SDM630-EV

DIN Rail Smart Meter for Single and Three Phase EV Systems

- Measures kWh Kvarh, KW, Kvar, KVA, P, F, PF, Hz, dmd, V, A, etc.
- Bi-directional measurement IMP & EXP
- ECC encryption
- LED pulse output
- 2 channels of RS485 Modbus
- Din rail mounting 35mm
- 100A direct connection
- Better than Class 1 / B accuracy

USER MANUAL

2022 V1.1

Introduction

The meter SDM630-EV is a three phase energy meter designed by EASTRON for E-Car Charger billing purpose. The meter adopts special encryption method for the safety of data transmission: One-way encryption is achieved through ECC (Ellipse Curve Ctyptography).

The SDM630-EV measures and displays the characteristics of single phase two wires (1p2w), three phase three wires (3p3w,) and three phase four wires(3p4w) supplies, including voltage, frequency, current, power ,active and reactive energy, imported or exported. Energy is measured in terms of kWh, kVArh. Maximum demand current can be measured over preset periods of up to 60 minutes. In order to measure energy, the unit requires voltage and current inputs in addition to the supply required to power the product.

The meter SDM630-EV supports max. 100A direct connection, saves the cost and avoid the trouble to connect external CTs, giving the unit a cost-effective and easy operation. Built-in interfaces provides 2 channels RS485 Modbus RTU outputs. Configuration is password protected.

PART 1 Specification

Unit Characteristics

The Unit can measure and display:
• Line voltage and THD% (total harmonic distortion) of all phases
• Line Frequency
• Currents, Current demands and current THD% of all phases
• Power, maximum power demand and power factor
• Active energy imported and exported
• Reactive energy imported and exported

The unit has password-protected set-up screens for:
• Changing password
• Supply system selection 1p2w, 3p3w,3p4w
• Demand Interval Time(DIT)
• Reset for demand measurements

LED pulse output indicates real-time energy measurement.
Two RS485 output allows remote monitoring from another display or a computer.

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RS485 Serial – Modbus RTU

This uses RS485 serial port with Modbus RTU protocol to provide a means of remotely monitoring and controlling the Unit

For Modbus RTU, the following RS485 communication parameters can be configured from Set-up menu.

- 1st Modbus Output (confifigurable):

  Baud rate :2400, 9600 (default) , 19200, 38400

  Parity: none (default) / odd / even

  Stop bits: 1 or 2

  RS485 network address : 001 to 247

- 2nd Modbus Pitput (non-confifigurable):

  Baud rate: 9600

  Parity: none

  Stop bits: 1

  Modbus™ Word order Hi/Lo byte order is set automatically to normal or reverse. It cannot be confifigured from the set-up menu.

Pulse output

This provides LED pulse outputs that clock up measured active energy. The constant of pulse output is fixed 400imp/kWh (unconfigurable).

Measured Parameters

The unit can monitor and display the following parameters of a single phase two wire(1p2w), three phase three wire(3p3w) or four phase four wire(3p4w) supply.

Voltage and Current

Phase to neutral voltages 100 to 276V a.c. (not for 3p3w supplies)

Voltages between phases 173 to 480V a.c. (3p supplies only)

Basic current (Ib): 10A

Max current : 100A

Min. Current: 5% of Ib

Starting current: 0.4% of Ib

Percentage total voltage harmonic distortion (THD%) for each phase to N (not for 3p3w supplies)

Percentage voltage THD% between phases (three phase supplies only)

Current THD% for each phase

Power factor and Frequency and Max. Demand

Frequency in Hz

Instantaneous power:

    Power 0 to 99999 W

    Reactive Power 0 to 99999 VAr

    Volt-amps 0 to 99999 VA

Maximum demanded power since last Demand reset Power factor

Maximum neutral demand current, since the last Demand reset (for 3p4w supply only)

Energy Measurements

- Imported active energy   0 to 9999999.99 kWh
- Exported active energy   0 to 9999999.99 kWh
- Imported reactive energy   0 to 9999999.99 kVArh
- Exported reactive energy   0 to 9999999.99 kVArh
- Total active energy   0 to 9999999.99 kWh
- Total reactive energy   0 to 9999999.99 kVArh

Measured Inputs

Voltage inputs through 4-way fixed connector with 25mm^2 stranded wire capacity. single phase two wire(1p2w), three phase three wire(3p3w) or four phase four wire(3p4w) unbalanced. Line frequency measured from L1 voltage or L3 voltage.

Accuracy

- Voltage   0·5% of range maximum
- Current   0·5% of nominal
- Frequency   0·2% of mid-frequency
- Power factor   1% of unity (0.01)
- Active power (W)   ±1% of range maximum
- Reactive power (VAr)   ±2% of range maximum
- Apparent power (VA)   ±1% of range maximum
- Active energy (Wh)   Class 1 IEC 62053-21

    Class B EN50470-1/3

- Reactive energy (VArh)   Class 2 IEC62053-23
- Total harmonic distortion   1% up to 19st harmonic
- Response time to step input   1s, typical, to >99% of final reading, at 50 Hz.

Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.
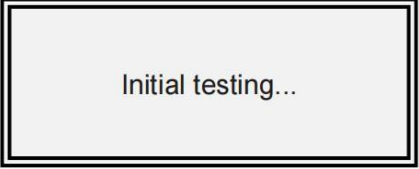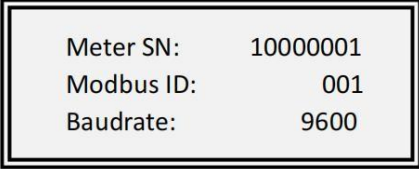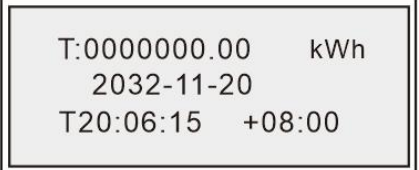
- Ambient temperature   23°C ±2°C
- Input frequency   50Hz (MID)

    50 or 60Hz ±2% (Non -MID)

- Input waveform   Sinusoidal (distortion factor < 0·005)
- Magnetic field of external origin   Terrestrial flux

Environment

- Operating temperature   -25°C to +55°C

                                                   -40°C to +70°C (optional)
- Storage temperature   -40°C to +70°C*
- Relative humidity   0 to 90%, non-condensing
- Altitude   Up to 2000m
- Warm up time   5s
- Vibration   10Hz to 50Hz, IEC 60068-2-6, 2g

PART 2 Operation

Start-up Screens

1	Initial testing...	The interface performs initial testing
2	Software Version 41 01.00 CX-XXXX	The second screen indicates the software version.
3	Meter SN: 10000001 Modbus ID: 001 Baudrate: 9600	Meter serial number; Modbus ID; Baud rate info are provided.
4	T:0000000.00 kWh 2032-11-20 T20:06:15 +08:00	After a short delay, the screen will display active energy measurements, date, time, time zone.

