

PBAT600 String Sensor

Installation & Operation Manual

V1.0



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Danger and warning!

This device can be installed only by professionals.

The manufacturer shall not be held responsible for any accident caused by the failure to comply with the instructions in this manual.



Risks of electric shocks, burning, or explosion

- This device can be installed and maintained only by qualified people.
- Before operating the device, isolate the voltage input and power supply and short-circuit the secondary windings of all current transformers.
- Use appropriate voltage tester to make sure the voltage has been cut-off.
- Put all mechanical parts, doors, or covers in their original positions before energizing the device.
- Always supply the device with the correct working voltage during its operation.

Failure to take these preventive measures could cause damage to equipment or injuries to people.

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Chapter 1 Product Overview

PBAT600 battery string sensor is specially designed as highly integrated smart sensor module for VRLA batteries, can quickly and accurately measure the VRLA's voltage, charge and discharge current and other parameters. String sensor uses specified isolated communication bus, equipped with PBAT61 battery cell sensor, to realize the real-time monitoring of the entire string of batteries. Real-time control of the actual operation of the battery string and health status, then promptly found problems during use battery. Real-time know the actual operation of the battery pack and health status, and discover the battery string existing problems during using, and realize automatic maintenance functions. It helps the battery string to keep voltage balance under float status, so that each unit of the battery to maintain the best active status, improve the battery life, timely find out the problem battery and maintenance, reduces labor cost and other maintenance costs, improve the safety of battery use to reduce the accident rate.

The PBAT600 string sensor can fulfill following functions:

- ◆ Real-time monitoring of the entire string of battery voltage, charge and discharge current, Battery string of SOC, SOH.
- ◆ PBAT600 and PBAT61 series with the use of a dedicated isolation bus real-time monitoring of each battery voltage, internal resistance, temperature, SOC, SOH.
- ◆ Auto-sensing for S/N, without excessive manual intervention and configuration, reducing engineering effort.
- ◆ About the PBAT61 program upgrade, you can use the local 600 to upgrade.
- ◆ Advanced measurement algorithm, no need for high current discharge, to

achieve non-destructive measurement.

- ◆ Balancing function, the battery pack keep voltage balance under floating status, this allows each battery to maintain the best active state, improve the battery backup time and operating life.
- ◆ With PBAT61 collector, it collects the collected data into the register for use by the background device.
- ◆ Using RS485 communication with isolated power, safely and stably
- ◆ By the circular alarm LED with breathing light, users can quickly locate the fault batteries in the machine room
- ◆ With the external linked Hall sensor, PBAT61 could measure different ranges of charge and discharge current
- ◆ The isolation voltage of communication interface is AC 3750V

Chapter 2 Installation and Wiring

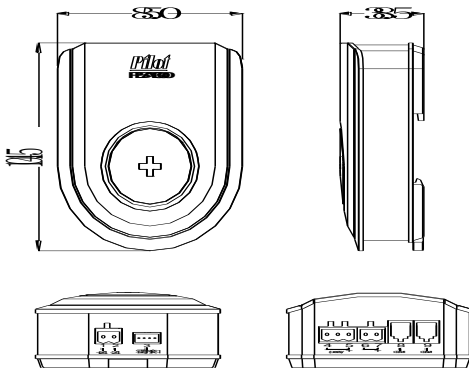
2.1 Environment

2.1.1 Environmental requirements

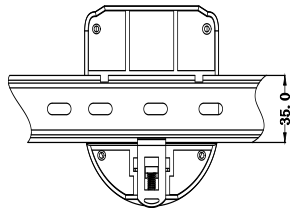
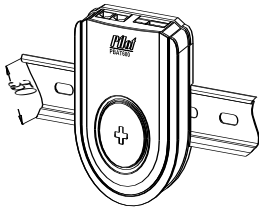
- ◇ Standard operating temperature : 0°C ~ +45°C
- ◇ Operating temperature limit : -10°C ~ +55°C
- ◇ Storage temperature : -40°C ~ +70°C
- ◇ Working humidity : 5% ~ 95%RH , Non-condensing

