T317

ADL400(MID)

Installation and operation instruction T1.6

ACREL Co.,Ltd

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2022.05.17		T1.0	1. First version
2022.08.19	T1.0	T1.1	2. Add direct access model
2023.02.08	T1.1	T1.2	3. Add Device model register
2023.12.21	T1.2	T1.3	4. Added some detailed descriptions
2024.03.21	T1.3	T1.4	5. Add a current specification 6. Add some descriptions of data units 7. Edit the size description image
2024.09.24	T1.4	T1.5	8. Modify cover icon and typography 9. Amend the torque of connect via CT
2026.01.20	T1.5	T1.6	10. Modify wiring diagram terminal identification 11. Modify address list section description error 12. Modify Key Press Flowchart 13. Add configurable data items 14. Added a note regarding the precision of dimensional data 15. Added clarification regarding time synchronization.

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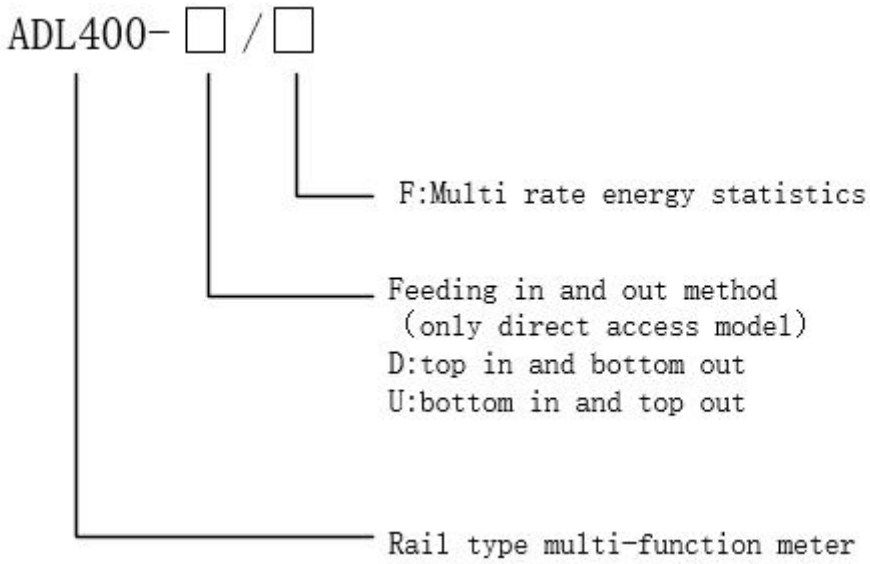
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1 General

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 2nd-32st subharmonics 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



Note, after selecting the F function, the meter needs to be calibrated regularly.

3 Function description

Table 1 Function description list

Function	Function description	Function provide
Measurement of energy	Active kWh (positive and negative)	■
	Reactive kvarh (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	2~31ST Voltage and Current harmonic	■

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LCD Display	12 bits section LCD display, background light	■
Key programming	3 keys to communication and set parameters	■
Pulse output	Active pulse output	■
Multi-tariff and functions	Date, time	□
	Max demand and occurrence time	□
	Frozen data on last 48 months, last 90days	□
	Adapt 4 time zones, 4 time interval lists, 14 time interval by day and 4 tariff rates	□
Communication	Communication interface: RS485, Communication protocol: MODBUS-RTU	■

4 Technical parameter

Table 2 technical parameter description

project			**performance parameter**
Specification			3 phase 3 wires, 3 phase 4 wires
Measurement	Voltage	Reference voltage	3×230/400V
		Consumption	<10VA(Single phase)
		Impedance	>2MΩ
		Accuracy class	Error±0.2%
	Current	Input current	0.01-1(6)A (Secondary access model) 0.1-10(80)A(Direct access model) 0.1-10(100)A(Direct access model)
		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	Active Energy Class*(kWh)*		0.01-1(6)A,0.1-10(80)A:C*(kWh)* 0.1-10(100)A:B(*kWh*)
	Clock		≤0.5s/d
Digit signal	Energy pulse output		1 active photocoupler output
pulse	Width of pulse		80±20ms
	Pulse constant		Direct access model, 400imp/kWh Secondary access model, 10000imp/kWh
communication	Interface and communication protocol		RS485：Modbus RTU
	Range of communication address		Modbus RTU:1~ 247；
	Baud rate		1200bps~38400bps
environment	working temperature		-25℃ to +55℃ (Secondary access model) -40℃ to +70℃(Direct access model)
	Relative humidity		≤95%(No condensation)

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5 Dimension drawings(Unit: mm, dimensional tolerance ±1 mm, wiring hole dimensional tolerance ±0.5 mm)

