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# ADL3000-E

Installation and operation instruction V3.1

**ACREL Co,.Ltd**

# Declare



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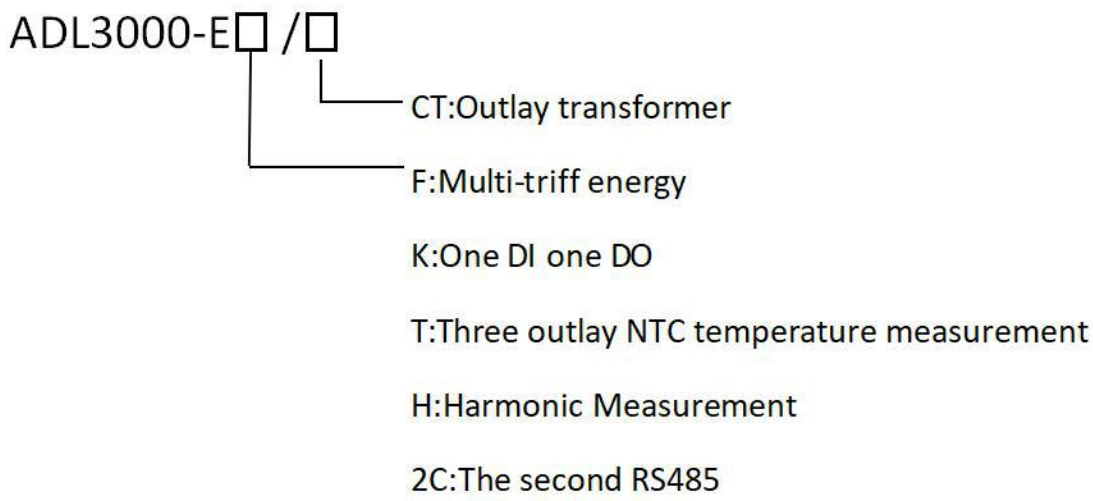
# Content

# 1 General

ADL3000-E is a smart meter designed for power supply system, industrial and mining enterprises and utilities to calculate the electricity consumption and manage the electric demand. It features the high precision, small size and simple installation. It integrates the measurement of all electrical parameters with the comprehensive electricity metering and management provides various data on previous 12 months, checks the 31st harmonic content and the total harmonic content, realizes the remote communication and the remote control with switching input and relay output and boasts the alarm output. It is fitted with RS485 communication port and adapted to MODBUS-RTU. ADL3000-E can be used in all kinds of control systems, SCADA systems and energy management systems. All meters meet the related technical requirements of electricity power meter in the IEC62053-21、IEC62053-22 standards.

# 2 Type description




# 3 Function description

| Function | Function description | Function provide |
|---|---|---|
| Measurement of kWh | Active kWh (positive and negative) | ■ |
| | Reactive kWh (positive and negative) | ■ |
| | A, B, C phase positive active kWh | ■ |
| Measurement of electrical parameters | U、IP、Q、S、PF、F | ■ |
| | | ■ |
| Measurement of | 2~31$^{ST}$ Voltage and current harmonic | □Note 1 |
| LCD Display | 8 bits section LCD display, background light | ■ |
| Key programming | 4 keys to communication and set parameters | ■ |
| Pulse output | Active pulse output | ■ |
| | Reactive pulse output | □Note 2 |

| | | |
|---|---|---|
| | Clock pulse output | □Note 2 |
| Multi-tariff and functions | Active switch input | □Note 3 |
| | Switch output | □Note 2 |
| | Adapt 4 time zones, 2 time interval lists, 14 time interval by day and 4 tariff rates | □ |
| | Max demanded kWh and time happened | □ |
| | Frozen data on last 48 months, last 90days | □ |
| | Date, time | □ |
| Communication | Infrared communication | ■ |
| | The first communication path:<br>Communication interface: RS485,<br>Communication protocol: MODBUS-RTU | □ |
| | The second communication path:<br>Communication interface: RS485,<br>Communication protocol: MODBUS-RTU | □Note 3 |
| Temperature measurement | Support 3 outlay NTC temperature | □Note 4 |

“■” means standard, “□” means optional.

Note:

1: Harmonic is a standard while choosing outlay transformer, optional for other situation.

2: Reactive pulse output, clock pulse output and switching output: Choose one of these three.

3: Active switching, the second communication path: Choose one of these two.

4: Both 1 and 2 cannot be chosen while choosing temperature measurement.

# 4 Technical parameter

| | | |
|---|---|---|
| Specification | | 3 phase 3 wires, 3 phase 4 wires |
| Voltage | Reference voltage | 3×100V、 3×380V、3×57.7/100V、 3×220/380V |
| | Consumption | <10VA(Single phase) |
| | Impedance | >2MΩ |
| | Accuracy class | Error±0.2% |
| Current | Input current | 3×1(6)A，3×1(6)A(Outlay transformer)，3×10(80)A，3×10(100)A(Outlay transformer) |
| | Consumption | <1VA(Single phase rated current) |
| | Accuracy class | Error±0.2% |
| Power | | Active, reactive, apparent power, error±0.5% |
| Frequency | | 45～65Hz， Error±0.2% |
| Temperature | | -40℃～99℃ |
| Energy | | Active energy(Accuracy class:0.5, 1), reactive energy(Accuracy class 2) |
| Clock | | ≤0.5s/d |
| Energy pulse output | | 1 active optocoupler output, 1 reactive optocoupler output |
| Switching output | | 1 Switching output |
| Switching input | | 1 optocoupler input |

| | |
|---|---|
| Width of pulse | 80±20ms |
| Pulse constant | 6400imp/kWh,400imp/kWh(Correspond with the basic current) |
| Interface and communication | RS485：Modbus RTU |
| Range of communication address | Modbus RTU:1~ 247； |
| Baud rate | 1200bps~19200bps |
| Relative temperature | -25℃~+55℃ |
| Relative humidity | ≤95%(No condensation) |

