

iDCM7

User Manual

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User Manual

1.1 Overview

1.2 Main Uses and Application Scope

The iDCM7 series DC smart energy meter (rail-mounted) (hereinafter referred to as “the meter”) is a next-generation intelligent instrument designed for power monitoring systems in industries such as new energy, telecommunications, construction, and others that use DC power distribution. It integrates measurement and communication functions, primarily used for measuring and displaying electrical parameters such as voltage, current, power, and forward active energy in DC electrical circuits. It can also communicate with external devices through an RS485 interface for networking. It is suitable for applications like DC charging stations, batteries, solar panels, as well as energy measurement and monitoring in industrial enterprises, residential buildings, and building automation systems.

Complied standards:

EN 50470-4:2023 Electricity metering equipment - Part 4: Particular requirements - Static meters for DC active energy (class indexes A, B and C);

EN IEC 62052-11 Electricity metering equipment - General requirements, tests and test conditions - Part 11: Metering equipment;

IEC 62052-31:2015 Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests;

IEC 62052-41:2022 Electricity metering equipment - General requirements, tests and test conditions - Part 41: Energy registration methods and requirements for multi-energy and multi-rate meters;

IEC 62053-41:2021 Electricity metering equipment - Particular requirements - Part 41: Static meters for DC energy (classes 0,5 and 1);

EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements;

IEC 61010-2-030 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits;

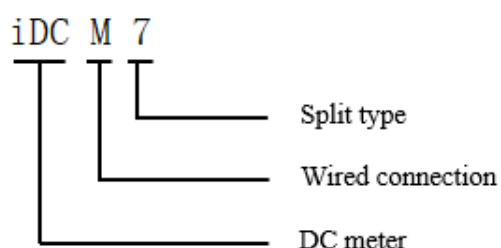
Modbus-RTU Communication Protocol;

DL/T 645_2007 Multi-function energy meter communication protocol.;

1.3 Product Features

- 1) Metering the positive and negative active power;
- 2) Measures power, voltage, current, and other electrical parameters.;
- 3) Single-loop metering and electrical parameter measurement;
- 4) Supports RS485 communication with Modbus-RTU and DL/T645-2007 communication protocols;
- 5) Supports separate sensor installation and large current direct measurement;
- 6) Current sampling refresh cycle $\leq 200\text{ms}$, voltage and current refresh cycle $\leq 300\text{ms}$.;
- 7) Up to 600A for current range and voltage range up to 1000V (with a lower limit for voltage measurement no less than 135V);
- 8) Temperature compensation function for accuracy;

1.4 Model Composition and Representation Meaning



2 Working Principle

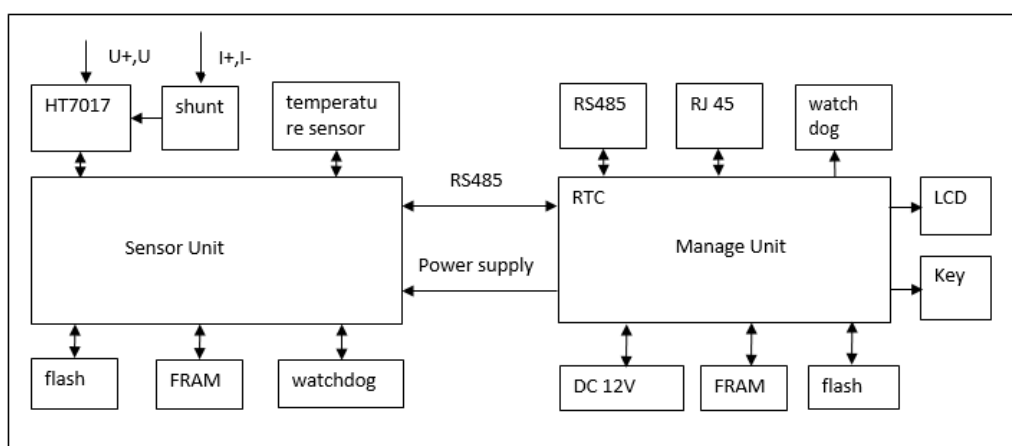


Figure1 Work principle block diagram

The product consists of two main components: the Sensor Unit (SU) and the Management Unit (MU). The Sensor Unit is responsible for data collection and recording, while the Management Unit handles communication, display, key processing, and other system functions.

