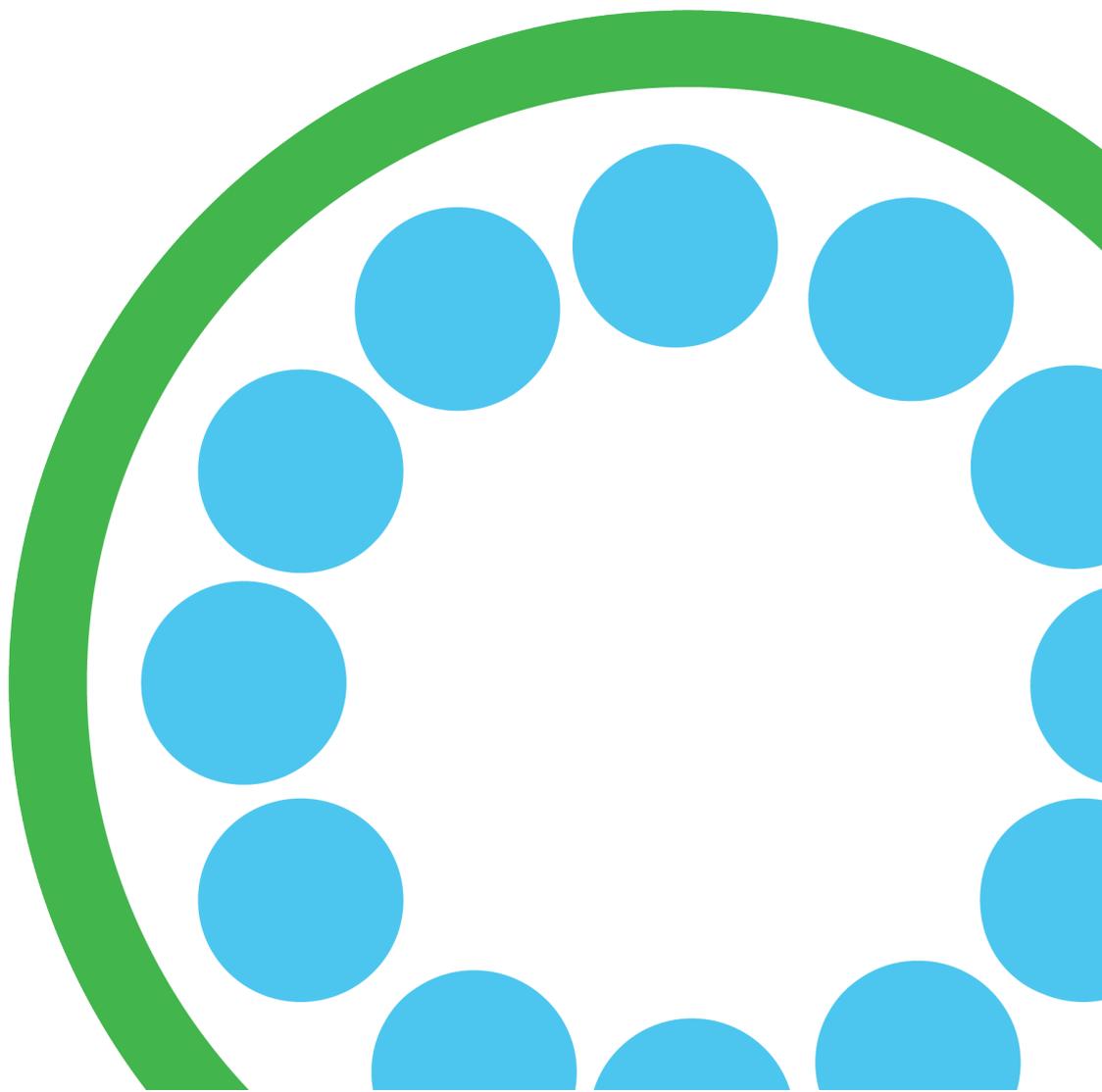




Protocol Max v4

Third party interface





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Introduction

This document explains the RS485 designated bus connection on our generation 3 and 4 charging stations. This bus connection is intended to be used by third party devices, allowing these devices to control the stations or smart grids maximum available current real-time.