# 5 Dimension drawings

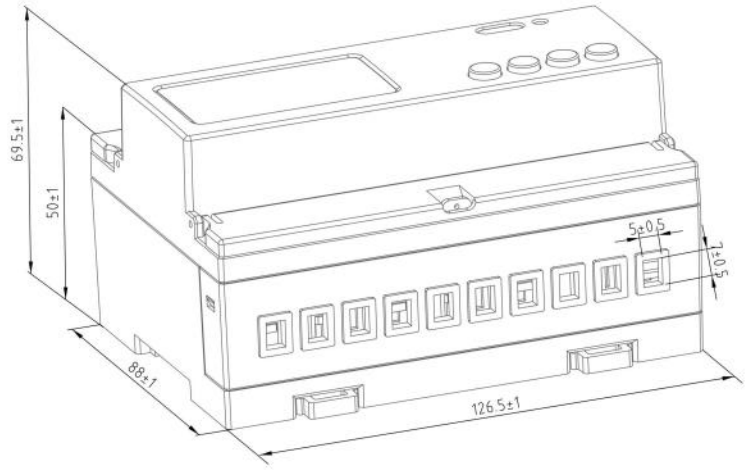



Fig1 connect via CT

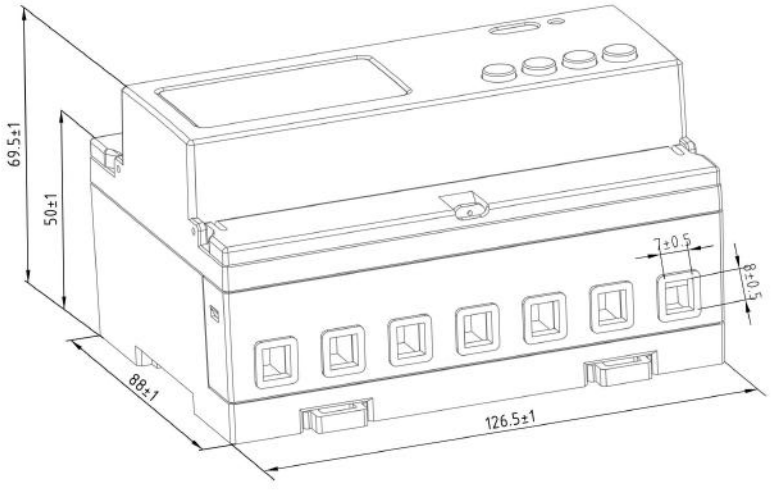



Fig2 direct connect

Note：The torque of direct connect should not be greater than 4.0N·m，and the torque of connect via CT should not be greater than 2.0N·m。

