

ABAT series battery online monitoring system

Installation and Instruction Manual V1.1

Statement

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1 Overview

Acrel's ABAT series battery online monitoring system is an online battery monitoring product, which can give early warning and battery balancing for failed batteries, and meets the requirements of ANSI/TIA-942 standard. The system has the function of monitoring the voltage, internal resistance and internal temperature of the battery, and is very convenient for installation, maintenance and access. The system is mainly composed of ABAT-S module, ABAT-C module and ABAT-M collector. The collector can query alarms and real-time data, set parameters, etc., and can choose a monitoring platform to realize centralized network management.

2 Product Model

Name	Model	Function Description
Collector	ABAT-M-02	Auxiliary power supply AC220V, can manage up to six groups of batteries, the maximum total number is 960, with display and buttons
Collector	ABAT-M-06	Auxiliary power supply AC220V, can manage up to six groups of batteries, the maximum total number is 360, with display and buttons
Single Battery Monitoring Module	ABAT-S-02	Monitor a 2V battery, monitor battery voltage, internal resistance and negative electrode temperature
Single Battery Monitoring Module	ABAT-S-06	Monitor a 6V battery, monitor battery voltage, internal resistance and negative electrode temperature
Single Battery Monitoring Module	ABAT-S-12	Monitor a 12V battery, monitor battery voltage, internal resistance and negative electrode temperature
Current Temperature Monitoring Module	ABAT-C-500	Monitor a charge and discharge current and an environment temperature, the maximum current range is 1000A
Charge and Discharge Current Transformer	ABAT-CS-210	Hall Sensor, inner diameter 21, one for each battery
Charge and Discharge Current Transformer	ABAT-CS-405	Hall Sensor, inner diameter 40.5, one for each battery
Touch Screen	ABAT-D-07	7-inch industrial-grade capacitive touch screen, local display and control expansion
Integrated Energy Efficiency Management System	Acrel-8000	Monitor high and low voltage power distribution, monitor and analyze important equipment, including UPS, air conditioners, column cabinets, batteries, diesel engines, and provide operation and maintenance functions to help users manage.

3 Product Description

3.1 ABAT-M-02 Collector

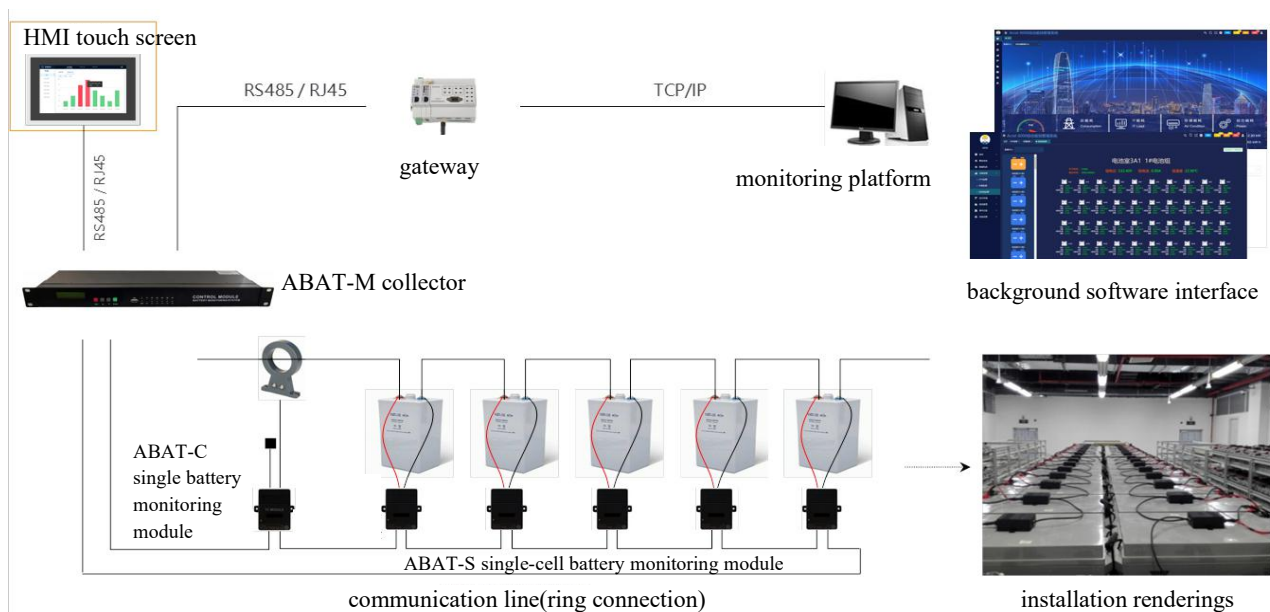
Management and Data Processing Analysis



- It is used to manage and collect the data of the front-end distributed single battery monitoring module, and perform data processing, analysis, alarm generation, saving and uploading
- One collector can manage up to six sets of batteries
- The data is automatically analyzed and processed, and the remaining capacity of the battery can be estimated
- Support MODBUS and SNMP protocols, easy access to third-party monitoring systems
- Support standard cabinet installation or battery rack/cabinet installation
- Flexible configuration and easy maintenance

Introduction

The collector plays the role of a management host, which is used to read the battery monitoring data of the front-end single battery monitoring sub-module, analyze and process the data, and estimate the remaining capacity of each cell and the entire battery group. All operating parameters can be set directly through the module panel, and the collected data can be viewed directly. The collector will automatically and regularly save key battery data, and can upload it to a third-party monitoring system through the RS485 port or network port. One collector can manage up to six groups of batteries, and the maximum number of manageable modules is 960.