Measurements

The buttons operate as follows:

1	U/I ESC	Selects the Voltage and Current display screens In Set-up Mode, this is the "Left" or "Back" button.
2	M ▲	Select the Frequency and Power factor display screens In Set-up Mode, this is the "Up" button
3	P ▼	Select the Power display screens In Set-up Mode, this is the "Down" button
4	E ▶	Select the Energy display screens In Set-up mode, this is the "Enter" or "Right" button

Voltage, Current and Frequency

Each successive pressing of the [U/I ESC] button selects a new range:

1-1	L1: 230.0 V L2: 230.0 L3: 230.0 48.95Hz	Phase to neutral voltages(3p4w) Frequency
1-2	L1-2: 400.0 V L2-3: 400.0 L3-1: 400.0 48.99Hz	Phase to phase voltages(3p3w) Frequency
2	L1:100.00 A L2:100.00 L3:100.00	Current on each phase
3-1	N:100.00 A	Neutral current

Power factor and Demand

Each successive pressing of the [M] button selects a new range:

1	PF L1:1.000 T: 1.000 L2:1.000 L3:1.000	Power Factor

2	L1:100.00 L2:100.00 L3:100.00　A Max. Demand	Maximum Current Demand
3	T:　00000.00　W Max. Demand	Maximum Power Demand

Power

Each successive pressing of the [P ▼] button select a new range:

1	T:69000.00　W T:69000.00　Var T:69000.00　VA	Total kW, kVArh, kVA
2	L1:69000.00 L2:69000.00　W L3:69000.00	Instantaneous active Power in W
3	L1:69000.00 L2:69000.00　Var L3:69000.00	Instantaneous reactive Power in Var
4	L1:69000.00 L2:69000.00　VA L3:69000.00	Instantaneous Volt-amps in VA

Energy Measurements

Each successive pressing of the [E ▶ ↵] button selects a new range:

1-1	T: 0000000.00 kWh 2022-10-20 T20:06:15 +08:00	Total kWh and time will be showed when no charging.
1-2	T: 0000000.00 kWh C:0000000.00 kWh	Total kWh and charged kWh will be showed when charging
2-1	CS ID:2022102200001 2022-10-20 T20:06:15 +08:00	CSID Numbers And current time will be showed when charging
2-2	T: 0000000.00 kWh Imp:0000000.00 Exp:0000000.00	Total active kWh import active kWh export active kWh
3-1	T: 0000000.00 kVarh Imp:0000000.00 Exp:0000000.00	Total reactive kVarh import reactive kVarh export reactive kVarh

Set-up

To enter set-up mode, pressing the [E ►↵] button for 3 seconds, until the password screen appears.

```
┌─────────────────────────┐
│                         │
│     PASSWORD:           │
│     ▮0 0 0              │
│                         │
└─────────────────────────┘
```

Setting up is password-protected so you must enter the correct password (default '1000') before processing. If an incorrect password is entered, the display will show: Error!

To exit setting-up mode, press [U/I ◄ ESC] repeatedly until the measurement screen is restored.

Set-up Entry Methods

Some menu items, such as password, require a four-digit number entry while others, such as supply system, require selection from a number of menu options.

Menu Option Selection

1) Use the [M ▲] and [P ▼] buttons to select the required item from the menu. Selection does not roll over between bottom and top of list

2) Press [E ►↵] to confirm your selection

3) If an item flashes, then it can be adjusted by the [M ▲] and [P ▼] buttons. If not, there maybe a further layer.

4) Having selected an option from the current layer, press [E ►↵] to confirm your selection. The SET indicator will appear.

5) Having completed a parameter setting, press [U/I ◄ ESC] to return to a higher menu level. The SET indicator will be removed and you will be able to use the [M ▲] and [P ▼] buttons for further menu selection.

6) On completion of all set-up, press [U/I ◄ ESC] repeatedly until the measurement screen is restored.

Number Entry Procedure

When setting up the unit, some screens require the entering of a number. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

1) The current digit to be set flashes and is set using the [M ▲] and [P ▼] buttons

2) Press [E ▶↵] to confirm each digit setting. The SET indicator appears after the last digit has been set.

3) After setting the last digit, press [U/I ◀ ESC] to exit the number setting routine. The SET indicator will be removed.

Main Set

```
      1.Main
1.1Sytem Type      3P4W
1.2Password        1000
1.3Reset           DMD
```

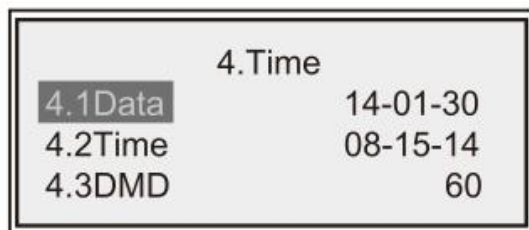| 1.1	System type	From the Set-up menu, use the [M ▲] and [P ▼] to select the System option. The screen will show the currently selected system type. Press [E ▶↵] for 3 seconds to select and confirm the selected system. Options: 1P2W, 3P3W, 3P4W
1.2	Password	From the Set-up menu, use the [M ▲] and [P ▼] to change Password option.
1.3	Reset	Press to enter the selection routine. If succeed, the cursor will jump back to Reset.
		Press [U/I ◀ ESC] to exit the number setting routine and return to the Set-up menu. SET will be removed.

Communication Set

```
2.Communication
2.1Addr              002
2.2Baud              9600
2.3Parity            NONE
```

```
2.Communication
2.4Stop                1
```

2.1	Addr	From the Set-up menu, use the [M▲] and [P▼] to select the Address. The screen will show the currently selected Address. press [E▶] for 3 seconds to select and confirm the Address. Options: 001~247
2.2	Baud	From the Set-up menu, use the [M▲] and [P▼] to change Baud rate option. Options: 2400,9600,19200,38400
2.3	Parity	From the Set-up menu, use the [M▲] and [P▼] to change Parity option. Options: NONE, EVEN, ODD
2.4	Stop	From the Set-up menu, use the [M▲] and [P▼] to change Stop option. Options: 1, 2 Note: Default is 1, and only when the parity is NONE that the stop bit can be changed to 2.
Press [U/I◀ESC] to exit the number setting routine and return to the Set-up menu. SET will be removed.		

Time Set

<table>
<tr><td>4.1</td><td>Date</td><td>From the Set-up menu, use ![M▲] and ![P▼] buttons to select the data.

Use ![E▶] to move cursor</td></tr>
<tr><td>4.2</td><td>Time</td><td>From the Set-up menu, use ![M▲] and ![P▼] buttons to select the time. Use ![E▶] to move cursor</td></tr>
<tr><td>4.3</td><td>DMD</td><td>From the Set-up menu, use ![M▲] and ![P▼] buttons to select the DMD.

Options: 0, 5, 8, 10, 15, 20, 30, 60</td></tr>
<tr><td>4.4</td><td>ZONE</td><td>From the Set-up menu, use ![M▲] and ![P▼] buttons to select the ZONE.

Option: -12~+12</td></tr>
<tr><td>4.5</td><td>Backlight</td><td>From the Set-up menu, use ![M▲] and ![P▼] buttons to select the Backlight.

Options: on,10, 30, 60, 120, off</td></tr>
</table>

Use ![M▲] and ![P▼] buttons to select the time interval. Press ![E▶] to confirm the set-up. Press ![U/I◀ESC] to exit the number setting routine and return to the Set-up menu. SET will be removed.