# 6 Wiring and installing

## 6.1 Wiring sample of voltage and current

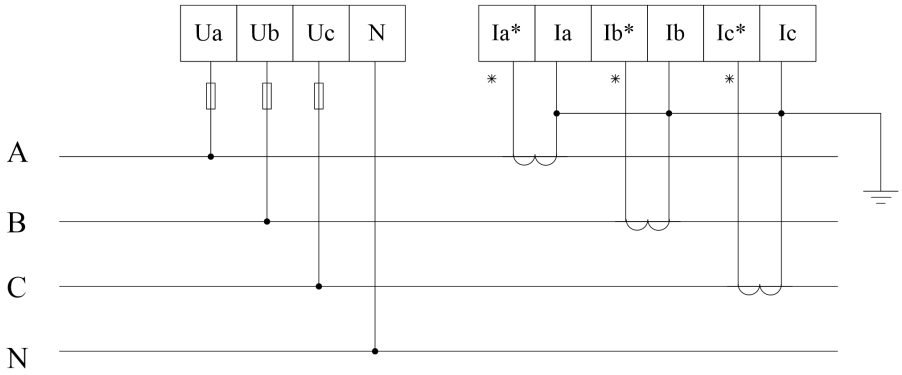



Fig 3 Three phase four lines connect via CT

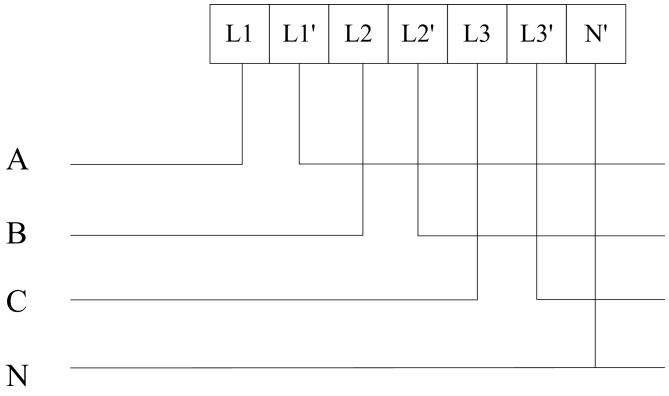



Fig 4 Three phase four lines direct connect

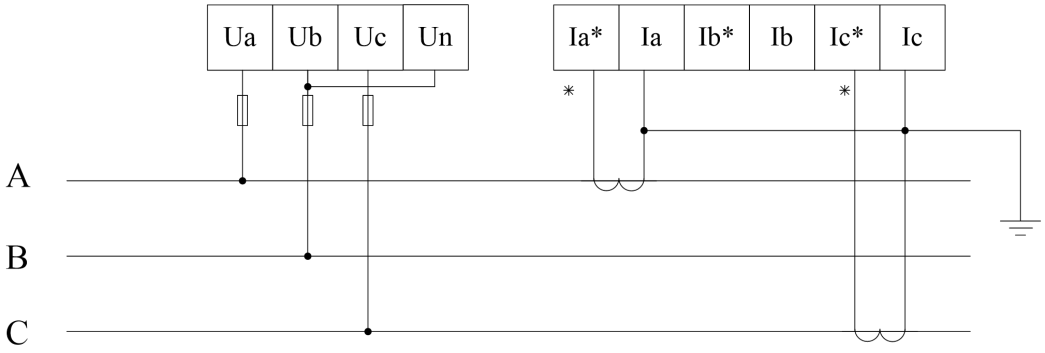



Fig 5Three phase three lines connect via CT

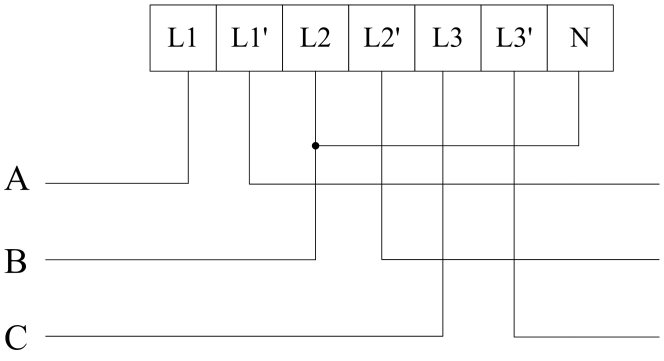


Fig 6 Three phase three lines direct connect

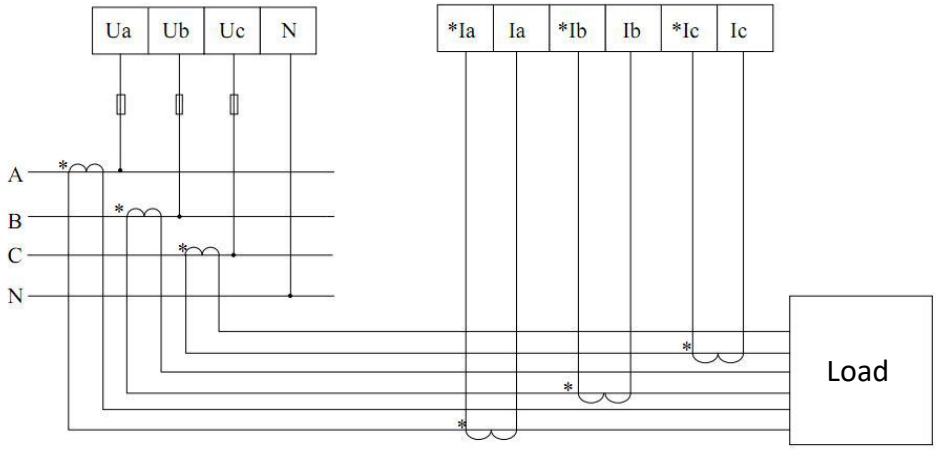



Fig 7 Three phase four lines, 3CT

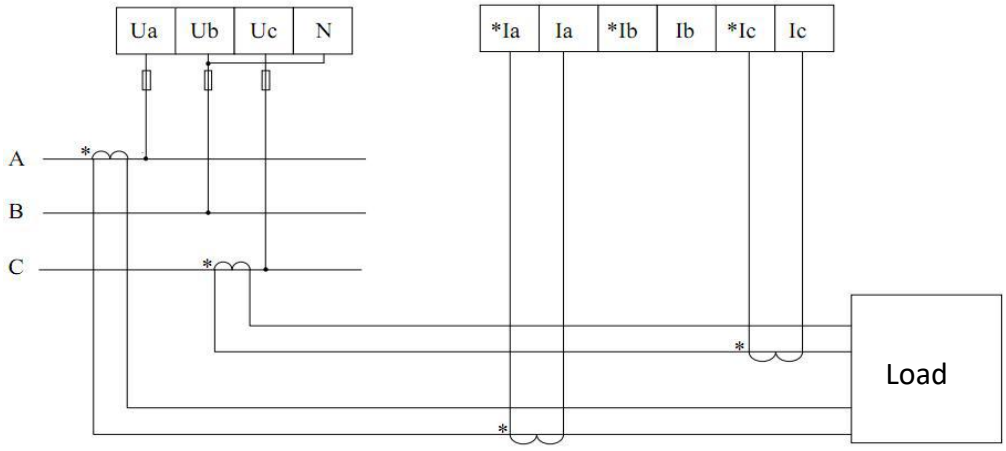



Fig 8 Three phase three lines, 2CT

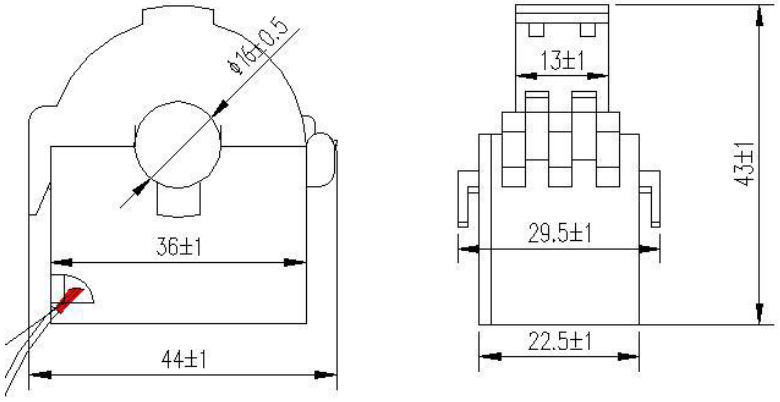



Fig 9 Outline of transformer

Note: The method of wiring is: input downward and output downward.

## 6.2 Switching input, output, NTC temperature terminals

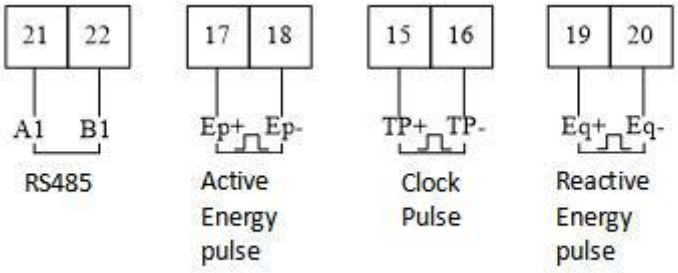



Fig 10 Communication, pulse connection

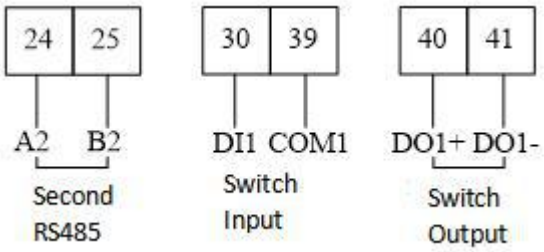



Fig 11 Communication, pulse connection

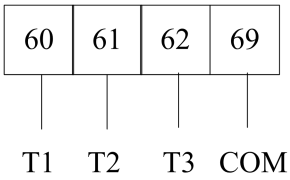



Fig 12 Outlay NTC temperature measurement

Switching output is relay output, can achieve the remote-control and alarm output.

The switch input adapts the method of on-off signal input and powered by outer power supply. It can be gotten by meter when there is a change of on or off via a switching input module. The parameter of switching input can not only get and show the state of local switching information but also achieve the communication via RS485, which called “remote information” function.

Note: (17-18) are active energy pulse, (60,61,62,69) are NTC temperature measurement port, (15,16) are clock pulse, (19,20) are reactive energy pulse, (40,41) are switch output and multiplex with (60,61), (24,25) are 2 path of communication, (30，39) are switch input and multiplex with (62,69).

# 7 Function description

## 7.1 Measurement

The meter can measure all electrical parameters such as voltage, current, active power, reactive power, apparent power, power factor, frequency, 31$^{st}$ harmonic and total harmonic. The value format of voltage, current, frequency and power are listed as below.

Example: U = 220.1V， f = 49.98Hz, I = 1.99A， P = 0.439kW

### 7.2 Calculating

The meter can calculate the current active energy, forward active energy, reversing active energy, forward reactive energy and reversing reactive energy.

### 7.3 Timing

The meter has 2 time lists, and can be divided into 4 time zones per year. Each time list can be divided into 8 time periods and 4 tariff (F1、F2、F3、F4). The main purpose of multi-tariff is promote the energy efficiency and economic benefits.

### 7.4 Demand

There are some definitions on demand:

| | |
|---|---|
| Demand | The average power in the demand cycle. |
| Maximum demand | The maximum value of demand in a period of time. |
| Slip time | A recurrence method to measure the demand from any time point during a period shorter than the demand period. The demand measured by this means is called sliding demand. The recurrence time is sliding window time. |
| Demand cycle | The time period between two same average value of demand. |

The default demand cycle is 15 minutes, slip time is 1 minute.