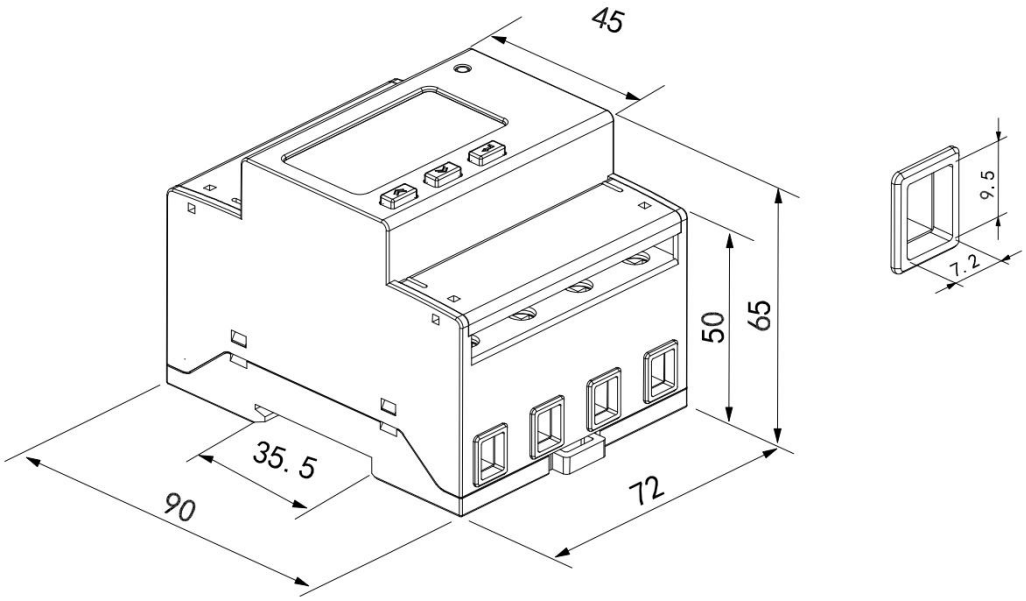


Fig 1 connect via CT

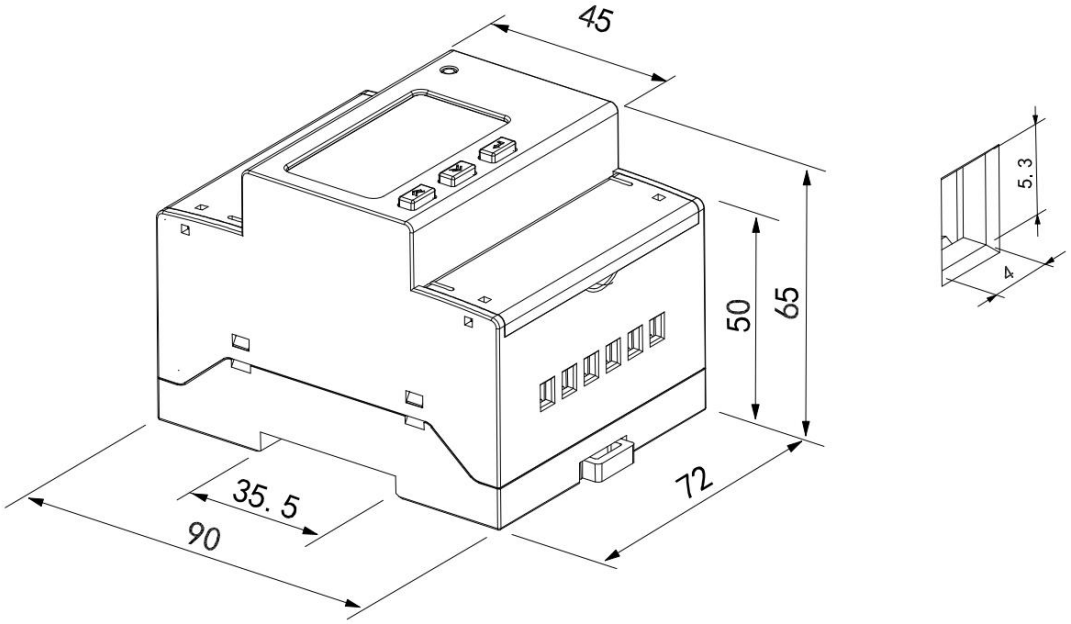


Fig 2 direct connect

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 0.5N·m.

