

# Fox ESS EV Charger Modbus TCP & RTU Protocol 1.06



**Fox ESS EV Charger**  
**Modbus TCP & RTU Protocol V1.06**  
**FOX ESS CO.,LTD**

|               |                |         |       |
|---------------|----------------|---------|-------|
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## **1. Protocol Description**

### **1.1 Acronyms Description**

- **EMS:** Energy Management System
- **EVC:** Electric Vehicle Charger
- **INV:** Inverter
- **PV:** Photovoltaic
- **BAT:** Battery
- **SMT:** Smart Meter
- **mDNS:** Multicast Domain Name System

- **CRC:** Cyclic Redundancy Check

## 1.2 Target Group

This protocol is intended only for use by persons with technical knowledge and programming skills in the relevant field. If you have any questions, please contact our technical support staff. Please note that this protocol must be used with the permission of the Company. We do not assume any responsibility for any adverse consequences caused by private use.

## 1.3 Application Scenarios

### 1.3.1 Scenario Overview

Green and environmentally friendly charging scenarios are becoming more and more popular, such as realizing green energy closed loop, improving clean energy utilization efficiency, reducing carbon emissions, and reducing charging costs. Through EMS, photovoltaic systems, smart loads and multiple EVC are connected together through communication networks to achieve centralized equipment management and intelligent energy deployment. At the same time, it is equipped with a cloud monitoring system to realize remote data monitoring. This efficient and transparent way of using energy has benefited more and more families.

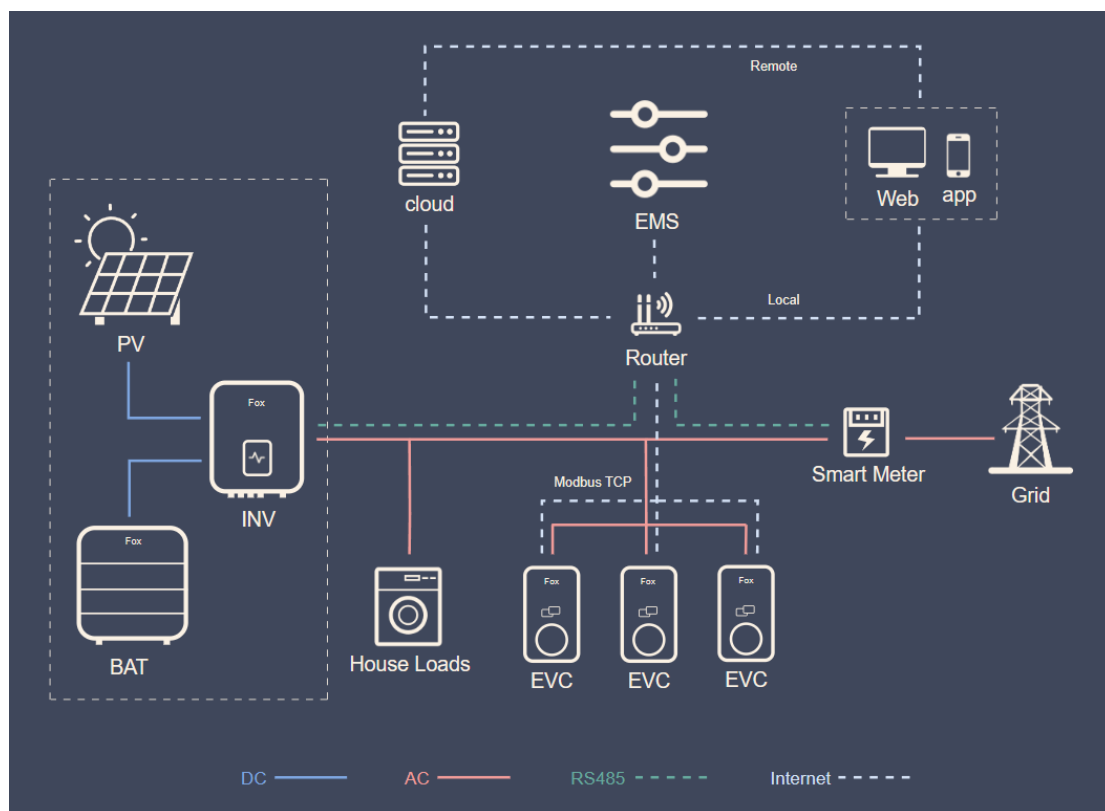


Figure 1. Usage scenario diagram of Modbus TCP

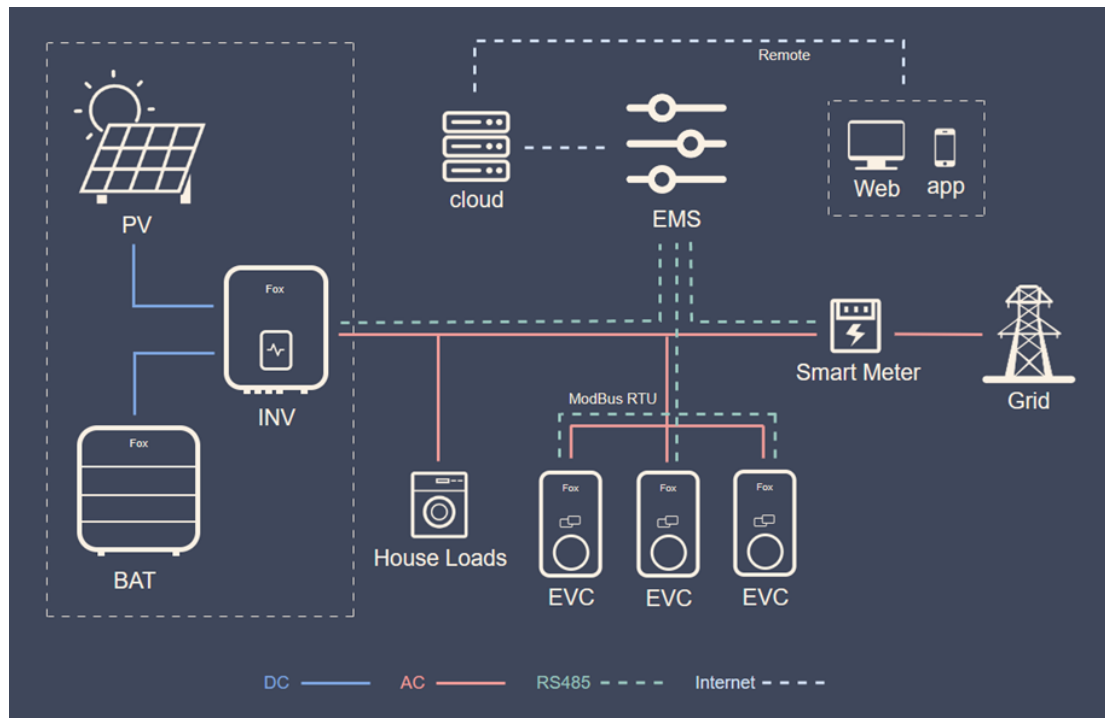


Figure 2. Usage scenario diagram of Modbus RTU

In this scenario, EMS manages the energy use of EVC, which is an important step in achieving efficient energy utilization. An efficient way to manage energy is to connect the EMS and EVC to the same network through a router, or through the RS485 to connect the network. Then, after the EMS establishes communication with EVC through the Modbus TCP Protocol, it controls one or more EVC in a reasonable way. This includes starting charging at the right time, controlling the charging power of EVC, and viewing the current charging data of EVC locally or remotely.