Changelog

Version 1.0	Laurens van Jaarsveld	Revision 12 of the document made September 15 th , 2016
Version 2.0	Erik Homs	Merge of Revision 12 of the document with a translation of the Dutch document EVB_SmartGridProtocol made September 15 th , 2016
Version 3.0	Erik Homs	This was never officially released
Version 4.0	Erik Homs	Addition of the 68 command



How it works

A third party can connect on the chargepoint designated RS485 bus. The third party can utilise an ongoing command message. The expected requirements of the message will be as follows. To prevent the station from entering the fail-safe situation a message should be repeated within the given time-out timeframe as keep alive method.

- **Message properties**
 - Serial number ChargePoint (only for command 68)
 - Information module (only for command 68)
 - Max current L1
 - Max current L2
 - Max current L3
 - Time-out
 - Fail-back max current L1
 - Fail-back max current L2
 - Fail-back max current L3
 - checksum

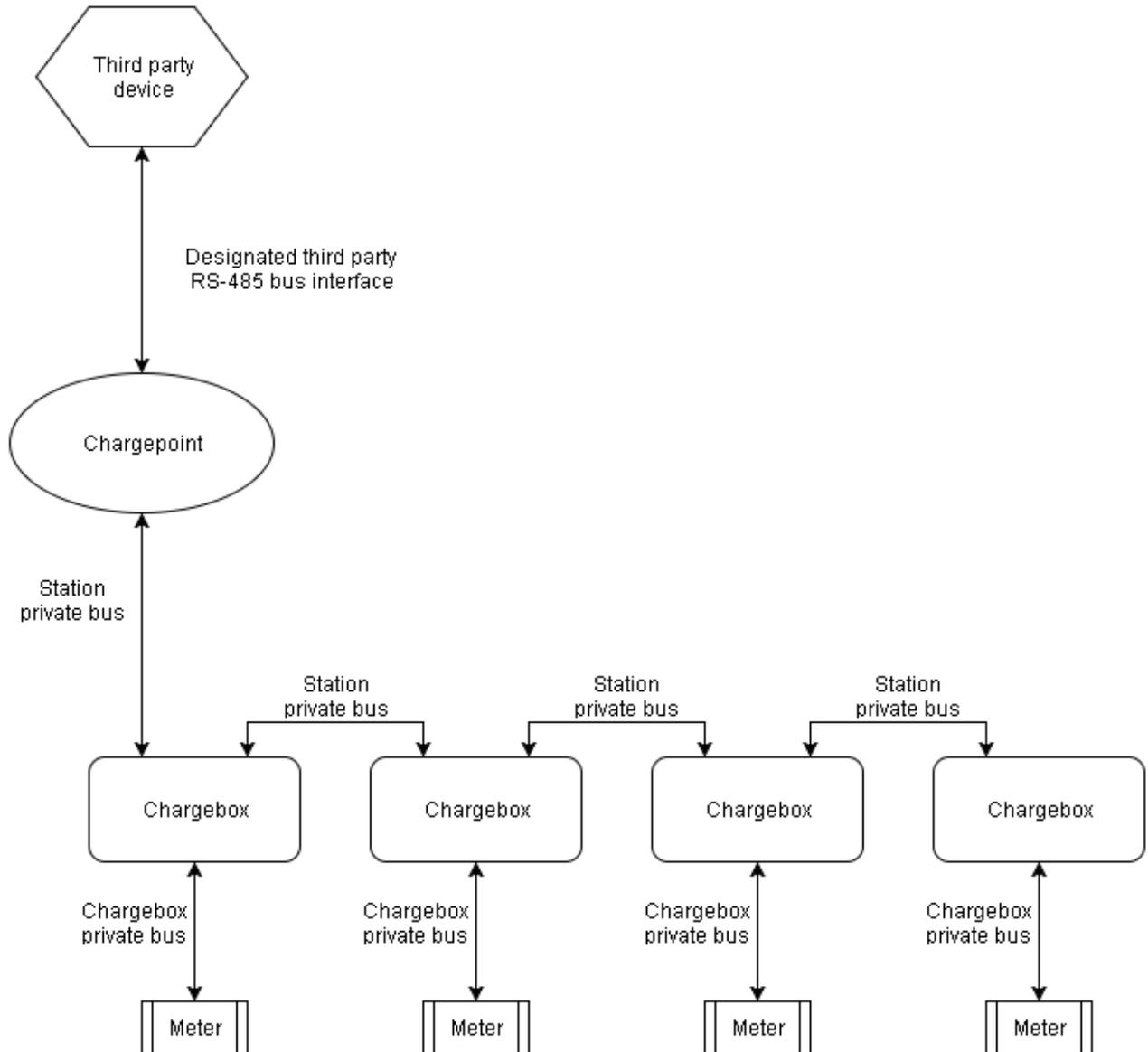
The station will reply on this message to confirm the settings are received and within that message the station will provide the following to the third party.

