伊米特电子科技
E-Meter electronic technology

E-METER

PRODUCT SELECTION MANUAL

产品使用手册

ZL2020系列液晶直流表

ZL2020 series LCD DC meter

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1. product introduction

ZL2020 series has single/double circuit DC input, mainly for telecom base station, DC charging pile, Designed for applications such as solar photovoltaic, this series of meters can measure voltage and electricity in DC systems Flow, power, can respectively measure positive and negative electric energy and so on. The collected data can be used for both local display and It can be connected with industrial control equipment and PC terminal to form a measurement and control system. According to IEC 62053-21, DL/T645-2007 "Multi-function energy meter Communication Protocol" and other relevant national and industry standards design and manufacture.

The product meets JJG842 "Verification Regulations of Electronic DC watt-hour meter", and can measure DC energy of two circuits at the same time at most.

Instrument has RS-485 communication interface, support Modbus-RTU, DL/T645-2007 protocol; support Positive and negative metering, according to different requirements, you can set the parameters of the meter by pressing the meter button.

2. technical parameters

Project			Parameters
Measurements	Wiring		Three wire, four wire connection
	Electric voltage	Measuring Range	DC 100V, 300V, 500V, 700V, 1000V (please specify when ordering)
		Impedance	> 2MΩ
		Power consumption	≤1W
	Electrical current	Measuring Range	Shunt external: DC 0~75mV(current range can be set, please specify when ordering) Hall sensor external: this table comes with power supply (±12V) Direct access type: 0 ~ 20A (please specify when ordering)
		Impedance	> 1 kΩ
		Power consumption	≤ 0.5W
	Maximum voltage		1.15Un
	Maximum current		1.2In

Project		Parameters
Metering	Electrical accuracy	Class 0.5
	Power resolution	0.0001 kWh
	Clock error	0.5s /d (for use with double rate feature only)
Power supply	Working range	AC/DC 85~265V (please specify when ordering) DC 12 ~ 96V (please specify when ordering)
	Power consumption	≤ 2W
Output	Pulse Output	Maximum power ≤ 999.9W Constant: 100000 imp/kWh
		Maximum power ≤ 9.999 kW Constant: 10000 imp/kWh
		Maximum power ≤ 99.99 kW Constant: 1000 imp/kWh
		Maximum power ≤ 999.9 kW Constant: 100 imp/kWh
		Maximum power > 999.9kW constant: 10 imp/kWh
Communications	Baud Rate	RS485 interface :1200bps~9600bps (default 9600bps)
	Protocol	DL/T645-2007 and MODBUS-RTU
	Verify	N.8.1, E.8.1, O.8.1 (Factory default N.8.1)
	Address	Modbus table number can be set (default 1 way 01, 2 way 02) 645 Comm address see case number
Environment	Work environment	- 30 ℃ ~ + 80 ℃
Electrical Performance	Insulation properties	Ac withstand voltage test 4kV
	Electromagnetic compatibility	Fast transient pulse group immunity, test voltage: ± 4kV
		Electrostatic discharge immunity test: Contact discharge: ± 8kV Air discharge: ± 15kV

3.instrument function

Feature	Function Description	Single loop	Double loop
Electrical Energy	Forward energy metering	■	■
	Reverse energy metering	■	■
Electrical Metering	U	■	■
	I	■	■
	P	■	■
Keystroke programming	Key programmable communication and other parameters	■	■
Pulse output	Active pulse output	■	■
Switching quantity	Route 2 access	□	□
	2 Way out	□	□
Double Rate	Support for multiple time zones, time periods, and rates	□	□
	Date, time	□	□

Note:

"■" indicates standard configuration

"□" indicates optional

4. installation and wiring

1, instrument size



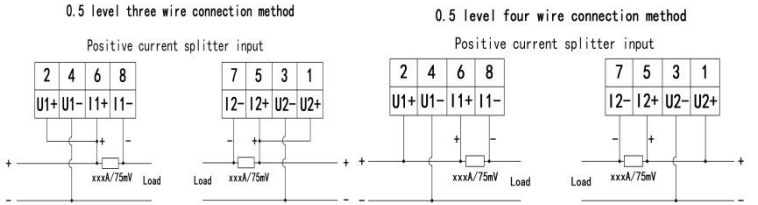
Unit:: mm

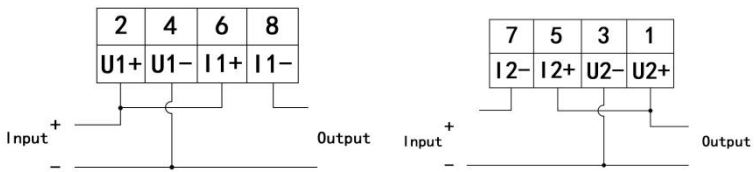
long	wide	high
100	72	67

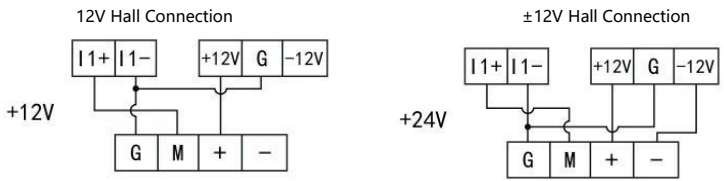
2, signal and function terminal number

Items	Number	Instructions
power supply	11, 12	11 is the L pole and 12 is the N pole
One-channel signal input	2, 4, 6, 8	2 is the positive terminal of one voltage (U1+) 4 is the negative terminal of one voltage (U1-) 6 is the positive terminal of a current (I1+) 8 is the negative terminal of a current (I1-)
Two-channel signal input	1, 3, 5, 7	1 is the positive terminal of the two voltages(U2+) 3 is the negative terminal of the two voltages (U2-) 5 is the positive terminal of the two currents (I2+) 7 is the negative terminal of the two currents (I2-)
RS485	17, 18	17 is 485A1 and 18 is 485B1
Electrical energy pulse	21, 22	21 is AP-, 22 is AP+, one or two pulse outputs can be switched
Switching quantity input	14, 15, 16	14 is one and 15 is two channel switch input, and 16 is the common terminal
Relay output	26, 27, 28	28 is one and 27 is two channel relay output,and 26 is the common terminal
Hall power	23, 24, 25	23 is -12V, 24 is GND, and 25 is +12V

3, the input signal wiring method



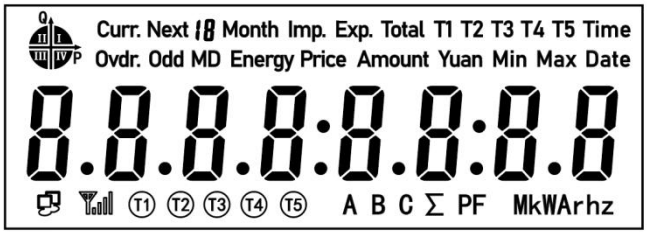




Note: 2468 is a one-channel signal input port
1357 is a two-channel signal input port

5. display page introduction

1, display logo introduction

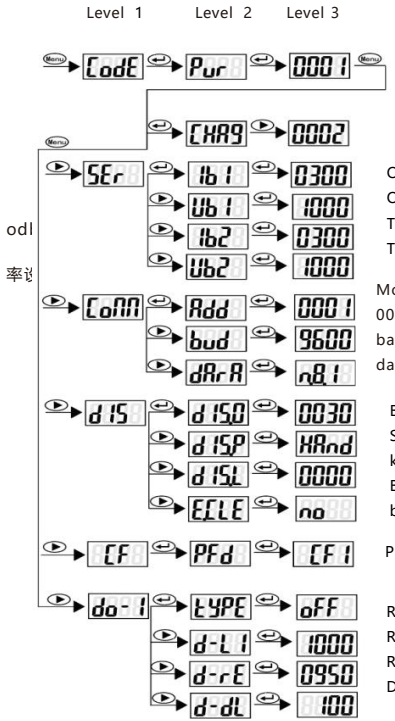


Logos	Features
A B	No A means one way, No B means two ways
MkWA	Current A, kA; Voltage V, kV; Positive and negative power W, kW, MW
	Communication indication sign
T1 T2 T3 T4 T5	Current Rate sign
T1 T2 T3 T4 T5 Time Yuan Min Max Date	Rate power display interface and time display interface logo
Month Imp. Exp. Total Energy Price Amount	The current power display interface
Menu	Menu Enters Edit and returns to the upper menu
	Menu page turning or value modification
	Cursor shift, save changes, go to the next level menu

2、Character meaning

First level menu	Secondary menu		Third level menu	Description
Password CodE	Enter your password	Pur	0 ~9999	Enter your current password (default 0001)
	Change password	CHAG	0 ~9999	Change your current password (not recommended)
Parameter Settings SEr	Current ratio	ib1	0 ~9999	Set the all way current ratio
	Voltage ratio	Ub1	0 ~9999	Set the voltage ratio all the way
	Current ratio	ib2	0 ~9999	Set the two current ratio
	Voltage ratio	Ub2	0 ~9999	Set the two-way voltage ratio
Communication Settings CoMM	Table Number	Add	1-247	Modbus comm table number
	Baud rate	bud	1200 to 9600	1200, 2400, 4800, 9600
	Check method	dAtA	N.8.1/O.8.1 /E.8.1	None/odd/even check
System Settings di5	Display duration	di5.0	0 ~9999	0 means the backlight is always on,and 0030 means the backlight time is 30s
	Display page	di5P	Auto/Hand	Auto is the automatic wheel display, Hand manually switches the display
	Brightness Settings	di5L	0 ~ 8	Brightness range 0-8 0 is brightest.
	Energy clearing	ECLE	YES or NO	YES clears accumulated power, NO does not clear.
Pulse CF	Pulse output setting			
Alarm settings do-1	Alarm parameters	tYPE	Turn off the alarm and use it remotely.	
	ALARM VALUE	d-L1	0 ~9999	Set alarm values
	Alarm response value	d-rE	0 ~9999	Set alarm hysteresis value (recovery value)
	Alarm delay	d-dL	0 ~9999	0001 represents 10ms, 0010 represents 100ms