The meter can measure 4 kinds of maximum demand: forward active, reversing active, inductance performance reactive, capacitance performance reactive maximum demand and the occur time.

### 7.5 History data statistics

The meter can record last 48 months or last 90 days history energy in each tariff.

### 7.6 Switching input and output

The switch input adapts the method of on-off signal input and powered by outer power supply. It can be gotten by meter when there is a change of on or off via a switching input module. The parameter of switching input can not only get and show the state of local switching information but also achieve the communication via RS485, which called “remote information” function.

### 7.7 Temperature measurement

The meter support three path of outlay NTC temperature measurement, the range of temperature is -40℃~99℃.

## 8 Operation and display

### 8.1 Key function description

| Key symbol | Key name | Function |
|---|---|---|
|  | Menu | Enter/quit menu |

| | | |
|---|---|---|
| ▲ | Voltage and current, up | Check the voltage and current<br>Leftward and change flash in programming menu |
| ▼ | Power, down | Check the power<br>Rightward and change the value on flash |
| ↵ | Energy, enter | Check the energy<br>Enter in programming menu |

## 8.2 Display menu

The meter will show the forward active energy after powering. The customers can change the information showing by pressing the keys. **The sequence of the screens** is described as follows:

| | |
|---|---|
| ▲ | Voltage on A, B, C phase, Current on A, B, C phase, Frequency, Date, Time, Address, Version, Test on display |
| ▼ | Total active/reactive/apparent power and on A, B, C phase, Total power factor and on A, B, C phase, Forward/reversing active/reactive maximum demand |
| ↵ | Total forward/reserving active/reactive energy, forward/reserving active/reactive spike/peak/flat/valley energy, forward active energy on A, B, C phase.**Combined active total electric energy of standby loop，total positive active energy of the standby loop,total electrical energy in reverse active of standby loop** |

Note:

1 All the display menus above are in the model of ADL3000-EF three phases four lines with multi-tariff rate function and can be changed by the keys.

2 There will not be power or power factor on each phase and will only show total power and power factor (Active, reactive, apparent) under the three phase three lines.

3 There will not be date, time, maximum demand and energy by time without the function of multi-tariff rate.


Current forward active energy 12.34kWh


Current reversing active energy 12.34kWh


Current forward reactive energy 12.34kWh


Current forward active spike energy 12.34kWh


Current total power is 1.234kW


Current forward active demand is 1.234kW


Voltage on A phase is 123.4V


Current on A phase is 12.34A


Temperature on T1 is 25.5 cent degree


Temperature on T2 is 25.5 cent degree


Temperature on T3 is 25.5 cent degree

Note: There are parts of the display function, and other menus are familiar with the example above. The customers can understand the meaning refer to the above examples.

## 8.3 Key Menu

Press SET at any main menu and get in “PASS” interface, and then press ↵ show “0000”, and enter the code. If you enter a wrong code, it will show “fail” and back to main menu; and if you enter a right code, you can set the parameter. After setting the parameter and press SET, it will show “save” and save the change by pressing ↵ in “yes” interface and quit without save by pressing ↵ in “no” interface.

## 8.4 Data settings

| Num | First menu | | Second menu | | |
|---|---|---|---|---|---|
| | Symbol | Mean | Symbol | Mean | Range |
| 1 | BUS | Communication settings | ADDR | Address setting | 1-247 |
| | | | Baud | Baud rate | 19200、9600、4800、2400、1200 |
| | | | Parity | Parity | None、Even |
| 2 | SyS | System settings | PL | Network | 3P4L: 3 phase 4 lines 3P3L: 3 phase 3 lines |
| | | | EF.E | Multi-tariff rate | EF: Multi-tariff rate E: No multi-tariff rate |
| | | | Code | Code setting | 1-9999 |
| | | | LED | Time of light | 1-9999 |
| 3 | In. | Transformer settings | Pt | Voltage transformer | 1-9999 |
| | | | Ct | Current | 1-9999 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | transformer | |

Note: Customers can choose None or Even under Modbus protocol.

# 9 Communication description

The meter adapts MODBUS-RTU protocol, and the baud rate can be chosen from 1200bps、2400 bps、4800 bps、9600bps and 19200 bps. The parity is None.

The meter needs shielded twisted pair conductors to connect. Customers should consider the whole network's parameters such like communication wire's length, the direction, communication transformer and network cover range, etc.

Note:

Wiring should follow the wiring requirements;

Connect all the meter in the RS485 net work even some do not need to communication, which is benefit for error checking and testing;

Use two color wires in connecting wires and all the A port use the same color.

No longer than 1200 meters of RS485 bus line.

## 9.1 ADDR list

MODBUS-RTU protocol has 03H and 10H command to read and write registers respectively. The following chart is registers' address list:

| Address | Variable | Length | R/W | Notes |
|---|---|---|---|---|
| 0000H | Current total active energy | 4 | R | E=data*PT*CT*0.01<br>Data：data read in the communication,<br>Pt：voltage ratio<br>CT：current ratio<br>Unit:kWh (active)<br>kVarh(reactive)<br>This formula is applicable to all electric energy values. |
| 0002H | Current spike total active energy | 4 | R | |
| 0004H | Current peak total active energy | 4 | R | |
| 0006H | Current flat total active energy | 4 | R | |
| 0008H | Current valley total active energy | 4 | R | |
| 000AH | Current forward active total energy | 4 | R | |
| 000CH | Current forward active spike energy | 4 | R | |
| 000EH | Current forward active peak energy | 4 | R | |
| 0010H | Current forward active flat energy | 4 | R | |
| 0012H | Current forward active valley energy | 4 | R | |
| 0014H | Current reversing active total energy | 4 | R | |

| | | | | |
|---|---|---|---|---|
| 0016H | Current reversing active spike energy | 4 | R | |
| 0018H | Current reversing Active peak energy | 4 | R | |
| 001AH | Current reversing active flat energy | 4 | R | |
| 001CH | Current reversing Active valley energy | 4 | R | |
| 001EH | Current total reactive energy | 4 | R | |
| 0020H | Current total reactive spike energy | 4 | R | |
| 0022H | Current total reactive peak energy | 4 | R | |
| 0024H | Current total reactive flat energy | 4 | R | |
| 0026H | Current total reactive valley energy | 4 | R | |
| 0028H | Current forward reactive total energy | 4 | R | |
| 002AH | Current forward reactive spike energy | 4 | R | |
| 002CH | Current forward reactive peak energy | 4 | R | |
| 002EH | Current forward reactive flat energy | 4 | R | |
| 0030H | Current forward reactive valley energy | 4 | R | |
| 0032H | Current reversing reactive total energy | 4 | R | |
| 0034H | Current reversing reactive spike energy | 4 | R | |
| 0036H | Current reversing reactive peak energy | 4 | R | |
| 0038H | Current reversing reactive flat energy | 4 | R | |
| 003AH | Current reversing reactive valley energy | 4 | R | |
| 003CH | Time: second, minute | 2 | R/W | |
| 003DH | Time: hour, day | 2 | R/W | |