- **Message reply**
 - Serial number ChargePoint (only for command 68)
 - Minimum allowed interval time in seconds
 - Maximum phase current
 - Number of chargebox modules
 - Connector data (for each connected connector)
 - Minimal required phase current
 - Used current L1
 - Used current L2
 - Used current L3
 - Cosine phi L1
 - Cosine phi L2
 - Cosine phi L3
 - kWh total

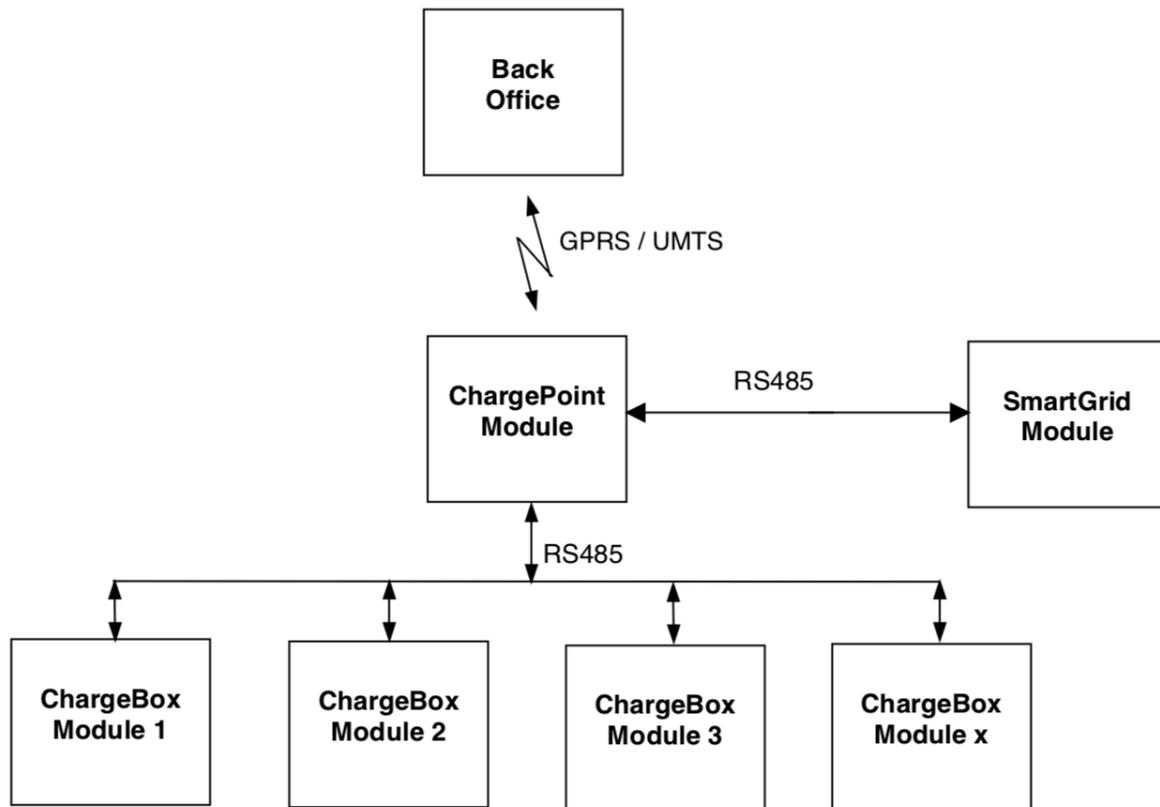


Topology

Overview of connected components.



SmartGrid Protocol technical details



The picture above displays the communication paths.

The ChargePoint-module communicates to the back office through mobile data. Communication with the ChargeBox-modules and external modules takes place via RS-485. Minimum 1 and maximum 20 ChargeBox modules can be connected to 1 ChargePoint Module.

