

Inhoud

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1. Modbus TCP

The Alfen EVCS is recommended to connect through Modbus TCP.
The Modbus TCP installation requires UTP cable from the interface to the Flexbox.
For extending the interfaces with Modbus TCP, a 24v switch is needed.

The data transfer for this interface goes with the IP address.
This IP address needs to be set on fixed.

2. Installation

The UTP cable needs to be in the interface and in the 24v switch, which is connected to the Flexbox.

The IP address needs to be configured in the same range as the IP address off the Flexbox. The IP address of the Flexbox can be found through an IP scanner or through CMD on your Windows laptop. Example: 192.168.1.xxx or 10.10.20.xxx

The ACE service installer is necessary to connect to the EVCS.

To log in on the ACE service installer you use:

Username: Post

Password: prEze8

For connection to the specific Alfen EVCS you can find a form with was included with the EVCS.

For further information and configuration, look in the appendix or the enclosed Alfen manual.

3. Configuration

Configuration of an interface with the Oliva Flexbox will be done in the config file. The program Win SCP is necessary and the manual can be found on the portal.

In the config file, change the parameters which is shown below.

- Device ID are following up on each other in the config file
- Device type is filled in for the EVCS
- Manufacturer is Alfen
- Address is where you fill in the IP address of the inverter(s)
- Port becomes 502, necessary for Modbus TCP
- Protocol is Modbus TCP
- To activate the interface, set in use to TRUE

```
"alfen_evcs": {  
  "device_id": [0,1,2,3,4,5,6,7,8,9],  
  "device_type": "evcs",  
  "manufacturer": "alfen",  
  "address": ["192.168.1.91", "", "", "", "", "", "", "", "", ""],  
  "port": 502,  
  "protocol": "modbus_tcp",  
  "in use": "TRUE"
```

4. Final check

After the configuration has been done, log in into the HMI and check the Acrel 3Ph page to see if the data is showing in the portal. If data is showing, the interface is installed correctly.

EVC - Alfen

Name: LIB_10720
 Manufacturer: Alfen NV
 Firmware: 6.6.2-4312
 Platform Type: NG910
 Serial nr: ACE0202601
 Status Mode: ☐E

Station Max Current: 16.0 A
 Temperature: 23.9375 C
 Sockets: 1

SCN Mode data:

SCN Name: 0
 Powerfactor L1: 0
 Powerfactor L2: 0
 Powerfactor L3: 0
 PowerFactor SUM: 0.0
 Apparent Power L1: 0 VAh
 Apparent Power L2: 0 VAh
 Apparent Power L3: 0 VAh
 Apparent Power SUM: 0 VAh
 Real Power L1: 0 Wh
 Real Power L2: 0 Wh
 Real Power L3: 0 Wh
 Max Current L1: 0 A
 Max Current L2: 0 A
 Max Current L3: 0 A

Ruijsbossche Hoeve

Available: ●
 Car connected: ●
 Car charging: ●
 EMS Setpoint used: ●

Max Charge Power: A
 Charging phases (1 or 3):

Socket data:

Meter Type: 0
 Meter State: Updated
 Voltage L1: 236.0 V
 Voltage L2: 237.8 V
 Voltage L3: 237.9 V
 Current L1: 0.0 A
 Current L2: 0.0 A
 Current L3: 0.0 A
 Frequency: 50.0 Hz
 Real Energy Delivered: 6.8 Wh
 Real Energy Consumed: 0.0 Wh
 Max Current: 16 A
 Safe Current: 16.0 A
 Phases enabled for charging: 3
 Setpoint valid Time: 53 sec

5. Appendix

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1 Introduction

This is a draft of the implementation of the Modbus slave functionality to the NG9xx charging stations of Alfen N.V. All information in this document might be subject to change in the future and should be used as an indication of which functionality will be supported. There is an important difference between the master and slave roles in the Modbus communication protocol. This implementation covers the slave role that supports serving a Modbus master, these roles are also referred to server and client roles respectively when using Modbus over TCP/IP. The master initiates the connection to the slave and sends either read or write requests of certain Modbus registers.