6 Wiring and installing

6.1 Wiring sample of voltage and current

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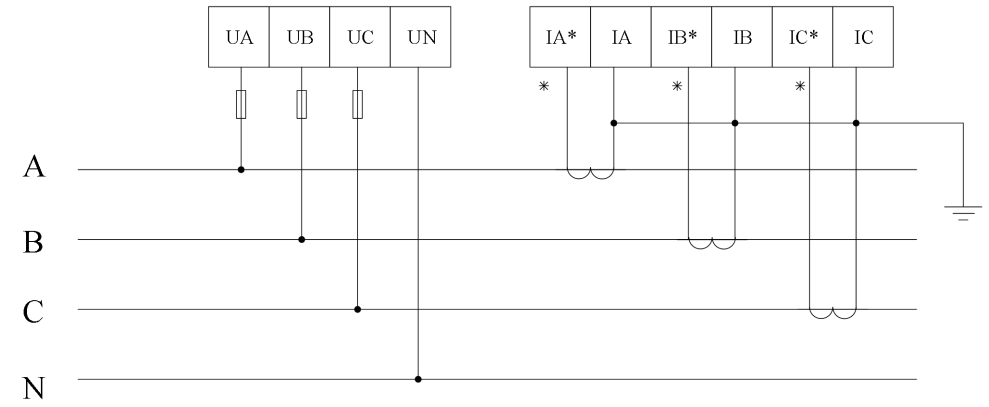


Fig 3 Three phase four lines connect via CT

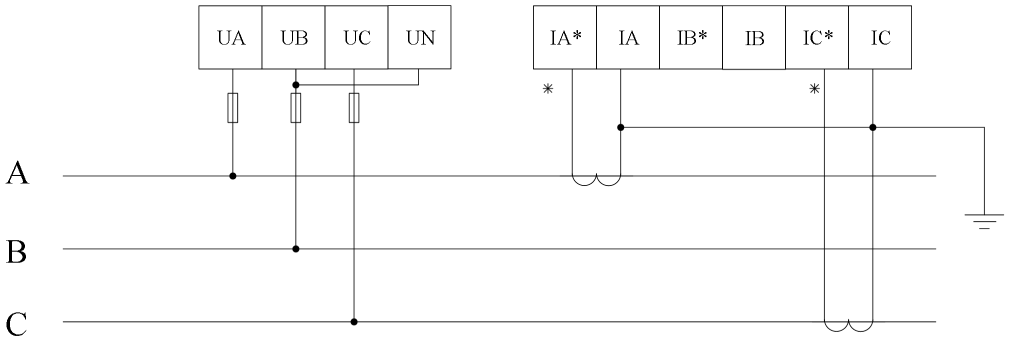


Fig 4 Three phase three lines connect via CT

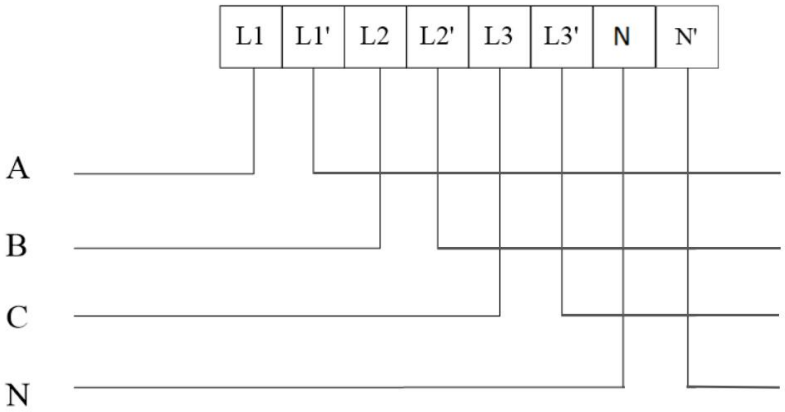


Fig 5 Three phase four lines direct connect

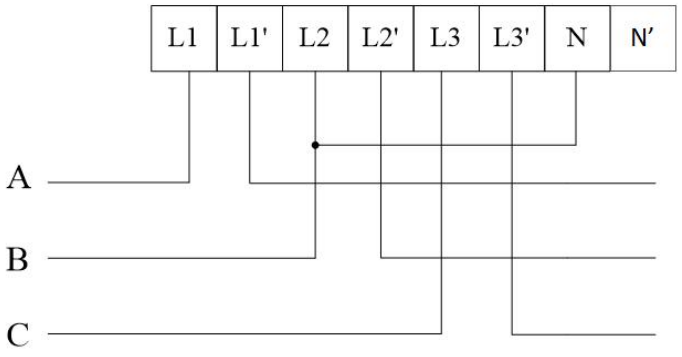


Fig 6 Three phase three lines direct connect

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Note：

1.Installation of standard 35mm guide rail (No maintenance,repair or adjustment intended)

2.The meter is intended to be installed in a Mechanical Environment‘M1’, with Shock and Vibrations of low significance, as per 2014/32/EU Directive.

3.The meter is intended to be installed in Electromagnetic Environment ‘E2’, as per 2014/32/EU Directive.

