

DCEM-3MS

DC Energy Meter

User Manual



Version:1.10

Revision 2023.08

Read me

When you use DCEM-3MS DC Energy Meter, be sure to read this user manual carefully, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use of DCEM-3MS DC Energy Meter, and help to solve the various problems at the scene.

1. Always keep safe distance between the instrument and operator.
2. Measurements must not be taken when thunderstorms are nearby.
3. Do not operate the instrument or accessories in explosive atmospheres.
4. Do not open the instrument without permission, this will affect the warranty of the product. The factory is not responsible for self-disassembly.
5. When the instrument is transported, it should avoid rain erosion and prevent collision and falling.
6. When storing and keeping the instrument, attention should be paid to the ambient temperature and humidity, and it should be protected from dust, moisture, shock, acid, alkali and corrosive gas.



- **Please read this user manual carefully**
- **Please save this document**

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1.- SUMMARIZE

DCEM-3MS DC Energy Meter is a combined DC power measurement terminal, which is a highly integrated product for DC parameter measurement applications. It can accurately measure 1 DC voltage and 1 DC current (with direction) with an external shunt, power, total electricity, each single-way electricity and other electrical parameters, and can be equipped with a switch output.

The device has an RS485 interface, supports the MODBUS-RTU communication protocol, and can upload the data collected by the measurement and the status of the equipment. The device can be widely used in electric power, communication, railway, transportation, environmental protection, petrochemical, steel and other industries to monitor the current and power consumption of DC equipment.

FEATURES

- DC multi-function meter has powerful data acquisition and processing functions
- Various electrical parameters and operating status of a circuit can be viewed locally
- It can view or set operating parameters
- High security, good reliability, using a variety of anti-interference measures
- Electrostatic discharge immunity complies with level 3; electrical fast transient burst immunity complies with level 4
- High-voltage shock immunity meets level 4; surge anti-interference meets level 3
- The protection level of the panel meets IP54, and the protection level of the shell meets IP20
- The external dimension of the DC multi-function meter is suitable for standard 35mm rail installation, small in size and easy to install
- The system wiring mode is single-phase system
- The dedicated LCD module can display multiple information in real time, and the operation mode is humanized

APPLICATIONS

- Power System Monitoring and Management
- Real-time grasp of power usage and load distribution
- Industrial Automation Control
- Electric Vehicle Charging Management
- The Sun can generate system
- Ensure stable operation of industrial equipment

2.- TECHNICAL PARAMETERS

Parameters		Value	
Input	Distribution	DC network	
	Voltage	Rated value	0-1000V
		Overload	Measurement: 1.2 times Instantaneous: 2 times/10s
		Impedance	>1 k Ω /V
		Accuracy	Accuracy grade: 0.5%FS
	Current	Rated value	Shunt: conventional 75mV, others need to be specified separately
		Overload	Measurement: 1.2 times Instantaneous: 10 times/1s
		Impedance	<100m Ω
		Accuracy	0.5%FS
	Power	Accuracy: 0.5%FS	
	Electric energy	Active energy level 1	
Display	LCD with white backlit		
Power supply	Work scope	AC/DC85V~265V	
	Power consumption	\leq 4VA	
Output	Digital interface	RS-485,MODBUS-RTU	
	Pulse output	Optional 1 channel active energy pulse output	
Environment	Working environment	-25~55 $^{\circ}$ C Altitude \leq 2000m, 98%RH, no condensation, no corrosive gas	
	Storage environment	-30~75 $^{\circ}$ C	
Safety	Pressure resistance	Input and Power>2kV; Input and Output>2kV; Power and Output>2kV	
	Insulation	Input, output, power supply > 5M Ω to the chassis	

3.- INSTALLATION AND START-UP



The manual you hold contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep it in safety conditions. The instrument must not be powered on and used until its definitive assembly is on the cabinet's door.