The collector communicates with the front-end single battery monitoring sub-module through its own four sets of UART ports, and can read data such as battery voltage, internal resistance, temperature, charge and discharge current, and environment temperature.

Estimation of remaining capacity

The built-in capacity estimation model can automatically obtain the remaining capacity of the battery according to the monitored battery data.

Support multiple communication protocols

The collector has RS485 and network ports, supports MODBUS/RTU, MODBUS/TCP and SNMP protocols, and has dry contact output, which is extremely easy to connect to third-party systems.

WEB configuration function

With WEB remote parameter configuration function
With WEB remote real-time data query function

Local data storage

Key data such as alarm records, event records, and discharge records can be saved.

High stability

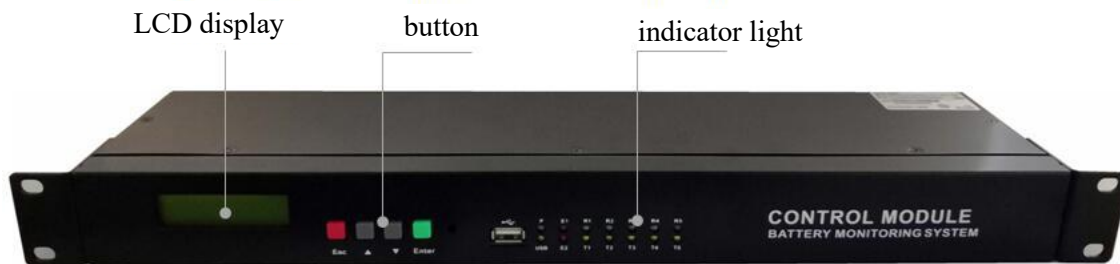
The long-term operation of the product is reliable and stable.

Wide range of applications

Suitable for UPS/EPS/HVDC, data centers, communications, nuclear power, electricity, military, high-speed rail, subways, airports, factories, government departments, battery manufacturers, fire safety, etc.

Outward appearance

ABAT-M-02 Collector



Specification

Working environment

operating temperature: $-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$
relative humidity: $5\%\sim 95\%$
atmospheric pressure: $80\sim 110\text{kPa}$

Management ability

One collector can manage up to six groups of batteries, and the maximum total number of batteries that can be monitored is 960

Power requirements

$85\sim 264\text{VAC}$ (standard), $\text{DC}48\text{V}$ or $\text{DC}110\sim 370\text{V}$ (optional), 15W

Protection

With overvoltage and short circuit protection

Communication interface

With RS485 and 10/100M network port, support MODBUS/RTU, MODBUS/TCP and SNMP protocol

Insulation withstand voltage

2000VAC

Installation method

Fixed on 19-inch cabinet or battery rack

Weight

1.8Kg

Reliability

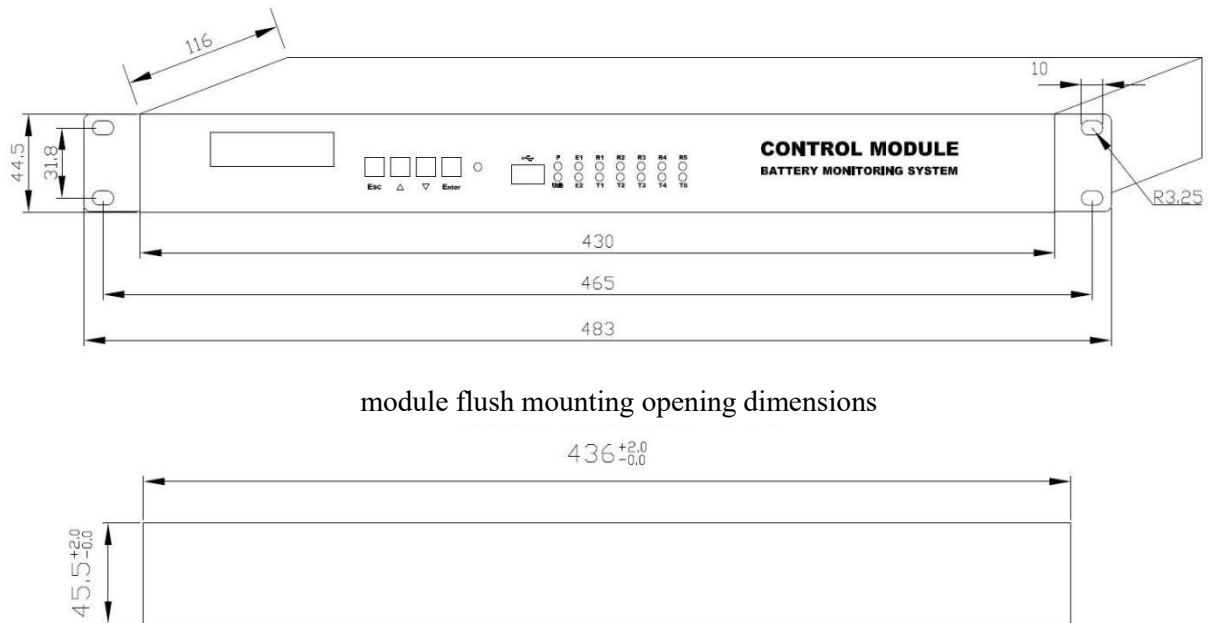
Auto restart trigger: built-in WDT
MTBF: 100,000 hours