| | | | | |
|---|---|---|---|---|
| 003EH | Time: month, year | 2 | R/W | |
| 003FH<br>high byte | First communication path：Address | 1 | R/W | 1～247 |
| 003FH<br>low byte | First communication path：Baud rate | 1 | R/W | 1：9600pbs<br>2：4800pbs<br>3：2400pbs<br>4：1200pbs |
| 0040H | Pulse constant | 2 | R | |
| 0041H | Time table number of the first time zone<br>Time zone 1 start date: day | 2 | R/W | Time table No.:<br>1: the first time table<br>2: the second time table |
| 0042H | Time zone 1 start date: month<br>Time table number of the second time zone | 2 | R/W | |
| 0043H | Time zone 2 start date: day<br>Time zone 2 start date: month | 2 | R/W | |
| 0044H | Time table number of the third time zone<br>Time zone 3 start date: day | 2 | R/W | |
| 0045H | Time zone 3 start date: month<br>Time table number of the fourth time zone | 2 | R/W | |
| 0046H | Time zone 4 start date: day<br>Time zone 4 start date: month | 2 | R/W | |
| 0047H | Rate no. of period 1<br>Start of period 1: minute | 2 | R/W | The first time list:<br>Rate No.:<br>1: sharp<br>2: peak<br>3: flat<br>4: Valley<br>0: no rate |
| 0048H | Start of period 1: hour<br>Rate no. of period 2 | 2 | R/W | |
| 0049H | Start of period 2: minute<br>Start of period 2: hour | 2 | R/W | |
| 004AH | Rate no. of period 3<br>Start of period 3: minute | 2 | R/W | |
| 004BH | Start of period 3: hour<br>Rate no. of period 4 | 2 | R/W | |
| 004CH | Start of period 4: minute<br>Start of period 4: hour | 2 | R/W | |
| 004DH | Rate no. of period 5<br>Start of period 5: minute | 2 | R/W | |
| 004EH | Start of period 5: hour<br>Rate no. of period 6 | 2 | R/W | |

| | | | | |
|---|---|---|---|---|
| 004FH | Start of period 6: minute<br>Start of period 6: hour | 2 | R/W | |
| 0050H | Rate no. of period 7<br>Start of period 7: minute | 2 | R/W | |
| 0051H | Start of period 7: hour<br>Rate no. of period 8 | 2 | R/W | |
| 0052H | Start of period 8: minute<br>Start of period 8: hour | 2 | R/W | |
| 0053H | Rate no. of period 1<br>Start of period 1: minute | 2 | R/W | The second time list<br>Rate No.:<br>1: sharp<br>2: peak<br>3: flat<br>4: Valley<br>0: no rate |
| 0054H | Start of period 1: hour<br>Rate no. of period 2 | 2 | R/W | |
| 0055H | Start of period 2: minute<br>Start of period 2: hour | 2 | R/W | |
| 0056H | Rate no. of period 3<br>Start of period 3: minute | 2 | R/W | |
| 0057H | Start of period 3: hour<br>Rate no. of period 4 | 2 | R/W | |
| 0058H | Start of period 4: minute<br>Start of period 4: hour | 2 | R/W | |
| 0059H | Rate no. of period 5<br>Start of period 5: minute | 2 | R/W | |
| 005AH | Start of period 5: hour<br>Rate no. of period 6 | 2 | R/W | |
| 005BH | Start of period 6: minute<br>Start of period 6: hour | 2 | R/W | |
| 005CH | Rate no. of period 7<br>Start of period 7: minute | 2 | R/W | |
| 005DH | Start of period 7: hour<br>Rate no. of period 8 | 2 | R/W | |
| 005EH | Start of period 8: minute<br>Start of period 8: hour | 2 | R/W | |
| 005FH | Rate no. of period 9<br>Start of period 9: minute | 2 | R/W | |
| 0060H | Start of period 9: hour | 2 | R/W | |
| 0061H | Voltage of A phase | 2 | R | U=data*PT*0.1<br>Unit:V |
| 0062H | Voltage of B phase | 2 | R | |
| 0063H | Voltage of C phase | 2 | R | |

| | | | | |
|---|---|---|---|---|
| 0064H | Current of A phase | 2 | R | I=data*CT*0.01<br>Unit:A |
| 0065H | Current of B phase | 2 | R | |
| 0066H | Current of C phase | 2 | R | |
| 0067H-0076H | Reserve | | | |
| 0077H | Frequency | 2 | R | F= data*0.01<br>Unit:Hz |
| 0078H | Voltage between A-B | 2 | R | |
| 0079H | Voltage between C-B | 2 | R | |
| 007AH | Voltage between A-C | 2 | R | |
| 007BH | Forward active maximum demand | 2 | R | Keep 3 decimal places for the maximum demand; |
| 007CH | Time of occurrence :minute,hour | 2 | R | |
| 007DH | Time of occurrence :day,month | 2 | R | |
| 007EH | Reversing active maximum demand | 2 | R | |
| 007FH | Time of occurrence :minute,hour | 2 | R | |
| 0080H | Time of occurrence :day,month | 2 | R | |
| 0081H | Maximum forward demand for reactive power | 2 | R | |
| 0082H | Time of occurrence :minute,hour | 2 | R | |
| 0083H | Time of occurrence :day,month | 2 | R | |
| 0084H | Maximum reversing demand for reactive power | 2 | R | |
| 0085H | Time of occurrence :minute,hour | 2 | R | |
| 0086H | Time of occurrence :day,month | 2 | R | |
| 0087H | Forward active energy of A phase | 4 | R | |