6.2 Wiring diagram of communication and pulse terminals

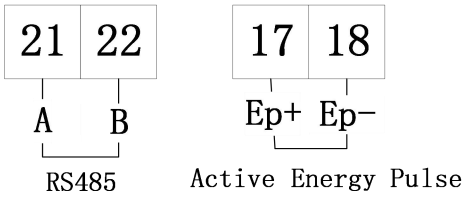


Fig 7 Communication, pulse connection

7 Function description

7.1 Measurement

It can measure the electrical parameter, include U, I, P, Q, S, PF, F, 2nd-31st harmonics and total harmonic content.

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

7.2 Calculating

Can measure the total active energy, forward active energy, reversing active energy, forward reactive energy, reversing reactive energy.

7.3 Timing

There are four time tables, the year can be divided into four time zones, and every table have fourteen daily time periods and four rates can be set.

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.
Slip time	The method of measuring the demand from any point in time by a recurrence of time less than the period of the demand is called sliding demand. The recurrence time is called the slip time.
Demand cycle	An equal interval of time between successive measurements of average power, also called window time.

The default demand cycle is 15 minutes, slip time is 1 minute, neither of which can be modified.

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The meter can measure 4 kinds of maximum demand, forward active, reversing active, inductive reactive, capacitive reactive maximum demand and the time of occurrence.

7.5 History data statistics

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

8 Operation and display

8.1 Key function description

Table 4 Key's function description

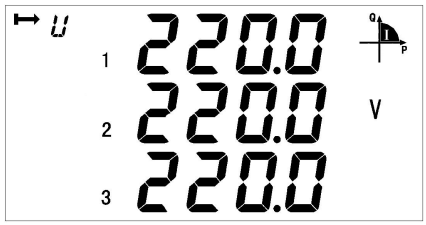
icon	Name	Function
	Voltage and current, up	Check the voltage and current Leftward and change flash in programming menu
	Power, down	Check the power Rightward and change the value on flash
	Energy, enter	Check the energy In/out programming menu Save changes

8.2 Display menu

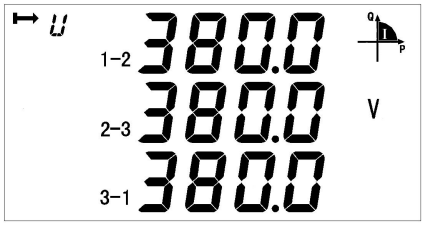
The meter will show the total active energy after powering. The customers can change the information showing by pressing the keys. After setting the transformation ratio, all data displayed by the meter represents primary-side values, i.e., actual values that include the transformation ratio calculation. The menu description is listed as below.

Table 5 display descriptions

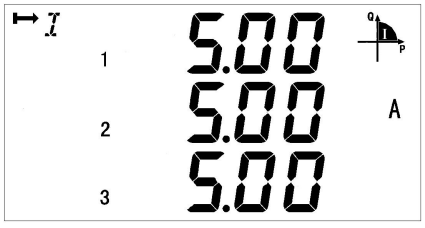




Three-phase voltage



Three phase line voltage



Three-phase Current

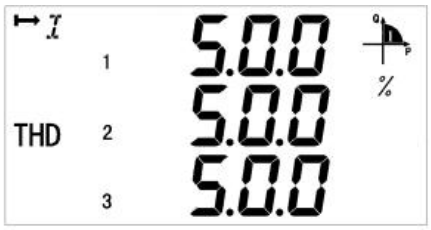


Frequency

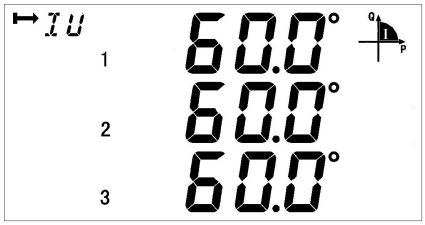
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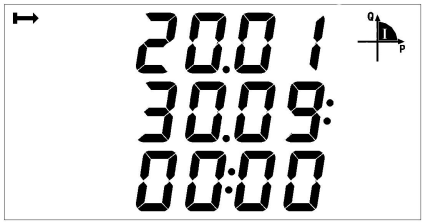
Harmonic content of three phase Voltage



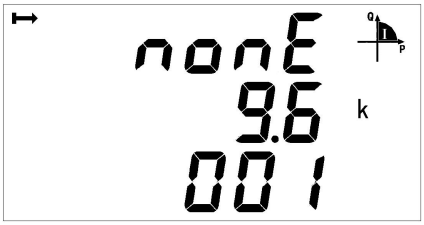
Harmonic content of three phase Current



Phase angle

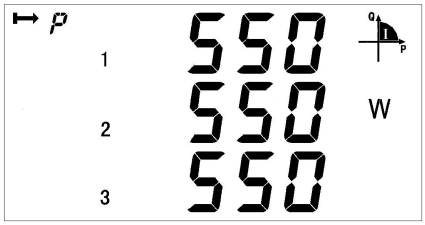


Time



Check bit, baud rate, meter address,

And software version number, Software unique identifier, full display detection.