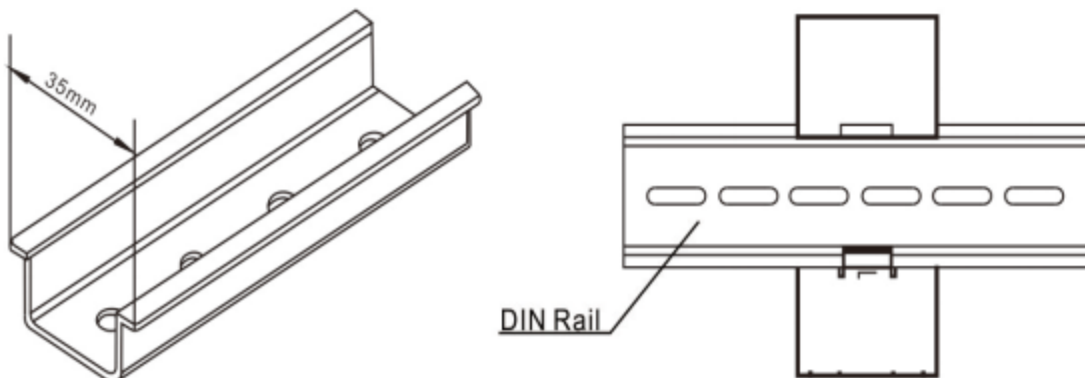
If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

3.1.- Installation

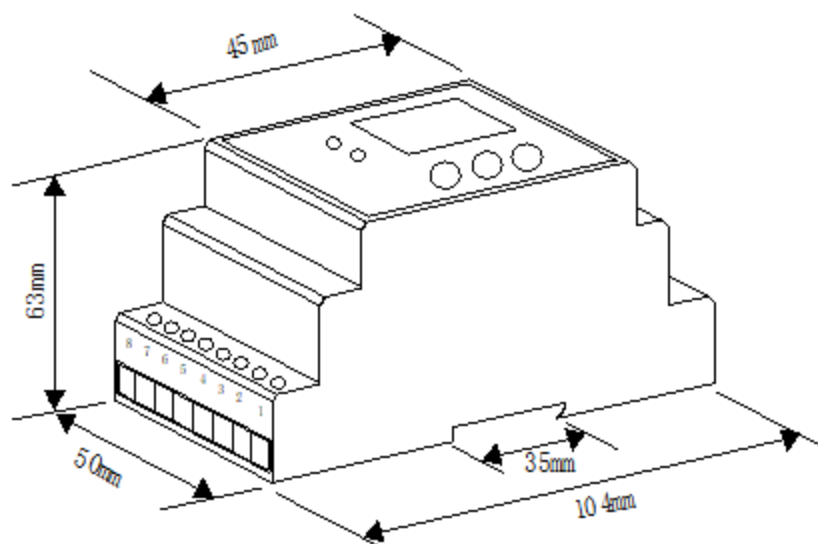
Mounting

Instrument is to be mounted on 35mm Din-rail. Keep all connections into the cabinet. Please note that with the instrument powered on, the terminals could be dangerous to touch and cover opening actions or elements removal may allow accessing dangerous parts. Therefore, the instrument must not be used until this is completely installed.



Dimension:

Unit: mm



Side view

3.2. - Connection Terminal

Upper connection terminal

16	15	14		13	12	11	10	9
U+				U-	I+	I-	DO	

16. Voltage input+

13. Voltage input-

12. Current input+

11. Current input-

10. Digital output

9. Digital output

Lower connection terminal

8	7	6	5	4	3	2	1
RP-	RP+	485G	485B	485A		N	L

8. Active energy pulse output (-)

7. Active energy pulse output (+)

6. RS-485 (GND)

5. RS-485 (-)

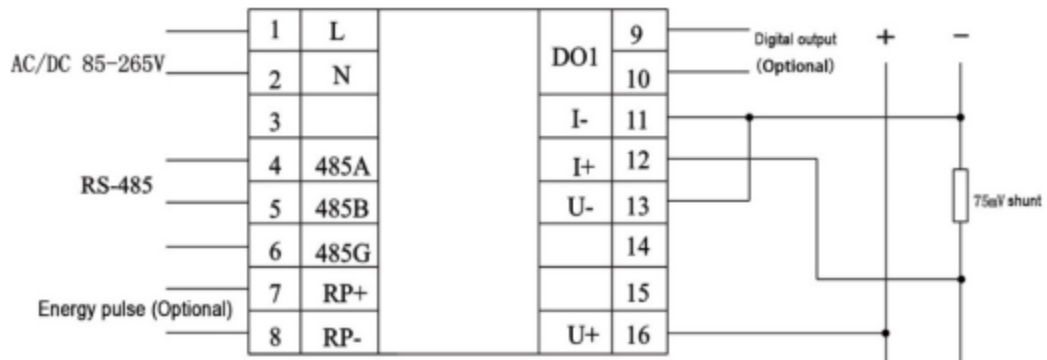
4. RS-485 (+)

1.2 Power supply

Note:

The terminal pin definition may change depends on customer order, please refer to the label on the meter!



