# Morningstar SureSine 2 Inverter MODBUS Specification v1

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# General Information

The SureSine Gen 2 supports the industry standard MODBUS® application protocol via its EIA-485 interface and MODBUS® TCP via the Ethernet port (700W to 2,500W models only). This document assumes that the user is familiar with the MODBUS® protocol and its terminology. Please refer to the documents listed in the References section for more information. MODBUS® is a registered trademark of Modbus-IDA.

# Parameters

The SureSine Gen 2 supports RTU mode only.

16bit MODBUS® addresses (per the modbus.org spec)

The serial communication parameters are:

BPS: 9600 baud

Parity: None

Data bits: 8

Stop bits: 2

Flow control: None

All addresses listed are for the request PDU - add one (1) for the logical address.

| | |
|---|---|
| MODBUS ID | 1 |

**Default TCP communication parameters (700W to 2500W models only):**

| | |
|---|---|
| UDP Port | 502 |
| MODBUS ID | 1 |

IP 192.168.1.253

Gateway 192.168.1.1

Primary DNS 192.168.1.1

Secondary DNS 192.168.1.1

Subnet Mask 255.255.255.0

# Supported Modbus® Functions

### Read Holding Registers (0x03) and Read Input Registers (0x04)

## RAM

| PDU Addr | Logical Address | Variable name | Variable description | Units | Scaling or Range |
|---|---|---|---|---|---|
| 0x0000 | 1 | Reserved | - | - | - |
| 0x0001 | 2 | Reserved | - | - | - |
| 0x0002 | 3 | Reserved | - | - | - |
| 0x0003 | 4 | Prated | AC output power rating (read only) | W | N*0.1 |
| 0x0004 | 5 | DC Input | Nominal DC input voltage rating (read only) | V | N*0.01 |
| 0x0005 | 6 | AC Output | AC output voltage rating (read only) | V | N*0.1 |
| 0x0006 | 7 | hertz | Output frequency rating (read only) | Hz | n |
| 0x0007 | 8 | adc_remote | Remote switch status OFF-ON | - | (0=OFF, 1=ON) |
| 0x0008 | 9 | Vb | Battery voltage, slow filter (τ ≈ ?s) | V | N*0.01 |
| 0x0009 | 10 | Ib | Battery current, filtered (τ ≈ ?s) | A | N*0.01 |
| 0x000A | 11 | Vac | AC output voltage, filtered (τ ≈ ?s) | V | N*0.1 |
| 0x000B | 12 | Iac | AC output current, filtered (τ ≈ ?s) | A | N*0.01 |
| 0x000C | 13 | Ths | Heatsink temperature | ºC | -40 to 120 |
| 0x000D | 14 | Reserved | - | | |
| 0x000E | 15 | Ta | Internal temperature | ºC | -40 to 120 |
| 0x000F | 16 | dip_switch | dip switch settings switches[1..8] in bits[0..7] | - | - |
| 0x0010 | 17 | load_state | Load state bitfield | - | - |
| 0x0012 | 19 | Heatsink_temp_status | Heatsink temperature sensor status | - | 0, 1, 2 |
| 0x0013 | 20 | Reserved | - | - | - |
| 0x0014 | 21 | Ta_status | Internal temperature status | - | 0, 1, 2 |
| 0x0015 | 22 | Fault | Fault bitfield | - | 0 or 1 |
| 0x0016 | 23 | Alarm | Alarm bitfield | - | 0 or 1 |
| 0x0017-0x0021 | 24 - 34 | Reserved | - | - | - |
| 0x0022 | 35 | hourmeter_HI | hourmeter, (inverter on) HI word | h | n(0 to ($2^{24}$-1)) |
| 0x0023 | 36 | hourmeter_LO | hourmeter, (inverter on) LO word | - | - |
| 0x0024 | 37 | kwh_ resettable_HI | AC Load Energy kWh - Resettable HI Word | kwh | N*0.1 |
| 0x0025 | 38 | kwh_ resettable_LO | AC Load Energy kWh - Resettable LO Word | kWh | N*0.1 |
| 0x0026 | 39 | rtc_tm_count_HI | System time RTC_HI | - | Note 3 |
| 0x0027 | 40 | rtc_tm_count_LO | System time RTC_LO | - | |
| 0x0028-0x002F | 41 - 48 | Reserved | - | - | |
| 0x0030 | 49 | Modbus_ID | Modbus address (read only) | - | N, 1-247 |
| 0x0031-0x0033 | 50 - 52 | MAC_Address | MAC address | - | - |
| 0x0034 | 53 | Reserved | - | - | - |
| 0x0035 | 54 | Port_UDP | UDP port number | - | - |
| 0x0036-0x003B | 55 - 60 | IP_Address & SubNetMask & Gateway | IP address, subnet mask, gateway | - | - |
| 0x003C-0x003F | 61 - 64 | Bluetooth _ID | Bluetooth communication ID | - | Reserve |