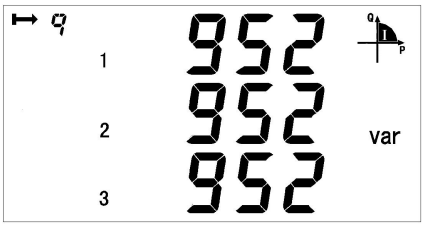


Three phase active power



Total active power



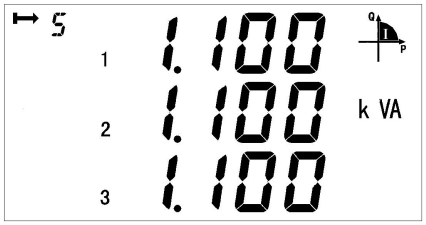


Three phase reactive power



Total reactive power

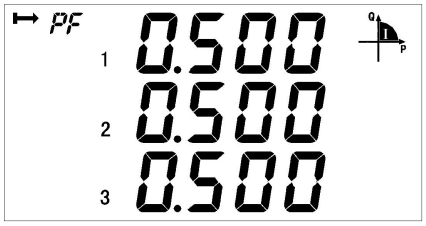
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Three phase apparent power



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

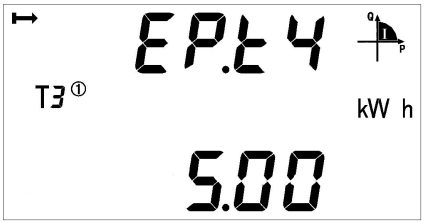




Current peak active energy



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



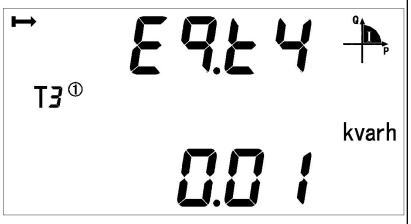
Current reactive spike energy



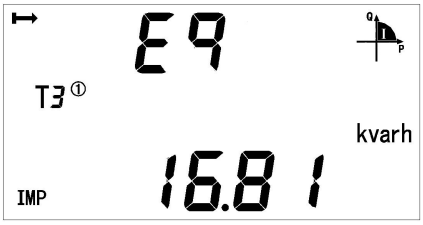
Current reactive peak energy



Current reactive flat energy



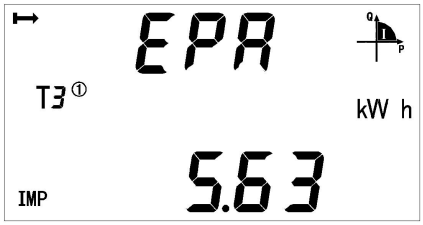
Current reactive valley energy



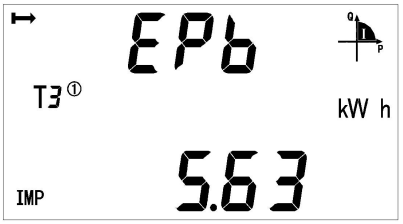
Current forward reactive total energy



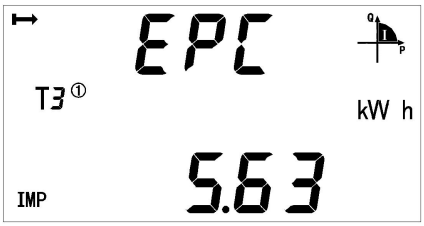
Current reversing reactive total energy



Current forward active energy on A phase



Current forward active energy on B phase



Current forward active energy on C phase

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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.

