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# ADL400

Installation and operation instruction V1.4

**ACREL Co.,Ltd**

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## Declaration

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说明书修订记录

| Data | Old | New | Change |
|---|---|---|---|
| 2019.11.13 | | V1.0 | 1.First version |
| 2020.04.30 | V1.0 | V1.1 | 2.Heading 6.2 changed |
| 2020.08.24 | V1.1 | V1.2 | 3.Figure 4 Figure 6 changed |
| 2021.04.08 | V1.2 | V1.3 | 4.Correction of key setting flow chart |
| 2022.01.14 | V1.3 | V1.4 | 5. Correcte mistakes in data settings<br>6. Add partial ADDR list<br>7. Update some notes in ADDR list |

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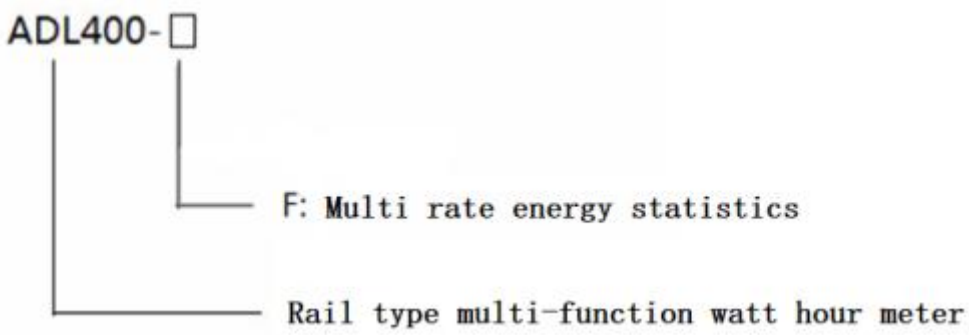
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# 1 General

ADL400 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 48 months, checks the 31st harmonic content and the total harmonic content. It is fitted with RS485 communication port and adapted to MODBUS-RTU .ADL400 can be used in all kinds of control systems, SCADA systems and energy management systems. The meter meet the related technical requirements of electricity meter in the IEC62053-21standards.

# 2 Type description




# 3 Function description

Table 1 Function description list

| Function | Function description | Function provide |
|---|---|---|
| Measurement of kWh | Active kWh (positive and negative) | ■ |
| | Reactive kWh (positive and negative) | ■ |
| | A. B, C split phase positive active energy | ■ |
| Measurement of electrical parameters | U、I | ■ |
| | P、Q、S、PF、F | ■ |
| Measurement of harmonics | 2~31$^{ST}$ Voltage and current harmonic | ■ |
| LCD Display | 12 bits section LCD display, background light | ■ |
| Key programming | 3 keys to communication and set parameters | ■ |
| Pulse output | Active pulse output | ■ |



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| | | |
|---|---|---|
| Multi-tariff and functions | Adapt 4 time zones, 2 time interval lists, 14 time interval by day and 4 tariff rates | □ |
| | Max demand and occurrence time | □ |
| | Frozen data on last 48 months, last 90days | □ |
| | Date, time | □ |
| Communication | Communication interface: RS485, Communication protocol: MODBUS-RTU | ■ |

# 4 Technical parameter

Table 2 technical parameter descriptions

| **project** | | | **performance parameter** |
|---|---|---|---|
| Specification | | | 3 phase 3 wires, 3 phase 4 wires |
| Measurement | 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， 3×10(80)A |
| | | 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% |
| Metering | Energy | | Active energy(Accuracy class: 0.5)<br>reactive energy(Accuracy class 2) |
| | Clock | | ≤0.5s/d |
| Digit signal | Energy pulse output | | 1 active photocoupler output |
| pulse | Width of pulse | | 80±20ms |
| | Pulse constant | | 400imp/kWh,10000imp/kWh(Correspond with the basic current) |
| communication | Interface and communication protocol | | RS485 口：Modbus RTU<br>RS485：Modbus RTU |
| | Range of communication address | | Modbus RTU:1~ 247； |
| | Baud rate | | 1200bps~19200bps |



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| | | |
|---|---|---|
| environment | working temperature | -25℃~+55℃ |
| | Relative humidity | ≤95%(No condensation) |