| | | | | | |
|---|---|---|---|---|---|
| 0x0040-0x004F | 65 – 80 | Reserved | - | - | |
| 0x0050 | 81 | Boat_SW_state | AC output mode Boat Switch state | - | 1- (AC on)<br>2- (AC remote)<br>3- (neutral gear) |
| 0x0051 | 82 | kwh_total_HI | Total AC load energy kWh HI Word | kWh | N*0.1 |
| 0x0052 | 83 | kwh_total_LO | Total AC load energy kWh LO word | - | - |
| 0x0053-0x005B | 84-92 | Reserved | - | - | |
| 0x005C | 93 | Run_State | Run state (Off/ On) | - | 0 or 1 |
| 0x005D | 94 | LED1 LED2 Display | LED1 LED2 display | - | 0-7 |
| 0x005E | 95 | P_ AC instantaneous | AC instantaneous power | W | N*0.1 |
| 0x005F | 96 | Relay_State | Relay state | | 0 or 1 |
| 0x006E-0x006F | 111-112 | Reserved | - | - | - |
| 0x007A-0x007F | 123-128 | Reserved | - | - | - |
| 0x008E-0x008F | 143-144 | Reserved | - | - | - |

# EEPROM

| PDU Addr | Logical Addr | Variable name | Variable description | Write Allowed | Unit | Scaling or Range |
|---|---|---|---|---|---|---|
| 0xE000 | 57345 | Reserved | - | - | - | - |
| 0xE001 | 57346 | Reserved | - | - | - | - |
| 0xE002 | 57347 | Et_lvd_warn | LVD Warning time | yes | S | n |
| 0xE003 | 57348 | Ev_lvd | Low voltage disconnect | yes | V | N*0.01 |
| 0xE004 | 57349 | Ev_lvr | Low voltage reconnect | yes | V | N*0.01 |
| 0xE005 | 57350 | Ev_lvdwarn_beep_ start | LVD alarm voltage | yes | V | N*0.01 |
| 0xE006 | 57351 | Reserved | - | - | - | - |
| 0xE007 | 57352 | Et_hvd_warn | HVD warning time HVD | no | S | n |
| 0xE008 | 57353 | Ev_hvd | High voltage disconnect HVD | no | V | N*0.01 |
| 0xE009 | 57354 | Ev_hvr | High voltage reconnect HVR | no | V | N*0.01 |
| 0xE00A | 57355 | Ev_hvdwarn_beep_ start | HVD alarm voltage | no | V | N*0.01 |
| 0xE00B | 57356 | Reserved | - | - | - | - |
| 0xE00C | 57357 | Ev_startlvd | Start LVD setting | yes | V | N*0.01 |
| 0xE00D | 57358 | Ev_starthvd | Start HVD setting | Yes | V | N*0.01 |
| 0xE00E | 57359 | Ehour meter_hi | Accumulated hours (inverter on) HI word | no | h | - |
| 0xE00F | 57360 | Ehour meter_lo | Accumulated hours (inverter on) LO word | no | - | - |
| 0xE010-0xE019 | 57361-57370 | Reserved | - | - | - | - |
| 0xE01A-0xE021 | 57371-57378 | E_IP_Address & SubNetMask & Gateway | IP address, subnet mask, gateway | yes | - | See Note 1 |
| 0xE022-0xE028 | 57379-57385 | Reserved | - | - | - | - |
| 0xE029-0xE02B | 57386-57388 | E_MAC_Address | MAC address (reserved) | TEST MODE | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0xE02C | 57389 | Reserved | - | - | - | - |
| 0xE02D | 57390 | E_kwh_ resettable_HI | AC load energy kWh - Resettable HI word | yes | kwh | N*0.1 |
| 0xE02E | 57391 | E_kwh_ resettable_LO | Load AC load energy kWh – resettable LO word | yes | kWh | N*0.1 |
| 0xE02F | 57392 | E_kwh_total_HI | Total AC load energy kWh HI word | no | kwh | N*0.1 |
| 0xE030 | 57393 | E_kwh_total_LO | Total AC load energy kWh LO word | no | - | - |
| 0xE031 | 57394 | Et_Relay_Open | Delay opening time of relay | yes | S | N |
| 0xE032 | 57395 | Ev_Relay_Open | Relay open voltage | yes | V | N*0.01 |
| 0xE033 | 57396 | Ev_Relay_Close | Relay closed voltage | yes | V | N*0.01 |
| 0xE034-0xE03A | 57397-57403 | Reserved | - | - | - | - |
| 0xE03B | 57404 | E_Port_UDP | UDP Port | yes | - | - |
| 0xE034-0xE116 | 57397-57623 | Reserved | - | - | - | - |
| 0xE117 | 57624 | E_Modbus_ID | Modbus address | yes | - | N，1-247 |
| 0xE118-0xE127 | 57625 | E_HW_VER | Hardware version | no | - | Note 2 |
| 0xE128-0xE137 | 57626 | E_SW_VER | Software version | no | - | Note 2 - |
| 0xE138-0xE147 | 57627 | E_Device_sn | Device serial number | no | - | |
| 0xE148-0xE14F | 57528-57535 | Reserved | - | - | - | |