The documented command set is applicable for the communication between the ChargePoint Module and the external SmartGrid-module for Smart Charging.

The RS-485 communication takes place in multi master mode. Each module can transmit messages on the bus. Before a message can be sent the module needs to verify the bus is available for at least 100ms.

RS-485 communication setup is baud rate 38k4, 8 bits data, 1 stop bit and no parity.



Message format

Start	Address	Command	Data	Checksums	End
-------	---------	---------	------	-----------	-----

Start: 0x02 <STX>
Address: two parts:
Part 1: the address of the receiver (destination address) in a byte
Part 2: the address of the sender (source address) in a byte
Command: Purpose of the message, in a byte
Data: The information itself, in words
Checksum: two parts:
Part 1: the sum of all byte in the parts address, command and data, in a byte
Part 2: the XOR of all bytes in the parts address, command and data, in a byte
End: 0x03 <ETX>

Outside of start and end all bytes and words shall be sent in ASCII, upper case.

A byte 0x5A shall be sent as '5A', which is 0x35 and 0x41.

A digit "K" will be sent as "K", so 0x4B

A Word 0x43E1 shall be sent as '43E1', which is 0x34, 0x33, 0x45 and 0x31.

A Sting/Char shall be sent as characters/bytes.

A String "ABC" shall be sent as '416263' which is 0x34, 0x31, 0x36, 0x32, 0x36 and 0x33
(0x41 = 'A', 0x62 = 'b' and 0x63 = 'c')

Important: if the Slave receives a message with an incorrect checksum or corrupt data the message will be ignored.

Formats

Type:	Format:	ASCII character in message:
1 byte:	8 bits	2
1 char:	16 bits	2
1 digit:	4 bits	1
1 nibble:	4 bits	1
1 word:	2 bytes (=16 bits)	4
1 kbyte:	1000 bytes	
1 kword:	1000 words	

ACK: 0xAA00

NACK: 0x0055

If the data is shorter than the given format the data will be filled with digit "0" (0x30) until the length of the format is met.

Index numbers always start at 1. Index number 0 can be used for extra information

Bit #/Byte # =	bit/byte N	bit/byte n-1	...	bit/byte 1	bit/byte 0
----------------	---------------	-----------------	-----	---------------	---------------



Addresses

ChargePoint-module: 0x80
SmartGrid-module: 0xA0
BroadCast: 0xBC

Macros

<STX> 0x02
<ETX> 0x03
ACK 0xAA00
NACK 0x0055

Layout

Messages should be formatted according the following method, the response is optional and there can be multiple:

Command number: title

Request			
Parts	Fixed value	Description	Format

Response			
Parts	Fixed value	Description	Format

Command 68

68: Maximum phase currents with address (Smartgrid-module -> ChargePoint-module)

An external Smart Charging module can command the ChargePoint to a certain current value for charging. The ChargePoint will respond with the actual use.

Request:

[start]	0x02 <STX>	
[dest address]	0x38 <address ChargePoint-module 0x80> 0x30	
[source address]	0x41 <address SmartGrid-module 0xA0> 0x30	
[command]	0x36 <command number: 68> 0x38	
[data]	Serialnumber ChargePoint Information module maximum phase current L1 */** maximum phase current L2 */** maximum phase current L3 */** time out time in seconds maximum phase current L1 after time out */** maximum phase current L2 after time out */** maximum phase current L3 after time out */**	4 bytes 16 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes
[checksums]	SUM [Address], [Command] and [Data] XOR [Address], [Command] and [Data]	1 byte 1 byte
[end]	0x03 <ETX>	



Response:

[start]	0x02 <STX>	
[dest address]	0x41 <address SmartGrid-module 0xA0> 0x30	
[source address]	0x38 <address ChargePoint-module 0x80> 0x30	
[command]	0x36 <command number: 68> 0x38	
[data]	Serialnumber ChargePoint minimum allowed interval time in seconds maximum phase current of connection* number of ChargeBox-modules [n] ChargeBox data minimum required phase current used phase current L1 * used phase current L2 * used phase current L3 * cosine phi L1 *** cosine phi L2 *** cosine phi L3 *** kWh total reading in Wh Voltage L1 in V Voltage L2 in V Voltage L3 in V	4 bytes 2 bytes 2 bytes 1 byte n*24 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes 2 bytes 4 bytes 2 bytes 2 bytes 2 bytes
[checksums]	SUM [Address], [Command] and [Data] XOR [Address], [Command] and [Data]	1 byte 1 byte
[end]	0x03 <ETX>	

* PLEASE NOTE: All currents are in tenth of an Amp, 10.0A = 100

** Initially the maximum currents of phases L1, L2 and L3 are equal to the maximum rating of the connection. The maximum currents can never exceed the maximum rating of the connection. It can take up to 10 seconds before the cars accept the updated currents.