# 5 Dimension drawings

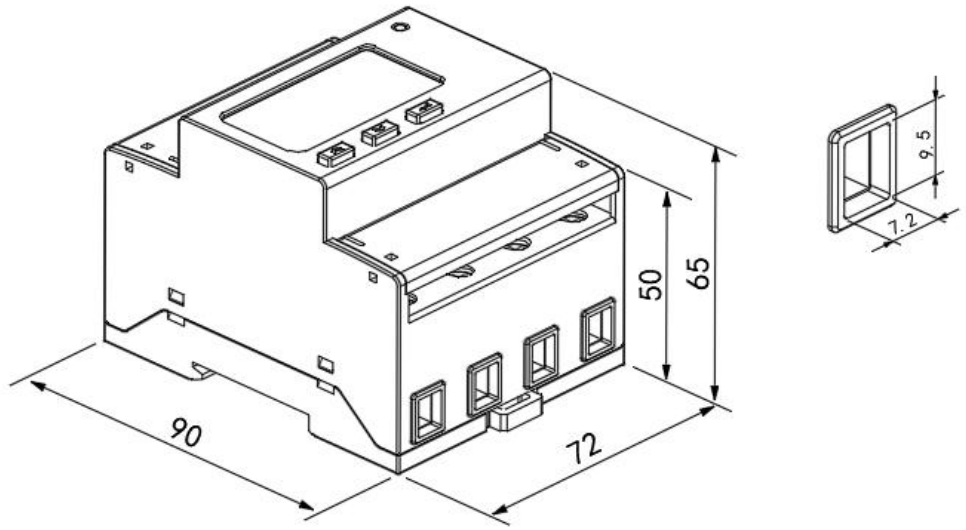



Fig 1 direct connect

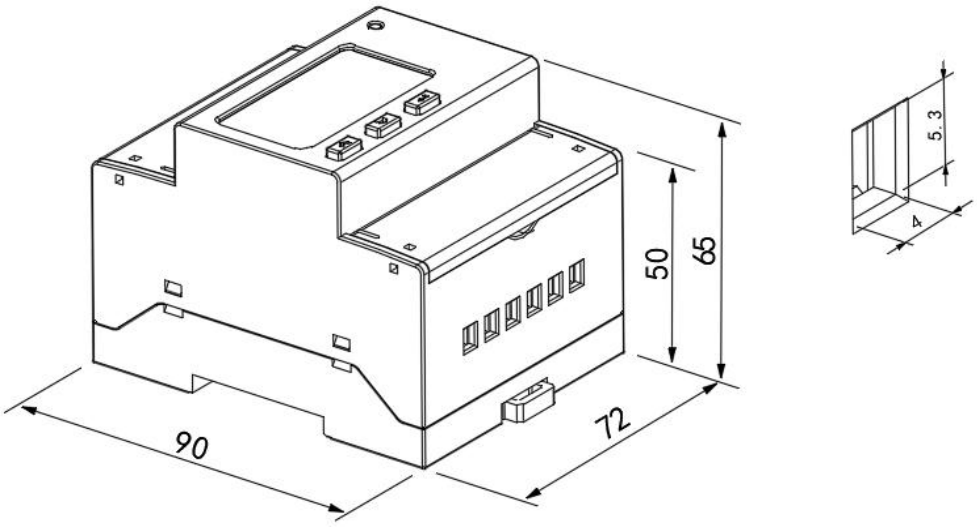



Fig 2 connect via CT

Note：The torque of direct connect should not be greater than 3-4N·m，and the torque of connect via CT should not be greater than 1.5-2N·m。

# 6 Wiring and installing

## 6.1 Wiring sample of voltage and current



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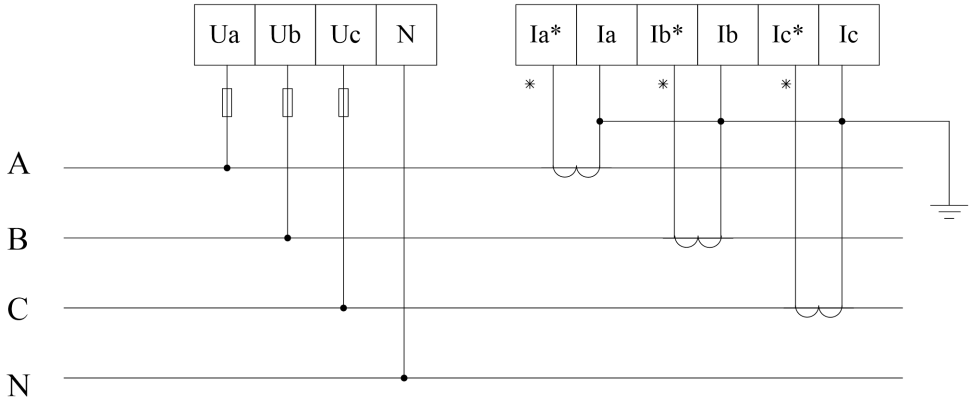