## 1.3.2 Discovery and Connection of EVC

### 1.3.2.1 Using Modbus TCP

The EMS communicates with the EVC through the local network port. An important part of establishing communication is that the EMS obtains the IP and port of the EVC. Here we use mDNS technology. The EVC will broadcast its master name and local IP, the EMS gets the IP of the EVC after obtaining the broadcast command, and then actively establishes a TCP/IP connection with the EVC. Finally, using Modbus TCP protocol, a complete communication is established.

The specific process is as follows:

- (1) The EVC accesses the LAN through Ethernet or WIFI, and automatically obtains IP through DHCP;
- (2) EVC sends information about the mDNS service whose multicast type is `_modbus._tcp.local` and instance name is `EVC-<SN>._modbus._tcp.local`, and SN indicates the serial number of EVC. For example, `EVC-60AE74B037KQ012._modbus._tcp.local`;

(3) The main control device on the same LAN uses the mDNS service to scan the instance with the type `_modbus._tcp.local` and obtains the IP and port of EVC from the instance;

(4) The master device is connected to the Modbus TCP service of the EVC by IP and port.

|                                 |                                                     |                                        |                                        |                  |                                                                                                                                                                                                                                                                      |
|---------------------------------|-----------------------------------------------------|----------------------------------------|----------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>_modbus._tcp.local</code> | <code>EVC-60AE74B037KQ013._modbus._tcp.local</code> | <code>EVC-60AE74B037KQ013.local</code> | <code>192.168.9.51,192.168.9.77</code> | <code>502</code> | <code>ServiceInfo(type='_modbus._tcp.local', name='EVC-60AE74B037KQ013._modbus._tcp.local', addresses=[('192.168.9.51', 502), ('192.168.9.77', 502)], weight=0, priority=0, server='EVC-60AE74B037KQ013.local', properties={'b': None}, interface_index=None)</code> |
|---------------------------------|-----------------------------------------------------|----------------------------------------|----------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 1.3.2.2 Using Modbus RTU

The EMS communicates with the EVC over RS485. The EMS can send any commands defined in this protocol with device addresses 1 to 247 in sequence. If a correct response is received, the EVC is detected and successfully connected. You can also view the EVC device address and connect it through the company's EVC management APP "Fox Switch" or "Elite Charger".

## 1.4 Protocol Instructions

(1) The firmware versions applicable to Modbus TCP are A022KS1-E-2 series 1.14 or later, A011KS1-E-2 series 1.14 or later, and A7300S1-E-2 series 1.06 or later;

(2) Modbus RTU is suitable for AEB 2.0 series;

(3) The device address in the protocol can be configured using the company's EVC management APP "Fox Switch" or "Elite Charger". For detailed operations, please view the instruction manual.

(4) When using Modbus TCP, the EVC must be connected to the same network (local area network) as the EMS;

(5) When using Modbus TCP, the default port of the server is 502;

(6) When using Modbus RTU, the EVC device addresses on the same network must be unique;

(7) Unless otherwise specified, the sending interval of each message is 500 ms.

## 1.5 Protocol Overview

Modbus TCP Protocol is a communication protocol based on TCP/IP network. Modbus RTU Protocol uses serial communication to transmit data such as RS-485. They allow data exchange between a master and several slaves. This protocol realizes the control of the master from the slave and the transmission of data from the slave to the master. When communicating using the Modbus TCP Protocol, each participant must have a unique address, with address 0 reserved for broadcast use. Each participant can send a message over the bus, usually initiated by the master and answered by the addressed slave. This protocol fully follows the specifications of the Modbus TCP Protocol and the Modbus RTU Protocol.

## 1.6 Message Format

### 1.6.1 Data Frame Structure

#### 1.6.1.1 Modbus TCP

| MBAP                       |                         |         |                     | PDU           |         |
|----------------------------|-------------------------|---------|---------------------|---------------|---------|
| Transaction Identification | Protocol Identification | Length  | Unit Identification | Function Code | Data    |
| 2 Bytes                    | 2 Bytes                 | 2 Bytes | 1 Byte              | 1 Byte        | n Bytes |

#### 1.6.1.2 Modbus RTU

| PDU                  |               |         |         |
|----------------------|---------------|---------|---------|
| Slave device address | Function Code | Data    | CRC     |
| 2 Bytes              | 1 Byte        | n Bytes | 2 Bytes |

Instructions:

1. Transaction identification: The sequence number of the message. Different sequence numbers are used to distinguish different messages;
2. Protocol identification: 0000 indicates Modbus TCP Protocol ;
3. Length: The length of the data after this field;
4. Unit identification: device address (1-255, default value:1);
5. Function code: Function code provided by Modbus TCP Protocol;
6. Slave device address: Slave device address of Modbus TCP ranges from 1 to 247. The default value is 1;
7. CRC: Adopts the standard CRC-16/MODBUS. Parameter model (MODULE) = $x^{16}+x^{15}+x^2+1$ , width =16, polynomial (POLY) =0x8005, initial value (INIT) =0xFFFF, result XOR value (XOROUT) =0x0000;
8. Data:

| Modbus Request |          |                 |  |
|----------------|----------|-----------------|--|
| Read           | register | register number |  |

|                        |                  |                       |             |                |
|------------------------|------------------|-----------------------|-------------|----------------|
|                        | address          |                       |             |                |
| Write                  | register address | register number       | data length | register value |
| <b>Modbus Response</b> |                  |                       |             |                |
| Read                   | data length      | register value        |             |                |
| Write                  | register address | register number/value |             |                |

## 1.6.2 Function Code

| Code        | Describe                 |
|-------------|--------------------------|
| <b>0x01</b> | Read Coils               |
| <b>0x05</b> | Write Single Coil        |
| <b>0x0F</b> | Write Multiple Coils     |
| <b>0x02</b> | Read Discrete Inputs     |
| <b>0x04</b> | Read Input Registers     |
| <b>0x03</b> | Read Holding Registers   |
| <b>0x06</b> | Write Single Register    |
| <b>0x10</b> | Write Multiple Registers |
| <b>0x15</b> | Write File Record        |

The function codes we use are 0x03, 0x06, 0x10 and 0x15.