3 Main Technical Performance and Parameters

3.1 Information and marking illustrate

Table1 Information and marking

Information	Location						Technical information reference
	C	D	P	IM	UM	MM	
General information							
Manufacturer's name or trade mark	√		√	√	√	√	CHNT
Designation of function							
Type	√		√	√	√	√	iDCM7
Space for approval mark	√						
Serial number and year of manufacture	√	√					
Detached indicating display serial number	√	√					
Embedded software identification		√					Refer chapter 4.3
Protective class	√		√	√	√	√	Refer chapter 6.5
Rated impulse voltage				√	√	√	Refer chapter 3.3
Utilization category for directly connected meters only with SCS							Not applicable
Environmental conditions, storage				√	√	√	Refer chapter 3.3
Environmental conditions, operation, including				√	√	√	Refer chapter 3.3
● Mechanical condition				√	√	√	Refer chapter 3.3
● Climatic condition				√	√	√	Refer chapter 3.3
● altitude				√	√	√	Refer chapter 3.3
● location (dry or wet)				√	√	√	Refer chapter 3.3
IP rating			√	√	√	√	Refer chapter 3.3
Reference to standards	√		√	√	√	√	Refer chapter 1.2
Reference to instructions							

Nominal value and the operation range of the auxiliary power supply voltage	√			√	√	√	Refer chapter 3.3
Nominal value and the operation range of the auxiliary power supply frequency	√			√	√	√	Refer chapter 3.3
General information for installation and commissioning							
Handling and mounting				√	√	√	Refer chapter 5
Enclosure				√	√	√	Refer chapter 5
Connection requirements				√	√	√	Refer chapter 6.2
Connection and wiring diagrams	√			√	√	√	Refer chapter 6.3
Mains terminals	√			√	√	√	Refer chapter 6.3
Auxiliary terminals	√			√	√	√	Refer chapter 6.3
Connecting cables				√	√	√	Refer chapter 6.4
Isolation from the supply				√	√	√	Refer chapter 6.4
Protection requirements				√	√	√	Refer chapter 6.5
Protective class and earthing	√			√	√	√	Refer chapter 6.5
External protection devices				√	√	√	Refer chapter 6.5
Supply for external devices				/	/	/	Not applicable
Self-consumption				√	√	√	Refer chapter 3.3
Commissioning				/	/	/	Not applicable
General information for use							
General				√	√	√	
Display, push buttons and other controls				√	√	√	Refer chapter 4.3
Switches	/	/			/		Not applicable
Connection to user's equipment					√		Refer chapter 6.3
External protection devices					√		Refer chapter 6.5
Cleaning					/		Refer chapter 9.2
General information for maintenance							
Maintenance instructions					√	√	Refer chapter 9
Cleaning					√	√	Refer chapter 9
Batteries	/		/	/	/	/	Not applicable
Information specific for meters							
Nominal voltage(s)	√			√	√	√	Refer chapter 3.4
Service type	√		√	√	√	√	

Nominal current and current range	√			√	√	√	Refer chapter 3.4
Nominal frequency	/			/	/	/	Not applicable
Meter constant	√			√	√	√	Refer chapter 3.4
Accuracy class index	√			√	√	√	Refer chapter 3.4
Specified operating temperature range	√			√	√	√	Refer chapter 3.3
Instrument transformer ratio	/			/	/	/	Not applicable
Special type information	/			/	/	/	Not applicable

a) For location:

C = Case. These markings may appear on nameplate(s) or may be carried by the meter cover(s) in a permanent manner. Connection diagrams may be marked on the underside of the terminal cover(s).

D = Display;

P = Packaging;

IM = Instruction manual – UM = User manual – MM = Maintenance manual.

b M = Mandatory, O = OPTIONAL

c The installation, user and maintenance manuals may be combined as appropriate and, if acceptable to the customer, may be supplied in electronic format. When more than one of any product is supplied to a single customer, it is not necessary to supply a manual with each unit, if acceptable to the customer.

b) “√” in the table above means the item is satisfied.

Nameplate information is printed by laser. And the display information is stored in the nonvolatile memory.

3.2 Labels signs and signals

The following symbols are used to draw your attention to the relevant danger level, i.e. the severity and probability of any danger, in the individual chapters of this document:

Danger



Identifies an extraordinarily great and immediate danger that could lead to serious physical injury or death.

Warning



Indicates a potentially hazardous situation that may result in minor physical injury or material damage. If you see the symbol anywhere during the

installation and use of the instrument, be sure to refer to the manual for the corresponding information and measures to be taken.

Note:

Indicates general details and other useful information to help you with your work.

In addition to the danger level, safety information also describes the type and source of the danger, its possible consequences and measures for avoiding the danger.