| | | | | |
|---|---|---|---|---|
| 0089H | Forward active energy of B phase | 4 | R | |
| 008BH | Forward active energy of C phase | 4 | R | |
| 008DH | Voltage transfer(PT) | 2 | R/W | |
| 008EH | Current transfer(CT) | 2 | R/W | |
| 008FH | State of DIDO, over-voltage, loss-voltage | 2 | R | |
| 0090H | Reserve | 2 | R | |
| 0091H<br>high byte | Running state 1 | 1 | R/W | |
| 0091H<br>low byte | Running state 2 | 1 | R/W | |
| 0092H | Zero sequence current | 2 | R | |
| 0093H | Voltage imbalance | 2 | R | unit 0.1% |
| 0094H | Current imbalance | 2 | R | |
| 0095H | First communication path：<br>Testing byte（High 8 bytes）<br>Stop byte（Low 8 bytes） | 2 | R/W | testing byte：<br>0： none<br>2： even<br>stop byte：<br>0: 1 stop byte<br>1: 2 stop bytes |
| 0096H | Second communication path：<br>Address（High 8 bytes）<br>Baud rate（Low 8 bytes） | 2 | R/W | Same as the first communication path |
| 0097H | Second communication path：<br>Testing byte（High 8 bytes）<br>Stop byte（Low 8 bytes） | 2 | R/W | Same as the first communication path |
| 0098H-<br>00B1H | Reserved | | | |
| 00B2H | Rate no. of period 9<br>Start of period 9: minute | 2 | R/W | The first time list:<br>Rate No.:<br>1: sharp<br>2: peak<br>3: flat<br>4: Valley<br>0: no rate |
| 00B3H | Start of period 9: hour<br>Rate no. of period 10 | 2 | R/W | |
| 00B4H | Start of period 10: minute<br>Start of period 10: hour | 2 | R/W | |
| 00B5H | Rate no. of period 11 | 2 | R/W | |

| | | | | |
|---|---|---|---|---|
| | Start of period 11: minute | | | |
| 00B6H | Start of period 11: hour<br>Rate no. of period 12 | 2 | R/W | |
| 00B7H | Start of period 12: minute<br>Start of period 12: hour | 2 | R/W | |
| 00B8H | Rate no. of period 13<br>Start of period 13: minute | 2 | R/W | |
| 00B9H | Start of period 13: hour<br>Rate no. of period 14 | 2 | R/W | |
| 00BAH | Start of period 14: minute<br>Start of period 14: hour | 2 | R/W | |
| 00BBH | Rate no. of period 9<br>Start of period 9: minute | 2 | R/W | The second time list<br>Rate No.:<br>1: sharp<br>2: peak<br>3: flat<br>4: Valley<br>0: no ratet |
| 00BCH | Start of period 9: hour<br>Rate no. of period 10 | 2 | R/W | |
| 00BDH | Start of period 10: minute<br>Start of period 10: hour | 2 | R/W | |
| 00BEH | Rate no. of period 11<br>Start of period 11: minute | 2 | R/W | |
| 00BFH | Start of period 11: hour<br>Rate no. of period 12 | 2 | R/W | |
| 00C0H | Start of period 12: minute<br>Start of period 12: hour | 2 | R/W | |
| 00C1H | Rate no. of period 13<br>Start of period 13: minute | 2 | R/W | |
| 00C2H | Start of period 13: hour<br>Rate no. of period 14 | 2 | R/W | |
| 00C3H | Start of period 14: minute<br>Start of period 14: hour | 2 | R/W | |
| 00C4H<br>…<br>0163H | Reserved | | | |
| 0164H | Active power of A phase | 4 | R | PQS=data*PT*CT*0.001<br>Unit:KW(active)<br>kVar(reactive)<br>kVA(apparent)<br>Active power and |
| 0166H | Active power of B phase | 4 | R | |
| 0168H | Active power of C phase | 4 | R | |
| 016AH | Total active power | 4 | R | |
| 016CH | Reactive power of A phase | 4 | R | |

| | | | | |
|---|---|---|---|---|
| 016EH | Reactive power of B phase | 4 | R | reactive power are signed data, please set them as signed variables. |
| 0170H | Reactive power of C phase | 4 | R | |
| 0172H | Total reactive power | 4 | R | |
| 0174H | Apparent power of A phase | 4 | R | |
| 0176H | Apparent power of b phase | 4 | R | |
| 0178H | Apparent power of c phase | 4 | R | |
| 017AH | Total apparent power | 4 | R | |
| 017CH | Power factor of A phase | 2 | R | PF=data*0.001<br>Data is signed data, please set them as signed variables. |
| 017DH | Power factor of B phase | 2 | R | |
| 017EH | Power factor of C phase | 2 | R | |
| 017FH | Total power factor | 2 | R | |
| 0180H | Maximum forward active demand a day | 2 | R | Keep three decimal places |
| 0181H | Occur time:minute,hour | 2 | R | |
| 0182H | Maximum reversing active demand a day | 2 | R | |
| 0183H | Occur time:minute,hour | 2 | R | |
| 0184H | Maximum forward reactive demand a day | 2 | R | |
| 0185H | Occur time:minute,hour | 2 | R | |
| 0186H | Maximum reversing reactive demand a day | 2 | R | |
| 0187H | Occur time:minute,hour | 2 | R | |
| 0188H | Maximum forward active demand last day | 2 | R | |
| 0189H | Occur time:minute,hour | 2 | R | |

| | | | | |
|---|---|---|---|---|
| 018AH | Maximum reversing active demand last day | 2 | R | |
| 018BH | Occur time:minute,hour | 2 | R | |
| 018CH | Maximum forward reactive demand last day | 2 | R | |
| 018DH | Occur time:minute,hour | 2 | R | |
| 018EH | Maximum reversing reactive demand last day | 2 | R | |
| 018FH | Occur time:minute,hour | 2 | R | |
| 0190H | Maximum forward active demand last 2 days | 2 | R | |
| 0191H | Occur time:minute,hour | 2 | R | |
| 0192H | Maximum reversing active demand last 2 days | 2 | R | |
| 0193H | Occur time:minute,hour | 2 | R | |
| 0194H | Maximum forward reactive demand last 2 days | 2 | R | |
| 0195H | Occur time:minute,hour | 2 | R | |
| 0196H | Maximum reversing reactive demand last 2 days | 2 | R | |
| 0197H | Occur time:minute,hour | 2 | R | |
| 0198H | Current forward active demand | 2 | R | |
| 0199H | Current reversing active demand | 2 | R | |
| 019AH | Current forward reactive demand | 2 | R | |
| 019BH | Current reversing reactive demand | 2 | R | |
| 019BH-01FFH | Reserved | | | |
| 0200H | Maximum voltage on A phase | 2 | R | |
| 0201H | Occur time:month,day | 2 | R | |
| 0202H | Occur time:hour,minute | 2 | R | |
| 0203H | Maximum voltage on B phase and occur time | 6 | R | |