3.3. – Typical Wiring



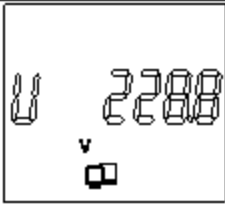
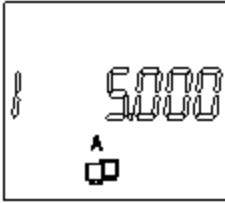
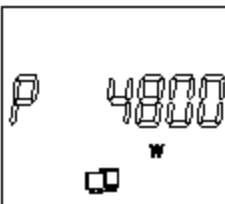
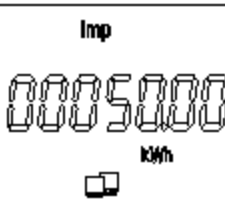
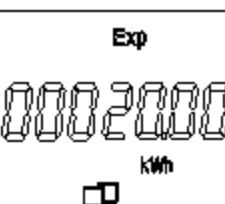
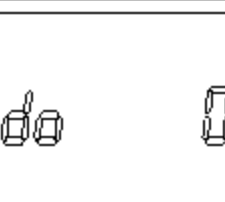
Notes:

- 1.The wire cross-sectional area of the access device should be selected according to the measuring range and calculated according to the actual load.
- 2.The communication line must use shielded twisted pair.
- 3.The RS485+ and RS485- of the communication line cannot be reversed.
- 4.When the communication connection adopts the linear connection mode, a line matching resistance of 100-120 ohms should be connected between the RS485+ and RS485- terminals at the start and end of the communication cable.
- 5.When the baud rate is 9600, the cable length is <1200 meters.

4.3.- Indicator light description

Name	Function definition(when lighting)
	Active power reverse
	Active energy pulse

4.4.- Screen pages' description

Screen No.	Screen interface	Description
1		Voltage: 228.8V
2		Current: 5.000A
3		Active power: 4800W
4		Active power: 50.00kwh
5		Reactive power: 20.00kwh
6		Digital output(Optional)