2.1.2 Installation and Dimensions

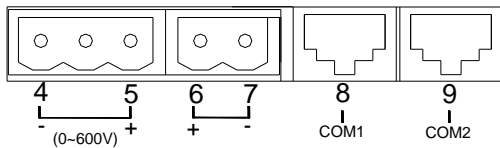
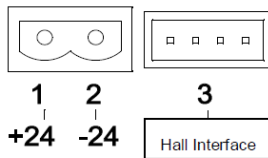
Unit : mm



Unit : mm



2.1.3 Structure and Terminals



The main terminal definitions :

No.	Symbol	Definition
1	+24V	Positive power supply
2	-24V	Negative power supply
3	Hall Terminal	Interface for the string current sensor
4	-	Negative terminal for the string voltage measurement
5	+	Positive terminal for the string voltage measurement
6	485+	RS+485 communication port
7	485-	RS-485 communication port
8	COM1	DL-BUS communication , RJ11 interface
9	COM2	DL-BUS communication , RJ11 interface

Note:

- a. The String voltage measurement negative terminal (-) and positive terminal (+) can not be exchanged.
- b. The RS485 negative terminal (-) and positive terminal (+) can not be exchanged.

2.2 Order Information

Model : PBAT600		
PBAT600	For battery string	<ul style="list-style-type: none">✓ real-time string voltage measurement✓ Charge and discharge current measurement✓ DL-BUS communication✓ Collector information centralized processing

2.3 Power Supply

PBAT600 is supplied by 24VDC with the range from DC 18V to DC 36V , and its power loss is less than 1W.

Chapter 3 Measuring Parameters

3.1 Voltage

PBAT600 could measure the real-time voltage of VRLA battery string, with the range from DC 0V to DC 800V

3.2 Current

PBAT600 could measure the real-time charge and discharge current of VRLA battery string with the range from -1000 to +1000A.

3.3 Cell Data Acquisition

The PBAT600 communicates with the Cell using the DL-BUS bus, through COM1 and COM2 two RJ11 port for collection, each COM port can be connected to the maximum of 60 cell sensors. The collected data is stored in the internal registers.

Supports one-one cell sensor and one-two cell sensor. Specific configuration reference "PBAT600 Software Application Manual"

3.4 Voltage Balancing

PBAT600 provides voltage balancing, let the battery string keep voltage balancing under floating status, So that each cell of the battery to maintain the best active status, improve the battery backup time and operating life. This function needs to meet certain conditions to proceed.

1. The battery string status is floating.
2. Balancing function on (default is off).
3. The deviation of the group voltage is higher than the setting balancing deviation.
(Balancing deviation can be configured)
4. Meet time interval of the two balancing (default is 2 minutes)

When the battery string status is floating, if the balancing function is on, when the balancing period is reached, PBAT600 will calculate the deviation of all battery voltages in the string. If the deviation of the voltage is higher than the setting value, then PBAT600 will send a balanced command to the battery cell sensor. After Cell sensor receive balancing orders, its LED light will flashes three times in a row for balancing discharge. The balancing current is 0.2A and the balancing process is about 1 minute.

Note: Please refer to the "PBAT600 Software Application Manual" for the balanced configuration.

3.5 Internal Resistance test

The battery is in floating state, PBAT600 regularly send a test command to the cell sensor for internal resistance test. (Internal resistance only measure under floating status)

At the same time PBAT600 debugging software also provides internal resistance test command

Note: for manual test the internal resistance, please refer to " PBAT600 Software Application Manual " .

3.6 SOC Remaining Capacity

PBAT600 support calculate cell and string SOC (remaining battery capacity) estimates. SOC is an important basis for the battery characteristics of the parameters, including battery voltage level, recovery voltage, cut-off voltage. Battery SOC calculated using the default battery characteristic parameters:

Battery voltage level	2V	12V
Float range	-3A to +3A	-3A to +3A

Cut-off voltage	1.75V	10.8V
Recovery voltage	2.12V	12.68V

The characteristic parameters of the battery can be configured via the PBAT600 commissioning software.