| | | | |
|---|---|---|---|
| 0206H | Maximum voltage on C phase and occur time | 6 | R |
| 0209H | Maximum current on A phase and occur time | 6 | R |
| 020CH | Maximum current on B phase and occur time | 6 | R |
| 020FH | Maximum current on C phase and occur time | 6 | R |
| 0212H | Maximum active power on A phase | 4 | R |
| 0214H | Occur time:month,day | 2 | R |
| 0215H | Occur time:hour,minute | 2 | R |
| 0216H | Maximum active power on B phase and occur time | 8 | R |
| 021AH | Maximum active power on C phase and occur time | 8 | R |
| 021EH | Maximum total active power and occur time | 8 | R |
| 0222H | Maximum reactive power on A phase and occur time | 8 | R |
| 0226H | Maximum reactive power on B phase and occur time | 8 | R |
| 022AH | Maximum reactive power on C phase and occur time | 8 | R |
| 022EH | Maximum total reactive power and occur time | 8 | R |
| 0232H | Maximum apparent power on A phase and occur time | 8 | R |
| 0236H | Maximum apparent power on B phase and occur time | 8 | R |
| 023AH | Maximum apparent power on C phase and occur time | 8 | R |
| 023EH | Maximum total apparent power and occur time | 8 | R |
| 0242H | Minimum voltage on A phase and occur time | 6 | R |
| 0245H | Minimum voltage on B phase and occur time | 6 | R |
| 0248H | Minimum voltage on C phase and occur time | 6 | R |
| 024BH | Minimum current on A phase and occur time | 6 | R |
| 024EH | Minimum current on B phase and occur time | 6 | R |

| | | | | |
|---|---|---|---|---|
| 0251H | Minimum current on C phase and occur time | 6 | R | |
| 0254H | Minimum active power on A phase and occur time | 8 | R | |
| 0258H | Minimum active power on B phase and occur time | 8 | R | |
| 025CH | Minimum active power on C phase and occur time | 8 | R | |
| 0260H | Minimum active power and occur time | 8 | R | |
| 0264H | Minimum reactive power on A phase and occur time | 8 | R | |
| 0268H | Minimum reactive power on B phase and occur time | 8 | R | |
| 026CH | Minimum reactive power on C phase and occur time | 8 | R | |
| 0270H | Minimum reactive power and occur time | 8 | R | |
| 0274H | Minimum apparent power on A phase and occur time | 8 | R | |
| 0278H | Minimum apparent power on B phase and occur time | 8 | R | |
| 027EH | Minimum apparent power on C phase and occur time | 8 | R | |
| 0280H | Minimum apparent power and occur time | 8 | R | |
| 0284H-07FFH | Reserved | | | |
| **0700H** | Total current active energy of the standby loop | **4** | **R** | **E=data*PT*CT*0.01**<br>This formula applies to all electric energy values. Data is the data read in communication.PT is voltage change ratio, CT is current change ratio, and the unit of calculation result is kWh (degree).If the result does not |
| **0702H** | Current total active peak energy of the standby loop | **4** | **R** | |
| **0704H** | Current total active peak electric energy of the standby circuit | **4** | **R** | |
| **0706H** | Current total active flat energy of the standby loop | **4** | **R** | |
| **0708H** | Current total active valley energy of the standby circuit | **4** | **R** | |
| **070AH** | The total active energy of the standby loop is currently forward | **4** | **R** | |
| **070CH** | The current positive active power tip of the standby loop | **4** | **R** | |
| **070EH** | Current active peak power of the | **4** | **R** | |

| | | | | |
|---|---|---|---|---|
| | standby loop | | | correspond with the display, please pay attention to whether the variable ratio is involved in the calculation and the difference between the total energy and the positive and negative energy |
| **0710H** | The standby loop has positive active flat power | **4** | **R** | |
| **0712H** | The standby circuit is currently positive active valley power | **4** | **R** | |
| **0714H** | Standby back to the current reverse total active energy | **4** | **R** | |
| **0716H** | Current reverse active power tip of standby loop | **4** | **R** | |
| **0718H** | Current reverse active peak power of the standby loop | **4** | **R** | |
| **071AH** | Standby loop current reverse active flat power | **4** | **R** | |
| **071CH** | Current reverse active valley power of the standby circuit | **4** | **R** | |
| **071EH** | Total current reactive energy of the standby circuit | **4** | **R** | This formula applies to all electric energy values. Data is the data read in communication.PT is voltage change ratio, CT is current change ratio, and the unit of calculation result is kVarh.If the result does not correspond with the display, please pay attention to whether the variable ratio is involved in the calculation and the difference between the total energy and the positive and negative energy |
| **0720H** | Current total reactive power peak energy of the standby loop | **4** | **R** | |
| **0722H** | Current total peak reactive energy of the standby loop | **4** | **R** | |
| **0724H** | Total current reactive flat power of the standby loop | **4** | **R** | |
| **0726H** | Current total reactive valley power of the standby circuit | **4** | **R** | |
| **0728H** | Total positive reactive energy of the standby loop | **4** | **R** | |
| **072AH** | The current positive reactive power tip of the standby loop | **4** | **R** | |
| **072CH** | The current positive reactive peak power of the standby loop | **4** | **R** | |
| **072EH** | Current positive reactive flat power in the standby loop | **4** | **R** | |
| **0730H** | The current positive reactive valley power of the standby circuit | **4** | **R** | |
| **0732H** | Total current reactive energy in reverse of the standby loop | **4** | **R** | |
| **0734H** | Current reverse reactive power of the standby loop | **4** | **R** | |
| **0736H** | Current reverse reactive peak power of the standby loop | **4** | **R** | |
| **0738H** | Current reverse reactive flat power of the standby loop | **4** | **R** | |

| | | | | |
|---|---|---|---|---|
| **073AH** | Current reverse reactive valley power of the standby circuit | **4** | **R** | |
| **073DH** | State of DI | **2** | **R** | |
| 073EH-1FFFH | Reserve | | | |
| 2000H | T1 temperature | 2 | R | |
| 2001H | T2 temperature | 2 | R | |
| 2002H | T3 temperature | 2 | R | |

## 9.2 History energy frozen time and history energy energy date

ADL3000-EF's registers on frozen by day and by month.

| Address | Name | R/W | Note |
|---|---|---|---|
| 0121H | Frozen time by day | R/W | Null (High byte) Hour(Low byte) |
| 0122H | Frozen time by month | R/W | Day(High byte) Hour(Low byte) |

