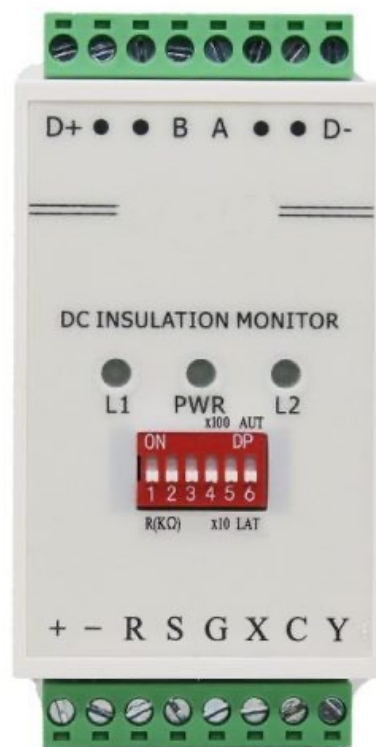


# Energom-DU-1

## DC Insulation Monitor User Manual



Version: 1.0

Revision 2023.05

## Read me

**When you use EnergoM-DU-1, 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 EnergoM-DU-1, and help to solve the various problems at the scene.**

1. Before turning on the power supply, be sure that the power supply within the provisions of the instrument;
2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;
3. Communication terminal (RS485) is strictly prohibited to impose on high pressure;
4. Be sure the instrument wiring consistent with the internal system settings;
5. When communicating with the PC, instrument communication parameters must be consistent with the PC.



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

## Directory

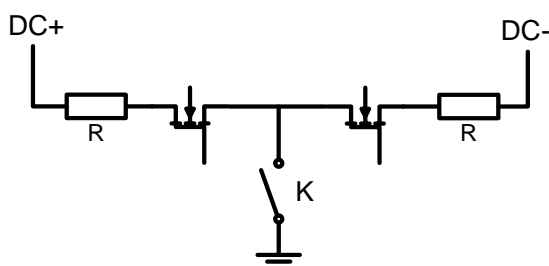
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## 1. - SUMMARIZE

Energom-DU-1 is a DC-to-Ground insulation monitoring module based on the principle of unbalanced bridge, which has monitoring and protection functions in one. It can monitor the insulation resistance value of the positive and negative poles of the DC floating system to the ground, ranging from  $0\Omega$  to  $10M\Omega$ ; at the same time, it can also detect the DC voltage value, ranging from  $0V$  to  $1000V$ .

The user can obtain the measurement value through RS485 communication, and can set the alarm resistance threshold through the DIP switch or RS485 communication. When the insulation resistance is less than this value, the fault relay operates and the L2 indicator light is on. At the same time, passive reset and automatic reset can also be selected through the configuration bit of the DIP switch, and the module stops working at the same time as manual or remote reset.

Energom-DU-1 is equipped with a high-voltage grounding switch (switch K in the picture), which can realize the online on-off function, that is, when the module is powered off, reset, and stops working, its high-voltage switch to the ground is disconnected, and it is completely separated from the ground. The DC-to-ground high voltage test is not higher than  $4200V_{dc}$ .



## FEATURES

- High voltage grounding switch
- Widely power supply range
- Widely insulation monitoring range ( $100V\sim 1000V_{DC}$ )
- insulation monitoring equipment self-test
- Adaptive capacitance to ground
- Convenient parameter setting
- Remote monitoring and management
- Monitor positive and negative poles
- Ground insulation resistance
- Voltage reverse polarity alarm

## **APPLICATIONS**

- Insulation resistance monitoring
- DC voltage monitoring
- Guarantee the safety and stability of charging
- Improvement of the efficiency and charging quality
- Personnel and equipment security

## 1.1 - Working method introduction

The insulation monitoring module can be in "working" mode or "stop working" mode.

<b>"Working" mode</b>	the insulation resistance is continuously monitored in real time, the alarm function is activated, the ground switch is closed, and the 'L1' light is on
<b>"Stop working" mode</b>	the insulation resistance is not monitored, the alarm function stops, the ground switch is disconnected, and the 'L1' light is off;

Notes:

1. When the module is powered on, it defaults to "working" mode.
2. Whether in "working" mode or "stop working" mode, the DC voltage can also be detected.

