back office it is mandatory to change the *SCN-SocketCount* setting on each charging station individually. Alfen recommends to add the new charging station to the SCN via the app or the . Than the *SCN-SocketCount* setting will be updated automatically (but only if the charging station is added to the SCN via the Add to SCN button). Reboot each charging station after the update.

6.16 Configuring SCN using EMS via a back office

NOTE

If a SCN is controlled by an EMS, one of the charging stations in the SCN should be configured as described here. This charging station will report the available charging current to the rest of the SCN.

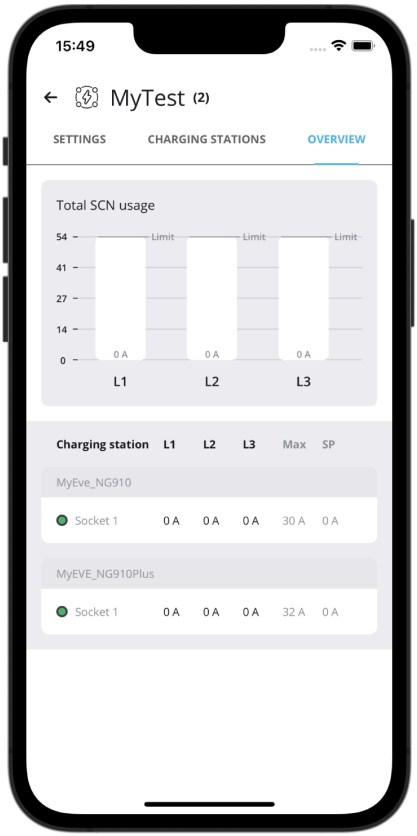
Configure the following settings:

Parameter (key)	Possible values
MbsSlaveTCPIP	On Off (default)
MbsSlaveTCPIPValidity-Time	60s (default)
MbsSlaveTCPIPMode	Off Socket SCN

1. Set the configuration setting *MbsSlaveTCPIP* to *ON*
2. Fill in the required validity time in the *MbsSlaveTCPIPValidityTime* setting. The EMS should communicate the available charging current for the charging station/SCN within the set validity time.
3. Determine whether the EMS should manage the available power for each socket or for the entire SCN.
4. Reboot the charging station.

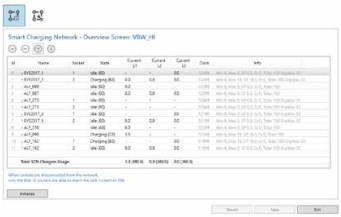
6.17 Verifying SCN via the MyEve app

Select the new SCN and click on the *Overview* button. The overview will show all the charging stations in the SCN, the sockets currently in use (state) and the load per phase (Current).



6.18 Verifying SCN via ACE Service Installer

Select the new SCN and click on the *Overview* button. The overview will show all the charging stations in the SCN, the sockets currently in use (*State*) and the load per phase (*Current*).



6.19 Verifying: SCN via a back office

Verifying the Smart Charging Network feature is possible via a back office only if the back office system setup is configured to interpret and display the required values.

6.20 Setting up an OCPP

The functionalities of the SCN are available via the UTP/Ethernet connection of the charging stations. This can easily be combined with communication over OCPP, via UTP/Ethernet or GPRS. Note that you need one SIM card per charging station. To limit costs, you can also use a router and a (2G/3G/4G) modem. In that case, the charging stations should be set to communicate with a wired network. The router is then set for the (secure) APN of the relevant management system.

Network choice	per charging station	OCPP settings
Smart Charging Network with OCPP GPRS	SCN ON	OCPP Management System Selection for GPRS
Smart Charging Network with OCPP GPRS	SCN ON	OCPP Management System selection for UTP
Smart Charging Network with OCPP through external GPRS router	SCN ON	OCPP Management System selection for UTP
Power supply (electrical installation)	Always set to full power per charging station	
Settings	Factory settings: set for charging station (max. output)	

7. USER INTERFACE

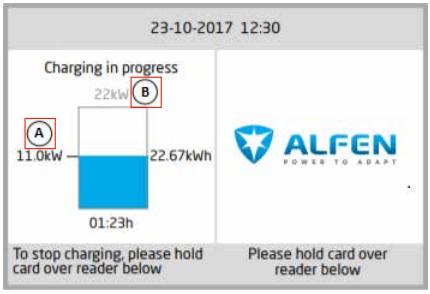
7.1 Eve Single Pro-line and S-line

Via the LED or the display of the Eve Single it is shown whether Active Load Balancing is active.