**Note 1: Local IP read and write**

Read data format description: Starting from 0x0034, 8 consecutive registers are 16 bytes in total

**Read Command: 0x03**

0x01 0x03 0x00 0x34 0x00 0x08 0x05 0xC2

Return 8 registers with a total of 16 bytes:

01 03 10 00 00 01 F6 C0 A8 01 FD FF FF FF 00 C0 A8 01 01 A2 69

Buf[0]：Modbus ID

Buf[1]：Command

Buf[2]：Data Length

Buf[3-4]：2 bytes：not used

Buf[5-6]：2 bytes： UDP Port，0x01F6=502

Buf[7-10]：4 bytes：Local IP：C0 A8 02 BC(192.168.1.253)

Buf[11-14]：4 bytes：Subnet mask: FF FF FF 00(255.255.255.0)

Buf[15-18]：4 bytes：gateway: C0 A8 02 01(192.168.1.1)

Buf[19-20]：2 bytes：CRC

**Write Command: 0x10**，Address：0xE01A-0xE021

01 10 E0 1A 00 08 10 00 00 01 F6 C0 A8 01 FD FF FF FF 00 C0 A8 01 01 F3 AB

Buf[0]：Modbus ID

Buf[1]：Command

Buf[2-3]：2 bytes：Register address

Buf[4-5]：2 bytes：Register Number

Buf[6]:1 bytes：Data Length

Buf[7-8]：2 bytes：not used

Buf[9-10]：2 bytes：UDP Port，0x01F6=502

Buf[11-14]：4 bytes：Local IP：C0 A8 01 FD(192.168.1.253)
Buf[15-18]：4 bytes：Subnet mask: FF FF FF 00(255.255.255.0)
Buf[19-22]：4 bytes：gateway: C0 A8 01 01(192.168.1.1)
Buf[23-24]：2 bytes：CRC
Returned data:
01 10 E0 1A 00 08 D7 C8
Buf[0]：Modbus ID
Buf[1]：Command
Buf[2-3]：2 bytes：Register address
Buf[4-5]：2 bytes：Register Number
Buf[6-7]: 2 bytes：CRC

### Note 2：Read Hardware version, Software version, device serial number

**Read Hardware version**
Read Command: 0x03
01 03 E1 18 00 10 F2 3D
Return 16 registers with a total of 32 bytes
01 03 20 00 10 53 75 72 65 53 69 6E 65 2D 32 35 30 30 2D 56 36 00 00 00 00 00 00 00 00 00 00 00 00 00 00 8D F0
Buf[0]：Modbus ID
Buf[1]：Command
Buf[2]：Data Length
Buf[3-4]：Hardware version data length=0x0010,”SureSine-2500-V6”
Buf[35-36]：CRC
**Read Software version**
Read Command: 0x03
01 03 E1 28 00 10 F2 32
Return 16 registers with a total of 32 bytes
01 03 20 00 0E 53 75 72 65 53 69 6E 65 2D 56 31 2E 31 30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 DF 50
Buf[0]：Modbus ID
Buf[1]：Command
Buf[2]：Data Length
Buf[3-4]: Software version data length=0x0010,”SureSine-V1.10”
Buf[35-36]: CRC
**Read device serial number**
Read Command: 0x03
01 03 E1 38 00 10 F3 F7
Return 16 registers with a total of 32 bytes
01 03 20 00 08 31 34 33 39 32 30 31 33 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 F8 33
Buf[0]：Modbus ID
Buf[1]：Command
Buf[2]：Data Length
Buf[3-4]：Sreial number data length=0x0008,”14392013”
Buf[35-36]：CRC