The current Modbus implementation supports up to two simultaneously connected Modbus TCP/IP masters, UDP is not supported. There is a keep alive timeout of 60 seconds before the connection with a Modbus master is closed when no new read or write is received. The Modbus master should connect to the IP of the Modbus slave's wired Ethernet connection on port 502. Requests with certain slave addresses are 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. All communication must be in the big endian format.

New values of received written registers by Modbus masters are logged in the charging station, only if this value is different than the current one.

This document is based on using:

- ☑ Firmware version 4.10
 - ☑ Service Installer Application 3.4.10-130
- Modbus Slave TCP/IP 30-10-2020 **004**

1.1 Configuration options

Configuring the Modbus slave functionality can be done using the Alfen ACE Service Installer¹ with an administrator account or version 4.0 or higher with a service account. The charging station requires the license key for "Active load balancing" before the Modbus slave functionality can be enabled. The following configured settings are persistent and remain preserved when the charging station reboots.

1 Available at https://alfen.com/downloads	Function
Name	

Allow reading	Allow reading of Modbus registers via TCP/IP. By default this is turned off.
Allow writing maximum currents	Allow writing maximum current Modbus registers. By default this is turned off.
Enable sockets	This enables the charging station to take the written maximum current values for sockets into account when calculating the actual maximum current for all the sockets.
Enable SCN	This enables the charging station to take the written maximum current values for SCN into account when calculating the actual maximum current for all the SCN phases.
Validity time	The validity time is the time in seconds in which the charging station requires an updated maximum current from a Modbus master before falling back to the safe current. The validity time is equal for all maximum currents, however each maximum current has its own remaining valid time which is updated every time that maximum current is set via Modbus. The default validity time is 60 seconds. It is recommended that the polling time of a Modbus master is lower than the validity time.
IP Address allocation	DHCP or fixed IP
Port	502
Modbus slave addresses	1: measurements socket 1 2: measurements socket 2 (if available)
Supported Modbus functions	0x03: Read Holding Registers 0x06: Write Single Register 0x10: Write Multiple Registers

1 Available at <https://alfen.com/downloads>

1.2 Reading registers

The Modbus slave implementation supports reading of holding registers with Modbus function code 3. Multiple registers can be requested within one Modbus request, as long as they are contiguous. Whenever a register is reserved or not available, the register reply is filled with Not a Number (NaN), which is set to 0xFFFF for a 16 bit register.

There are a Modbus registers that contain the datatype string. String registers contain strings where each 16-bit Modbus register contains two 8-bit ASCII chars. A string always contains a trailing zero.

Note: Reading registers is done in network byte order. Modbus Slave TCP/IP 30-10-2020 005

1.3 Writing registers

The Modbus slave implementation supports writing of holding registers. When writing a value with a datatype that contains multiple Modbus registers, then all registers should be written within one write request. For example when a variable is a 32 bit float, both consecutive 16 bit registers should be written in one Modbus request. When the Modbus write request does not write all registers, the request will be denied and a Modbus error will be returned.

Note: Writing registers is done in network byte order.

1.3.1 Maximum current

It is possible to set the maximum current via Modbus for a specific socket, or for a specific phase of the SCN network. Each maximum current has additional registers that are read only for the enabled property, actual maximum current, the configured safe current and the remaining validity time. Each time the maximum current is written via Modbus, the remaining valid time is updated with the validity time. For example, when the validity time is 60 seconds and the maximum current has been written most recently 10 seconds ago, then reading of the remaining valid time register will result in 50.

The maximum current and remaining valid time are not preserved during a reboot of the charging station. Since the enabled and safe current settings are persistent, the behaviour of the charging station will be such that it will first fall back to the safe current and waits for the Modbus master to rewrite the maximum current.