### The methods switch to "stop working" mode:

1. Short-connection the 'R' port and the 'S' port
2. Set bit5 of 02H to '1' by sending a communication frame. After the 'R' port is disconnected from the 'S' port, or the bit5 of 02H is set to '0' by sending a communication frame, it can return to the "working" mode.

Note: The short connection between the 'R' port and the 'S' port needs to be electrically isolated, such as a button or a relay is closed to realize the short connection.

## 1.2.- Fault alarm function introduction

### 1.2.1 - Fault alarm and reset method

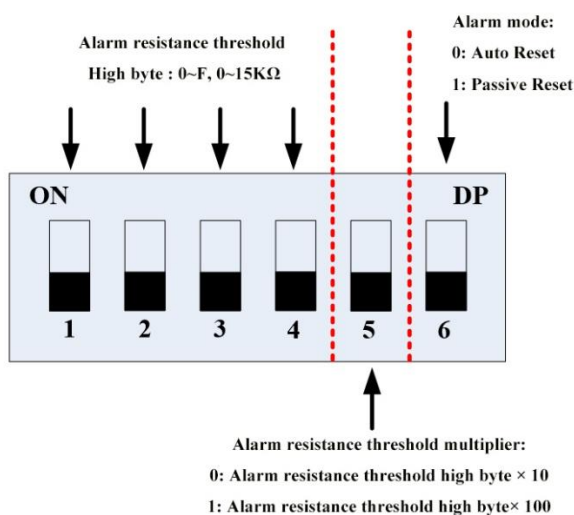
This product can be set in two modes of "Auto Reset" or "Passive Reset" through the 6th bit of the dial switch. 0: Auto Reset 1: Passive Reset

When the monitored insulation resistance value is < the alarm value, the module alarms. At this time, the fault relay coil is OFF, the corresponding NO dry contact is OFF, the NC dry contact is disconnected, and the 'L2' indicator light is ON.

If it is set to "Auto Reset" mode, the relay and indicator light 'L2' will automatically reset when the fault is recovered; If set to "Passive Reset" mode, user needs stop the insulation monitoring work to reset the fault relay and indicator light 'L2'.

#### Methods to stop insulation monitoring include:

- (1) Short-connected the 'R' port and 'S' port
- (2) Set the bit5 position of 02H to '1' by sending a communication frame.

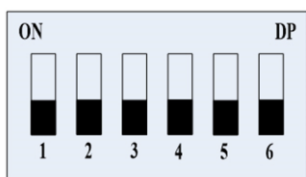


### 1.2.2 - Insulation resistance alarm threshold setting

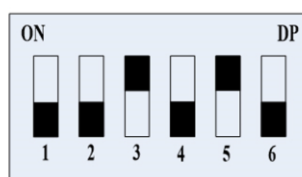
The insulation resistance alarm threshold can be set through the 1-5 digits of the DIP switch, the 1-4 digits are the setting value, and the 5 digit is the setting multiplier.

Example: If the setting value is 15 and the multiplier is 10, the set alarm value is 150KΩ.

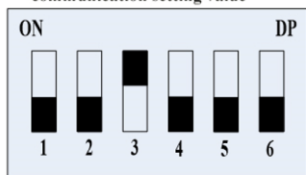
When all digits 1-4 are set to '0', the internal alarm value will be used. The internal alarm value can only be set by rewriting the value of 07H through RS485 communication. default is 0KΩ. The internal alarm value set by the communication is stored in the flash, and it will not be erased when the power is turned off.



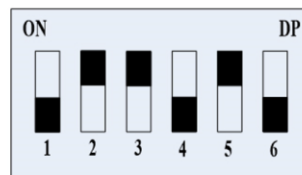
Alarm resistance value is communication setting value