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Record

```
        5.Record
    CSID:20140130000005
  T: 00:00:03
  C: 000006wh
```
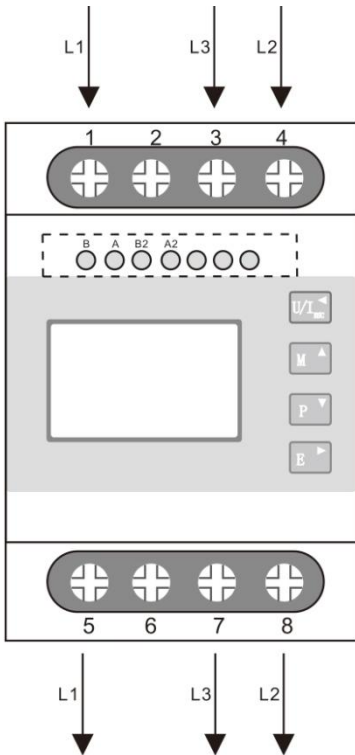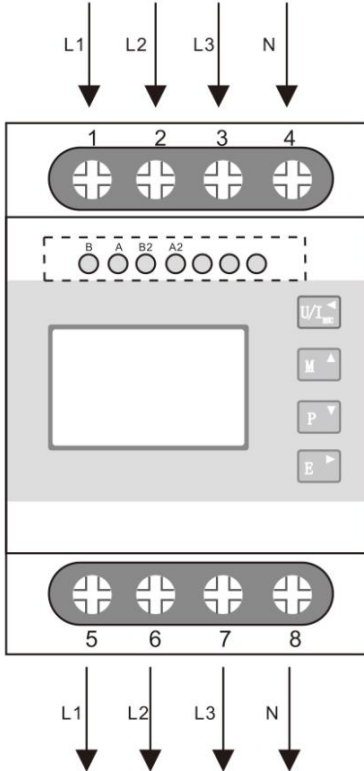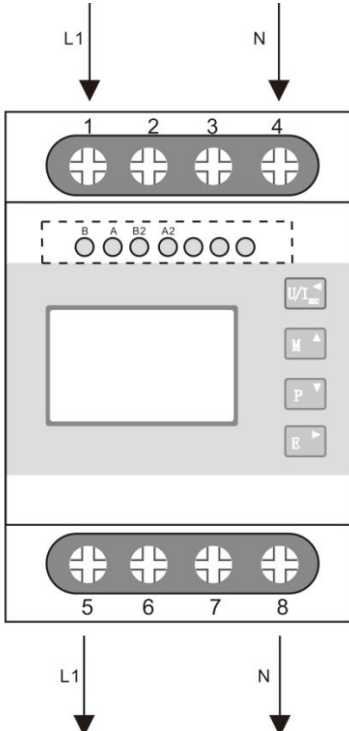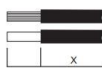
5	Record	From the Set-up menu, use the $M^\blacktriangle$ and $P^\blacktriangledown$ to select the Record data. Max.: lastest 10 records
Use $M^\blacktriangle$ and $P^\blacktriangledown$ buttons to select the time interval.		

Dimensions

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Wiring diagram

3P3W

3P4W

1P2W

Terminals		
COMM/Pulse/2T	0.5~1.5mm²	0.4Nm
Load	4~25mm²	3Nm

Wiring Torque

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PART 3 OCMF-EV software

Introduction

Eastron OCMF-EV can communicate with the electricity meter SDM630-EV through the converter USB to RS485. It can simulate the charging pile to set the parameters of the electricity meter and read the multi parameters of the meter , and charge control. It also supports the signatures of the OCMF data.

Connection

Step 1: Before setting the communication parameters, please connect the meter SDM630-EV with the computer via a converter USB to RS485.
Step 2: Open the OCMF-EV software, as shown in the figure below:
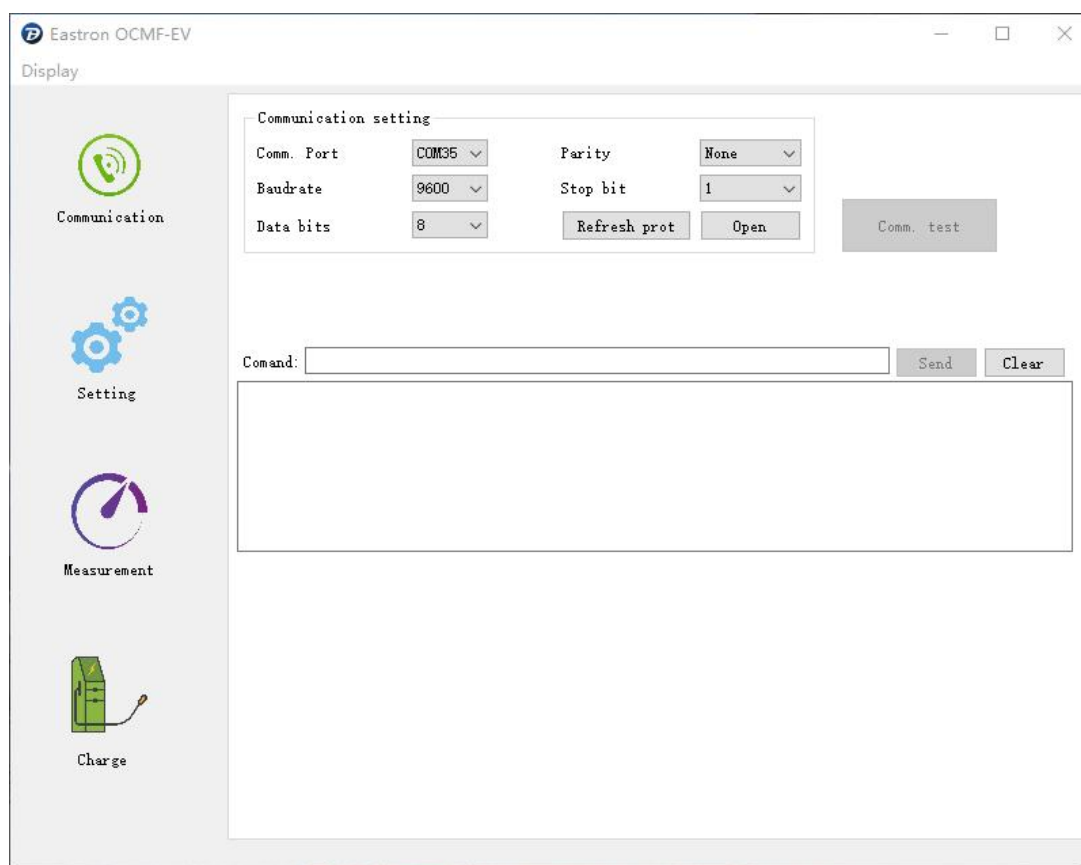
Step 3: Open the relevant terminal of the USB and set the correct parameters of the communication.　The default of the meter SDM630-EV:

　　　Baud rate: 9600
　　　Parity: None
　　　Stop: 1

If the OCMF-EV software cannot display the port of Com.of USB, please click " Refreshport".
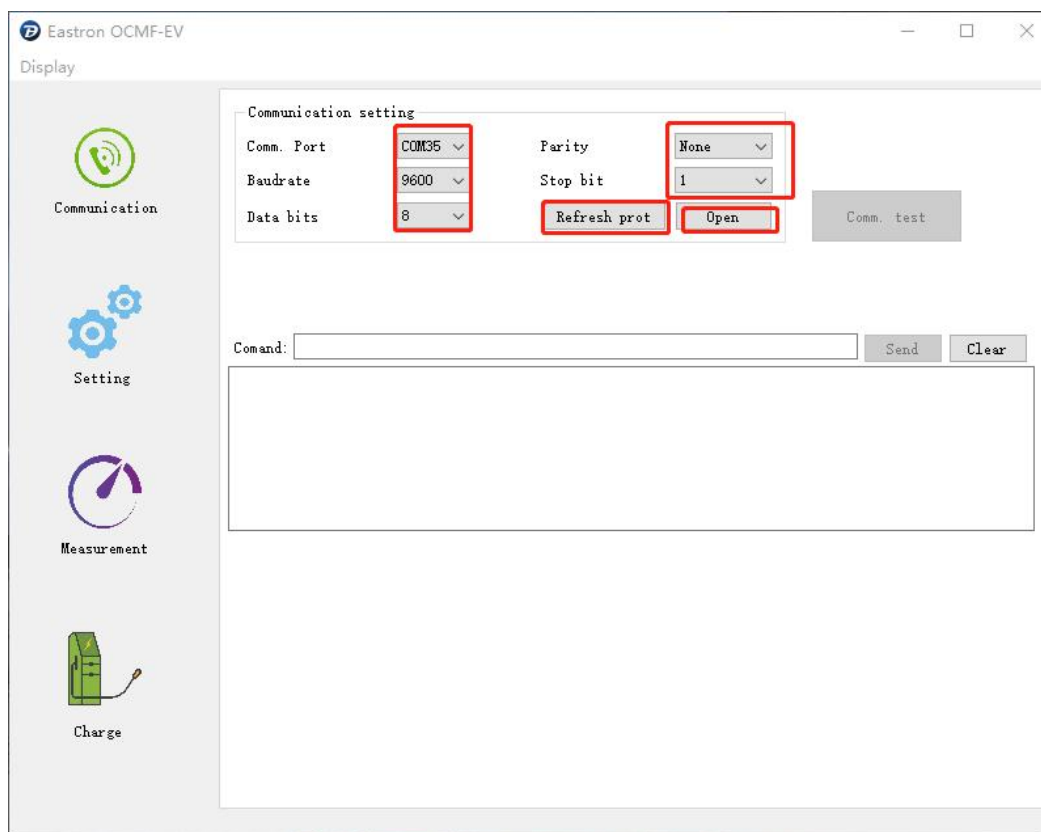
Step 4: After opening the Comm port, please click "Comm. Test" to test the communication. If the testing is OK, you will see a pop up window to show " The succeed" .