Fig 3 Three phase four lines connect via CT

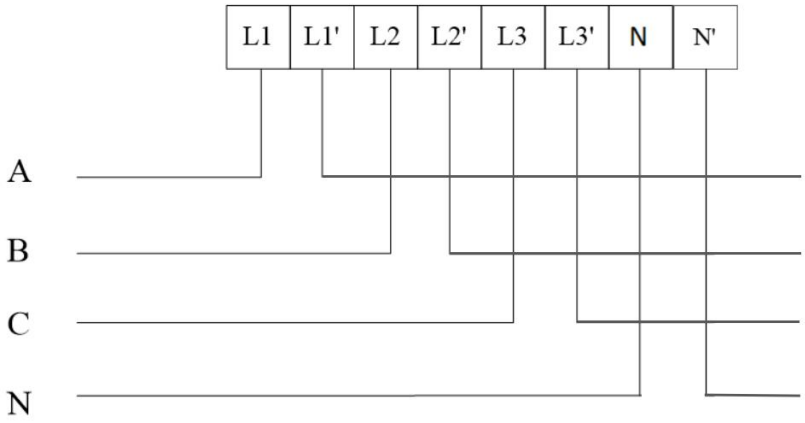



Fig 4 Three phase four lines direct connect

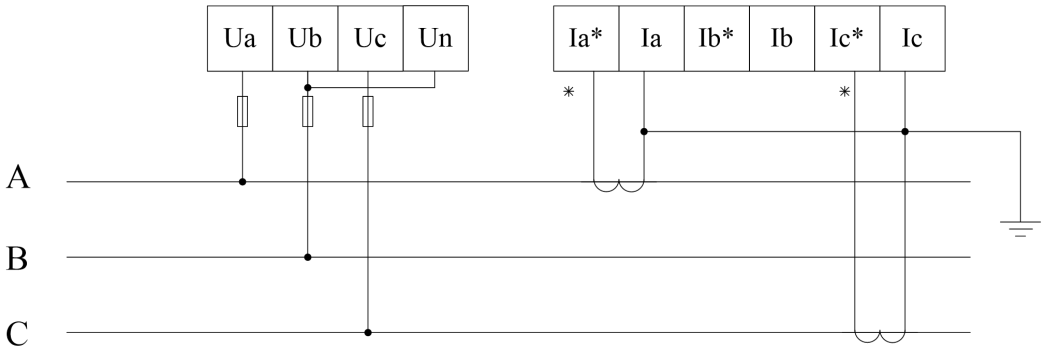



Fig 5 Three phase three lines connect via CT



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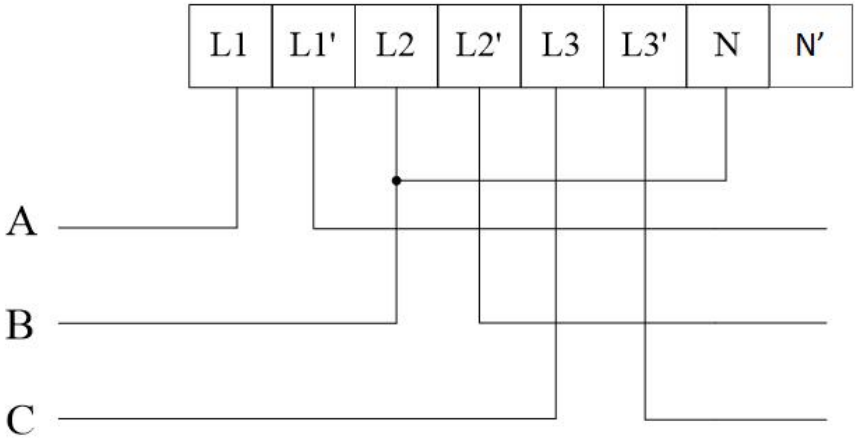



Fig 6 Three phase three lines direct connect

### 6.2 Wiring diagram of communication and pulse terminals

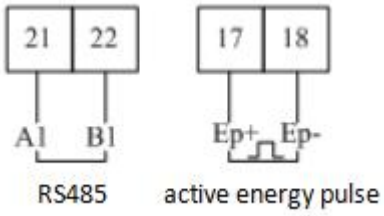



Fig 7 Communication, pulse connection

## 7 Function description

### 7.1 Measurement

It can measure the electrical parameter,include U、I、P、Q、S、PF、F、1~31th harmonic。

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

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

### 7.2 Calculating

Can measure the active energy、forward active energy、reversing active energy、forward reactive energy、reversing reactive energy。

### 7.3 Timing

Two timing table，four time zone，one table have fourteen timing，four rate。

### 7.4 Demand

The description about demand:

Table 3 Demand description list

| | |
|---|---|
| Demand | The average power in the demand cycle. |
| Maximum demand | The maximum value of demand in a period of time. |



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| | |
|---|---|
| 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, inductive reactive, capacitive 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.

## 8 Operation and display

### 8.1 Key function description

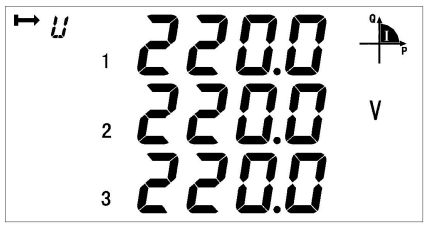
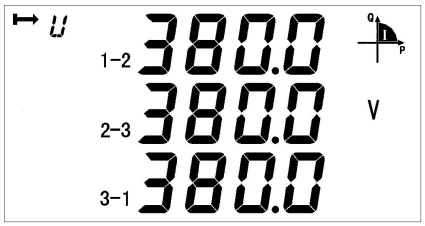
Table 4 Key's function description

| icon | Name | Function |
|---|---|---|
|  | 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>In/out programming menu<br>Save changes |