6. Programming structure diagram



Enter the default password: 0001

Change Password: 0002

One way current ratio setting: 300A
One way voltage ratio setting: 1000V
Two way current ratio setting: 300A
Two way voltage ratio setting: 1000V

Modbus communication table number: 0001
baud rate setting: 9600bps
data format setting: no verification

Backlight duration setting: 30s
Switch between wheel display and key display: key display
Brightness setting 0~8, 0 is the brightest ; Battery reset to zero

Pulse output setting: One pulse output

Relay alarm output project settings
Relay alarm threshold value: 100%
Relay alarm return value: 95%
Delay time setting: 100 times 10ms

Note: After the parameters are set, press 3 keys to appear (Menu) SAVE, press the key to save the setting parameters (↵). If you do not save, press (Menu) exit setup

7. Display

Show Display	Show instructions
	One way voltage display interface One road voltage: 1.000V T1: Current rate A: One road
	One way current display interface One current: 1.000A T1: Current rate
	One power display interface Power of one road: 1.000kW
	One way to the total power interface One way forward total power: 1.0000kWh
	One way forward T1 rate electric energy interface Forward T1 power: 1.0000kWh
	One way forward T2 rate electrical energy interface Forward T2 power: 1.0000kWh
	One way forward T3 rate electric energy interface Forward T3 power: 1.0000kWh

Show Display	Show instructions
	All the way forward T4 rate power interface Forward T4 power: 1.0000kWh
	All the way forward T5 rate power interface Forward T5 power: 1.0000kWh
	One way reverse total power interface One way reverse total power: 1.0000kWh
	One way reverse T1 rate electric energy interface Reverse T1 power: 1.0000kWh
	One way reverse T2 rate electric energy interface Reverse T2 power: 1.0000kWh
	One way reverse T3 rate electric energy interface Reverse T3 power: 1.0000kWh
	One way reverse T4 rate electric energy interface Reverse T4 power: 1.0000kWh
	One way reverse T5 rate electric energy interface Reverse T5 power: 1.0000kWh

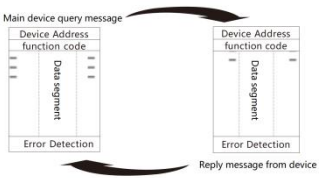
Display interface	Display instructions
	Two way voltage display interface Two road voltage: 1.000V T1: Current rate B: Two road
	Two way current display interface Two current: 1.000A T1: Current rate
	Two-channel power display interface Two-channel power: 1.000kW
	Two way to the total power interface Two way forward total power: 1.0000kWh
	Two way forward T1 rate electric energy interface Forward T1 power: 1.0000kWh
	Two way forward T2rate electric energy interface Forward T2 power: 1.0000kWh
	Two way forward T3 rate electric energy interface Forward T3 power: 1.0000kWh
	Two way forward T4 rate electric energy interface Forward T4 power: 1.0000kWh

Display interface	Display instructions
	Two way forward T5 rate electric energy interface Forward T5 power: 1.0000kWh
	Two-way reverse total power interface Two way reverse total power: 1.0000kWh
	Two way reverse T1 rate electric energy interface Reverse T1 power: 1.0000kWh
	Two way reverse T2 rate electric energy interface Reverse T2 power: 1.0000kWh
	Two way reverse T3 rate electric energy interface Reverse T3 power: 1.0000kWh
	Two way reverse T4 rate electric energy interface Reverse T4 power: 1.0000kWh
	Two way reverse T5 rate electric energy interface Reverse T5 power: 1.0000kWh
	Switch quantity input status display interface From right to left, there are 1 and 2 channels 1 channel switch quantity conduction 2 way switch quantity disconnected

Display interface	Display instructions
	Relay output status display interface From right to left, there are 1 and 2 circuits
	645 Communication address high level display page H:202411
	645 Communication address low display interface L: 290001 Mailing address: 202411290001
	The Modbus communication table number is displayed Table number: 001
	Communication baud rate display interface Baud rate: 9600
	Communication format display interface Communication format: N.8.1(no check)
	Time display interface Current time: 17:02:34
	Date display interface Current date: 11/29/24

8. Communication module

1. RS485 communication interface, asynchronous half duplex mode;
2. The communication speed can be set between 1200 and 9600bps, with a factory default of 9600bps;
3. Byte transfer format: 1 start bit, 8 data bits, 1 check bit, 2-3 stop bits(N81, E81, O81)optional;



The MODBUS protocol only allows communication between hosts (PCs, PLCs, etc.) and terminal devices, and does not allow data exchange between independent terminal devices. This way, each terminal device will not occupy the communication line during their initialization, but only respond to query signals that arrive locally.