### 1. Read Holding Registers (0x03)

Read the contents of the continuous block of Read Holding Registers from the remote device.

Request:

Modbus TCP: 00 01 00 00 00 06 01 03 00 00 00 03

| MBAP                 | Code | Reg Addr | Reg Num |
|----------------------|------|----------|---------|
| 00 01 00 00 00 06 01 | 03   | 00 00    | 00 03   |

Modbus RTU: 01 03 00 00 00 03 CB 05

| Slave Addr | Code | Reg Addr | Reg Num | CRC   |
|------------|------|----------|---------|-------|
| 01         | 03   | 00 00    | 00 03   | CB 05 |

Notice:

Reg Addr: Register starting address;

Reg Num: Number of registers;

Reg Val: The value of registers;

Slave Addr: Slave device address.

Response:

Modbus TCP: 00 01 00 00 00 09 01 03 06 00 21 00 00 00 00

| MBAP                 | Code | Data Len | Reg Val           |
|----------------------|------|----------|-------------------|
| 00 01 00 00 00 09 01 | 03   | 06       | 00 21 00 00 00 00 |

Modbus RTU: 01 03 06 00 21 00 00 00 00 72 9D

| Slave Addr | Code | Data Len | Reg Val           | CRC   |
|------------|------|----------|-------------------|-------|
| 01         | 03   | 06       | 00 21 00 00 00 00 | 72 9D |

## 2. Write Single Register(0x06)

Write a hold register in a remote device.

Request:

Modbus TCP: 00 01 00 00 00 06 01 06 00 00 00 01

| MBAP                 | Code | Reg Addr | Reg Val |
|----------------------|------|----------|---------|
| 00 01 00 00 00 06 01 | 06   | 00 00    | 00 01   |

Modbus RTU: 01 06 00 00 00 01 0A 48

| Slave Addr | Code | Reg Addr | Reg Val | CRC |
|------------|------|----------|---------|-----|
|------------|------|----------|---------|-----|

|    |    |       |       |       |
|----|----|-------|-------|-------|
| 01 | 06 | 00 00 | 00 01 | 0A 48 |
|----|----|-------|-------|-------|

Response:

Modbus TCP: 00 01 00 00 00 06 01 06 00 00 00 01

| MBAP                 | Code | Reg Addr | Reg Val |
|----------------------|------|----------|---------|
| 00 01 00 00 00 06 01 | 06   | 00 00    | 00 01   |

Modbus RTU: 01 06 00 00 00 01 0A 48

| Slave Addr | Code | Reg Addr | Reg Val | CRC   |
|------------|------|----------|---------|-------|
| 01         | 06   | 00 00    | 00 01   | 0A 48 |

### 3. Write Multiple Registers(0x10)

Write a continuous register block in a remote device (1 to 123 registers)。

Request:

Modbus TCP: 00 02 00 00 00 09 01 10 00 00 00 02 04 00 01 00 02

| MBAP                    | Code | Reg Addr | Reg Num | Data Len | Reg Val     |
|-------------------------|------|----------|---------|----------|-------------|
| 00 02 00 00<br>00 09 01 | 10   | 00 00    | 00 02   | 04       | 00 01 00 02 |

Modbus RTU: 01 10 00 00 00 02 04 00 01 00 02 AE 23

| Slave Addr | Code | Reg Addr | Reg Num | Data Len | Reg Val     | CRC   |
|------------|------|----------|---------|----------|-------------|-------|
| 01         | 10   | 00 00    | 00 02   | 04       | 00 01 00 02 | AE 23 |

Response:

Modbus TCP: 00 02 00 00 00 06 01 10 00 00 00 02

| MBAP                 | Code | Reg Addr | Reg Num |
|----------------------|------|----------|---------|
| 00 02 00 00 00 06 01 | 10   | 00 00    | 0. 02   |

Modbus RTU: 01 10 00 00 00 02 C8 41

| Slave Addr | Code | Reg Addr | Reg Num | CRC |
|------------|------|----------|---------|-----|
|------------|------|----------|---------|-----|

|    |    |       |       |       |
|----|----|-------|-------|-------|
| 01 | 10 | 00 00 | 00 02 | C8 41 |
|----|----|-------|-------|-------|

#### 4. Write File Record(0x15)

This function code is used to perform a file record write.

Request:

Modbus TCP:

| MBAP                 | PDU                                    |
|----------------------|----------------------------------------|
| 00 01 00 00 00 F8 01 | The contents of the PDU are as follows |

Modbus RTU:

| Slave Addr | PDU                                  | CRC |
|------------|--------------------------------------|-----|
| 01         | The contents of a PDU are as follows |     |

|                               |           |                                   |
|-------------------------------|-----------|-----------------------------------|
| <b>Code</b>                   | 1 Byte    | 15                                |
| <b>Data Len</b>               | 1 Byte    | F5 (Range: 0x07 to 0xF5)          |
| <b>Subreq x, Refer Type</b>   | 1 Byte    | 06                                |
| <b>Subreq x, File Num</b>     | 2 Bytes   | 00 01 (Range: 0x0000 to 0xFFFF)   |
| <b>Subreq x, Record Num</b>   | 2 Bytes   | 00 00 (Register starting address) |
| <b>Subreq x, Record Len</b>   | 2 Bytes   | 00 77 (N=119)                     |
| <b>Subreq x, Record Data</b>  | N*2 Bytes |                                   |
| <b>Subreq x+1, Refer Type</b> |           |                                   |
| <b>Subreq x+1, File Num</b>   |           |                                   |
| ...                           |           |                                   |

Response: Same as request frame.