### 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 menu description is listed as below:

Table 5 display descriptions

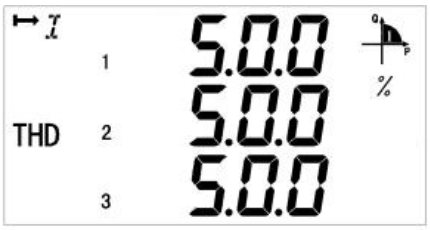
| | | |
|---|---|---|
|  |  |  |
| | Three-phase voltage<br>Three-phase Current | Three phase line voltage<br>Frequency |



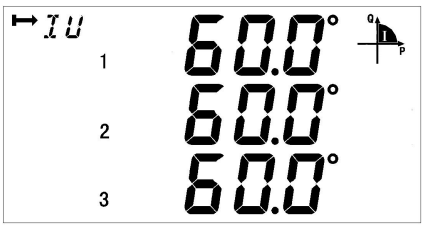
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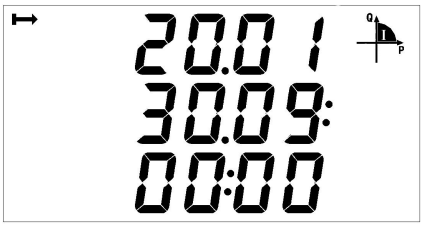

Harmonic content of three phase Voltage



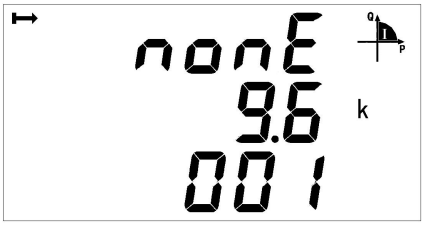

Harmonic content of three phase Current



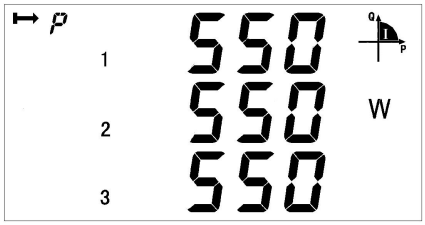

Phase angle




Time




Check bit, baud rate, table address, software version number, full display detection;

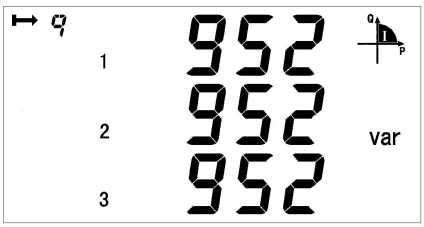



Three phase active power




Total active power





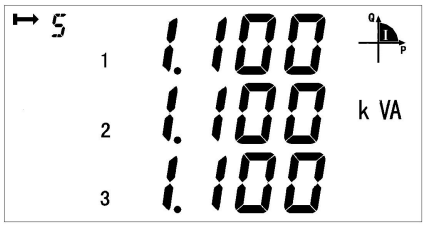

Three phase reactive power




Total reactive power



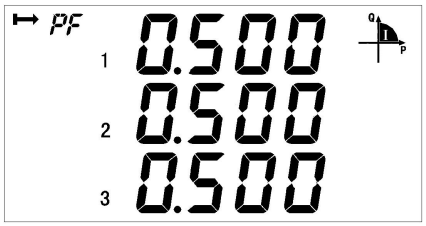
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Three phase apparent power




Total apparent power




Three phase power factor




Total power factor

T3 represents the normal period, ① represents the first time table




(Current value is1616.89kWh)

Current total active energy




Current spike active energy

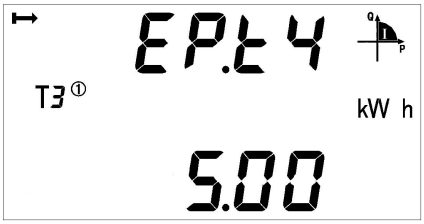





Current peak active energy




Current flat active energy




Current valley active energy




Current forward active total energy



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Current reversing active total energy




Current total reactive energy

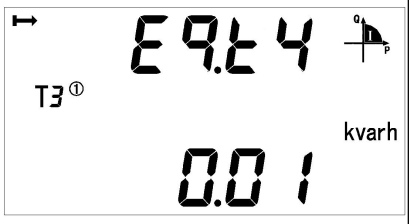



Current reactive spike energy



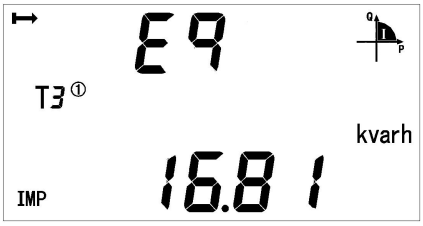

Current reactive peak energy




Current reactive flat energy

Current reactive valley energy

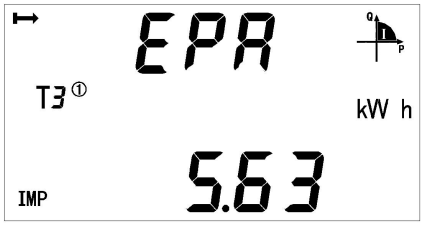






Current forward reactive total energy

Current reversing reactive total energy





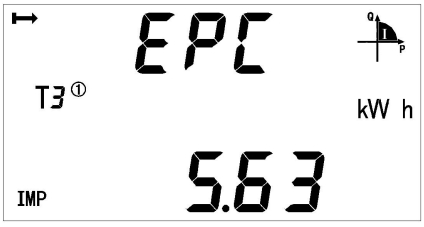


Current forward active energy

on A phase

Current forward active energy

on B phase






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| | |
|---|---|
| | Current forward active energy on C phase |