Alarm resistance threshold is 200KΩ



Alarm resistance threshold is 20KΩ



Alarm resistance threshold is 600KΩ



## 2. - TECHNICAL PARAMETERS

### Basic parameters

Parameter	Value		
Power supply	10-30VDC, Power 3w		
DC voltage range	0V~1000V		
DC voltage measurement accuracy	$\leq 2V + 0.3\%$		
Insulation resistance measurement range	1K $\Omega$ ~10 M $\Omega$ (DC System voltage:100V~1000V)		
	<b>C<sub>Y</sub> range</b>	<b>Resistance range</b>	<b>Accuracy</b>
Insulation monitoring accuracy (When :DC voltage:100V-1000V)	0~0.8 $\mu$ F	$\leq 60k\Omega$ 60k $\Omega$ <R $\leq$ 1M $\Omega$	$\leq 3k\Omega$ $\leq 5\%$
	0.8 $\mu$ F ~3 $\mu$ F	$\leq 60k\Omega$ 60k $\Omega$ <R $\leq$ 1M $\Omega$	$\leq 6k\Omega$ $\leq 20\%$
Off-line pressure test	<2mA		
Maximum relay switching voltage	250VAC/30VDC		
Maximum relay switching current	3A		
Relay contact resistance	<100m $\Omega$		
Relay insulation resistance	100M $\Omega$		
Standard	IEC 61851-23 (2014-03):2014-11		
Humidity	85%		
Storage temperature	- 40°C ~125°C		
Operating temperature	- 40°C ~75°C		

#### Notes:

1. When facing the ground insulation resistance  $R_{ISO+}$  and negative insulation resistance to ground  $R_{ISO-}$ , The difference is too large, Multiplier of difference >5 times,  $R_{ISO+}$  and  $R_{ISO-}$  Large resistors may not be typical values.

2.  $C_Y$  Refers to the positive and negative Y capacitance values of the system bus to ground respectively.

**Other parameters**

<b>Pressure point</b>	<b>Maximum voltage rating</b>	<b>Time</b>
DC+/DC- To GND	4200VDC/2500VAC	≤1min
Power supply +/- To GND	3500VDC/2500VAC	≤1min
RS485 A/B To GND	3500VDC/2500VAC	≤1min
DC+/DC- To Power supply +/-	3500VDC/2000VAC	≤1min
DC+/DC- To A/B	3500VDC/2000VAC	≤1min

**Note:**

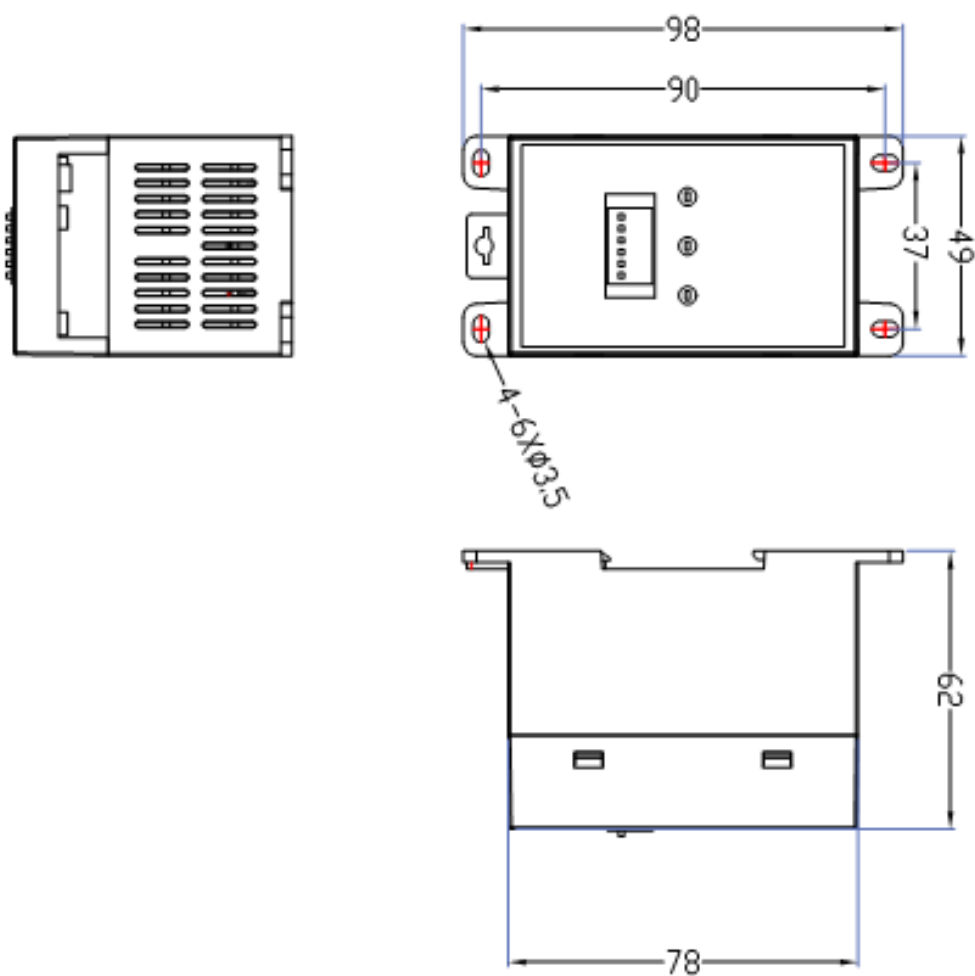
The power supply (+/-), RS485(A/B), and Ground(G) should be isolated from each other