## 2 Register List

| Reg Addr      | Name                        | Attr | Reg Num | Len(Bytes) | Multi-Connector Parameter? (Yes/No) |
|---------------|-----------------------------|------|---------|------------|-------------------------------------|
| <b>0x1000</b> | Device Address              | R    | 1       | 2          | N                                   |
| <b>0x1001</b> | Software Version            | R    | 1       | 2          | N                                   |
| <b>0x1002</b> | Stop Reason                 | R    | 1       | 2          | Y                                   |
| <b>0x1003</b> | Connector Status            | R    | 1       | 2          | Y                                   |
| <b>0x1004</b> | CP Status                   | R    | 1       | 2          | Y                                   |
| <b>0x1005</b> | CC Status                   | R    | 1       | 2          | Y                                   |
| <b>0x1006</b> | Charging Port Temperature   | R    | 1       | 2          | Y                                   |
| <b>0x1007</b> | EVC Environment Temperature | R    | 1       | 2          | N                                   |
| <b>0x1008</b> | Voltage of Phase A          | R    | 1       | 2          | Y                                   |
| <b>0x1009</b> | Voltage of Phase B          | R    | 1       | 2          | Y                                   |
| <b>0x100A</b> | Voltage of Phase C          | R    | 1       | 2          | Y                                   |
| <b>0x100B</b> | Current of Phase A          | R    | 1       | 2          | Y                                   |
| <b>0x100C</b> | Current of Phase B          | R    | 1       | 2          | Y                                   |
| <b>0x100D</b> | Current of Phase C          | R    | 1       | 2          | Y                                   |
| <b>0x100E</b> | Active Power                | R    | 1       | 2          | Y                                   |
| <b>0x100F</b> | Electronic Lock Status      | R    | 1       | 2          | Y                                   |
| <b>0x1010</b> | Current Phase Sequence      | R    | 1       | 2          | N                                   |

|               |                                     |   |    |    |   |
|---------------|-------------------------------------|---|----|----|---|
| <b>0x1011</b> | Max Supported Power                 | R | 1  | 2  | N |
| <b>0x1012</b> | Min Supported Power                 | R | 1  | 2  | N |
| <b>0x1013</b> | Max Supported Current               | R | 1  | 2  | N |
| <b>0x1014</b> | Min Supported Current               | R | 1  | 2  | N |
| <b>0x1015</b> | System Alarm Information            | R | 1  | 2  | Y |
| <b>0x1016</b> | Current Energy                      | R | 2  | 4  | Y |
| <b>0x1018</b> | Total Charging Energy               | R | 2  | 4  | Y |
| <b>0x101A</b> | System Fault Information            | R | 2  | 4  | Y |
| <b>0x101C</b> | RFID Card                           | R | 2  | 4  | Y |
| <b>0x101E</b> | Id Model Code                       | R | 4  | 8  | N |
| <b>0x1022</b> | Id Serial Number                    | R | 16 | 32 | N |
| <b>0x1032</b> | Extended RFID Card                  | R | 10 | 20 | Y |
| <b>0x103C</b> | Connector Number                    | R | 1  | 2  | N |
| <b>0x103D</b> | Single/three-phase Switching Status | R | 1  | 2  | Y |
| <b>0x103E</b> | Single/three-phase Work Status      | R | 1  | 2  | Y |
| <b>0x103F</b> | Real-time Power of Phase A          | R | 1  | 2  | Y |
| <b>0x1040</b> | Real-time Power of Phase B          | R | 1  | 2  | Y |
| <b>0x1041</b> | Real-time Power of Phase C          | R | 1  | 2  | Y |

|               |                                                  |     |   |   |   |
|---------------|--------------------------------------------------|-----|---|---|---|
|               |                                                  |     |   |   |   |
| <b>0x3000</b> | Work Mode                                        | W/R | 1 | 2 | N |
| <b>0x3001</b> | Max Charging Current                             | W/R | 1 | 2 | Y |
| <b>0x3002</b> | Max Charging Power                               | W/R | 1 | 2 | Y |
| <b>0x3003</b> | Allowable Charge Time                            | W/R | 1 | 2 | Y |
| <b>0x3004</b> | Allowable Charge Energy                          | W/R | 1 | 2 | Y |
| <b>0x3005</b> | Time Validity                                    | W/R | 1 | 2 | N |
| <b>0x3006</b> | Default Current                                  | W/R | 1 | 2 | N |
| <b>0x3007</b> | Reserve                                          |     |   |   | N |
| <b>0x3008</b> | Reserve                                          |     |   |   | N |
| <b>0x300A</b> | Single/three-phase automatic switching           | W/R | 1 | 2 | N |
| <b>0x300B</b> | EVC suspend switching minimum interval           | W/R | 1 | 2 | N |
| <b>0x300C</b> | Current Charging Connector Number                | W/R | 1 | 2 | N |
| <b>0x300D</b> | Minimum Interval for EVC Suspended Status Change | W/R | 1 | 2 | N |
|               |                                                  |     |   |   |   |
| <b>0x4000</b> | Electronic lock control                          | W   | 1 | 2 | Y |
| <b>0x4001</b> | Charging Control                                 | W   | 1 | 2 | Y |
| <b>0x4002</b> | Phase Sequence Switching                         | W   | 1 | 2 | N |

|               |         |   |   |   |   |
|---------------|---------|---|---|---|---|
| <b>0x4003</b> | Restart | W | 1 | 2 | N |
|---------------|---------|---|---|---|---|

Note:

1. "R": read-only, "W": write-only, "W/R": readable and writable;
2. Write-only registers are written with 0x06, readable and writable registers are written with 0x10.

## 2.1 Device Address

This register describes the device address value of the EV charger in the Modbus TCP Protocol.

| Address       | Name           | Type   | Attr |
|---------------|----------------|--------|------|
| <b>0x1000</b> | Device Address | UINT16 | R    |

Supported values:

- Range: 1~255, and default value: 1.

## 2.2 Software Version

This register describes the current software version of EV charger.

| Address       | Name             | Type   | Attr |
|---------------|------------------|--------|------|
| <b>0x1001</b> | Software Version | UINT16 | R    |

Supported values:

- Byte1: Major version number;
- Byte0: Minor version number;

eg: If the value of this register is 0x0110, the software version is 1.16.

## 2.3 Stop Reason Code

This register describes the reason why EV charger stopped.

| Address       | Name        | Type   | Attr |
|---------------|-------------|--------|------|
| <b>0x1002</b> | Stop Reason | UINT16 | R    |

Supported values:

- Details are in Appendix 1 Stop Reason Code.

Notice:

When EV charger is not in the finish state, reading this register value can get the stop reason for the last charging end;

This register will be cleared after the EVC restarts.

## 2.4 Connector Status

This register describes the connector status information.

| Address | Name             | Type   | Attr |
|---------|------------------|--------|------|
| 0x1003  | Connector Status | UINT16 | R    |

Supported values:

- 0: idle. The EVC and connector have no faults and not connected to the car;
- 1: connect. Connector has been connected to the car and EVC waiting for the start command;
- 2: start. The EVC has received the start command and is waiting for the car to be ready for charging;
- 3: charging. The EVC is providing electric energy to the car;
- 4: pause. The charging process is suspended by the car;
- 5: finish. This charging has finished;
- 6: fault. The EVC or connector is faulty and cannot be used for charging at this time;
- 7: reserve. (Not covered yet);
- 8: locked. In the locked state, the EVC cannot perform any other operations.