3.3 Other Marking

	Bidirectional meter Energy received at the measuring point(for example, import) Energy received at the measuring point(for example, export)
	Caution, hot surface
	Caution
	Caution, possibility of electric shock
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION

3.4 Technical specifications additional

Table2 Technical Specification

Accuracy Class	Active	Class B
Auxiliary supply voltage	12~24V DC.	
Auxiliary supply frequency	DC.	
Current and Voltage Connection	Direct Connection	
Starting current	$\leq 0.04I_{tr}$	
Output Pulse Ratio	imp/kWh	1000
IP Rating	MU: IP20 (Indoor use only)	
	SU: IP10, Installed in an electrical cabinet with IP51 rating	
Temperature	Operation Range	-35°C to +70°C

	Limit Range for Storage	-40°C to +85°C
	Limit Range for Transport	-40°C to +85°C
Rel. Humidity	5% RH to 95% RH, non-condensing.	
Altitude	Up to 4000m. For altitudes between 2000m and 4000m, temperature derating applies, with a decrease of 1°C for every 200m increase in altitude	
Mechanical Environment	M1	
Electromagnetic Environment	E2	
Pollution class	DEGREE 2	
Overvoltage categories	CAT II	
Nominal voltages	1000 V DC	
Specified operational voltage	From 135V to 1100V DC	
Limited range of operation	From 135V to 1150V DC	
Insulation Strength	Basic insulation	5400V
	Reinforce insulation	9600V
Power consumption	Voltage Circuit	≤0.5W
	Current circuit	30W (250A) /48W (400A) / 72W (600A) /78W (650A) /
	Auxiliary Power	≤4W
Antistatic ability	Contact discharge	>8 kV
	Air discharge	>15 kV
Service Life	≥15 years	
Weight	MU: Net Weight: 0.289kg	
	SU: Net Weight: 0.513kg	
Local Communication	RS485	

3.5 Type Specifications

Table3 Type specifications

Product Model	Accuracy Class	Norminal Voltage	Current Specification	Meter Constant
iDCM7	Class B	1000V	4-80(650)A	1000imp/kWh
iDCM7	Class B	1000V	4-80(600)A	1000imp/kWh
iDCM7	Class B	1000V	4-80(400)A	1000imp/kWh
iDCM7	Class B	1000V	2.5-50(250)A	1000imp/kWh

4 Main Functions

4.1 Metering Function

- 1) Bidirectional measurement , Forward and reverse data are stored independently;
- 2) The stored data in the meter is not lost after a power outage.

4.2 Electrical Parameter Measurement Function

- 1) The meter is capable of accurately measuring electrical parameters such as power, voltage, and current.
- 2) Refreshing time of metering parameters: $\leq 200\text{ms}$.

4.3 Display Function

The instrument adopts segment LCD design and has the function of displaying electrical parameters and power data. When the energy meter is working normally (under load), the front pulse indicator should blink. If there is no flicker for a long time or the light is not on, please check whether the energy meter is connected correctly.

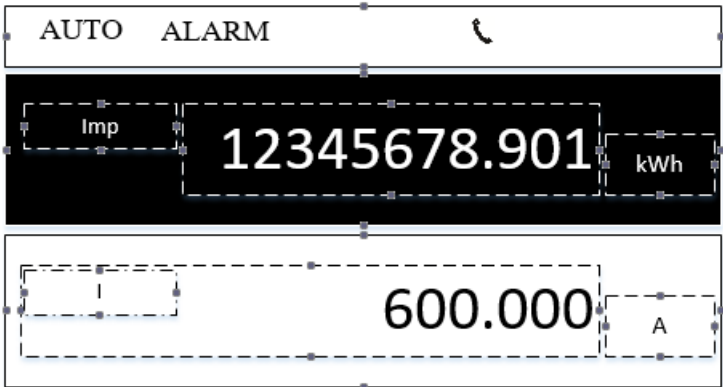


Figure2 Display Interface

The instrument adopts a dot-matrix liquid crystal screen design. The display content is divided into three areas. From top to bottom, the first part is the display status indication area, which is used to show the current working status of the instrument. The black background with white characters area in Part 2 is the legal data display area. The electricity consumption data display format is 8+3, and the unit is kWh. Part 3 is the non-legal data display area, which is used to show other data contents.

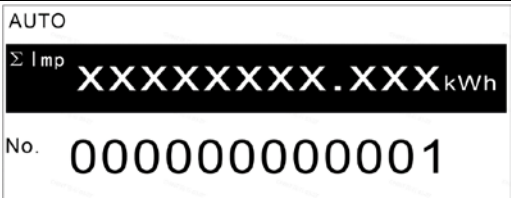
Table4 LCD Symbol Descriptions

	Symbol	Description
1	AUTO	Current display mode, “AUTO” means current is automatic list mode.