The structure of data frames: i.e. message format

Address code	function code	data code	verification code
1个BYTE	1个BYTE	N个BYTE	2个BYTE

Address code: composed of one byte (8-bit binary code), with decimal values ranging from 0 to 255. In our system, only 1 to 247 are used, while other addresses are reserved. The address of each terminal device must be unique, and only the addressed terminal will respond to the corresponding query.

Function code: tells the addressed terminal what function to perform. The following table lists the function codes supported by Z-series instruments, as well as their meanings and functions.

Code	Description
0x01	Read the output status of the relay
0x02	Read switch input status
0x03/0x04	Read the register value
0x05	Remote control of a single relay action
0x0F	Remote control of multiple relay actions
0x10	Write register setting instruction

9. Examples of communication applications

1, read data register instruction (function code 03/04)

This function allows the user to obtain the data and system parameters collected and recorded by the device. The number of requests made by the host at a time.There is no limit to the number of data, but it cannot exceed the defined address range.

The following example reads 2 data from the slave at address 01, with voltage ratio Ub1 and circuit ratio Ib1 .(The data in the data frame occupies 2 bytes per address, and the starting address of Ub1 is 20(14H).Data length is 2(02H) number)

Query data frames (host)

address	Commands	Start register address (high 8 bits)	Start register address (low 8 bits)	Number of registers (high 8 bits)	Number of registers (low 8 bits)	CRC16 (low 8 bits)	CRC16 (High 8 bits)
01H	03H	00H	14H	00H	02H	84H	0FH

Response data frame

The response contains the slave address, function code, amount of data, and CRC error check.

Address	Commands	Data word Section length	Data 1234	CRC16 (lower 8 digits)	CRC16 (High 8 bits)
01H	03H	04H	03 E8 01 2C	7AH	0EH

Indicate Ub1 =03E8H(1000), Ib1 =012CH(300)

2、Read data register instruction (function code 03/04) (floating - point data)

Query data frame (host)

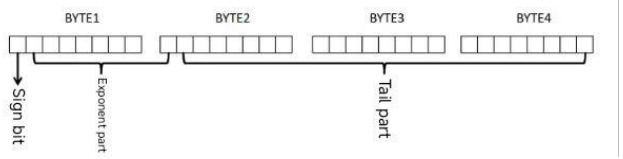
address	Commands	Start register address (high 8 bits)	Start register address (low 8 bits)	Number of registers (high 8 bits)	Number of registers (low 8 bits)	CRC16 (low 8 bits)	CRC16 (High 8 bits)
01H	03H	00H	5CH	00H	02H	04H	19H

Response data frame (slave)

Address	Commands	Data word Section length	Data 1234	CRC16 (lower 8 digits)	CRC16 (High 8 bits)
01H	03H	04H	42 A1 4E 70	8BH	EDH

Total forward reading power: =42 A1 4E 70 (80.6531982421875 kWh)

3、IEEE-754 floating point number and decimal number conversion. IEEE-754 is the use of 4 bytes of binary floating point number to represent a data power, its data format and meaning are as follows:



SIGN bits: SIGN=0 is positive, SIGN=1 is negative.

Exponent part E= exponent part -126.

Mantissa part M= mantissa part is complemented by the highest place of 1.

Data result REAL=SIGN x(2^E) x M/(256 x 65536).

For example: the host read the power data, from the address table can know the total forward power.

The address is 92(005CH) and the length is 4(0004H).

Host: 01 03 00 5C 00 02 04 19.

Slave: 01 03 04 42A14E70 8B ED Where 0x42A14E70 is a positive total battery data, 8B, ED is the low and high of the CRC16 check code.

Its size: SIGN(sign bit =0, positive), index EX=85H-126=7, mantissa :A14E70H

Result: (2^7)xA14E70H/1000000H=80.6531982421875kWh.

Version update record		
Version number	Modify the time	Modify the content
V1.0	2023-12-03	Initial version
V1.1	2025-5-20	1. Regarding the update and modification of the description of signal and function terminals in 4.2, and the special marking of terminal numbers for the first and second channels in 4.3