### 3. - INSTALLATION AND STAR UP

#### 3.1. - Mounting

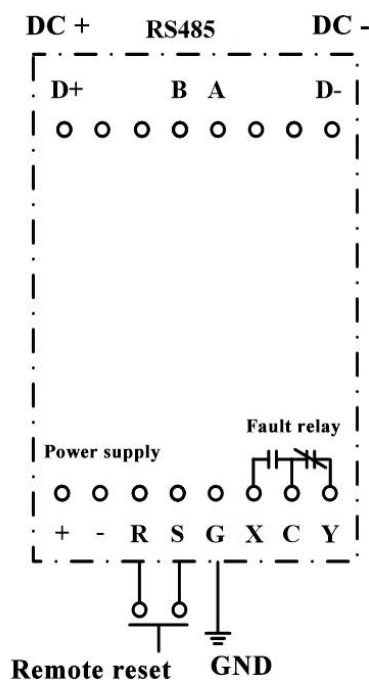
Energom-DU-1 module can be installed by rail or screw. Guide rails use standard width of 35mm. Overall dimensions are shown in Figure 1 below: (Unit: mm)

**Dimensions: L\*W\*H (mm) 98\*49\*62**

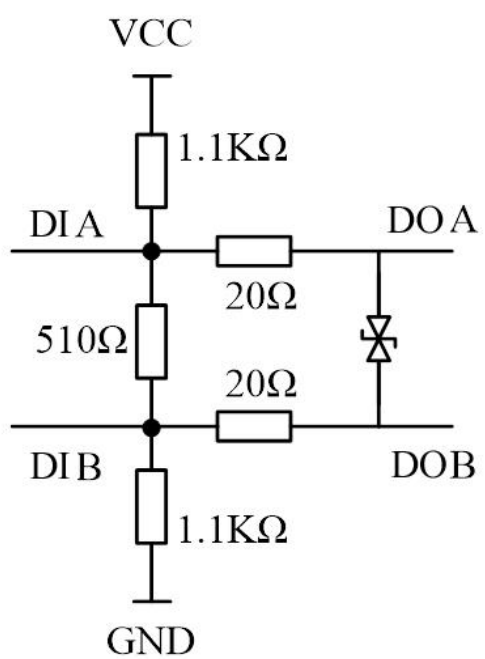


### 3.2. - Wiring Method

The wiring diagram is shown in the below. Realize remote reset with switch, short circuit current 0.25mA, direction R->S.



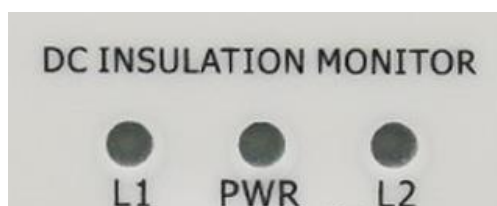
Interface	Connection mode	Definition
D+	Positive pole of DC	DC interface
D-	Negative pole of DC	
A	RS485-A	
B	RS485-B	
+	Positive pole of power supply	9-30VDC
-	Negative pole of power supply	
GND	Grounding point	
C	Relay common point	When insulation resistance alarm occurs  NO contact is closed NC contact is disconnected.
X	NO contact	
Y	NC contact	



**RS485 output port internal circuit**

### 3.3.- The LED display

After the module is powered on, the PWR indicator is on.