## Note 3: System time reading and writing

0x0026 and 0x0027 rtc_tm_count_hi rtc_tm_count_lo
registers, used to read and write system time 2 registers, totaling 4 bytes
Write Command：0x10
The order of the 4 bytes is high order before low order. Form an unsigned integer.
The method of replacing the data read back with time:

**Read**

Read Command：0x03
Send： 01 03 00 26 00 02 25 C0
Return： 01 03 04 2C 16 85 54 70 08
Time to read back+(2000-01-01 00:00:00)=now
2000-01-01 00:00:00:00 is the absolute number of seconds relative to the 1970-01-01 00:00:00 moment, which is 946656000 seconds.
Replace now with date and time

**Write**

Write Command：0x10
01 10 00 26 00 02 04 2C 16 14 72 17 EC
Method to set the controller time: Subtract the current computer time by 2000-01-01 0:0:0 to obtain the absolute number of seconds.
Form an absolute number of seconds into 4 bytes of data, with high bits in the first and low bits in the second.

### Write Single Coil(0x05)

| PDU Addr | Variable description |
|---|---|
| 0x0010 | Turn off inverter (Communication mode) |
| 0x0011 | Turn on inverter (Communication mode) |
| 0x0012 | Reset load kWh |
| 0x0013 | Reset Accumulated working hours |
| 0x0014 | Clear faults (set only, will always read 0) |
| 0x0015 | Clear alarms (set only, will always read 0) |
| 0x0016 | Restore factory settings |
| 0x0019 | Relay Open or Close (close:0xFF 0x00；open:0x00 0x00) |
| 0x00FF | Reset control |

### Write Single Register(0x06)

See EEPROM table in Read Input Registers(0x04)

### Read Device Identification (0x2B, subcode 0x0E)

| Object Id | Object Name/Description | Typical Value |
|---|---|---|
| 00 | manufacturer name | Morningstar |
| 01 | Product model | SI-2500-48-120-60-HW |
| 02 | Hardware version | SureSine-2500-V6 |
| 03 | Software version | SureSine-V1.10 |
| 04 | device serial number | 20310001 |

Read command：01 2B 0E 01 00 70 77
Inverter return：01 2B 0E 01 01 00 00 05 00 0B 4D 6F 72 6E 69 6E 67 53 74 61 72 01 14 53 49 2D 32 35 30 30 2D 34 38 2D 31 32 30 2D 36 30 2D 48 57 02 10 53 75 72 65 53 69 6E 65 2D 32 35 30 30 2D 56 36 03 0E 53 75 72 65 53 69 6E 65 2D 56 31 2E 30 37 04 08 32 30 33 31 30 30 30 31 DF 8E
Data description:
01 2B 0E 01 01 00
00 05
00 0B 4D 6F 72 6E 69 6E 67 53 74 61 72 //Object Id 0, corporate name

01 14 53 49 2D 32 35 30 30 2D 34 38 2D 31 32 30 2D 36 30 2D 48 57 //Object Id 1, Product model
02 10 53 75 72 65 53 69 6E 65 2D 32 35 30 30 2D 56 36 //Object Id 2,Hardware version
03 0E 53 75 72 65 53 69 6E 65 2D 56 31 2E 30 37 //Object Id 3,Software version
04 08 32 30 33 31 30 30 30 31 //Object Id 4, device serial number
DF 8E //Check for CRC

# Variables and Definitions

**Variable Name** (PDU Address) (Units). Short description. Definition.

## Read Holding and Read Input Registers

Located in processor RAM, updated continuously

**Prated** (0x0003) (W). AC Output Power rating

**DC volts** (0x0004) (V). Input DC Voltage rating.
Nominal input DC voltage rating. Note: does not report actual input voltage.