2	ALT	Current display mode, “ALT” means current is alternate list mode.
3	ALARM	Alarm symbol, detail information refer alarm register definition.
4		Communication indicator.

After the meter is powered on, it first displays the full screen and then the blank screen for testing. After the test is completed, the firmware version and verification will be displayed. This process can be interrupted by pressing keys and enter the normal display mode.

Table5 Display Example Description

	Item	Description
1		The black background part of the content represents the import active energy
2		The black background part of the content represents export active energy
3		The white background is the serial number "000000000001".
4		Management unit firmware version is V1.03.
5		Sensor unit firmware version is V1.03.

6	AUTOALARM Σ Imp XXXXXXXXXX.XXX kWh MU 3856	Management unit firmware CRC is 3856, The verification shall be based on the actual situation.
7	AUTOALARM Σ Exp XXXXXXXXXX.XXX kWh SU 0458	Sensor unit firmware CRC is 0458, The verification shall be based on the actual situation.
8	AUTO Σ Exp XXXXXXXXXX.XXX kWh U 1000.0_V	Instantaneous voltage value
9	AUTO Σ Imp XXXXXXXXXX.XXX kWh I 120.0_A	Instantaneous current value
10	AUTO Σ Exp XXXXXXXXXX.XXX kWh P 600.0_{kW}	Instantaneous power value
11	AUTOALARM Σ Exp XXXXXXXXXX.XXX kWh Baud 115200	Communication baud rate
12	AUTOALARM Σ Exp XXXXXXXXXX.XXX kWh Parity 8n1	Communication parity
13	AUTOALARM Σ Imp XXXXXXXXXX.XXX kWh Addr 0080	Communication address

14	AUTO ALARM Σ Imp XXXXXXXXXX.XXX kWh Err 00000001	Alarm: Display the alarm screen only when an alarm occurs
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The measurement data cycles by default every 15 seconds. An example of a single-page measurement data display is shown. If it differs from the actual meter display, the actual product shall prevail. If the sensor unit fails to authenticate successfully, “–” will be shown to indicate invalid data.

4.4 Button

The meter only provides two buttons, the upper button is used to switch the display mode, and the lower button is used to switch the display screen.

The combination of the two keys can be used to set the communication address. The specific operation methods are as follows:

Up Button: Long press to enter the settings menu. After entering the correct password, you can set the communication address.

Down Button: Display the next page of content. In the menu mode, the value increases.

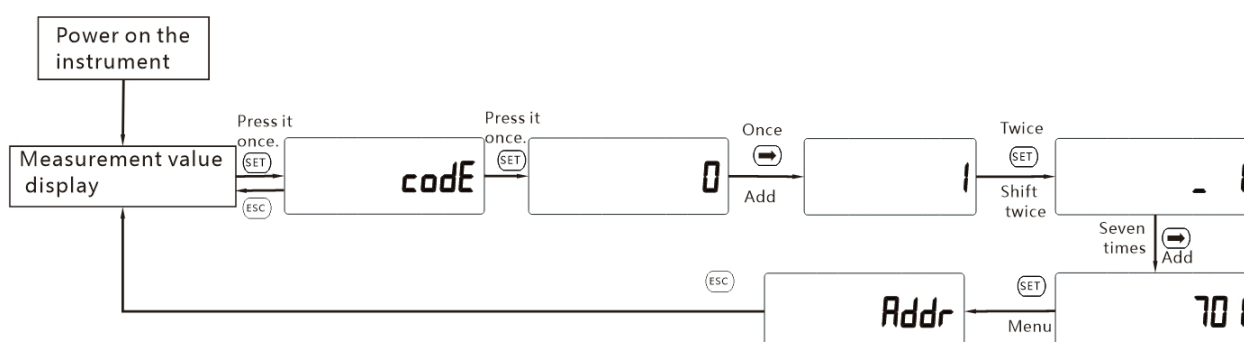


Figure3 Long Press Button Instructions

4.5 Alarm Register

The alarm register is a 32-bit data field, where 0 indicates normal operation and 1 indicates an alarm condition:

BIT31~BIT12	BIT11	BIT10	BIT9~BIT1	BIT0
Reserved	Reserved	Reserved	Reserved	Meter Fault

4.6 Indicator Functions

The meter panel has two LED indicators with the following functions:

1) **Status LED:** Indicates the working status of the meter. The light is on when the meter is operating normally.

2) Pulse LED: Indicates energy pulses. The pulse constant is 1000imp/kWh.

4.7 Communication Functions

4.7.1 Communication Interface

1) One RS485 communication interface, supporting a maximum baud rate of 115200bps, with the default configuration of 8N1 (baud rate can be configured).