**PWR "ON"** The device is powered on.

**L1 "ON"** **"Working" mode**  
the insulation resistance is continuously monitored in real time, the alarm function is activated, and the ground switch is closed.

**L1 "OFF"** **"Stop working" mode**  
the insulation resistance is not monitored, the alarm function is stopped, and the grounding switch is disconnected.

**L2 "ON"** When the monitored insulation resistance value is less than the alarm value, the module alarms.  
the coil of the fault relay is closed, the corresponding normally open dry contact is closed the normally closed dry contact is disconnected.

## 4. - COMMUNICATION INTERFACE

### 4.1. - Connection for RS485

Users can send and receive data frames through the RS485 communication port. For details, see chapter of communication protocol. Terminals A and B correspond to RS485 outputs A and B respectively.

### 4.2. - Communication Protocol

Energom-DU-1 adopt custom protocol, initial address: 10H, initial baud rate: 9600bps, parity: none, stop bit 1, data bit 8.

#### 4.2.1 - Data address

Function	Item	Rated value range	Unit	Byte mode	Read-Write attribute
02H	Communication address + Alarm work Control /query +Fault code	0~65535		int	R/W
03H	DC voltage	0~1023	V	int	R
04H	Positive Grounding Resistance	0~65535	kΩ	int	R
05H	Negative Grounding Resistance	0~65535	kΩ	int	R
07H	Internal Alarm Resistor Threshold	0~10000	kΩ	int	W

## 4.2.2 - Detailed definition

**02H Read/Write**

Bit15~Bit8      Communication address

Bit7~Bit6      Null

**Work status control**

Bit5(R)      0= Enter the working mode (insulation resistance monitoring, alarm function ON, light L1 ON)  
1= Enter the stop working mode (stop the insulation resistance monitoring, the alarm function is OFF, light L1 OFF)

**Work status inquiry**

Bit4(R)      0= working normally  
1= stop working

**Negative pole to ground insulation alarm sign**

Bit3(R)      1=Negative to ground insulation alarm (negative grounding resistance < set threshold)  
0=No fault

**Positive pole-to-ground insulation alarm sign**

Bit2(R)      1=Positive pole to ground insulation alarm (positive pole grounding resistance < set threshold value)  
0=No fault

Bit1(R)      Null

Bit0(R)      Null

**03H Read**

Bit15~Bit0      DC voltage value: 0V~1000V

**04H Read**

Positive grounding resistor resistance. The range is 1kΩ~10MΩ.

Bit15~Bit0      If the read data is 0XEA 60 (60000), it means that the positive grounding resistance is infinite. If it is greater than 10MΩ, it will display 60000.

**05H Read**

Negative ground resistance. The range is 1kΩ~10MΩ.

Bit15~Bit0      If the read data is 0XEA 60 (60000), it means that the negative grounding resistance is infinite. If it is greater than 10MΩ, it will display 60000.

**07H Write**

Bit15~Bit0      Set the internal alarm resistor threshold. Range 0Ω~10000kΩ



## 4.3 - Command samples

### 4.3.1 - Read Command

#### Sample 1

**Host inquiry:**

10 01 02 03 04 05 CRC CRC

**Slave response:**

10 04 01 C4 00 31 EA 60 EA 40

**Notes:**

02H Data=0X1004, Mean: the communication address is 10H, and there is a fault between the positive pole and the ground.

03H Data=0X01C4=500, Mean: the DC voltage is 452V.

04H Data=0X0031=49, Mean: the positive grounding resistance is 19K $\Omega$

05H Data=0XEA60=60000, Mean: the resistance of the negative grounding resistance is infinite

### 4.3.2 -Write Command

**Sample 1** Turn on "work" mode

**Host inquiry:**

10 02 00 02 10 00 D7 4B

**NO slave response**

**Sample 2** Turn on "Stop work" mode

**Host inquiry:**

10 02 00 02 10 20 D6 93

**NO slave response**

**Sample 3** Set the internal alarm threshold to 100K $\Omega$

**Host inquiry:**

10 02 00 07 00 64 CB 61

**NO slave response**

## 5. - 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;

## 6. - MAINTENANCE

The EnergoM-DU-1 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.