*** Cosine Phi is expressed in 1/1000: 654=0.654, 65414=-0.122



If the ChargePoint-module does not receive the command before the time-out the maximum currents of Phases L1, L2 and L3 will become equal to the maximum current after time-out.

Because the serialnumber of the ChargePoint is in the message it is possible to connect multiple ChargePoints on 1 bus to 1 SmartCharging module. A ChargePoint will only listen to a message if the serial matches or if the serialnumber equals "0".

The content of the "information module" is 16 bytes in size and not defined. The content can be filled by the SmartCharging module and/or the Backend. The ChargePoint will pass this information on transparently and will not use this information itself.

Recommended use of the Information Module, first byte is mandatory:

- Byte1: Vender Code:
 1. Maxem
 2. EVOptimizer
 3. Smappee
 4.
- Bytes 2&3: Product code and version
- Bytes 4&5: Firmware version
- Bytes 6&7: Vendor error code
- Bytes 8&9: Value of the maximum current for the connection in A
- Bytes 10-16: other information



Example:

The command transmitted over the RS485 bus looks like this:

Send:

```
<STX>80A0680192305400112233445566778899AABBCCDDEEFF00E6008C014003C002800500046F703<ETX>
```

Receive:

```
<STX>A08068019230540014015E020078008C008C008C021C0140038400014C1D00E600E500E700500000000000A00085FFBFFF32000B823C00E300E400E20C70<ETX>
```

The message to Chargepoint with serial 1923054 (01923054). The module gives extra information about itself (00112233445566778899AABBCCDDEEFF).

A maximum current is transmitted on L1, L2 and L3 of 23.0A (00E6), 14.0A (008C) and 34.0A (0152) with a time out of 60 seconds (003C). The maximum current after expiration of the time out for L1, L2 and L3 is 4.0A (0028), 8.0A (0050) and 7.0A (0046).

The answer from the ChargePoint with serial 1923054 (01923054) indicates the minimal time interval is 20 seconds (0014) with a maximum current of 35.0A (015E) and the data of 2 ChargeBox-modules (02).

The first ChargeBox-module uses a minimum current of 12.0A (0078) and uses on L1, L2 and L3 currents of 14.0A (008C), 14.0A (008C) and 14.0A (008C). It has on L1, L2 and L3 a Cosine Phi of 0.540 (021C), 0.320 (0140) and 0.900 (0384). The total readout of the meter is 85021 Wh (00014C1D). The Voltages on L1, L2 en L3 are 230V (00E6), 229V (00E5) en 231V (00E7).

The second ChargeBox-module uses a minimum current of 8.0A (0050) and uses on L1, L2 and L3 a current of 0.0A (0000), 0.0A (0000) and 16.0A (00A0). It has on L1, L2 and L3 a Cosine Phi of 0.133 (0085), -0.065 (FFBF) and -0.206 (FF32). The total readout of the meter is 754236 Wh (000B823C). The Voltages on L1, L2 en L3 are 227V (00E3), 228V (00E4) en 226V (00E2).



Command 69

69: Maximum phase currents (Smartgrid-module -> ChargePoint-module)

SmartGrid-module (send):

Start	Address	Command	Data	Checksums	End
[start]	0x02	<STX>			
[dest address]	0x38 0x30	<address ChargePoint-module 0x80>			
[source address]	0x41 0x30	<address SmartGrid-module 0xA0>			
[command]	0x36 0x39	<command number: 69>			
[data]		maximum phase current L1 */** maximum phase current L2 */** maximum phase current L3 */** time out time in seconds maximum phase current L1 after time out */** maximum phase current L2 after time out */** maximum phase current L3 after time out */**		1 word 1 word 1 word 1 word 1 word 1 word 1 word	
[checksums]		SUM [Address], [Command] and [Data] XOR [Address], [Command] and [Data]		1 byte 1 byte	
[end]	0x03	<ETX>			