## 2.5 CP Status

This register describes CP voltage level status.

| Address | Name      | Type   | Attr |
|---------|-----------|--------|------|
| 0x1004  | CP Status | UINT16 | R    |

Supported values:

- 0: CP fault, CP voltage is not within a normal range;
- 1: CP 12V. When EVC is not connected for charging, the CP voltage value is +12V;
- 2: CP 9V. When EVC is connected for charging, the CP voltage value is +9V;

- 3: CP 6V. When the car is ready for charging, the CP voltage value is +6V.

## 2.6 CC Status

This register describes the connection status of CC.

| Address       | Name                 | Type   | Attr |
|---------------|----------------------|--------|------|
| <b>0x1005</b> | CC Connection Status | UINT16 | R    |

Supported values:

- 0: Plug unconnected;
- 1: Plug connected;

## 2.7 Charging Port Temperature

This register describes the temperature inside the connector of EVC.

| Address       | Name                      | Type   | Attr |
|---------------|---------------------------|--------|------|
| <b>0x1006</b> | Charging Port Temperature | UINT16 | R    |

Supported values:

- 0~65535, the temperature shifts upward by 50 °C, and the resolution is 0.1, unit: °C;

eg: If the value of this register is 0x0320 = 800, the actual temperature  $T = 800 * 0.1 - 50 = 30$  (°C).

Notice:

The plug version of the EVC does not have this detection, and the value of this register read is invalid. For the A7300S1-E-2 model with EVC greater than or equal to V1.10 and the A022KS1-E-2 model with EVC greater than or equal to V1.20, the value of this register is fixed to 0xFFFF.

## 2.8 EVC Environment Temperature

This register describes the temperature around the PCB inside the EVC.

| Address       | Name                        | Type   | Attr |
|---------------|-----------------------------|--------|------|
| <b>0x1007</b> | EVC Environment Temperature | UINT16 | R    |

Supported values:

- 0~65535, the temperature shifts upward by 50 °C, and the resolution is 0.1, unit: °C;

## 2.9 Voltage of Phase A

This register describes the phase A charging voltage value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x1008  | Voltage of Phase A | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: V.

eg: If the value of this register is 0x08FC = 2300, the actual voltage  $V = 2300 * 0.1 = 230.0$  (V).

## 2.10 Voltage of Phase B

This register describes the phase B charging voltage value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x1009  | Voltage of Phase B | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: V.

Consistent with the Voltage of Phase A example.

## 2.11 Voltage of Phase C

This register describes the phase C charging voltage value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x100A  | Voltage of Phase C | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: V.

Consistent with the Voltage of Phase A example.

## 2.12 Current of Phase A

This register describes the phase A charging current value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x100B  | Current of Phase A | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: A.

eg: If the value of this register is 0x0140 = 320, the actual current value is  $320 * 0.1 = 32.0$  (A).

## 2.13 Current of Phase B

This register describes the phase B charging current value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x100C  | Current of Phase B | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: A.

Consistent with the current of phase A example.

## 2.14 Current of Phase C

This register describes the phase C charging current value.

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x100D  | Current of Phase C | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: A.

Consistent with the current of phase A example.

## 2.15 Active Power

This register describes the power of EVC being charged.

| Address | Name         | Type   | Attr |
|---------|--------------|--------|------|
| 0x100E  | Active Power | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW。

eg: If the value of this register is 0x0049 = 73, the active power is  $73 \times 0.1 = 7.3$  (KW).

## 2.16 Electronic Lock Status

This register describes the locked state of the electronics inside the EVC.

| Address | Name                   | Type   | Attr |
|---------|------------------------|--------|------|
| 0x100F  | Electronic Lock Status | UINT16 | R    |

Supported values:

- 0: Unlocked state;
- 1: Locked state.

## 2.17 Current Phase Sequence

This register describes the voltage phase of the EVC providing electric energy to the car.

| Address | Name                   | Type   | Attr |
|---------|------------------------|--------|------|
| 0x1010  | Current Phase Sequence | UINT16 | R    |

Supported values:

- 0: Three-phase output;
- 1: L2 output;
- 2: L3 output;
- 3: Reserve.

Notice:

This instruction is meaningful only when the pile is connected to an external device named phase switch box.

## 2.18 Max Supported Power

This register describes the rated maximum working power supported by the EVC.

| Address | Name                | Type   | Attr |
|---------|---------------------|--------|------|
| 0x1011  | Max Supported Power | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW;

eg: If the value of this register is 0x0049 = 73, Max Supported Power is  $73 * 0.1 = 7.3$  (KW).

Notice:

The max supported power value is determined by the model of the EVC you purchase. For example, the max supported power of 7.3 KW series EVC is 7.3 KW, the max supported power of 11 KW series EVC is 11 KW, and the max supported power of 22 KW series EVC is 22 KW . And this value is read only and cannot be changed;

## 2.19 Min Supported Power

This register describes the rated Min working power supported by the EVC.

| Address | Name                | Type   | Attr |
|---------|---------------------|--------|------|
| 0x1012  | Min Supported Power | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW;

eg: If the value of this register is 0x000E = 14, the Min Supported Power is  $14 * 0.1 = 1.4$  (KW).

## 2.20 Max Supported Current

This register describes the maximum rated charging current allowed for each phase of the EVC.

| Address | Name                  | Type   | Attr |
|---------|-----------------------|--------|------|
| 0x1013  | Max Supported Current | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: A;

eg: If the value of this register is 0x0140 = 320, the Max Supported Current is  $320 * 0.1 = 32.0$  (A).

Notice:

The max supported current is determined by the EVC model. For example, the maximum supported current allowed per phase of EVC with a model of 11 KW serial is 16A. This value is read-only and cannot be changed.

## 2.21 Min Supported Current

This register describes the minimum rated charging current allowed for each phase of the EVC.

| Address | Name                  | Type   | Attr |
|---------|-----------------------|--------|------|
| 0x1014  | Min Supported Current | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: A;

eg: If the value of this register is 0x003C = 60, the Min Supported Current is  $60 * 0.1 = 6.0$  (A).

Notice:

Generally, the minimum current supported by EVC by default is 6A.

## 2.22 System Alarm Information

This register describes the system alarm information of EVC.

| Address | Name                     | Type   | Attr |
|---------|--------------------------|--------|------|
| 0x1015  | System Alarm Information | UINT16 | R    |

Supported values:

- Details are in Appendix 3 Alarm Code.