Window bar 1 is for sending some command if you need. And the software will automatically create CRC. Window bar 2 is for displaying the answer data from the meters
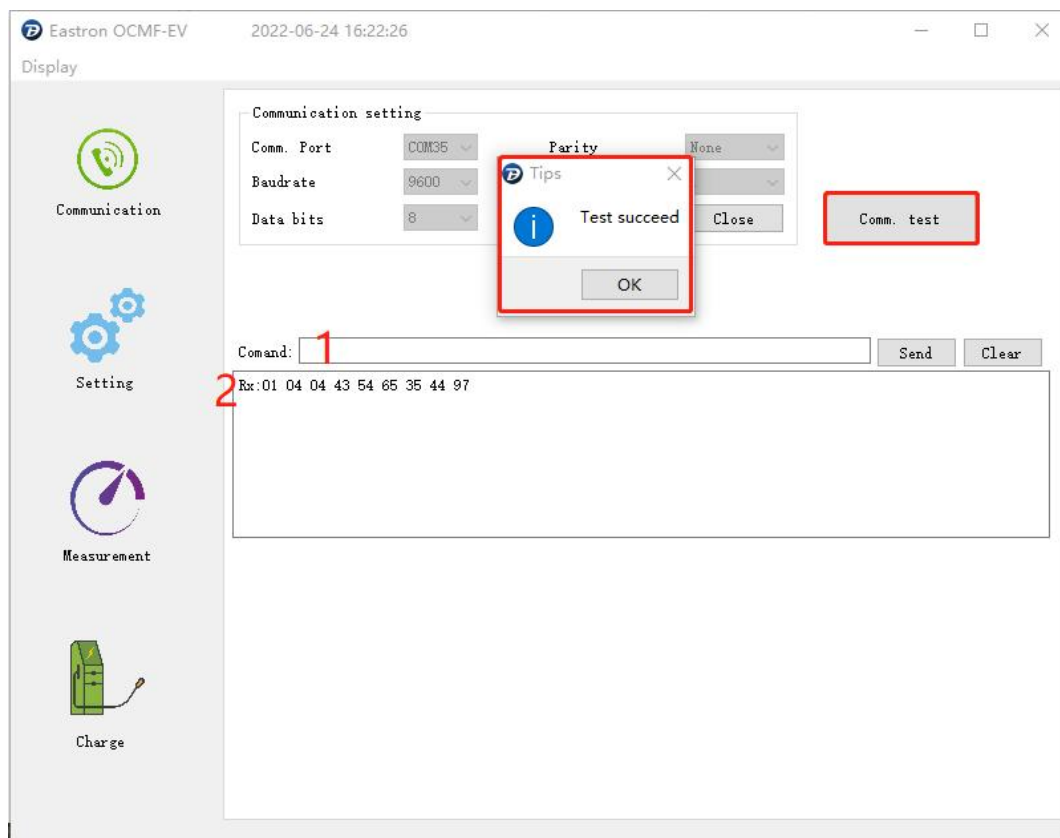
Step 1: Click " Setting " to set the parameters and click " read " to read the data from the energy meter SDM630-EV.
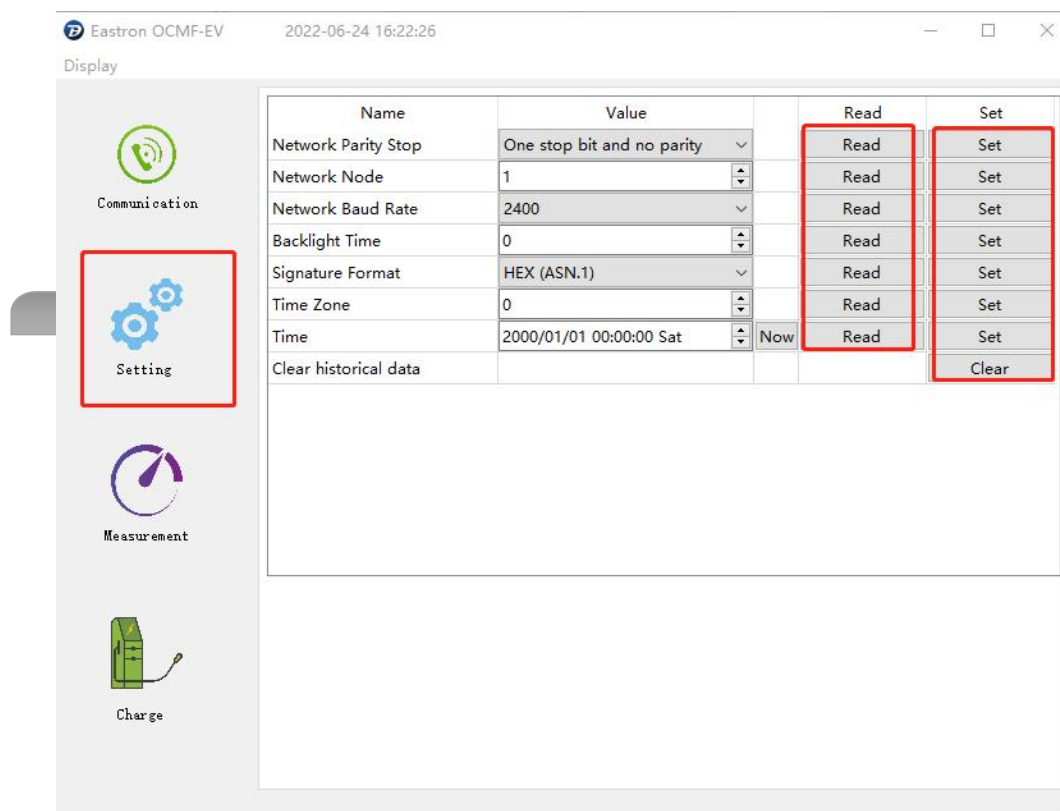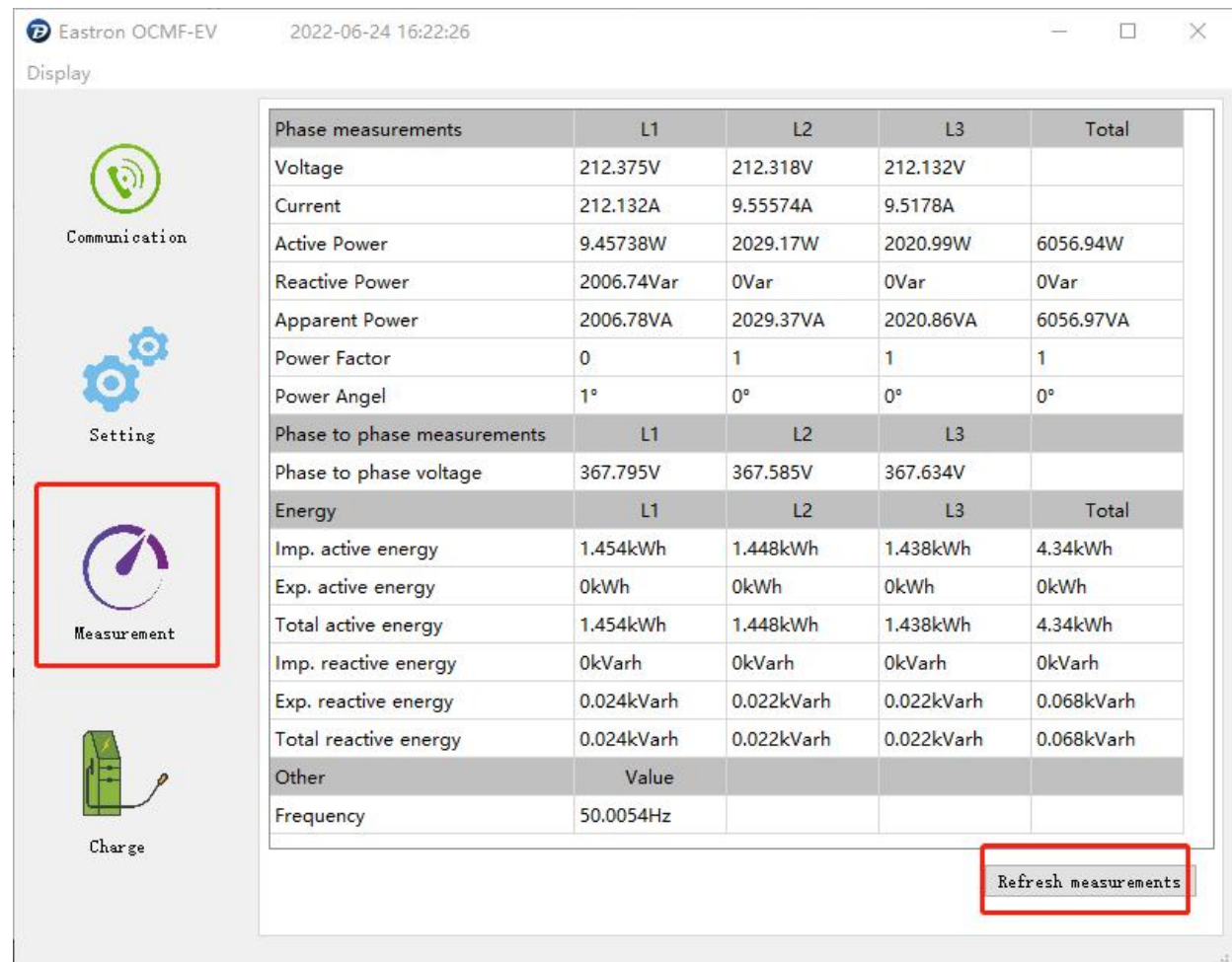
Step 2: Click " Set " to set the parameters. If done, it will show " Set successfully "
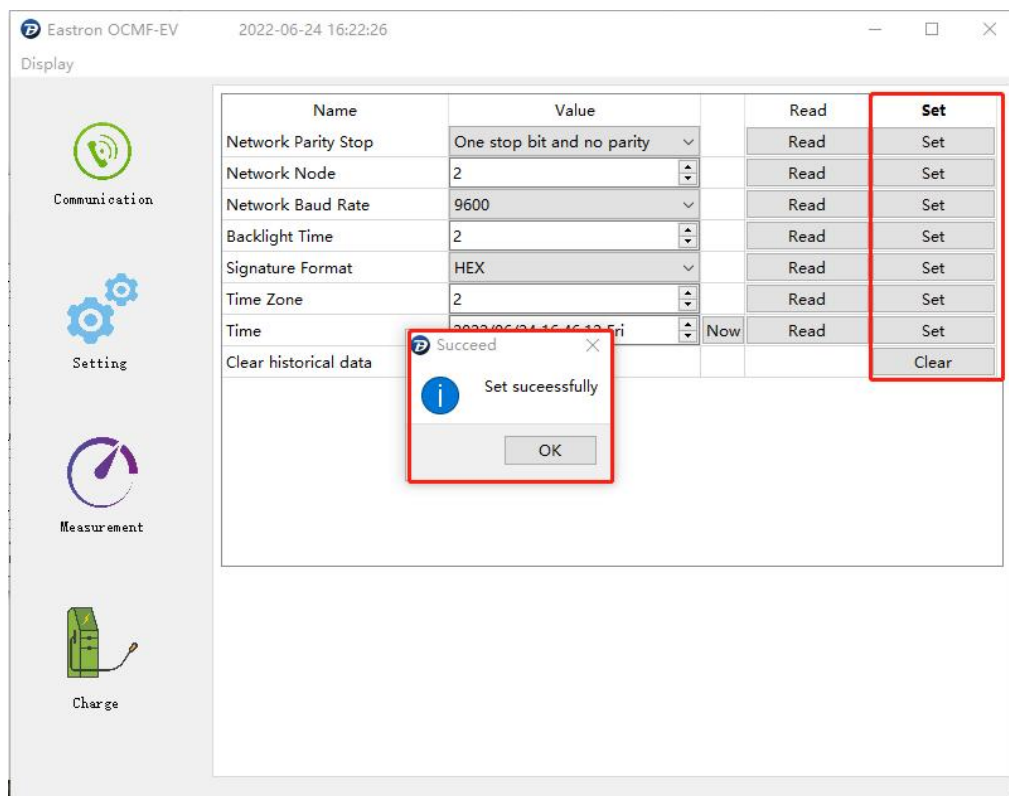
Note:

-> Measurement

Some common parameters can be ready via the Measurement part in the software as shown in the figure below. Click " Measurement " to enter the measurement window, then click " Refresh measurements to get updated data.

Phase measurements	L1	L2	L3	Total
Voltage	212.375V	212.318V	212.132V	
Current	212.132A	9.55574A	9.5178A	
Active Power	9.45738W	2029.17W	2020.99W	6056.94W
Reactive Power	2006.74Var	0Var	0Var	0Var
Apparent Power	2006.78VA	2029.37VA	2020.86VA	6056.97VA
Power Factor	0	1	1	1
Power Angel	1°	0°	0°	0°
Phase to phase measurements	L1	L2	L3	
Phase to phase voltage	367.795V	367.585V	367.634V	
Energy	L1	L2	L3	Total
Imp. active energy	1.454kWh	1.448kWh	1.438kWh	4.34kWh
Exp. active energy	0kWh	0kWh	0kWh	0kWh
Total active energy	1.454kWh	1.448kWh	1.438kWh	4.34kWh
Imp. reactive energy	0kVarh	0kVarh	0kVarh	0kVarh
Exp. reactive energy	0.024kVarh	0.022kVarh	0.022kVarh	0.068kVarh
Total reactive energy	0.024kVarh	0.022kVarh	0.022kVarh	0.068kVarh
Other	Value			
Frequency	50.0054Hz			

-> Charging :

The charge area can simulate the process of charging pile to charge energy and signature.
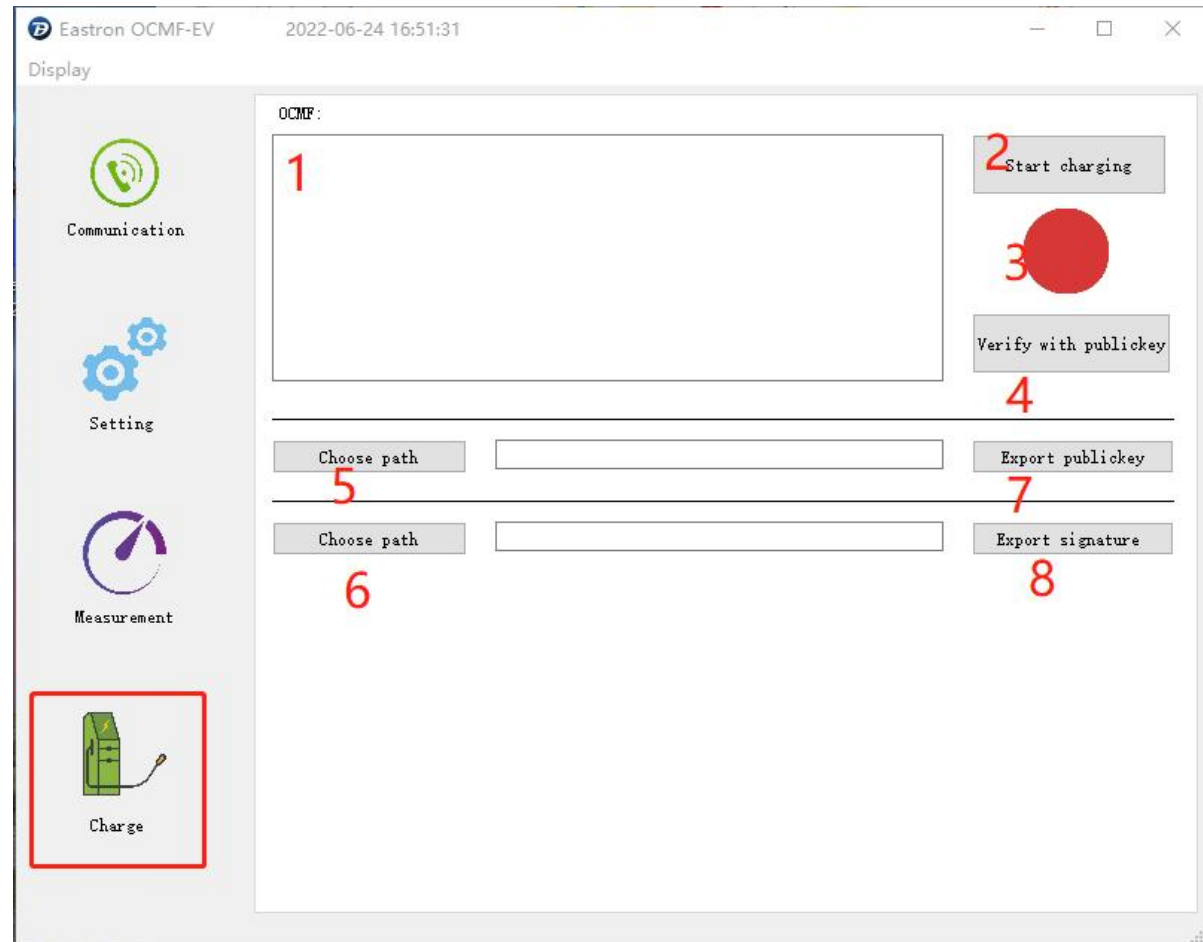
① Indicate receiving the OCMF data;

② Starting / Ending Charging button;

③ Charging light: red is for ending charging and green means it is under charging.

④ Use Public Key to sign.

⑤ Select the address of the output of Public Key file.