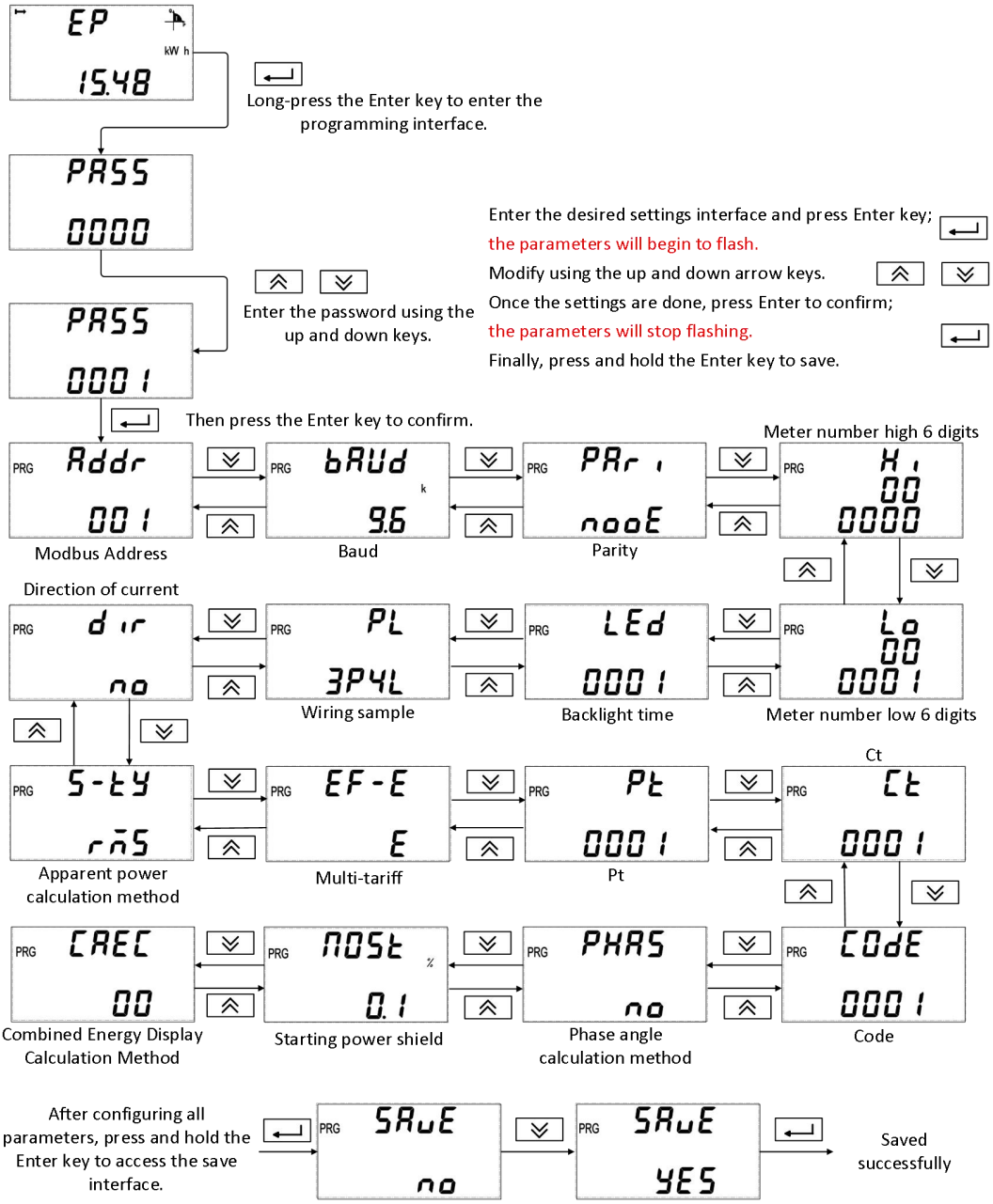
4. The arrow in the upper left corner of the screen represent the DIR settings, from left to right means that DIR is set to 0; if the arrow is from right to left, it indicates that DIR is set to 1.

5. 'IMP' in the lower left corner of the screen means forward, and 'EXP' means reverse.

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 Data settings

Table 6 setting menu description

Num	Second menu		
	Symbol	Mean	Range
1	ADDR	Communicate's ADDR settings	1-247
2	Baud	Baud choose	1200、2400、4800、9600、19200、38400
3	Pari	Parity choose	None、Odd、Even
4	LED	Backlight time	0-255minutes, 0 means always on

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5	PL	Wiring sample	3P4L:3 phase 4 wires 3P3L:3 phase 3 wires
6	DIR	direction of current	no-Forward yes-Reverse
7	S-TY	Apparent power calculation method	PQS RMS
8	EF-E	time-sharing measurement function	EF-Function on 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 Yes-Angle between three-phase current and phase a voltage
13	nost	Starting power shield	Shielding range, 0.1-2.0%(*UnIn)
14	CAEC	Combined energy display calculation method	00: EP = IMP + EXP 01: EP = IMP - EXP 10: EP = EXP - IMP 11: EP= -IMP - EXP (Note, only display)

9 Communication description

The meter adapts MODBUS-RTU protocol, and the baud rate can be chosen from 1200bps,2400 bps,4800 bps,9600bps,19200bps and 38400 bps. The dafault 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, 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 7 communication address list

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Address	Variable	Length (bytes)	R/W	Note
0000H	Current total active energy	4	R	kWh UINT32 Keep 2 decimal places Particularly, if ct and Pt is not all 1, actual electric energy value should be product of register reading and Pt*Ct, except for the specially noted register data.
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	kvarh UINT32 Keep 2 decimal places Particularly, note the same as above.
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	Separate analysis of high and low positions
003DH	Time：hour、day	2	R/W	
003EH	Time：month、year	2	R/W	
003FH	Address（high 8 bit） Baud（low 8 bit）	2	R/W	baud： 0：1200 1：2400 2：4800 3：9600 4：19200 5：38400