Note:

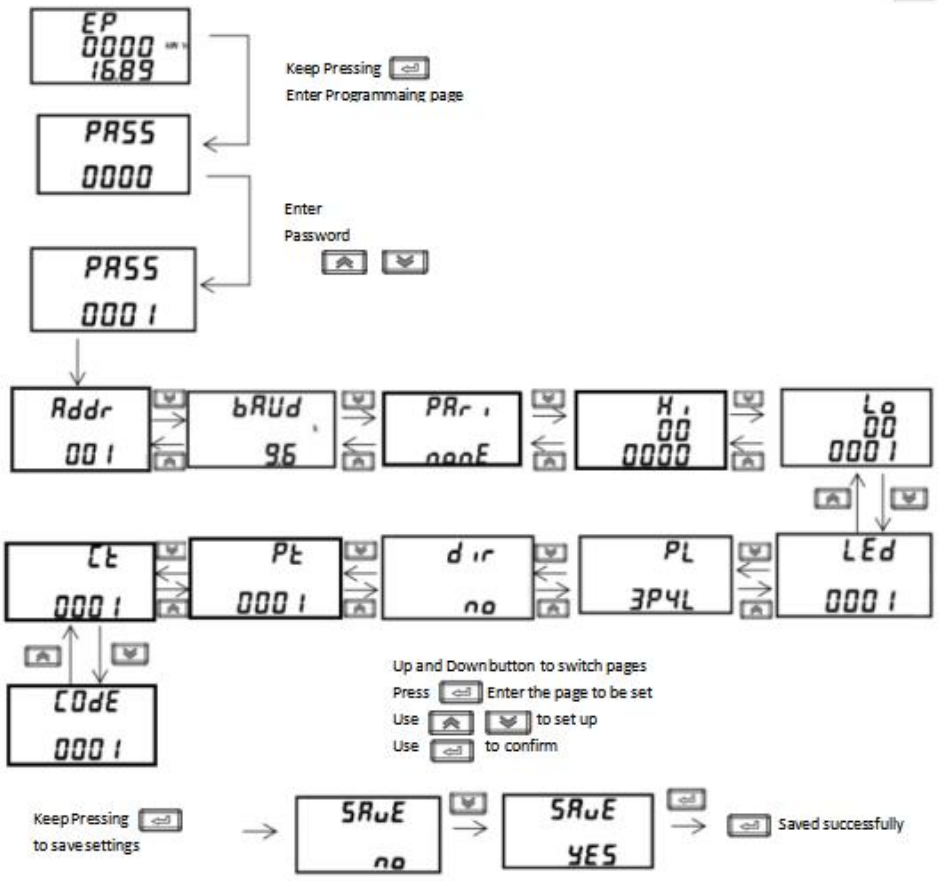
1 All the display menus above are in the model of ADL400 three phases four lines with multi-tariff rate function and can be changed by the keys.

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.

## 8.3 Key Menu

Keep press  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 keep press , it will show “save” and save the change by pressing in “yes” interface and quit without save by pressing  in “no” interface.






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### 8.4 Date settings

| Num | Second menu | | |
|---|---|---|---|
| | Symbol | Mean | Range |
| 1 | ADDR | Communicate's ADDR settings | 1-254 |
| 2 | Baud | Baud choose | 1200、2400、4800、9600、19200 |
| 3 | Pari | Parity choose | None、Odd、Even |
| 4 | LED | Backlight time | 0-255minutes，more than 000 stay light-on |
| 5 | PL | Wiring sample | 3P4L:3 phase 4 wires<br>3P3L:3 phase 3 wires |
| 6 | DIR | direction of current | no-Forward<br>yes-Reverse |
| 7 | S-TY | Apparent power calculation method | PQS<br>RMS |
| 8 | EF-E | time-sharing measurement function | EF-Function on<br>E-Function off |
| 9 | Pt | Voltage transformer settings | 1-9999 |
| 10 | Ct | Current transformer settings | 1-9999 |
| 11 | CoDE | Code settings | 1-9999 |
| 12 | PHAS | Phase angle calculation method | No-Angle between each current and each voltage<br>Yes-Angle between three-phase current and phase a voltage |
| 13 | nost | Starting power shield | Shielding range:0.1-2.0% (*UnIn) |

# 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:

1、Wiring should follow the wiring requirements;

2、Connect all the meter in the RS485 net work even some do not need to communication,



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which is benefit for error checking and testing;

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

4、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:

Table 8 communication address list

| Address | Variable | Length | R/W | Notes |
|---|---|---|---|---|
| 0000H | Current total active energy | 4 | R | kVarh<br>Int<br>Keep 2 decimal places<br><br>Particularly, if ct and Pt is not all 1, actual electric energy value should be product of register reading and Pt*ct. |
| 0002H | Current spike active energy | 4 | R | |
| 0004H | Current peak active energy | 4 | R | |
| 0006H | Current flat active energy | 4 | R | |
| 0008H | Current valley 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 reactive spike energy | 4 | R | |
| 0022H | Current reactive peak energy | 4 | R | |
| 0024H | Current reactive flat energy | 4 | R | |
| 0026H | Current 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 | |



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| | | | | |
|---|---|---|---|---|
| 003DH | Time：hour、day | 2 | R/W | |
| 003EH | Time：month、year | 2 | R/W | |
| 003FH | First communication path：<br>Address（high 8 bit）<br>Baud（low 8 bit） | 2 | R/W | baud：<br>0：1200<br>1：2400<br>2：4800<br>3：9600<br>4：19200 |
| 0040H | pulse constant | 2 | R | |
| 0041H | First time zone address<br>First time zone start data:day | 2 | R/W | Time zone number：<br>1：First time zone<br>2：Second time zone |
| 0042H | First time zone start data:month<br>Second time zone address | 2 | R/W | |
| 0043H | Second time zone start data:day<br>Second time zone start data:month | 2 | R/W | |
| 0044H | Third time zone address<br>Third time zone start data:day | 2 | R/W | |
| 0045H | Third time zone start data:month<br>Fourth time zone address | 2 | R/W | |
| 0046H | Fourth time zone start data:day<br>Fourth time zone start data:month | 2 | R/W | |
| 0047H-0060H | reserve | | | |
| 0061H | Voltage of A phase | 2 | R | Resolution：0.1V |
| 0062H | Voltage of B phase | 2 | R | |
| 0063H | Voltage of C phase | 2 | R | |
| 0064H | Current of A phase | 2 | R | Resolution：0.01A |
| 0065H | Current of B phase | 2 | R | |
| 0066H | Current of C phase | 2 | R | |
| 0067H | Active power of A phase | 2 | R | Complement form<br>Resolution：0.001kW |
| 0068H | Active power of B phase | 2 | R | |
| 0069H | Active power of C phase | 2 | R | |
| 006AH | Total active power | 2 | R | |
| 006BH | Reactive power of A phase | 2 | R | Complement form<br>Resolution：0.001KVar |
| 006CH | Reactive power of B phase | 2 | R | |
| 006DH | Reactive power of C phase | 2 | R | |
| 006EH | Total reactive power | 2 | R | |
| 006FH | Apparent power of A phase | 2 | R | Complement form<br>Resolution：0.001KVA |
| 0070H | Apparent power of B phase | 2 | R | |
| 0071H | Apparent power of C phase | 2 | R | |
| 0072H | Total apparent power | 2 | R | |



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| | | | | |
|---|---|---|---|---|
| 0073H | Power factor of A phase | 2 | R | Complement form<br>Resolution：0.001 |
| 0074H | Power factor of B phase | 2 | R | |
| 0075H | Power factor of C phase | 2 | R | |
| 0076H | Total power factor | 2 | R | |
| 0077H | frequency | 2 | R | Resolution：0.01 |
| 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 | Resolution：0.001<br>Sequence of occurrence time: minute Hour day month |
| 007CH | Time of occurrence for the forward active maximum amount:minute、hour | 2 | R | |
| 007DH | Time of occurrence for the forward active maximum amount:day、month | 2 | R | |
| 007EH | Reversing active maximum demand | 2 | R | |
| 007FH | Time of occurrence for the Reversing active maximum demand amount:minute、hour | 2 | R | |
| 0080H | Time of occurrence for the Reversing active maximum demand amount:day、month | 2 | R | |
| 0081H | Maximum forward demand for reactive power | 2 | R | |
| 0082H | Time of occurrence for the forward reactive maximum amount:minute、hour | 2 | R | |
| 0083H | Time of occurrence for the forward reactive maximum amount:day、month | 2 | R | |
| 0084H | Maximum reversing demand for reactive power | 2 | R | |
| 0085H | Time of occurrence for the reversing reactive maximum amount:minute、hour | 2 | R | |
| 0086H | Time of occurrence for the reversing reactive maximum amount: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 | PT | 2 | R/W | |
| 008EH | CT | 2 | R/W | |
| 008FH | Reserve | 2 | R | |
| 0090H | Reserve | 2 | R | |
| 0091H | Running state | 2 | R/W | |
| 0092H | Zero sequence current | 2 | R | |