**AC volts** 0x0005) (V). Output AC Voltage rating.
Nominal output AC voltage rating. Note: does not report actual output voltage.

**Hertz** (0x0006) (Hz). Output Frequency rating.
Nominal AC output frequency rating. Note: does not report actual AC frequency.

**adc_remote** (0x0007) (V). Remote On/Off Switch Status
Remote Switch Terminal Status. Open = 0 / Closed = 1
Note: Indicates the state of the remote control switch only, not if AC is ON or OFF.

**Vb** (0x0008) (V). Battery Voltage, filtered.

**Idc** (0x0009) (A). DC current, filtered.
Total DC current, with slow filter.

**Vac** (0x000A) (V). AC output Voltage, filtered.
AC output Voltage supplied to AC loads, with slow filter.

**Iac** (0x000B) (A). AC output current, filtered.
Total AC output current supplied to AC loads, with slow filter.

**Ths** (0x000C) (℃). Heatsink temperature.
Internal heatsink temperature used for over-temperature protection. Reported in degrees Celsius.

**Ta** (0x000E) (℃). internal temperature.
Internal PCB temperature generally indicates temperature inside the enclosure. Reported in degrees Celsius.

**dip_switch** (0x000F) (bitfield). Dip Switch Configuration.
Each bit in the dipswitch bitfield indicates the position of one of the four DIP switches.
A “0” value indicates Down or OFF position, a “1” indicates Up or ON position. LSB = DIP switch #1.

**load_state** (0x0010) (unitless). Load State.
Reports a decimal number that corresponds to the operating state as follows:

| load_state value | Operating State |
|---|---|
| Bit 0 | Manual power on |
| Bit 1 | Manual power off |
| Bit 2 | Remote switch power on |
| Bit 3 | Remote switch power off |
| Bit 4 | Fault power off |
| Bit 5 | Timing automatic power on |
| Bit 6 | Timing automatic power off |
| Bit 7 | low power consumption power on |
| Bit 8 | low power consumption power off |
| Bit 9 | Load overload |
| Bit 10 | Load short circuit |
| Bit 11 | HVD Fault |
| Bit 12 | LVD Fault |
| Bit 13 | Load high temperature fault |
| Bit 14 | Communication command power off |
| Bit 15 | Communication command power on |

**Heatsink _temp_status** (0x0012) (unitless). Heatsink temperature status.
0 - Normal; 1 - High temperature; 2- Temperature sensor failure

**Ta_status** (0x0014) (unitless). Internal temperature status.
0-Normal; 1- High temperature; 2- Temperature sensor failure

**Fault** (0x0015) (bitfield). INV Faults. INV
Each bit in the fault bitfield corresponds to a fault as outlined in the table below. A fault is a critical error that ceases inverter operation.
0 = no fault. 1 = fault condition.

| Bit | Fault |
|---|---|
| Bit 0 (LSB) | |
| Bit 1 | AC overcurrent |
| Bit 2 | AC short-circuit |
| Bit 3 | HVD disconnect |
| Bit 4 | LVD disconnect |
| Bit 5 | heatsink high temperature (95°C) disconnect |
| Bit 6 | inverter fault |

**Alarm** (0x0016) (bitfield). Inverter Alarms.
Each bit in the alarm bitfield corresponds to an alarm as outlined in the table below.
The alarm is a non-critical notification, and the inverter operation is not stopped.

| Bit | Alarm |
|---|---|
| Bit 0 (LSB) | heatsink temperature sensor disconnect |
| Bit 1 | heatsink temperature sensor short circuit |
| Bit 2 | Ambient temperature sensor disconnect |
| Bit 3 | Ambient temperature sensor short circuit |
| Bit 4 | HVD |
| Bit 5 | LVD |
| Bit 6 | reserved |
| Bit 7 | AC over current |
| Bit 8 | heatsink temperature too high (above 90°C) |
| Bit 9 | AC overcurrent |