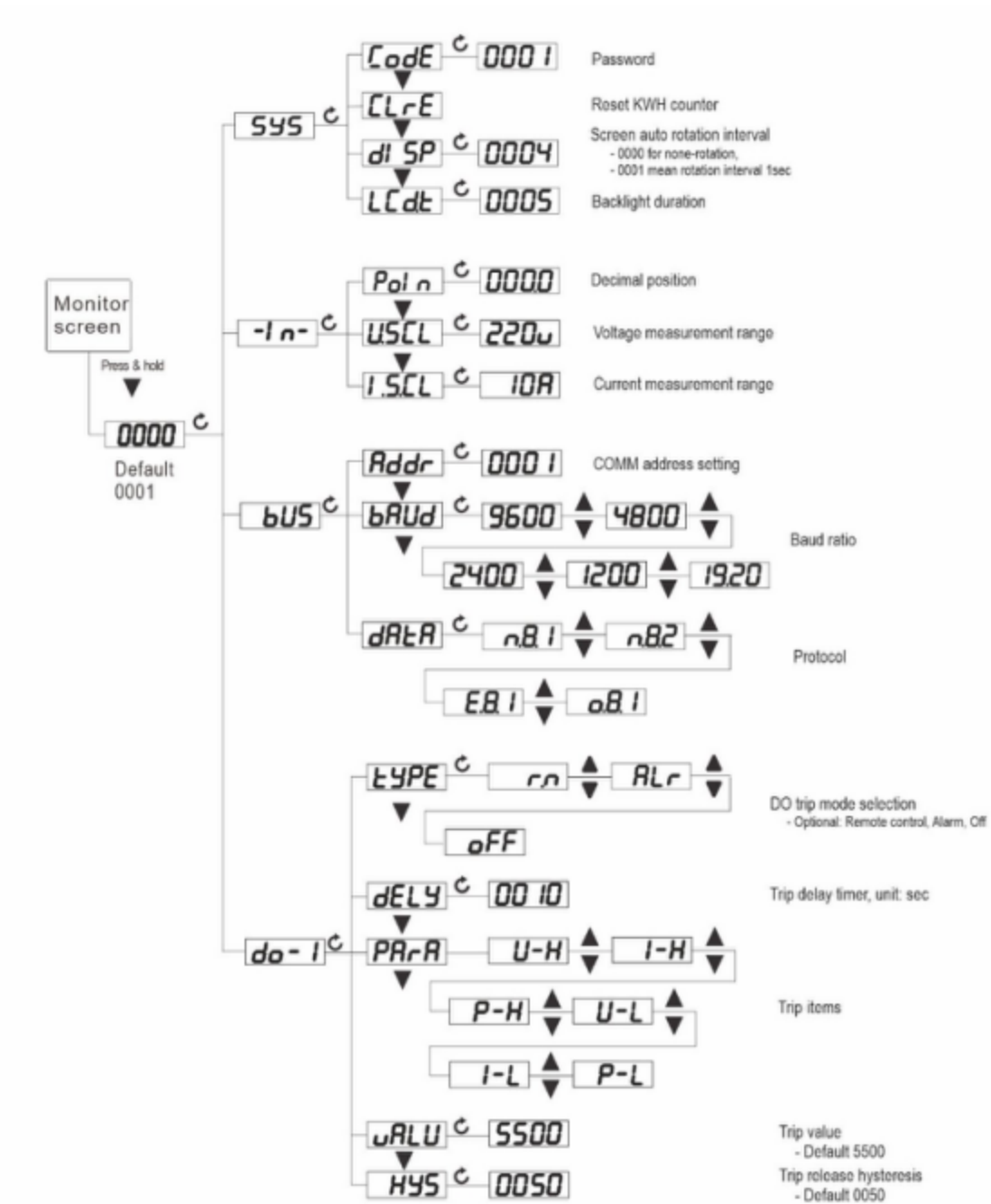
4.5.- Explanation of the flowchart part

Layer 1	Layer 2	Layer 3	Layer 4	Description
Input	U.SCL	0-1000V		Select the range of the input voltage signal
	I.SCL	0-9999A		Select the range of the input current signal
	PoIn	0000		Decimal point position
SYS	CodE	(Default 0001)		Set user-level passwords
	CLRE			Power clear
	DISP	0000 is not displayed cyclically, 0001 is displayed cyclically for 1 second		Switching time, in seconds. For example, if '1' is displayed, it means that the switching time between screens is 1 second.
	LCd,t	(Default 0005)		LCD backlight bright time setting
BUS	Addr.	(Default 0001)	1~247	Set the communication address of the instrument
	BAUD	1200,2400,4800,9600,19.20,(Default19.20)		Set the communication speed (baud rate)
	DATA	n.8.1, n.8.2,o.8.1,e.8.1(Default n.8.1)		Set communication data format
DO-1 (optional)	TYPE	r.n , ALr, OFF (Default ALr)		Alarm mode selection r.n, ALr, and oFF are the three working modes of the relay, which are remote control mode, alarm mode, off
	DELY	(Default 0010)		The setting value under the DELY menu is 0000, indicating the level mode. When it is not zero, it is the pulse mode, and the value inside is the pulse width.
	PARA	I-H、P-H.....U-H		Select the corresponding parameter, there are two

			forms of X-H and X-L, X-H means high alarm; X-L means low alarm; For example: I-H indicates that the current measurement value exceeds the alarm point and the relay operates;
	VALUE	(Default 5500))	Set the corresponding alarm value, the alarm value is set according to the actual value, the unit of voltage is V; the unit of current is A; the unit of active power is 0.1kW
	HYS	(Default 0050)	Set the corresponding hysteresis

4.6.- Main menu

In the case of measuring data, long press and hold the "Down" key, and the prompt of "0000" (that is, "password") will appear, enter the user-level password (default is 0001), and press the Confirmation key to enter the programming state. The instrument provides three types of input setting menu items: system factory commissioning (SYS), input (-IN-), and communication (BUS). Adopt LCD display layered menu structure management.