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| | | | | |
|---|---|---|---|---|
| 0093H | Voltage imbalance | 2 | R | Int<br>Resolution：0.001 |
| 0094H | Current imbalance | 2 | R | |
| 0095H | First communication path：<br>Address（high 8 bit）<br>Baud（low 8 bit） | 2 | R/W | parity bit：<br>0：None<br>1：Odd<br>2：Even<br>stop bit：<br>0：one stop bit<br>1：two stop bit |
| 0096H-0098H | Reserve | | | |
| 009FH-00A5H | reserve | | | |
| 00A6H | Code | 2 | R/W | 1-9999 |
| 00A7H-00B**1** | reserve | | | |
| 00B2H<br>...<br>00BAH | 9-14 period of time Parameters setting information | | | The first time list |
| 00BBH<br>...<br>00C3H | 9-14 period of time Parameters setting information | | | The second time list |
| 00C4H-00C9H | Reserve | | | |
| 00CAH | The back light time | 2 | R/W | 0-255minutes，more than 000 stay light-on |
| 00CBH-0120H | reserve | | | |
| 0121H | Daily frozen time:Hour | 2 | R/W | |
| 0122H | Monthly frozentime:day、hour | 2 | R/W | |
| 0123H-0163H | Reserve | | | |
| 0164H | Active power of A phase | 4 | R | Complement form<br>Resolution：0.0001KW |
| 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 | Complement form<br>Resolution：<br>0.0001kvarh |
| 016EH | Reactive power of B phase | 4 | R | |
| 0170H | Reactive power of C phase | 4 | R | |
| 0172H | Total reactive power | 4 | R | |
| 0174H | Apparent power of A phase | 4 | R | Complement form<br>Resolution：<br>0.0001KVA |
| 0176H | Apparent power of B phase | 4 | R | |
| 0178H | Apparent power of C phase | 4 | R | |
| 017AH | Total apparent power | 4 | R | |
| 017CH-017FH | reserve | | | |
| 0180H | Maximum forward active demand a | 2 | R | |



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| | | | | |
|---|---|---|---|---|
| | day | | | Resolution：0.001<br>Occur time:minute、hour |
| 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 | Reserve | | | |
| 0200H | Maximum voltage on A phase | 2 | R | |
| 0201H | Occur date：month、day | 2 | R | |



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| | | | |
|---|---|---|---|
| 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 B phase and occur time | 6 | R |
| 0212H | Maximum active power on A phase | 4 | R |
| 0214H | Occur data：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 | 6 | R |



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| | | | | |
|---|---|---|---|---|
| | occur time | | | |
| 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 total 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 total 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 total apparent power and occur time | 8 | R | |
| 0285H-1FFFH | Reserve | | | |

## 9.2 Floating point electrical parameter data

| | | | | |
|---|---|---|---|---|
| 5300H | Voltage of A phase | 4 | R | float (Secondary side data) |
| 5302H | Voltage of B phase | 4 | R | |
| 5304H | Voltage of C phase | 4 | R | |
| 5306H | Voltage between A-B | 4 | R | |
| 5308H | Voltage between C-B | 4 | R | |
| 530AH | Voltage between A-C | 4 | R | |
| 530CH | Current of A phase | 4 | R | |
| 530EH | Current of B phase | 4 | R | |



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| | | | | |
|---|---|---|---|---|
| 5310H | Current of C phase | 4 | R | |
| 5312H | Active power of A phase | 4 | R | |
| 5314H | Active power of B phase | 4 | R | |
| 5316H | Active power of C phase | 4 | R | |
| 5318H | Total active power | 4 | R | |
| 531AH | Reactive power of A phase | 4 | R | |
| 531CH | Reactive power of B phase | 4 | R | |
| 531EH | Reactive power of C phase | 4 | R | |
| 5320H | Total reactive power | 4 | R | |
| 5322H | Apparent power of A phase | 4 | R | |
| 5324H | Apparent power of B phase | 4 | R | |
| 5326H | Apparent power of C phase | 4 | R | |
| 5328H | Total apparent power | 4 | R | |
| 532AH | Power factor of A phase | 4 | R | |
| 532CH | Power factor of B phase | 4 | R | |
| 532EH | Power factor of C phase | 4 | R | |
| 5330H | Total power factor | 4 | R | |
| 5332H | frequency | 4 | R | |
| 5334H | zero line current | 4 | R | |
| | | | | |
| 0800H | Voltage of A phase | 4 | R | Float<br>(Primary side data) |
| 0802H | Voltage of B phase | 4 | R | |
| 0804H | Voltage of C phase | 4 | R | |
| 0806H | Voltage between A-B | 4 | R | |
| 0808H | Voltage between C-B | 4 | R | |
| 080AH | Voltage between A-C | 4 | R | |
| 080CH | Current of A phase | 4 | R | |
| 080EH | Current of B phase | 4 | R | |
| 0810H | Current of C phase | 4 | R | |
| 0812H | zero line current | 4 | R | |
| 0814H | Active power of A phase | 4 | R | |
| 0816H | Active power of B phase | 4 | R | |
| 0818H | Active power of C phase | 4 | R | |
| 081AH | Total active power | 4 | R | |
| 081CH | Reactive power of A phase | 4 | R | |
| 081EH | Reactive power of B phase | 4 | R | |
| 0820H | Reactive power of C phase | 4 | R | |
| 0822H | Total reactive power | 4 | R | |
| 0824H | Apparent power of A phase | 4 | R | |
| 0826H | Apparent power of B phase | 4 | R | |
| 0828H | Apparent power of C phase | 4 | R | |