## 2.23 Current Energy

This register describes the current electric energy reading of the electric meter inside the EVC.

| Address | Name           | Type   | Attr |
|---------|----------------|--------|------|
| 0x1016  | Current Energy | UINT32 | R    |

Supported values:

- 0~10000000, the resolution is 0.1, unit: kWH;

eg: If the value of this register is 0x0003F19F = 258463, the current energy is  $258463 * 0.1 = 25846.3$  (kWH).

## 2.24 Total Charging Energy

This register describes the total electric energy currently consumed by the charging car.

| Address | Name                  | Type   | Attr |
|---------|-----------------------|--------|------|
| 0x1018  | Total Charging Energy | UINT32 | R    |

Supported values:

- 0~100000000, the resolution is 0.1, unit: kWh;

eg: If the value of this register is 0x0003F19F = 258463, the total charging energy is 258463 \* 0.1 = 25846.3 (kWh).

## 2.25 System Fault Information

This register describes the system fault information of EVC.

| Address | Name                     | Type   | Attr |
|---------|--------------------------|--------|------|
| 0x101A  | System fault information | UINT32 | R    |

Supported values:

- Details are in Appendix 2 Fault Code.

## 2.26 RFID Card

This register describes the UID of the authorized card when swiping the card to start charging.

| Address | Name      | Type   | Attr |
|---------|-----------|--------|------|
| 0x101C  | RFID card | UINT32 | R    |

Supported values:

- 0x00000000~0xFFFFFFFF.

eg: If the value of this register is 0x4F8D637E, the UID of the authorization card that starts charging this time is 4F8D637E.

## 2.27 Id Model Code

This register describes the Id Model Code of EVC.

| Address | Name | Type | Attr |
|---------|------|------|------|
|---------|------|------|------|

|               |               |                 |   |
|---------------|---------------|-----------------|---|
| <b>0x101E</b> | Id Model Code | ASCII (8 Bytes) | R |
|---------------|---------------|-----------------|---|

Supported values:

- 0~65535.

eg: If the value of this register is 0x4130=A0, 0x3232=22, 0x4B50=KP, 0x3100=1, the type of EVC is A022KP1.

Notice:

If the last register is less than two bytes, add 0 at the end.

## 2.28 Id Serial Number

This register describes the Id Serial Number of EVC.

| Address       | Name             | Type             | Attr |
|---------------|------------------|------------------|------|
| <b>0x1022</b> | Id Serial Number | ASCII (32 Bytes) | R    |

Supported values:

- 0~65535.

eg: If the value of this register is 0x3630=60, 0x414C=AL, 0x3532=52, 0x4230=B0, 0x3341=3A, 0x4851=HQ, 0x3031=01, 0x3400=4, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, the serial number of EVC is 60AL52B03AHQ014.

Notice:

If the last register is less than two bytes, add 0 at the end;

If the total number of registers is less than 16, the rest of the register is replaced by 0.

## 2.29 Extended RFID Card

This register describes the extended RFID card id that has been stored in the EVC.

| Address       | Name               | Type             | Attr |
|---------------|--------------------|------------------|------|
| <b>0x1032</b> | Extended RFID Card | ASCII (20 Bytes) | R    |

Supported values:

- 0~65535.

eg: If the value of this register is 0x3341=3A, 0x4230=B0, 0x3733=73, 0x4543=EC, 0x3342=3B, 0x3839=89, 0x3031=01, 0x4400=D, 0x0000, 0x0000, the card id is 3AB073EC3B8901D.

Notice:

If the last register is less than two bytes, add 0 at the end;

If the total number of registers is less than 10, the rest of the register is replaced by 0.

Available on some models only.

## 2.30 Connector Number

This register describes how many connectors the EVC has.

| Address | Name             | Type   | Attr |
|---------|------------------|--------|------|
| 0x103C  | Connector Number | UINT16 | R    |

Notice:

If the EVC has one connector, the value is 1 and If the EVC has two connectors, the value is 2;

Only the EVC with multiple connectors support this register. For EVC with one connector, the value is fixed at 1.

## 2.31 Single/three-phase Switching Status

This register describes the current phase sequence switching status of the EVC.

| Address | Name                                | Type   | Attr |
|---------|-------------------------------------|--------|------|
| 0x103D  | Single/three-phase Switching Status | UINT16 | R    |

Supported values:

- 0: Idle
- 1: Switch from three-phase to single-phase
- 2: Switch from single-phase to three-phase

## 2.32 Single/three-phase Work Status

This register describes the current phase sequence charging status of the EVC

| Address | Name                           | Type   | Attr |
|---------|--------------------------------|--------|------|
| 0x103E  | Single/three-phase Work Status | UINT16 | R    |

Supported values:

- 0: Idle
- 1: Three-phase charging
- 2: Single-phase charging

## 2.33 Real-time Power of Phase A

This register describes the real-time power of phase A.

| Address | Name                       | Type   | Attr |
|---------|----------------------------|--------|------|
| 0x103F  | Real-time Power of Phase A | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW.

eg: If the value of this register is 0x0049 = 73, the actual power is  $73 \times 0.1 = 7.3$ (KW).

## 2.34 Real-time Power of Phase B

This register describes the real-time power of phase B.

| Address | Name                       | Type   | Attr |
|---------|----------------------------|--------|------|
| 0x1040  | Real-time Power of Phase B | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW.

eg: If the value of this register is 0x0049 = 73, the actual power is  $73 \times 0.1 = 7.3$ (KW).

## 2.35 Real-time Power of Phase C

This register describes the real-time power of phase C.

| Address | Name                       | Type   | Attr |
|---------|----------------------------|--------|------|
| 0x1041  | Real-time Power of Phase C | UINT16 | R    |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW.

eg: If the value of this register is 0x0049 = 73, the actual power is  $73 \times 0.1 = 7.3$ (KW).

## 2.36 Work Mode

This register describes the working mode of EVC.

| Address | Name      | Type   | Attr |
|---------|-----------|--------|------|
| 0x3000  | Work mode | UINT16 | W/R  |

Supported values:

- 0: Controlled mode. In this mode, you can start and stop charging through our company's EVC management APP "Fox Switch" or by swiping your card;
- 1: Plug and charge mode. In this mode, charging will start immediately after plugging.
- 2: Lock mode. In this mode, no operations can be performed on the EVC.

Notice:

This register takes effect only when the connector is not connected.

## 2.37 Max Charging Current

This register is used to set the maximum current value allowed during the charging session. Once set, the value takes effect immediately and is applied for 1 minute. If no new setting operation is performed within 1 minute, the system will automatically reset to the default rated maximum current (register 0x1013).

| Address | Name                 | Type   | Attr |
|---------|----------------------|--------|------|
| 0x3001  | Max Charging Current | UINT16 | W/R  |

Supported values:

- 0~65535, the resolution is 0.1, unit: A;

eg: If the value of this register is 0x00C8 = 200, the Max Charging Current is  $200 * 0.1 = 20.0$  (A).