ChargePoint-module (response):

Start	Address	Command	Data	Checksums	End
[start]	0x02	<STX>			
[dest address]	0x41 0x30	<address SmartGrid-module 0xA0>			
[source address]	0x38 0x30	<address ChargePoint-module 0x80>			
[command]	0x36 0x39	<command number: 69>			
[data]		minimum allowed interval time in seconds maximum phase current of connection* number of ChargeBox-modules [n] ChargeBox data minimum required phase current used phase current L1 * used phase current L2 * used phase current L3 * cosine phi L1 ***		1 word 1 word 1 byte n*9 words 1 word 1 word 1 word 1 word	



	cosine phi L2 *** cosine phi L3 *** kWh total reading in Wh	1 word 1 word 2 words
[checksums]	SUM [Address], [Command] and [Data] XOR [Address], [Command] and [Data]	1 byte 1 byte
[end]	0x03 <ETX>	

- * All currents are in tenth of an Amp, 10.0A = 100
- ** Initially the maximum currents of phases L1, L2 and L3 are equal to the maximum rating of the connection. The maximum currents can never exceed the maximum rating of the connection. It can take up to 10 seconds before the cars accept the updated currents.
- *** Cosine Phi is expressed in 1/1000: 654=0.654, 65414=-0.122

If the ChargePoint-module does not receive the command before the time-out the maximum currents of Phases L1, L2 and L3 will become equal to the maximum current after time-out.



Example:

The command transmitted over the RS485 bus looks like this:

Send:

```
<STX>80A06900E6008C0154003C002800500046F703<ETX>
```

Receive:

```
<STX>A080690014015E020078008C008C008C021C0140038400014C1D00500000000000  
A00085FFBFFF32000B823CFB05<ETX>
```

In this case a maximum current is transmitted on L1, L2 and L3 of 23.0A (00E6), 14.0A (008C) and 34.0A (0152) with a time out of 60 seconds (003C). The maximum current after expiration of the time out for L1, L2 and L3 is 4.0A (0028), 8.0A (0050) and 7.0A (0046).

The answer indicates the minimal time interval is 20 seconds (0014) with a maximum current of 35.0A (015E) and the data of 2 ChargeBox-modules (02).

The first ChargeBox-module uses a minimum current of 12.0A (0078) and uses on L1, L2 and L3 currents of 14.0A (008C), 14.0A (008C) and 14.0A (008C). It has on L1, L2 and L3 a Cosine Phi of 0.540 (021C), 0.320 (0140) and 0.900 (0384). The total readout of the meter is 85021 Wh (00014C1D)

The second ChargeBox-module uses a minimum current of 8.0A (0050) and uses on L1, L2 and L3 a current of 0.0A (0000), 0.0A (0000) and 16.0A (00A0). It has on L1, L2 and L3 a Cosine Phi of 0.133 (0085), -0.065 (FFBF) and -0.206 (FF32). The total readout of the meter is 754236 Wh (000B823C).



We are EVBox

EVBox is the leading global manufacturer of electric vehicle charging stations and charging management software.

Founded in 2010, EVBox made its breakthrough when the market for electric vehicles (EVs) was still in its infancy. Its founders Huub and Bram set their hearts and eyes on a clear concept: a fully modular charging station that facilitates easy installation, maintenance upgrades, and above all, uncompromising quality and durability.

Soon, EVBox became the sole supplier of public charging infrastructure in cities such as Amsterdam, Rotterdam and Monaco. Meanwhile, EVBox played an active role in promoting Smart Charging technologies and interoperability of charging infrastructure with industry partners and public organizations.

In 2017, EVBox was acquired by ENGIE FAB, a platform created by the energy conglomerate ENGIE to promote and facilitate open innovation. With an installed base of over 50,000 charging points across more than 980 cities worldwide today, EVBox offers charging solutions to electric drivers, businesses, commercial facilities and cities.

EVBox envisions a future where everyday transport is technologically advanced, emission-free, predominantly self-driven and sustained by a green charging infrastructure. EVBox's mission is to drive sustainable mobility, by bringing leading electric vehicle solutions to the world.

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