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| | | | | |
|---|---|---|---|---|
| 082AH | Total apparent power | 4 | R | |
| 082CH | Power factor of A phase | 4 | R | |
| 082EH | Power factor of B phase | 4 | R | |
| 0830H | Power factor of C phase | 4 | R | |
| 0832H | Total power factor | 4 | R | |
| 0834H | frequency | 4 | R | |
| 0836H | Voltage imbalance | 4 | R | |
| 0838H | Current imbalance | 4 | R | |
| 083AH | Current forward active demand | 4 | R | |
| 083CH | Current reversing active demand | 4 | R | |
| 083EH | Current forward reactive demand | 4 | R | |
| 0840H | Current reversing reactive demand | 4 | R | |
| 0842H | Current total active energy | 4 | R | |
| 0844H | Current spike active energy | 4 | R | |
| 0846H | Current peak active energy | 4 | R | |
| 0848H | Current flat active energy | 4 | R | |
| 084AH | Current valley active energy | 4 | R | |
| 084CH | Current forward active total energy | 4 | R | |
| 084EH | Current forward active spike energy | 4 | R | |
| 0850H | Current forward active peak energy | 4 | R | |
| 0852H | Current forward active flat energy | 4 | R | |
| 0854H | Current forward active valley energy | 4 | R | |
| 0856H | Current reversing active total energy | 4 | R | |
| 0858H | Current reversing active spike energy | 4 | R | |
| 085AH | Current reversing Active peak energy | 4 | R | |
| 085CH | Current reversing active flat energy | 4 | R | |
| 085EH | Current reversing Active valley energy | 4 | R | INT32 |
| 0860H | Current total reactive energy | 4 | R | Resolution：0.1kWh |
| 0862H | Current reactive spike energy | 4 | R | |
| 0864H | Current reactive peak energy | 4 | R | |
| 0866H | Current reactive flat energy | 4 | R | |
| 0868H | Current reactive valley energy | 4 | R | |
| 086AH | Current forward reactive total energy | 4 | R | |
| 086CH | Current forward reactive spike energy | 4 | R | |
| 086EH | Current forward reactive peak energy | 4 | R | |
| 0870H | Current forward reactive flat energy | 4 | R | |
| 0872H | Current forward reactive valley energy | 4 | R | |
| 0874H | Current reversing reactive total energy | 4 | R | |
| 0876H | Current reversing reactive spike energy | 4 | R | |
| 0878H | Current reversing reactive peak energy | 4 | R | |
| 087AH | Current reversing reactive flat energy | 4 | R | |
| 087CH | Current reversing reactive valley energy | 4 | R | |



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

ADL400's registers on frozen by day and by month.

Table 9 Frozen time communicate address

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

ADL400 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:

Table 10 History energy communicate address

| Address | Name |
|---|---|
| 6000H | Assemblage of last 1 month demand and energy |
| 6022H | Assemblage of last 2 months demand and energy |
| … | … |
| 6BD2H | Assemblage of last 48 months demand and energy |
| reserve | reserve |
| 7000H | Assemblage of last 1 day demand and energy |
| 7022H | Assemblage of last 2days demand and energy |
| … | … |
| 763EH | Assemblage of last 90days demand and energy |

| Data list | Name |
|---|---|
| 6000H | Frozen time:YY-MM |
| 6001H | Frozen time: DD-hh |
| 6002H | total active energy |
| 6004H | Spike active energy |
| 6006H | peak active energy |
| 6008H | flat active energy |
| 600AH | valley active energy |
| 600CH | total reactive energy |
| 600EH | Spike reactive energy |
| 6010H | peak reactive energy |
| 6012H | flat reactive energy |
| 6014H | valley reactive energy |
| 6016H | Total amount of phase A forward active energy |
| 6018H | Total amount of phase B combined active energy |
| 601AH | Total amount of phase C forward active energy |
| 601CH | Maximum active demand |



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| | |
|---|---|
| 601DH | Occur time: mm-hh |
| 601EH | Occur time : DD-MM |
| 601FH | Maximum reactive demand |
| 6020H | Occur time: mm-hh |
| 6021H | Occur time : DD-MM |

## 9.4 Sub harmonic data

ADL400 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.

Table 11 Harmonics data address

| Address | Name | Length(Bit) | R/W | Note |
|---|---|---|---|---|
| 05DDH | THDUa | 2 | R | Total distortion rate of voltage and current on each phase 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 Keep 3 decimal places |
| 0601H | THUb | 2×30 | | |
| 061FH | THUc | 2×30 | | |
| 063DH | THIa | 2×30 | | Harmonic current on 2nd-31st 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 | | |



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| | | | | |
|---|---|---|---|---|
| 06A1H | Harmonic current on B phase | 2 | | |
| 06A2H | Harmonic current on C phase | 2 | | |
| 06A3H | Fundamental active power on A phase | 2 | | Int<br>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 | | |

## 9.5 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 |



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| | |
|---|---|
| 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 |
| 0400 | UI record | UI status | 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<br>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 | | |



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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



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