- Display (Pro-line): the adjusted power is shown.

NOTE

If the charging current is decreased, the charging capacity (A) will not meet the maximum charging capacity of the socket (B)



- LED (S-line): there are two possible scenarios:
  - The LED flashes dark blue: the charging station requests the first EV to reduce the charging speed in order to divide the power over the two connected EVs;
  - The LED flashes light blue: the charging session of the second EV will be started as soon as the other EV has adjusted the charging speed. If only one of the EVs can be charged at a time, the LED will alternately flash light blue. The available power is divided over both EV's by charging alternately every 15 minutes. When this indication is shown, charging is currently paused and will resume within 15 minutes (configurable setting).

7.2 Notifications

When using the smart charging functionalities, the charging stations will inform the user via the display (Pro-line) or LED (S-line). The behavior of the charging station and the Mode 3 states are described in the table below, only for information purpose.

Indication on the Eve Single user interface	Description	Charging station state

• Display:
  - "Error code 302: One moment please. Your charging session will resume shortly."
• LED:
  - LED flashes red-blue
• Backoffice:
  - "ErrorCode: OverCurrentFailure Info: Over current detected allowed xxA actual xxA Status: Faulted VendorErrorCode: 302"
	• In case an overcurrent is detected, the charging station will pause the charging session.
	• After 5 minutes the charging session will be resumed.
	• In case an over current is detected again, the charging station will repeat the same cycle as described before.
		Over current protection

• Display:
  - displays a reduced power (value does not reach the max. current)
• LED:
  - flashing dark blue; charging station requests the first EV to reduce the charging speed. When charging speed is reduced, the dark blue LED will illuminate.
	• In case the charging station or SCN divides the available power over the sockets in use it is possible that the max. charging current is either limited or increased.	Load balancing/SCN

• Display:
  - displays the reduced power (to 0W) in case the charging session is paused.
• LED:
  - Charging: LED illuminates dark-blue
  - Alternating: LED flashes light-blue
	• In case the available power in a charging station or SCN is insufficient to serve all sockets in use, the charging vehicles will be charged alternately.
	• Part of the charging sessions will be paused for the length of a set alternating period, whilst other charging sessions will be resumed.
		Alternating

• LED:
  - paused session: LED flashes light-blue
  - probing phase: LED illuminates dark-blue
	• During the probing phase all sockets in use, except for the socket with the recent connected vehicle, will be paused, but only if the available power is not sufficient to serve all sockets in use.	Probing phase

Indication on the Eve Single user interface	Description	Charging station state

• Display:
  - "Charging session halted by energy supplier"
  - In case the charging station is part of an SCN and the whole SCN is suspended, the other charging stations in the SCN will show the message "Chargepoint ready, waiting for power."
• LED:
  - LED flashes blue
	• A running charging session can be suspended on request of the grid operator. Suspending the charging session is done in a controlled way, according to the Mode 3 protocol.
	• During the shut-off time it is possible to start a new charging session; the session, however, will be paused immediately.
	• The charging station indicates when the session can be resumed.
		Suspend Charging mode

• Display: - "Chargepoint ready, waiting for power."	• With an OCPP Smart charging profile a running charging session can be controlled by an OCPP back office. • The profile can be composed of multiple blocks of charging currents for a set amount of time. • When a Smart charging profile is sent to a charging station with more enabled smart charging features (SCN, Active Load Balancing), the most limiting setpoint communicated with a socket in use prevails.	OCPP Smart charging profile

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ALFEN
POWER TO ADAPT