**hourmeter_Hi hourmeter_Lo** (0x0022,0x0023) (h). Hourmeter. Reports the total operating time (with Inverter Output ON)

**kwh_ resettable_Hi kwh_ resettable_Lo** (0x0024) (kWh). AC Load Energy consumption, Resettable.

**kwh_total_Hi kwh_total_Lo** (0x0025) (kWh). Total AC Load Energy consumption, Not resettable

**rtc_tm_count_hi rtc_tm_count_lo** (0x0026,0x0027) (S). RTC Real Time Clock System Time - See Note 3

**Modbus_ID** (0x0030) (unitless). Modbus Address. 1-247

**MAC_Address** (0x0031-0x0033) (unitless). MAC Address

**Port_UDP** (0x0035) (unitless). UDP Port.

**IP_Address & SubNetMask & Gateway** (0x0036-0x003B) (unitless). IP address, subnet mask, gateway

**Bluetooth _ID** (0x003C-0x003F) (unitless). Bluetooth communication ID.

**Boat_SW_state** (0x0050) (unitless). AC Output Mode Boat switch state. 1- Ⅰ (AC on); 2- Ⅱ (AC remote) 3-(neutral gear)

**kwh_total_HI kwh_total_Lo** (0x0051,0x0052) (kWh). Total load AC Load Energy consumption

**Run_State** (0x005C) (unitless).Run State.1:AC ON;0:AC OFF

**LED1 LED2 Display** (0x005D) (unitless). LED1 LED2 Display.

| Status LED | AC output LED | Status State | AC output State | LED Value |
|---|---|---|---|---|
| OFF | OFF | N/A | N/A | 0 |
| GREEN | OFF | OK | OFF | 1 |
| GREEN | GREEN | OK | ON | 2 |
| GREEN | GREEN(BLINK) | OK | STANDBY | 3 |
| GREEN | RED(BINK) | LVD Warning | ON or STANDBY | 4 |
| GREEN | RED | LVD | OFF | 5 |
| RED | RED BLINK | CRITICAL FAULT | RESET | 6 |
| RED | RED | FAULT | OFF | 7 |

**P_ AC instantaneous** (0x005E) (W). AC instantaneous power.

**Relay_State** (0x005F) (unitless). Relay State.
1 - CLOSED; 0 - OPEN

## EEPROM Register Description

**Et_lvd_warn** (0xE002) (S). LVD Warning delay time.
Low Voltage Disconnect alarm delay time.
**Ev_lvd** (0xE003) (V). Low Voltage Disconnect.

**Ev_lvr** (0xE004) (V). Low Voltage Reconnect.

**Ev_lvdwarn_beep_ start** (0xE005) (V). LVD Alarm voltage.

**Et_hvd_warn** (0xE007) (S). HVD Warning delay time.
High voltage disconnect alarm delay time.

**Ev_hvd** (0xE008) (V). High voltage disconnect

**Ev_hvr** (0xE009) (V). High voltage reconnect

**Ev_hvdwarn_beep_ start** (0xE00A) (V). High alarm voltage.

**Ev_startlvd** (0xE00C) (V). Start LVD setting.
LVD immediately begins to disconnect the voltage without any delay.

**Ev_starthvd** (0xE00D) (V). Start HVD setting.
HVD immediately begins to disconnect the voltage without any delay.

**Ehour meter_hi Ehour meter_Lo** (0xE00E,0xE00F) (h). Accumulated working hours. Resets the total operating time (with Inverter Output ON)

**E_IP_Address & SubNetMask & Gateway** (0xE01A,0xE021) (unitless). Local IP address, subnet mask, gateway IP.

**E_MAC_Address** (0xE029,0xE02B) (unitless). MAC Address.

**E_kwh_ resettable_Hl E_kwh_ resettable_Lo** (0xE02D,0xE02E) (kWh). Load AC Load Energy consumption (Can be reset).

**E_kwh_total_Hl E_kwh_total_Lo** (0xE02F,0xE030) (kWh). Total load AC Load Energy consumption, NOT resettable.

**Et_Relay_Open** (0xE031) (S). Delay opening time of relay.

**Ev_Relay_Open** (0xE032) (V). Minimum voltage for relay opening. Can be used for external Low Voltage Disconnect. (LVD) with external loads or genstart

**Ev_Relay_Close** (0xE033) (V). Minimum voltage for relay closing. Can be used for Low Voltage Reconnect (LVR) with external loads or genstop

**E_Modbus_ID** (0xE117) (unitless). Modbus address.

**E_HW_VER** (0xE118,0xE127) (unitless). Hardware version.

**E_SW_VER** (0xE128,0xE137) (unitless). Software version.

**E_Device_sn** (0xE138,0xE147) (unitless). Device serial number.

## Document Revision History

v01: First release