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0040H	pulse constant	2	R	UINT16
0041H	First time zone time period number Start date of the first time zone: Day	2	R/W	Time zone number： 1：First time zone 2：Second time zone 3：Third time zone 4：Fourth time zone
0042H	Start date of the first time zone: month Second time zone time period number	2	R/W	
0043H	Start date of the second time zone: day Start date of the second time zone: month	2	R/W	
0044H	Third time zone time period number Start date of the third time zone: day	2	R/W	
0045H	Start date of the third time zone: month Fourth time zone time period number	2	R/W	
0046H	Start date of the fourth time zone: day Start date of the fourth time zone: month	2	R/W	
0047H-0060H	Reserve			
0061H	Voltage of A phase	2	R	UINT16 Resolution：0.1V
0062H	Voltage of B phase	2	R	
0063H	Voltage of C phase	2	R	
0064H	Current of A phase	2	R	UINT16 Resolution：0.01A
0065H	Current of B phase	2	R	
0066H	Current of C phase	2	R	
0067H-0076H	Reserve			
0077H	frequency	2	R	Resolution：0.01
0078H	Voltage between A-B	2	R	UINT16 Resolution：0.1V
0079H	Voltage between C-B	2	R	
007AH	Voltage between A-C	2	R	
007BH	Forward active maximum demand	2	R	UINT16 (Secondary side data) Units are as follows: Active demand 0.001kW Reactive demand 0.001kvar Occur time:minute、hour
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	

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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	kWh UINT32 Keep 2 decimal places
0089H	Forward active energy of B phase	4	R	
008BH	Forward active energy of C phase	4	R	
008DH	PT	2	R/W	UINT16
008EH	CT	2	R/W	UINT16
008FH-0091H	Reserve	2	R	
0092H	Zero sequence current	2	R	Resolution：0.01A
0093H	Voltage imbalance	2	R	UINT16 Resolution：0.001
0094H	Current imbalance	2	R	
0095H	Parity bit（high 8 bit） Stop bit（low 8 bit）	2	R/W	parity bit： 0：None 1：Odd 2：Even stop bit： 0：one stop bit 1：two stop bit
0096H-00A5H	Reserve			
00A6H	Code	2	R/W	1-9999
00A7H-00C9H	reserve			
00CAH	The back light time	2	R/W	0-255minutes, 0 means always on
00CBH-0120H	reserve			
0121H	Daily frozen time:Hour	2	R/W	Separate analysis of high and low positions
0122H	Monthly frozentime:day、hour	2	R/W	
0123H-0163H	Reserve			
0164H	Active power of A phase	4	R	INT32 Resolution：0.001kW
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	INT32 Resolution：0.001kvar
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	UINT32

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0176H	Apparent power of B phase	4	R	Resolution：0.001kVA
0178H	Apparent power of C phase	4	R	
017AH	Total apparent power	4	R	
017CH	Power factor of A phase	2	R	INT16 Resolution：0.001
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	UINT16 (Secondary side data) Units are as follows: Active demand 0.001kW Reactive demand 0.001kvar 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	

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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	
019CH-01FFH	Reserve			
0200H	Maximum voltage on A phase	2	R	UINT16 (Secondary side data) Units are as follows: Voltage 0.1V Current 0.01A Active power 0.001kW Reactive power 0.001kvar Apparent power 0.001kVA
0201H	Occur date：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 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	

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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 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			
F009H	Device model	2	R	A400(HEX)

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9.2 Floating point electrical parameter data

Table 8 Float data communication address list

Address	Name	Length (bytes)	R/W	Note
Secondary side data without multiplication of the variable ratio				
5300H	Voltage of A phase	4	R	Float Unit:V
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	Float Unit:A
530EH	Current of B phase	4	R	
5310H	Current of C phase	4	R	
5312H	Active power of A phase	4	R	Float Unit:W
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	Float Unit:var
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	Float Unit:VA
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	Float
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	Float Unit:Hz
5334H	zero line current	4	R	Float Unit:A
Primary side data that has been multiplied by the variable ratio				
0800H	Voltage of A phase	4	R	Float Unit:V
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	Float Unit:A
080EH	Current of B phase	4	R	
0810H	Current of C phase	4	R	

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0812H	zero line current	4	R	
0814H	Active power of A phase	4	R	Float Unit:kW
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	Float Unit:kvar
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	Float Unit:kVA
0826H	Apparent power of B phase	4	R	
0828H	Apparent power of C phase	4	R	
082AH	Total apparent power	4	R	
082CH	Power factor of A phase	4	R	Float
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	Float Unit:Hz
0836H	Voltage imbalance	4	R	Float Unit:0.1
0838H	Current imbalance	4	R	Float Unit:0.1
083AH	Current forward active demand	4	R	Float Unit:kW
083CH	Current reversing active demand	4	R	
083EH	Current forward reactive demand	4	R	Float Unit:kvar
0840H	Current reversing reactive demand	4	R	
0842H	Current total active energy	4	R	UINT32 Resolution：0.1kWh (Primary side data)
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	
0860H	Current total reactive energy	4	R	UINT32 Resolution：0.1kvarh (Primary side data)
0862H	Current reactive spike energy	4	R	
0864H	Current reactive peak energy	4	R	
0866H	Current reactive flat energy	4	R	

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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

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 communication address

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)

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 list below is the registers' name.