4.7.- Description of menu characters

Erro	(Error) Wrong input information
-In-	(Input) User Display Data Settings Menu
bUS	(Bus) Communication settings menu
SYS	(System) System settings menu
Code	(Code) Enter password
dAtA	(Data) Communication parameter setting
Addr	(Address) Local communication address setting
bAUD	(Baud) Communication baud rate
oB 1	(o.8.1) Indicates 8 data bits, 1 stop bit, odd parity
eB 1	(e.8.1) Indicates 8 data bits, 1 stop bit, even parity
nB 1	(n.8.1) Indicates 8 data bits, 1 stop bit, no parity bit
USCL	(U.scl) Select rated input voltage
ISCL	(I.scl) Select rated input current
do-1	DO setting
tYPE	Alarm mode selection (remote control, alarm, off)
PARA	Corresponding parameter selection
ALU	Set the alarm value
Ld S	Show low alarm setting
Hd S	Show high alarm settings
HYS	Hysteresis

5.- PULSE OUTPUT (Optional)

DCEM-3MS provides 1* pulse output for the active energy.

The host / PLC / DI module can cumulative the data of both the active and reactive power energy sent by the pulse from opt coupler relay.

- 1). Electrical specification: voltage $VCC \leq 48V$, $I_z \leq 50mA$.
- 2). Pulse constant: can be set according to customer needs, the default is set according to the secondary value of the instrument 10000imp/Wh: The high-level duration of the electric energy pulse is 80ms.

For example: the instrument defines the first channel of positive active energy pulse output, the cumulative output pulse is 5000, the rated voltage of the first channel is 500V, and the rated current is 200A. The actual electric energy measured is: $500 \times 200 \times 5000 / 10000Wh = 50000Wh = 50kWh$.

6.- COMMUNICATION INTERFACE

6.1.- Connection for RS485 BUS

The product provides serial asynchronous half-duplex RS485 communication interface, adopts MODBUS-RTU protocol, and can also be changed to DL/T645-2007 communication protocol. Various data information can be transmitted on the communication line. For the specific register address, please refer to our company Communication instructions provided.

Notes:

- For communication with the master unit, user can choose RS-485 to RS-232 converter or RS485 to USB adapter to use.
- For expand the number of devices in the communication network, a signal repeater can be used.
- RS485 PIN number is 58,59,60
- Due to product modifications or special requirements, the interface pin place may be change. For details, please refer to product label on the rear side

6.2.- MODBUS © Protocol

Modbus RTU Frame Format:

Address code	1 BYTE	<i>Slave device address 1-247</i>
Function code	1 BYTE	<i>Indicates the function codes like read coils / inputs</i>
Data code	4 BYTE	<i>Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte</i>
Error Check code	2 BYTE	<i>Cyclical Redundancy Check (CRC)</i>

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 01	Read Coil Status	<i>Only valid when equipped DO port</i>
FUNCTION 02	Read Input Status	<i>Only valid when equipped DI port</i>
FUNCTION 03	Reading of n Words	<i>This function permits to read all the electrical parameters</i>
FUNCTION 05	Force Single coil	<i>When DO in remote control mode can work</i> Disable in default
FUNCTION 06	Preset Single register	<i>If need valid this code, please contact Blue Jay Sales Team before your order!</i>

Note: Float data follow **IEEE754**, float low bit first, high bit next. **(CD AB)**

6.3.- Register Map

6.3.1.- Basic power data—Primary Side

Register	Data	Byte mode		Instruction
0x00	U	float	2	Voltage, Unit: V
0x02	I	float	2	Current of channel 1 , unit A
0x04	P	float	2	Power of channel 1, unit W
0x06	Epz	float	2	The combined active energy of channel , unit KWh
0x08	EP+	float	2	The positive active energy of channel, unit KWh
0x0a	EP-	float	2	Negative active energy of channel , unit KWh
0x200	DO	int	1	Remote control relay output status Bit0 1 output status

Notes:

1. The data can be read out depends on your multi-function meter model, please refer to the corresponding product manual before build your software.
2. Some software has different definitions of the start bit of register address, there will be offset, please add 1 for the right address. To get more info, please contact technical support.

7.- SAFETY CONSIDERATIONS



All installation specification described at the previous chapters named:
INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

- ◆ The device must have a professional installation and maintenance.
- ◆ Any operation of the device, you must cut off the input signal and power;

8. - MAINTENANCE

The DCEM-3MS DC Energy Meter does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is open and powered on, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allows a quick replacement in case of any failure.

9. - TECHNICAL SERVICE

For any inquiry about the instrument performance or whether any failure happens, contact to Blue Jay's technical service.

Blue Jay - After-sales service

*1802, Building 2, No.88, Jianxin East Road,
Chongqing, 400020, China*

Tel - + 0086 023 67628702

E-mail: tech@cqbluejay.com