Notice:

When the EVC is in the connect state or finish state, the maximum allowable current (register 0x3001) of the charging session is set to not 0 and the maximum allowable power (register 0x3002) of the current charging session is set to not 0, and the EVC starts charging immediately;

When the maximum allowable current (register 0x3001) of the charging session is set to 0, the EVC stops charging.

## 2.38 Max Charging Power

This register is used to set the maximum power allowed during the charging session. Once set, the value takes effect immediately and is applied for 1 minute. If no new

setting operation is performed within 1 minute, the system will automatically reset to the default rated maximum power (register 0x1011).

| Address | Name               | Type   | Attr |
|---------|--------------------|--------|------|
| 0x3002  | Max Charging Power | UINT16 | W/R  |

Supported values:

- 0~65535, the resolution is 0.1, unit: KW;

eg: If the value of this register is 0x006E = 110, the Max Charging Power is  $110 * 0.1 = 11.0$  (KW).

Notice:

When the EVC is in the connect state or finish state, the maximum allowable current (register 0x3001) of the charging session is set to not 0 and the maximum allowable power (register 0x3002) of the current charging session is set to not 0, and the EVC starts charging immediately;

When the maximum allowable power (register 0x3002) of the charging session is set to 0, the EVC stops charging.

## 2.39 Allowable Charge Time

This register describes the maximum charging allowed for this charge .

| Address | Name                  | Type   | Attr |
|---------|-----------------------|--------|------|
| 0x3003  | Allowable Charge Time | UINT16 | W/R  |

Supported values:

- 0~0xFFFF, unit: Minutes;

eg: If the value of this register is 0x003C = 60, EVC will stop charging after 60 minutes without other stopping conditions.

Notice:

This register is only valid in the start, charge, and pause states, and when the value is 0xffff, it means it will not take effect.

## 2.40 Allowable Charge Energy

This register describes the charging energy allowed this time.

| Address | Name | Type | Attr |
|---------|------|------|------|
|---------|------|------|------|

|               |                         |        |     |
|---------------|-------------------------|--------|-----|
| <b>0x3004</b> | Allowable Charge Energy | UINT16 | W/R |
|---------------|-------------------------|--------|-----|

Supported values:

- 0~0xFFFF, unit: KW·H;

eg: If the value of this register is 0x0014 = 20, EVC will stop charging when it reaches 20KW·H without other stopping conditions.

Notice:

This register is only valid in the start, charge, and pause states, andnd when the value is 0xffff,it means it will not take effect.

When the allowed charging time and the allowed charging energy take effect at the same time, EVC only needs to meet one of the conditions to stop charging. For example, the allowed charging time is 5 minutes and the allowed charging energy is 10KW·H. When charging reaches 5 minutes but the charging energy is only 2KW·H, EVC will stop charging at this time.

## 2.41 Time Validity

This register describes the time range how long the last command value of the EMS is valid.

| Address       | Name          | Type   | Attr |
|---------------|---------------|--------|------|
| <b>0x3005</b> | Time Validity | UINT16 | W/R  |

Supported values:

- Default value: 180s.
- Range: 10~255s;

Notice:

If the EVC does not receive any messages within this time, it is considered offline. If the EVC is in the charging state at this time, the EVC is charged with the default current (register 0x3006).

## 2.42 Default Current

This register describes the charging current when the connection to the EMS is lost.

| Address       | Name            | Type   | Attr |
|---------------|-----------------|--------|------|
| <b>0x3006</b> | Default Current | UINT16 | W/R  |

Supported values:

- Range: 60~320, the resolution is 0.1, unit: A;
- The default value is the rated maximum current (register 0x1013).

eg: If the value of this register is 0x00C8 = 200, the default current is  $200 * 0.1 = 20.0$  (A).

## 2.43 Single/three-phase automatic switching

This register describes the parameters of the single/three-phase automatic switching switch.

| Address       | Name                                   | Type   | Attr |
|---------------|----------------------------------------|--------|------|
| <b>0x300A</b> | Single/three-phase automatic switching | UINT16 | W/R  |

Supported values:

- 0: Disabled;
- 1: Enabled;

Note:

When this switch is turned on, the charger automatically switches between single-phase and three-phase charging according to the charging power set by the EMS, the logic is as follows:

If  $P \geq 4.2\text{KW}$ , the charger operates in three-phase mode for charging;

If  $P < 4.2\text{KW}$ , the charger operates in single-phase mode for charging;

The default value is 1, enabling the single/three-phase auto-switching function;

Single-phase pile does not support the read and write operation of the register;

## 2.44 EVC suspend switching minimum interval

This register defines the minimum time interval required for the charger to transition from its current charging state to a suspended (or standby) state.

The time interval starts counting after the completion of the last state switch, specifying the minimum duration the charger must remain in a non-suspended state (i.e., charging or standby but not suspended) before it can enter the suspended state again.

| Address       | Name                                   | Type   | Attr |
|---------------|----------------------------------------|--------|------|
| <b>0x300B</b> | EVC suspend switching minimum interval | UINT16 | W/R  |

Supported values:

- Range:0~30, unit: minutes;
- The default value is 12;

Note:

When the minimum interval for single/three-phase auto-switching is not met, but the phase-switching conditions are satisfied, the handling logic is as follows:

If  $P \geq 4.2\text{KW}$  and the charger is currently in single-phase charging, the phase will not switch, and current will be loaded in single-phase mode;

If  $P < 4.2\text{KW}$ , and the charger is currently in three-phase charging, with the interval not met, the EVC will charge with rated minimum current (6A);

Single-phase pile does not support the read and write operation of the register;

## 2.45 Current Charging Connector Number

This register describes the number of the connector currently in operation.

| Address | Name                              | Type   | Attr |
|---------|-----------------------------------|--------|------|
| 0x300C  | Current Charging Connector Number | UINT16 | W/R  |

Supported values:

- The default value is 1, which refers to connector 1;
- The total number of connectors is in register 0x103C (Connector Number);

Note:

Only the EVC with multiple connectors support this register;

The value of 0 refers to the EVC;

Registers marked as multi-connector parameters in the list are governed by this value.