⑥ select the address of the output of Signing file

⑦ Click to output the Public Key file

⑧ Click to output the Signing file

Step 3: Click " Start charging", you will see a pop-up window " Charging has started as following. And the button will switch to " Stop charging"
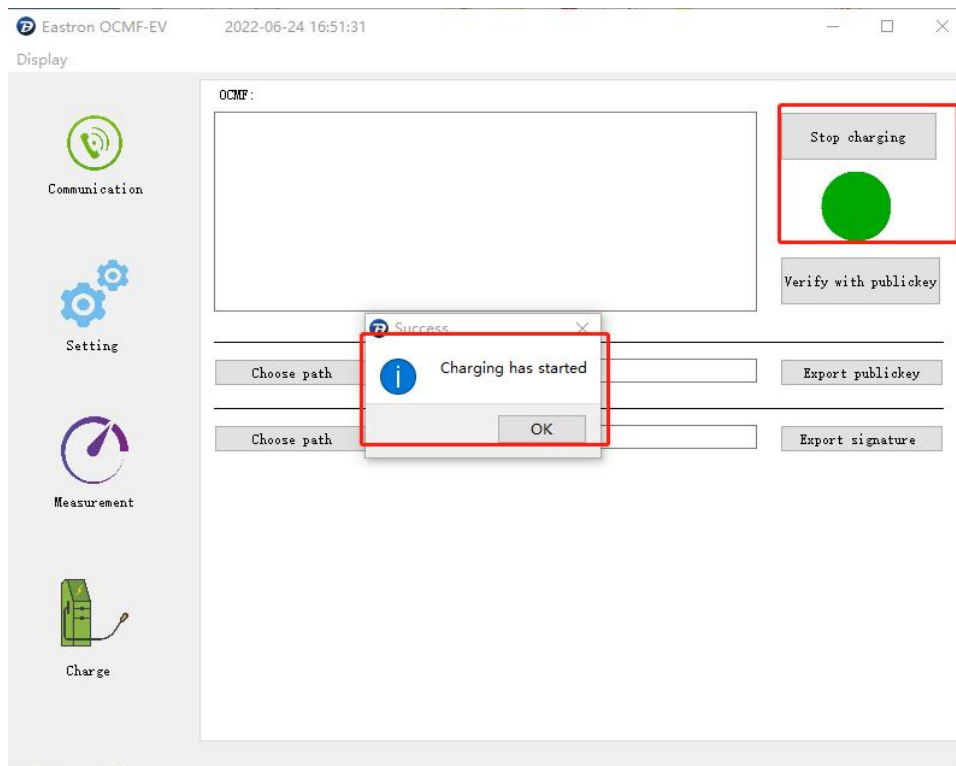
Step 4: Click " Stop charging " to end the charging, then click " Verify with Public Key to check the date of Signing, and then you will see the Pop-up window showing " Verify successed
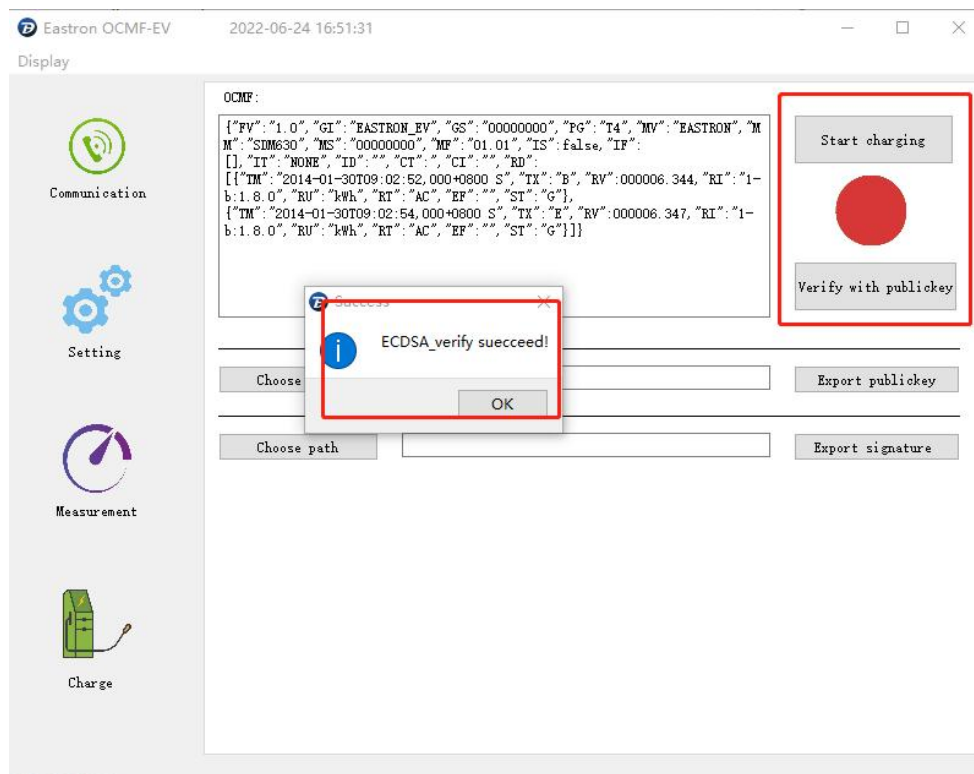
Step 5: Click "Communication" to open the Comm to monitor the data.   The relevant data can be exported via clicking the "Export public key" or " Export signature".
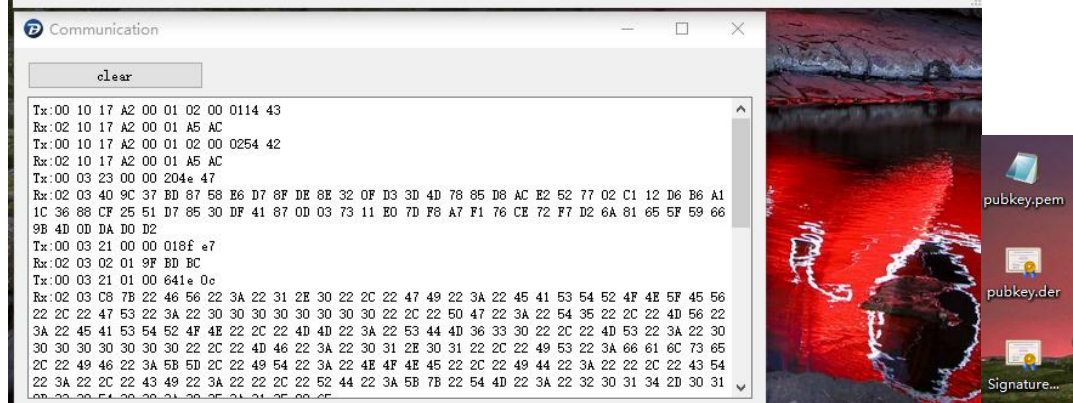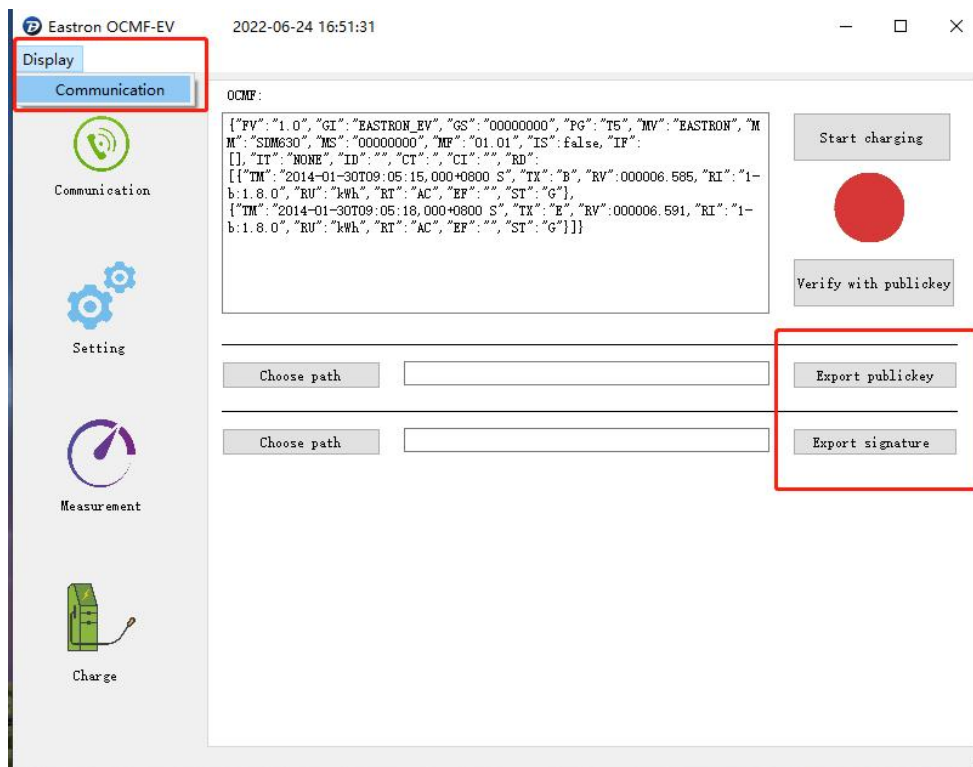
PART 4 Digital Signature