2) One RJ45 Ethernet interface, used for future expansion functionality.

4.7.2 Data Read and Write

The RS485 interface allows for parameter setting and data reading. The communication protocols follow DL/T 645-2007 and Modbus-RTU, with automatic switching between protocols during communication.

DL/T 645-2007 and Modbus-RTU Protocol: Can read real-time parameters (voltage, current, power, etc.), active energy measurement, communication parameter settings, and more.

5 Appearance and Installation Dimensions

5.1 Management Unit (MU)

Management Unit Structural Dimensions, External Dimensions: 126 mm (Length) × 92.0 mm (Width) × 63.5 mm (Height), As shown in the diagram below:

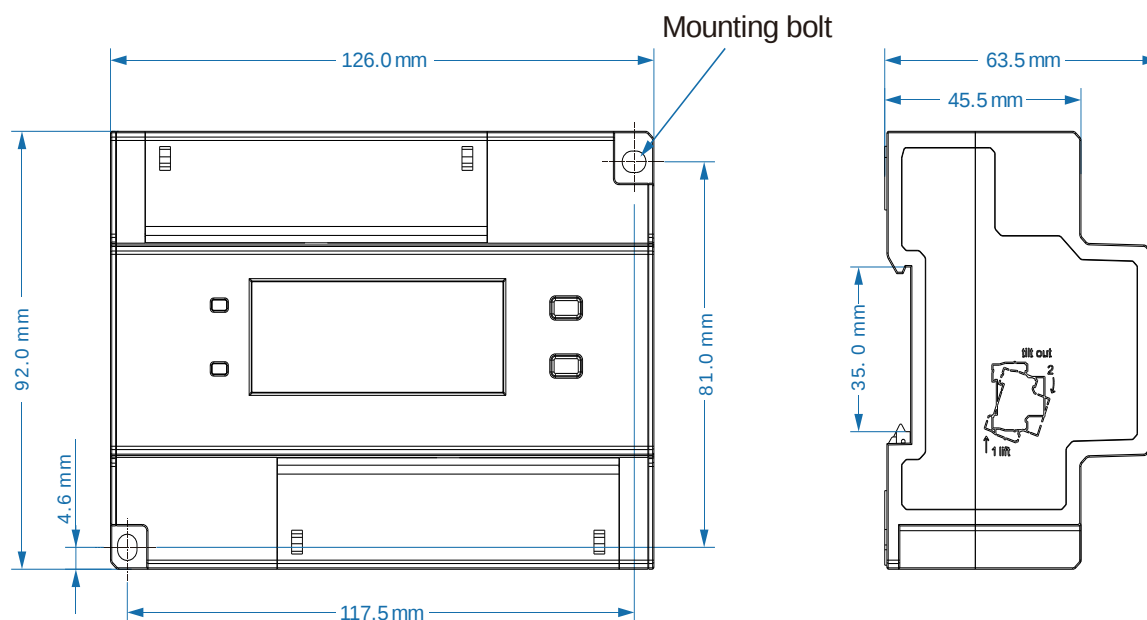


Figure4 MU Appearance and Installation Dimensions

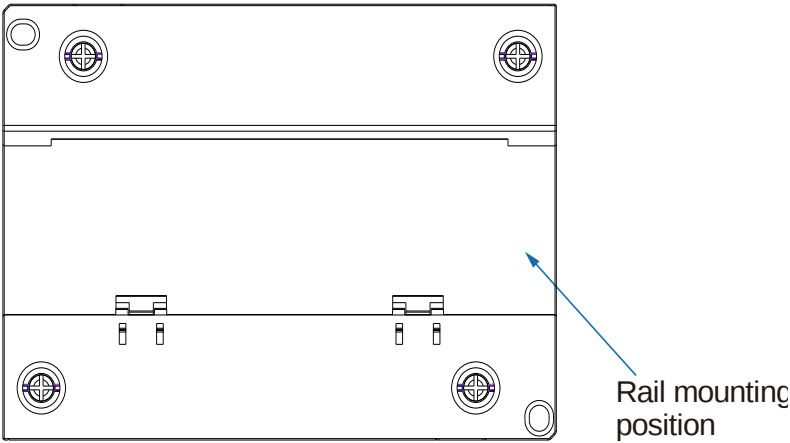
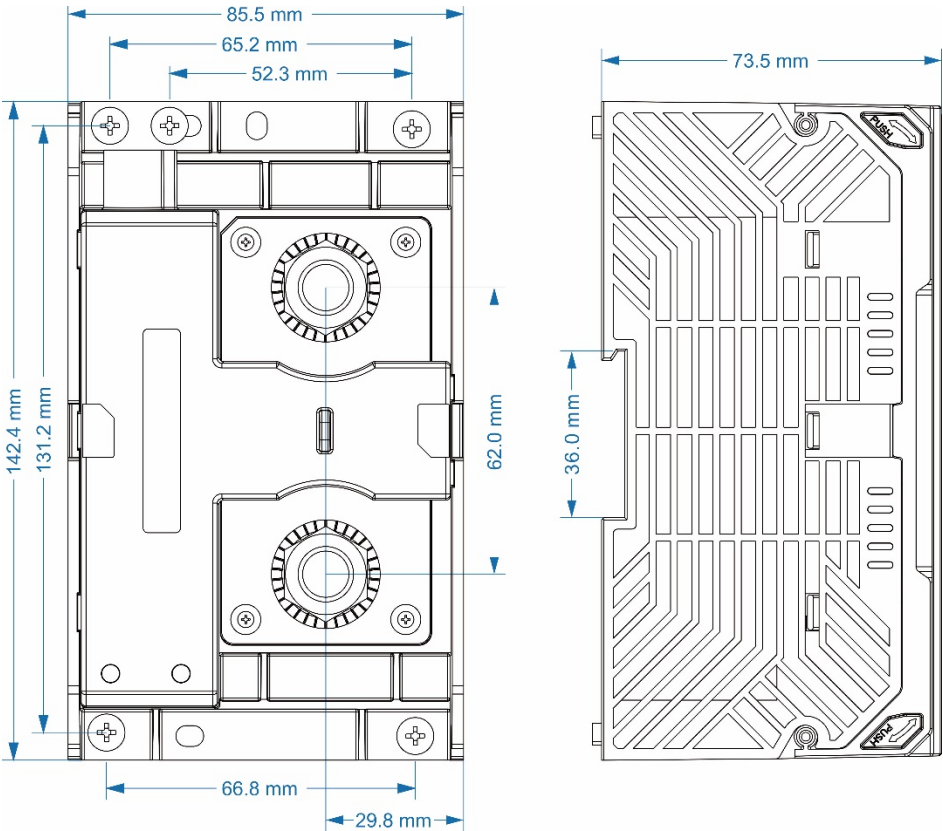


Figure5 MU DIN Rail Installation

Note 1: Dimensional tolerance $\pm 1\text{mm}$;

5.2 Sensor Unit (SU)

Sensor Unit Structural Dimensions, External Dimensions: 142.4 mm (Length) $\times$ 85.5 mm (Width) $\times$ 73.5 mm (Height), As shown in the diagram below:



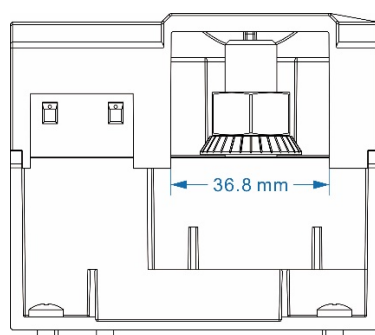


Figure6 SU Appearance and Installation Dimensions

Note 1: Dimensional tolerance $\pm 1\text{mm}$.

6 Installation and Usage Instructions

6.1 Unpacking Inspection Notes

1) If the meter's casing shows visible damage due to severe impact or dropping when unpacking, contact the supplier immediately.