ADL3000-EF can achieve the history energy statistic in last 48 months and last 90days. (Each tariff rate of energy can be recorded.)The history energy record can only be read by assemblage and the length of whole part is 120 byte (60 registers), and list below is the registers' name:

| Address | Name |
|---|---|
| 1001H | Assemblage of last 1 month demand and energy |
| 1002H | Assemblage of last 2 months demand and energy |
| … | … |
| 1030H | Assemblage of last 48 months demand and energy |
| 1101H | Assemblage of last 1 day demand and energy |
| 1102H | Assemblage of last 2days demand and energy |
| … | … |
| 115AH | Assemblage of last 90days demand and energy |

| Data list | Name |
|---|---|
| 0000H | Frozen time: YY-MM |
| 0001H | Frozen time: DD-hh |
| 0002H | Total forward active energy |
| 0004H | Spike forward active energy |
| 0006H | Peak forward active energy |
| 0008H | Flat forward active energy |
| 000AH | Valley forward active energy |
| 000CH | Total reversing active energy |
| 000EH | Spike reversing active energy |
| 0010H | Peak reversing active energy |
| 0012H | Flat reversing active energy |
| 0014H | Valley reversing active energy |
| 0016H | Total forward reactive energy |
| 0018H | Spike forward reactive energy |
| 001AH | Peak forward reactive energy |
| 001CH | Flat forward reactive energy |

| | |
|---|---|
| 001EH | Valley forward reactive energy |
| 0020H | Total reversing reactive energy |
| 0022H | Spike reversing reactive energy |
| 0024H | Peak reversing reactive energy |
| 0026H | Flat reversing reactive energy |
| 0028H | Valley reversing reactive energy |
| 002AH | Active energy on A phase |
| 002CH | Active energy on B phase |
| 002EH | Active energy on C phase |
| 0030H | Maximum forward active demand |
| 0031H | Occur time: mm-hh |
| 0032H | Occur time : DD-MM |
| 0033H | Maximum reversing active demand |
| 0034H | Occur time: mm-hh |
| 0035H | Occur time : DD-MM |
| 0036H | Maximum forward reactive demand |
| 0037H | Occur time: mm-hh |
| 0038H | Occur time : DD-MM |
| 0039H | Maximum reversing reactive demand |
| 003AH | Occur time: mm-hh |
| 003BH | Occur time : DD-MM |

## 9.3 Sub harmonic data

ADL3000-EH has function of harmonic. The function include 31st harmonic statistics of voltage and current, harmonic voltage and current of each phase apparently, harmonic active/reactive power of each phase apparently, fundamental voltage and current of each phase apparently and fundamental active/reactive power of each phase apparently.

| Addr | Name | Length | R/W | Note |
|---|---|---|---|---|
| 05DDH | THDUa | 2 | R | Total distortion rate of voltage and current on each phase<br>Int<br>Keep 3 decimal places |
| 05DEH | THDUb | 2 | R | |
| 05DFH | THDUc | 2 | R | |
| 05E0H | THDIa | 2 | R | |
| 05E1H | THDIb | 2 | R | |

| | | | | |
|---|---|---|---|---|
| 05E2H | THDIc | 2 | R | |
| 05E3H | THUa | 2×30 | | Harmonic voltage on 2nd-31st Int Keep 3 decimal places |
| 0601H | THUb | 2×30 | | |
| 061FH | THUc | 2×30 | | |
| 063DH | THIa | 2×30 | | Harmonic current on 2nd-31st Int Keep 2 decimal places |
| 065BH | THIb | 2×30 | | |
| 0679H | THIc | 2×30 | | |
| 0697H | Fundamental voltage on A phase | 2 | | Int Keep 1 decimal places |
| 0698H | Fundamental voltage on B phase | 2 | | |
| 0699H | Fundamental voltage on C phase | 2 | | |
| 069AH | Harmonic voltage on A phase | 2 | | |
| 069BH | Harmonic voltage on B phase | 2 | | |
| 069CH | Harmonic voltage on C phase | 2 | | |
| 069DH | Fundamental current on A phase | 2 | | Int Keep 2 decimal places |
| 069EH | Fundamental current on B phase | 2 | | |
| 069FH | Fundamental current on C phase | 2 | | |
| 06A0H | Harmonic current on A phase | 2 | | |
| 06A1H | Harmonic current on B phase | 2 | | |
| 06A2H | Harmonic current on C phase | 2 | | |
| 06A3H | Fundamental active power on A phase | 2 | | Int Keep 3 decimal places |
| 06A4H | Fundamental active power on B phase | 2 | | |
| 06A5H | Fundamental active power on C phase | 2 | | |
| 06A6H | Total fundamental active power | 2 | | |
| 06A7H | Fundamental reactive power on A phase | 2 | | |
| 06A8H | Fundamental reactive power on B phase | 2 | | |
| 06A9H | Fundamental reactive power on C phase | 2 | | |
| 06AAH | Total fundamental reactive power | 2 | | |
| 06ABH | Harmonic active power on A phase | 2 | | |
| 06ACH | Harmonic active power on B phase | 2 | | |
| 06ADH | Harmonic active power on C phase | 2 | | |
| 06AEH | Total harmonic active power | 2 | | |
| 06AFH | Harmonic reactive power on A phase | 2 | | |
| 06B0H | Harmonic reactive power on B phase | 2 | | |

| | | | |
|---|---|---|---|
| 06B1H | Harmonic reactive power on C phase | 2 | |
| 06B2H | Total harmonic reactive power | 2 | |

## 9.4 SOE record

| Address | Name |
|---|---|
| 3001H | Last event record |
| 3002H | Last 2 event record |
| … | … |
| 3064H | Last 100 event record |

| Data list | Name |
|---|---|
| 0000H | Occur date: YY-MM |
| 0001H | Occur time: DD-hh |
| 0002H | Occur time: mm-ss |
| 0004H | Event number |
| 0005H | Event details |
| 0006H | Reserve |

| Event num | Name | Details | Note |
|---|---|---|---|
| 0100/0101 | Power on/off | | |
| 0200 | Clear | 0001 | Clear current energy |
| | | 0002 | Clear history energy on Flash |
| | | 0003 | Clear maximum demand |
| | | 0004 | Clear history energy |
| | | 0005 | Clear maximum value on a period |
| | | 0006 | Clear out |
| 0300 | DO action | 0000 | DO off |
| | | 0001 | DO on |
| 0400 | UI record | UI | Bit0:<br>Over-voltage on A phase<br>Bit1:<br>Over-voltage on B phase<br>Bit2:;<br>Over-voltage on C phase<br>Bit3:<br>Lose-voltage on A phase<br>Bit4:<br>Lose-voltage on B phase<br>Bit5:<br>Lose-voltage on C phase<br>Bit6:<br>Reversing on A phase<br>Bit7:<br>Reversing on B phase<br>Bit8:<br>Reversing on C phase |

| | | | |
|---|---|---|---|
| | | | Bit9:<br>Over current on A phase<br>Bit10:<br>Over current on B phase<br>Bit11:<br>Over current on C phase<br>Bit12:<br>Low current on A phase<br>Bit13:<br>Low current on B phase<br>Bit14:<br>Low current on C phase |
| 0700 | Time calibration | | |

Example: The address is 001 at present, and we send the code: 01 03 30 01 00 06 9B 08 to get the last event record, and the slave station will give back: 01 03 0C 12 01 08 0A 01 01（2018/1/8 10:1:1）01 00（powered） 00 00（no details） 00 00（reserved） 80 23