The default value (Recovery voltage) is the optimal value from a large number of experiments, if no special circumstances do not change.

Note : Note setting for voltage rank, float range, cut-off voltage, recovery voltage, please refer to "PBAT600 software application manual"

3.7 SOH health status

PBAT600 support cell and string of SOH (remaining battery capacity) estimates. SOH estimation is based on the internal resistance of the battery, the user needs to set the internal resistance reference value of the battery according to the actual information of the battery.

Note: Note: setting for battery internal resistance, please refer to "PBAT600 Software Application Manual" .

3.8 RS485 interface

PBAT600 provides one RS485 interface, support the international common MODBUS-RTU protocol. Please refer to the corresponding "PBAT600 MODBUS communication protocol" for the specific agreement.

Chapter 4 Description of Indicated LED

Indicated LED	Status	LED
Running LED L1 (Green)	Normal working	Breathing mode
	String Voltage/Current surpass high limit or low limit String SOC surpass low limit	OFF
Alarm LED L2 (Red)	Normal working	OFF
	String Voltage/Current surpass high limit or low limit String SOC surpass low limit Hall connection abnormal	on

Chapter 5 Maintenance and fault remove

Problems	Causes	Solutions
Running LED is off after power on.	Power can not input to the device	Check whether the proper power is supplied on the sensor.
Master device can't communicate with the sensor.	Unit ID of the sensor is wrong	Check whether unit ID of the sensor is the same as the master.
	Baud rate is not match.	Check whether the baud rate of both sides is same.
	Communication line is disturbed.	Check whether the shielding layer of RS485 is grounded.
	Communication is interrupted.	Check whether the communication cable is disconnected.
Unable to see the collection of data	Communication line interruption	Check the communication wire PBAT600 is disconnected with the Cell sensor
	Point table configuration error	Re-configure the PBAT600 point table
	Parameter configuration	Protocol: Extended protocol and standard protocol Cell sensor type : one-one or one-two setting Whether the COM unit number is correctly
SOC	Battery characteristic parameter is incorrect	Voltage level, cut-off voltage, recovery voltage, float current is set incorrectly
SOH	Battery characteristic parameter is incorrect	Battery internal resistance reference value is wrong

Chapter 6 Technical Specifications

Dimension	Main-body : 104.5mm (L) ×85mm (W) ×38.5mm (H)
Power	Rated voltage is DC 24V with the normal range from DC18V to DC36V power
Supply	loss : ≤1W

Item	Range	Accuracy	Note
Voltage	DC 20~800V	±0.5%	Resolution : 0.01V
Current	DC-1000A~1000A	±2% (15℃~35℃)	Resolution : 0.01A

Item	Test Conditions
Insulation	Insulation voltage: DC1000V, Insulation resistance > 10MΩ
Dielectric strength	Test voltage AC 2kV , Test time 1minute , leakage current < 5mA
Impulse with stand voltage	Test voltage 5kV, 1.2/50us, ± 3 times each

Item	Reference Standard	Class
Electrostatic discharge immunity	GB/T17626.2-2006 (IEC61000-4-2:2001)	IV
RFEMS	GB/T17626.3-2006 (IEC61000-4-3:1998)	IV
Electrical fast transient burst immunity	GB/T17626.4-2008 (IEC61000-4-4:1998)	III
Surge Immunity	GB/T17626.5-2008 (IEC61000-4-5:2005)	III
RF conducted immunity	GB/T17626.6-2008 (IEC61000-4-6:1998)	III
Power frequency magnetic field immunity	GB/T17626.8-2008 (IEC61000-4-6:2001)	IV
Electromagnetic emission limits	GB/T14598.16-2002 (IEC60255-25:2000)	OK

Notice:

- PILOT reserves the right to modify this manual without prior notice in view of continued improvement.
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