2) After removing the meter from the packaging, place it on a flat, secure surface with the front facing up. Do not stack more than 5 units. If not installing or using the meter in a short time, it should be wrapped and placed back into the original packaging for storage.

6.2 Installation and Precautions



DANGER

Before connecting the cables, ensure that the smart meter has not been damaged. Otherwise, there may be risks of electric shock or fire. Ensure that all electrical connections comply with local electrical standards.

External protection device check: Please strictly follow the requirements for wiring installation and prohibit live operation. Install external fuses or circuit breakers at the front end of this product to ensure safe use.

6.2.1 Installation Check

If the product model or appearance does not match the one on the packaging, contact the supplier. If you find any damage to the inner packaging or the casing when removing the meter from the box, do not install or power on the meter. Contact the supplier as soon as possible.

6.2.2 Installation

The meter is directly clipped onto the DIN rail and then installed in the distribution box.

1) During installation, first clip the lower end of the slot into the rail, slightly lift it upwards, and then clip the top end into the rail.

2) To remove, slightly lift the meter upwards, detach the top end from the rail, and then remove the meter from the rail.

The installation should be performed by an experienced electrician or professional who has read this manual. If the meter is subjected to a severe impact or drop during installation and the casing shows visible damage, do not install or power on the meter, and contact the supplier immediately.