Table 10 History energy communication address

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

Data list	Name	Note
6000H	Frozen time:YY-MM	Separate analysis of high and low positions
6001H	Frozen time: DD-hh	
6002H	total active energy	kWh UINT32 Keep 2 decimal places (Secondary side data)
6004H	Spike active energy	
6006H	peak active energy	
6008H	flat active energy	
600AH	valley active energy	
600CH	total reactive energy	kvarh UINT32 Keep 2 decimal places (Secondary side data)
600EH	Spike reactive energy	
6010H	peak reactive energy	

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6012H	flat reactive energy	
6014H	valley reactive energy	
6016H	Total amount of phase A forward active energy	kWh UINT32 Keep 2 decimal places (Secondary side data)
6018H	Total amount of phase B forward active energy	
601AH	Total amount of phase C forward active energy	
601CH	Maximum active demand	Resolution：0.001kW (Secondary side data)
601DH	Occurrence time: mm-hh	
601EH	Occurrence time : DD-MM	
601FH	Maximum reactive demand	Resolution：0.001kvar (Secondary side data)
6020H	Occurrence time: mm-hh	
6021H	Occurrence time: DD-MM	

9.4 Sub-harmonic data

ADL400 can measure harmonics, statistics split-phase 2nd-31st harmonic voltage and current, total harmonic distortion rate, split-phase harmonic voltage and current, split-phase harmonic active power and reactive power, split-phase fundamental current and voltage, split-phase fundamental active and power reactive power.

Table 11 Harmonics data address list

Address	Name	Length (bytes)	R/W	Note
05DDH	THDUa	2	R	Total distortion rate of voltage and current on each phase UINT16 Resolution：0.01%
05DEH	THDUb	2	R	
05DFH	THDUc	2	R	
05E0H	THDIa	2	R	
05E1H	THDIb	2	R	
05E2H	THDIc	2	R	
05E3H	THUa	2×30	R	Harmonic voltage content on 2^{nd}-31^{st} UINT16,Resolution：0.01%
0601H	THUb	2×30	R	
061FH	THUc	2×30	R	
063DH	THIa	2×30	R	Harmonic current content on 2^{nd}-31^{st} UINT16,Resolution：0.01%
065BH	THIb	2×30	R	
0679H	THIc	2×30	R	
0697H	Fundamental voltage on A phase	2	R	UINT16 Resolution：0.1V
0698H	Fundamental voltage on B phase	2	R	
0699H	Fundamental voltage on C phase	2	R	
069AH	Harmonic voltage on A phase	2	R	
069BH	Harmonic voltage on B phase	2	R	
069CH	Harmonic voltage on C phase	2	R	

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069DH	Fundamental current on A phase	2	R	UINT16 Resolution：0.01A
069EH	Fundamental current on B phase	2	R	
069FH	Fundamental current on C phase	2	R	
06A0H	Harmonic current on A phase	2	R	
06A1H	Harmonic current on B phase	2	R	
06A2H	Harmonic current on C phase	2	R	
06A3H	Fundamental active power on A phase	2	R	INT16 Resolution：0.001kW
06A4H	Fundamental active power on B phase	2	R	
06A5H	Fundamental active power on C phase	2	R	
06A6H	Total fundamental active power	2	R	
06A7H	Fundamental reactive power on A phase	2	R	INT16 Resolution：0.001kvar
06A8H	Fundamental reactive power on B phase	2	R	
06A9H	Fundamental reactive power on C phase	2	R	
06AAH	Total fundamental reactive power	2	R	
06ABH	Harmonic active power on A phase	2	R	INT16 Resolution：0.001kW
06ACH	Harmonic active power on B phase	2	R	
06ADH	Harmonic active power on C phase	2	R	
06AEH	Total harmonic active power	2	R	
06AFH	Harmonic reactive power on A phase	2	R	INT16 Resolution：0.001kvar
06B0H	Harmonic reactive power on B phase	2	R	
06B1H	Harmonic reactive power on C phase	2	R	
06B2H	Total harmonic reactive power	2	R	

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
0003H	Event number
0004H	Event details
0005H	Reserve

Event num	Name
0100	Power on
0200	Clear

Details	Note
0001	Clear current energy
0002	Clear history energy on Flash
0003	Clear maximum demand
0004	Clear history energy
0005	Clear maximum value on

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0700	Time calibration

	a period
0006	Clear out

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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