Introduction

The energy meter SDM630-EV supports the digital signature of energy information, which can ensure the integrity of the data received by the terminal. All of the digital signatures are completed by special encryption chips, which can better ensure the security of data. The meter supports ECDSA FIPS186-3 elliptic curve digital signature. It can communicate with the EV charger control unit through RS485.

Process of Signature

EV charger control unit is responsible to send start and stop command to energy meter. Energy meter measures consumed energy during charging. When charging is finished, EV control unit provides data packet (customer info, time, etc.) to energy meter via MODBUS communication. Energy meter adds measured energy and generates final billing message with digital signature. EV charger control unit then reads complete billing information with measured energy consumption and digital signature.

```
┌─────────────────────────────────────────────────┐
│ before EV charging starts ,time must be sent to meter │
└─────────────────────────────────────────────────┘
                         │
                         ▼
┌─────────────────────────────────────────────────┐
│ Control unit sends BEGIN("B")commadn to energy meter │
└─────────────────────────────────────────────────┘
                         │
                         ▼
┌─────────────────────────────────────────────────┐
│ Control unit sends END("E")commadn to energy meter │
└─────────────────────────────────────────────────┘
                         │
                         ▼
┌─────────────────────────────────────────────────┐
│ Energy meter generates message and digitally signs it │
└─────────────────────────────────────────────────┘
                         │
                         ▼
┌─────────────────────────────────────────────────┐
│ EV Control unit reads billing message from energy meter │
└─────────────────────────────────────────────────┘
```
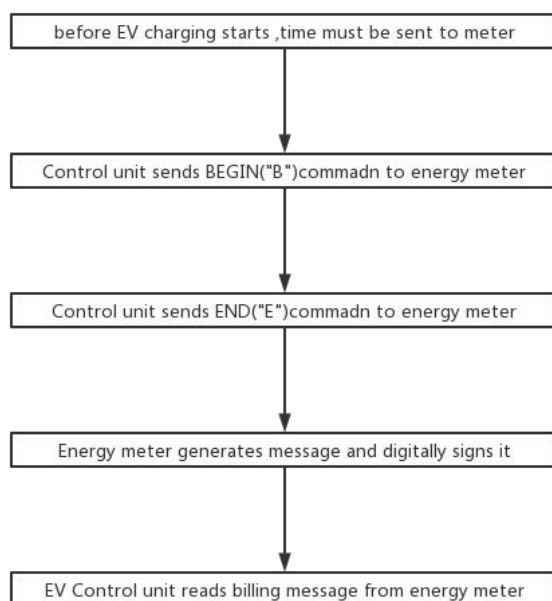
EV charger control unit must use following procedure to measure charging consumption and sign

Data packet:

1. Set time, time zone, signature format

3. Send Begin command

4. Enter data packet size

4. Send intermediate reading commands (optional)

5. Send End command (triggers signing process)

6. Check signature status register until signature is ready

7. Read Output message length

8. Read Output message

9. Read signature length

10. Read signature

11. Read public key

The generation and reading of the public key

Generation of private/public key

This is one-time procedure made at production of energy meter. Generation of key pair is HW based with dedicated crypto chip. Private key is stored internally within the crypto chip and there is no way of reading it.

Public key read

Public key is available to end user for verification of digital signature. Therefore, public key is readable through MODBUS communication.

Public key is stored in 64 bytes raw format at MODBUS address 48961.

For **Transparenz Software** check, public key header should be prepended:

3059301306072A8648CE3D020106082A8648CE3D03010703420004

For checking with ECDSA, public key header is: 04.

Json data format

Format is compliant with OCMF v1.0.

Energy meter requires following fields in data packet:

```
OCMF|{
"FV":"1.0",
"GI":"",
"GS":"",
"PG":"",
"MV":"",
"MM":"",
"MS":"",
"MF":"",
"IS":true,
"IF":[],
"IT":"NONE",
"ID":",
"CT":"",
```

"CI":"",
"RD":[
{
"TM":"2019-11-11T13:22:28,000+0000 S",
"TX":"B",
"RV":123457.529,
"RI":"1-b:1.8.0",
"RU":"kWh",
"RT":"AC",
"EF":"",
"ST":"G"
},
{
"TM":"2019-11-11T13:24:12,000+0000 S",
"TX":"E",
"RV":123457.529,
"RI":"1-b:1.8.0",
"RU":"kWh",
"RT":"AC",
"EF":"",
"ST":"G"}
]
} |
{
"SD":string,
}

key	type	describe
FV	String	Format-Version: = "1.0"
GI	String	Gateway identification= "EASTRON EV".
GS	String	serial number (string of 8 char)
PG	String	Pagination of the entire dataset = string of "T<value>" with value increased for each read of transaction
MV	String	Meter-Vendor = "EASTRON"
MM	String	Instrument identification= "SDM630"
MS	String	serial number (string of 8 char)
MF	String	Meter-Firmware: "01.01"
IS	Boolean	Identification status: General status for user assignment: true: Users successfully assigned, false: Users not associated.
IF	Array of String	Identification flags for RFID, OCPP, ISO15118 and PLMN protocol
IT	String	Identification-Type: "string"
ID	String	Identification-Data: "string"
CT	String	Charge-Point-Identification-Type

CI	String	Charge-Point-Identification
RI	String	1-b:1.8.0 .Purchase of electrical energy (active energy) from the power grid (of the charging point operator) to the customer.
EF	String	"" No error "E" Error in the energy register "t" Error in the time status "Et" Error in the energy registers and the time status

CONTACT US

If you have any question, please feel free to contact our sales team.

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