It is recommended to install the meter in the state of power failure; If live operation is necessary, insulation protection measures shall be taken.

6.3 Wiring diagram

MU Wiring Diagram:

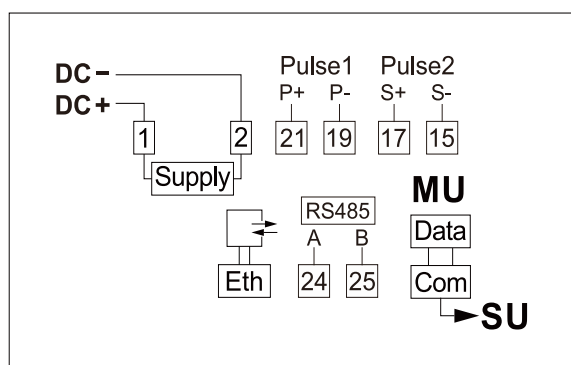


Figure7 MU Wiring Diagram

Sensor Unit Wiring Diagram:

It supports different wiring methods. Regardless of the wiring method, the current flow direction is always positive from I1 to I2, and the energy is accumulated to the import register. Otherwise the energy is accumulated to the export register. And the default connection is low side mounting direct current flow.

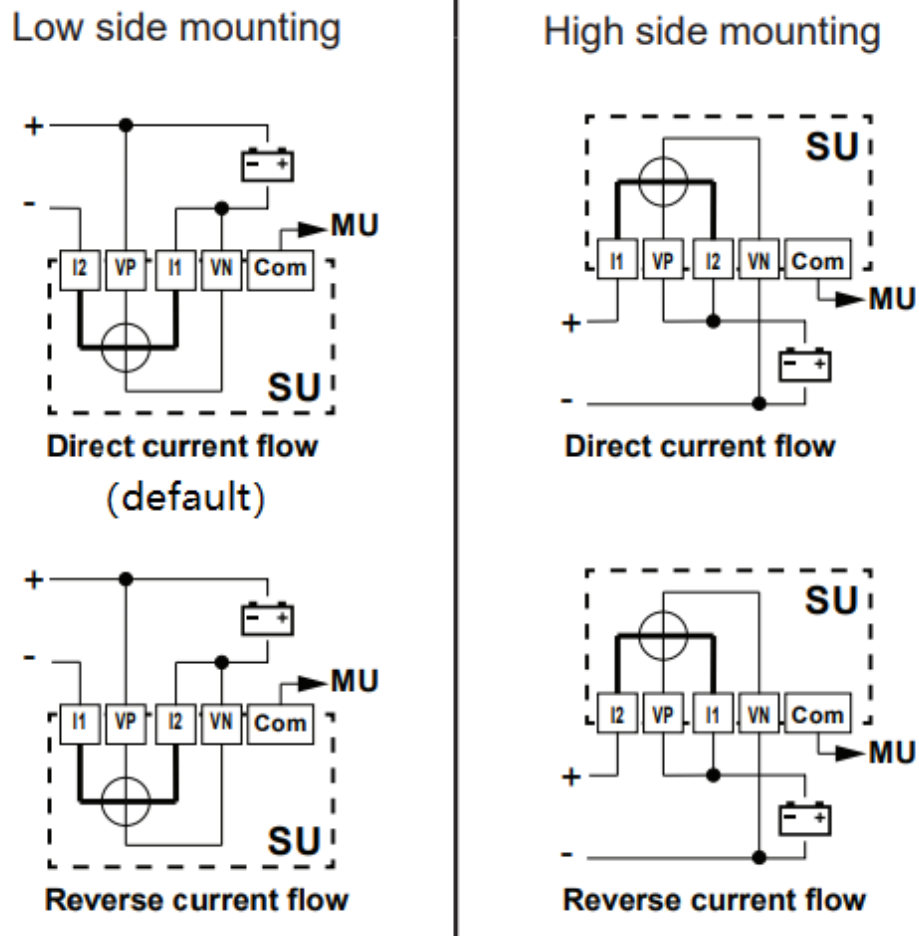


Figure8 Sensor Unit Wiring Diagram

6.4 Connecting cables

Current terminals:

- 1) It's better to use the copper wire or copper connection to connect.
- 2) Cable sectional size and torque refer the below table.
- 3) Cables need to be flame retardant. High temperature resistance according to the recommended below table.
- 4) Withstand voltage shall be at least 2 kV.

Voltage terminal:

- 1) Withstand voltage shall be at least 2 kV.
- 2) Suggest using ferrite to ensure measurement accuracy even in the presence of interference.
- 3) Other parameter refer the below table.