## 2.46 Minimum Interval for EVC Suspended Status Change

This register describes the minimum time interval required since the last status change for the EV charger to switch from the charging status to the suspended status. This register has the same function as the Register 0x300B, but enables higher temporal precision control.

| Address | Name | Type | Attr |
|---------|------|------|------|
|---------|------|------|------|

|               |                                                     |        |     |
|---------------|-----------------------------------------------------|--------|-----|
| <b>0x300D</b> | Minimum Interval for EVC<br>Suspended Status Change | UINT16 | W/R |
|---------------|-----------------------------------------------------|--------|-----|

Supported values:

- Range:0~1800, unit: seconds;
- The default value is 720s;

Note:

When phase-switching conditions are met but the switching interval requirement is unsatisfied:

If  $P \geq 4.2\text{kW}$  and the charger is in single-phase, phase switching shall not occur and current loading shall maintain single-phase operation;

If  $P < 4.2\text{kW}$  and the charger is in three-phase, the EVC shall operate at the rated minimum current (6A).

Single-phase pile does not support the read and write operation of the register;

## 2.47 Electronic Lock Control

This register describes the electronic lock control instruction.

| Address       | Name                    | Type   | Attr |
|---------------|-------------------------|--------|------|
| <b>0x4000</b> | Electronic Lock Control | UINT16 | W    |

Supported values:

- 0: No action;
- 1: Unlock;
- 2: Lock;

## 2.48 Charging Control

This register describes the start and stop charging function of EVC.

| Address       | Name             | Type   | Attr |
|---------------|------------------|--------|------|
| <b>0x4001</b> | Charging Control | UINT16 | W    |

Supported values:

- 0: No action;
- 1: Start charging;

- 2: Stop charging;

Note:

After executing the start and stop, you can judge whether the start and stop are successful by reading the EVC status register.

## 2.49 Phase sequence Switching

This register describes the phase sequence switching instructions.

| Address | Name                     | Type   | Attr |
|---------|--------------------------|--------|------|
| 0x4002  | Phase Sequence Switching | UINT16 | W    |

Supported values:

- 0: Three-phase power supply;
- 1: L2 power supply;
- 2: L3 power supply.

Notice:

Because it takes 1 minute from the start of charging to the stability of charging, phase cutting is allowed only after 1 minute of starting charging;

Only when the pile is connected to the phase cutting box and the pile state is charging, the phase cutting command will take effect;

Please check the current charge phase sequence register to confirm whether the phase cutting is successful.

## 2.50 Restart

This register describes restart EVC.

| Address | Name    | Type   | Attr |
|---------|---------|--------|------|
| 0x4003  | Restart | UINT16 | W    |

Supported values:

- 0xA5A5: Restart.

eg: If the value of this register is 0xA5A5, EVC will restart.

# Appendix

## 1 Stop Reason Code

| <b>Value</b> | <b>Reason</b>                               |
|--------------|---------------------------------------------|
| <b>0</b>     | None                                        |
| <b>1</b>     | Stopped on command                          |
| <b>2</b>     | Timed charging completed                    |
| <b>3</b>     | S2 timeout                                  |
| <b>4</b>     | Charging pause timeout                      |
| <b>5</b>     | Emergency stop button pressed               |
| <b>6</b>     | Abnormal CP voltage                         |
| <b>7</b>     | Abnormality in drawing a charging connector |
| <b>8</b>     | Abnormal AC contactor                       |
| <b>9</b>     | Abnormal electronic lock                    |
| <b>10</b>    | Abnormal card reader                        |
| <b>11</b>    | Abnormal overcurrent                        |
| <b>12</b>    | Abnormal overvoltage                        |
| <b>13</b>    | Abnormal undervoltage                       |
| <b>14</b>    | Charging port over-temperature              |
| <b>15</b>    | Abnormal leakage current                    |
| <b>16</b>    | N line reverse connection                   |
| <b>17</b>    | Abnormal frequency                          |
| <b>18</b>    | Charging stop button pressed                |
| <b>19</b>    | Abnormal circuit breaker                    |
| <b>20</b>    | Phase loss                                  |

|           |                                           |
|-----------|-------------------------------------------|
| <b>21</b> | Abnormal PE                               |
| <b>22</b> | Abnormal external electric meter          |
| <b>23</b> | Environment over-temperature              |
| <b>24</b> | Metering chip failure                     |
| <b>25</b> | Access control failure                    |
| <b>26</b> | PBOX switching phase sequence is abnormal |
| <b>27</b> | Reach the predetermined energy            |

## 2 Fault Code

| <b>Bit</b>   | <b>Fault name</b>         | <b>Value</b>        |
|--------------|---------------------------|---------------------|
| <b>Bit0</b>  | Emergency stop            | 0 Normal 1 Abnormal |
| <b>Bit1</b>  | Overvoltage               | 0 Normal 1 Abnormal |
| <b>Bit2</b>  | Undervoltage              | 0 Normal 1 Abnormal |
| <b>Bit3</b>  | Overcurrent               | 0 Normal 1 Abnormal |
| <b>Bit4</b>  | charging port temperature | 0 Normal 1 Abnormal |
| <b>Bit5</b>  | PE grounding              | 0 Normal 1 Abnormal |
| <b>Bit6</b>  | Leakage current           | 0 Normal 1 Abnormal |
| <b>Bit7</b>  | Frequency                 | 0 Normal 1 Abnormal |
| <b>Bit8</b>  | CP                        | 0 Normal 1 Abnormal |
| <b>Bit9</b>  | Connector                 | 0 Normal 1 Abnormal |
| <b>Bit10</b> | AC contactor              | 0 Normal 1 Abnormal |

|              |                              |                     |
|--------------|------------------------------|---------------------|
| <b>Bit11</b> | Electronic lock              | 0 Normal 1 Abnormal |
| <b>Bit12</b> | Breaker                      | 0 Normal 1 Abnormal |
| <b>Bit13</b> | CC                           | 0 Normal 1 Abnormal |
| <b>Bit14</b> | External meter communication | 0 Normal 1 Abnormal |
| <b>Bit15</b> | Metering chip                | 0 Normal 1 Abnormal |
| <b>Bit16</b> | Environment temperature      | 0 Normal 1 Abnormal |
| <b>Bit17</b> | Access control               | 0 Normal 1 Abnormal |

### 3 Alarm Code

| <b>Bit</b>  | <b>Alarm name</b>            | <b>Value</b>        |
|-------------|------------------------------|---------------------|
| <b>Bit0</b> | Card reader                  | 0 Normal 1 Abnormal |
| <b>Bit1</b> | Phase cutting box            | 0 Normal 1 Abnormal |
| <b>Bit2</b> | Phase loss                   | 0 Normal 1 Abnormal |
| <b>Bit3</b> | External meter communication | 0 Normal 1 Abnormal |
| <b>Bit4</b> | PLC                          | 0 Normal 1 Abnormal |