When a maximum current is enabled and the Modbus master did not update this for a certain time, the charging station will fall back to its safe current. The safe current has to be set before the maximum current can be set via Modbus. This value can also be configured by the back office.

Then internal handling of a newly written maximum current by the charging station can require some time. The time before the actual used current by the connected car is adapted to this relies on multiple factors, for starters by the response speed of the car itself.

1.4 Phase rotation

It must be noted that the naming of the phases depend on the installation and thus are for the charging station relative to the incoming phase rotation. This could potential result in confusion on the Modbus master side, especially when multiple Modbus slave charging stations are connected.

An example could be two charging stations of which the first is connected in order of the incoming phase connection L1-L2-L3, while the second charging station is wired in order L2-L3-L1. This could mean that if the Modbus master wants to read the current the current through phase L1, it should read the register of the phase L1 on the first charging station and the register of the phase L2 of the second charging station.

Enabling Modbus Slave in charging stations

Modbus Slave over TCP/IP is activated when the station is configured to communicate with an Energy Management System (EMS) and when Active Load Balancing is activated. Active Load Balancing is the functionality the currently implements Modbus Slave TCP/IP as a means of communication.

Note: Active Load Balancing is a locked feature of the charging station. It can only be unlocked after purchasing that feature. After the purchase, the unique license key of the charging station is updated.

This chapter displays the steps to take to enable Modbus Slave TCP/IP for e.g. testing purposes.

To configure the charging station on site, an account for Service Installer Application (SIA) is required. In case you do not have an account yet, please visit <https://support.alfen.com> to request an account.

2.1 Activate Active Load Balancing

Active Load Balancing can be activated using the selection box in the Section 'Load Balancing' of the Service Installer Application. In the menu on the left, select "Active balancing".

Note: the checkbox for 'Allow 1- and 3-phased charging'. This option must be active to allow an Energy Management System to control switching between single-phase and three-phases while charging. In the current implementation this option must be checked locally using the Service Installer Application. Modbus Slave TCP/IP 30-10-2020 **007**

In the Active Balancing menu, select your Data Source:

- **Meter**; This will activate 'Master' role for the charging station
- **Energy Management System**; This will activate 'Slave' role for the charging station

As a 'Master', the charging station calculates the available budget left for charging vehicles. Other consumers are considered of higher priority. Charging ramps up only if possible

As a 'Slave', the charging station responds to a command from an external device like an Energy Management System (EMS). The external device determines the priority of charging and acts accordingly. The charging station ramps up/down upon request.

2.2 Energy Management Systems

When Selecting 'EMS', the charging station will be configured as a 'Slave'. In the menu bar on the left, 'TCP/IP EMS' appears. Modbus TCP/IP is selected by default, no other protocol can be selected yet.

The following options are available:

Mode;

- **Socket;** control each socket
- **SCN;** control the charging station as a complete station, or control a complete Smart Charging Network as one entity.

Validity time (s); After validity time, the station assumes that the Energy Management System (EMS) is not available anymore and reverts to safe current, configured in menu 'Active balancing'. Register values must be rewritten before validity time has expired.

Configuring IP-address of the charging station

The charging station is by default configured to work with automatic IP allocation using DHCP. This can be used for Modbus Slave TCP/IP operation as well (station being the TCP server). To retrieve the station's identity use (for example) mDNS to retrieve its DNS name

❓ **Service type:** _alfen._tcp.local

❓ Assigned IP address

❓ **Port:** 80

❓ **Modelname-serial number:** NG920-61001-ACE0012345 (example)

❓ **Station Identifier** ALF_123 (example)

❓ **SCN name** (if applicable): ALF_HBW (example)

As an alternative it is also possible to use a fixed IP address on the network to find the station.

❓ Navigate to tab 'Connectivity'

❓ Click 'Wired' in the menu on the left

❓ Select Fixed IP address

❓ Fill in the details