Auxiliary terminals:

- 1) recommended cable sectional area is 1mm.The auxiliary terminal is the low-voltage part, type voltage and working temperature of the cable is not mandatory.
- 2) Suggest using ferrite to ensure power stability even in the event of interference.

Ethernet:

- 1) Product's Ethernet interface mustn't be exposed to a public network; network must be private and secured.
- 2) Suggest using ferrite to ensure stable communication even in the event of interference.

Table6 Recommendations for cable specifications

Type of terminal	Maximum current	Cable specification	Tightening torque (N·m)	Temperature Resistance (°C)
Current terminal	650A	$\geq 400 \text{ mm}^2$	27	≥ 125
	600A	$\geq 400 \text{ mm}^2$	27	≥ 125
	400A	$\geq 250 \text{ mm}^2$	27	≥ 125
	250A	$\geq 150 \text{ mm}^2$	27	≥ 125
Voltage terminal	/	$0.2 \sim 2.5 \text{ mm}^2$	$0.15 \sim 0.25$	≥ 125
Auxiliary terminal	/	$0.2 \sim 2.5 \text{ mm}^2$	$0.15 \sim 0.25$	≥ 125

Note: the final selection should be made in combination with specific working conditions, such as ambient temperature, installation method, heat dissipation method, and in accordance with local electrical standards.

6.5 Protection

The meter is designed for protective class II , earth connector is not use in the meter.



It is recommended to use protection device at the supply side of the meter. Installer is responsible for coordinating the rating and the characteristics of the supply side over current protection device to maximum current rating of meter .

7 Common Fault Diagnosis, Analysis, and Troubleshooting Methods

Table7 Common Fault Diagnosis, Analysis, and Troubleshooting Methods

Phenomenon	Cause Analysis	Troubleshooting	Notes
Display Fault	Possible incorrect wiring according to	Check if the actual wiring matches the diagram, especially	Ensure the meter is in a disconnected state when

	the wiring diagram	the position of “N” for voltage, the high and low terminals for current, and the terminal numbers	inspecting wiring to ensure personal safety
Communication Fault	Possible incorrect communication settings of the meter	Check the communication settings of the meter, such as communication address, baud rate, and parity, and ensure they match the settings of the host computer	Ensure the meter is in a disconnected state when inspecting wiring to ensure personal safety
Alarm Display	Possible issue with the connection between the management unit and sensor unit	Check if the connecting cable between the management unit and the sensor unit is intact and properly connected.	Ensure the meter is in a disconnected state when inspecting wiring to ensure personal safety

8 Transportation and Storage

The meter should be packaged using environmentally friendly materials. The meter and accessories should be stored in a ventilated and dry place, avoiding exposure to moisture and corrosive gases. The storage temperature range is -40°C to +85°C, with a relative humidity not exceeding 75%.

Packaging for Single Product:

- 1) One set of the meter, including the measuring unit, display unit, and connection cables.
- 2) One user manual.
- 3) One certificate of conformity.

9 Information for maintenance

9.1 Maintenance instructions

In order to ensure the stable operation of products, regular maintenance is required.

- 1) Maintenance every month, to check the installation environment, alarm symbol, and connection cable.
- 2) During maintenance, when it is necessary to remove the product, power off as much as possible.

- 3) When connecting wire, it may contact the mains power, please take safety precautions.
- 4) If an alarm is displayed, check the alarm cause according to the manual and handle the alarm in time.
- 5) After the maintenance, check the LCD, make sure there is no alarm symbol occurred.
- 6) When the electricity meter is damaged or reaches the end of its service life, please comply with the national laws and regulations related to waste electrical and electronic products recycling, and give it to a local manufacturer with the state-approved recycling qualification for recycling.

9.2 Clearing

The product does not require cleaning after installation.

10 Warranty and Service

The manufacturer provides a warranty for product quality under the “Three Guarantees” policy. If the meter is damaged within 18 months from the date of shipment, and the user fully complies with the instructions and the factory seal remains intact, the company will repair or replace the meter free of charge.

Dear clients,

Please assist us: when the product life is end, to protect our environment, please recycle the product or components, while for the materials that cannot be recycled, please also deal with it in a proper way. Really appreciate your cooperation and support.

DECLARATION

- 1、The products, services or functions you purchase are all subject to the commercial contract and terms signed with our company. All or part of the products, services or functions described in this manual may not be included in the scope of the products you purchased.
- 2、Unless otherwise agreed in the contract, the company does not make any express or implied statement or guarantee for the contents of this manual.
- 3、The information in this manual is subject to change without notice.
- 4、The company is not responsible for any indirect losses caused by the provision, display or use of this information.

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