Display

With LCD display, you can view real-time and historical records

Size

Unit: mm



3.2 ABAT-M-06 Collector

Management and data

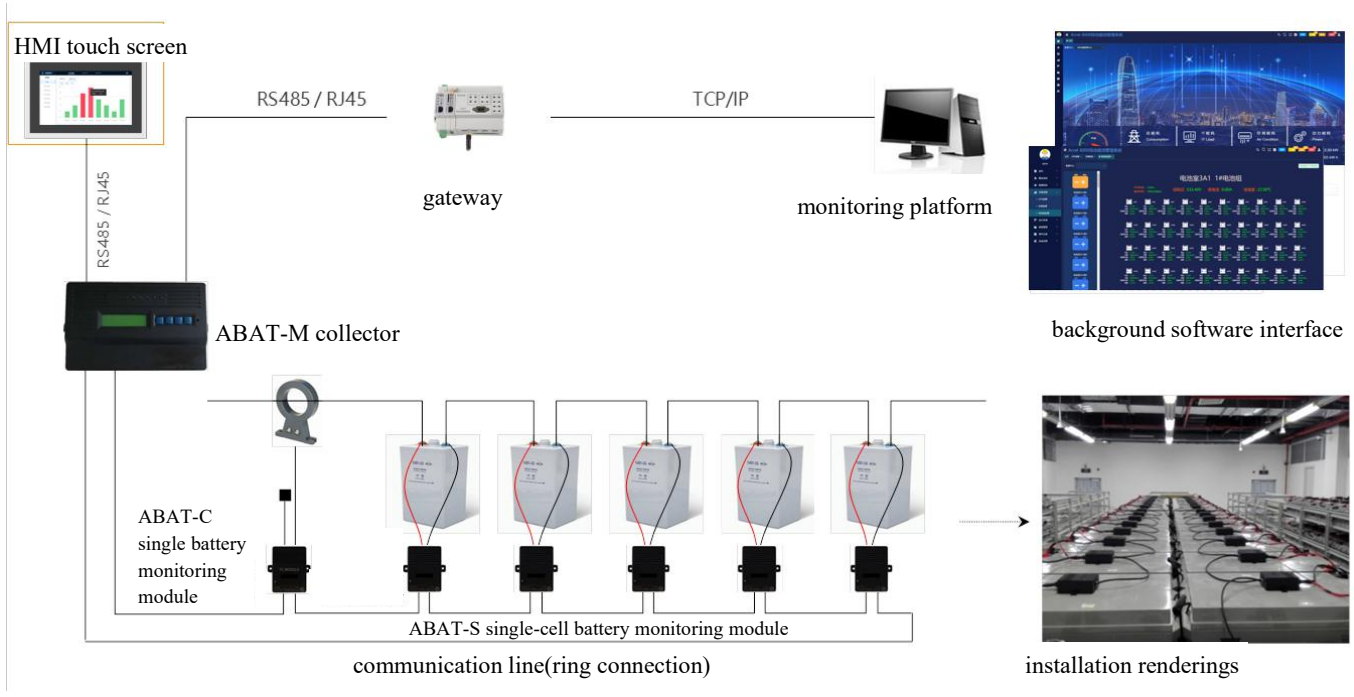
processing analysis



- It is used to manage and collect the data of the front-end distributed single battery monitoring module, and perform data processing, analysis, alarm generation, saving and uploading
- With display and operating buttons
- One collector can manage 360 batteries
- The data is automatically analyzed and processed, and the remaining capacity of the battery can be estimated
- Support MODBUS and SNMP protocols, easy access to third-party monitoring systems
- Flexible configuration and easy maintenance
- Low cost solution

Introduction

The collector plays the role of a management host, which is used to read the battery monitoring data of the front-end single battery monitoring sub-module, analyze and process the data, and estimate the remaining capacity of each cell and the entire battery group. All operating parameters can be set directly through the module panel, and the collected data can be viewed directly. The collector will automatically and regularly save key battery data, and can upload it to a third-party monitoring system through the RS485 port or network port. One collector can manage up to six groups of batteries, and the maximum number of manageable modules is 360.



Local data query

With display and operation buttons, support local data query

Estimation of remaining capacity

Built-in capacity estimation model, which can automatically obtain the remaining capacity of the battery according to the monitored battery data

Support multiple communication protocols

The collector has RS485 and network ports, supports MODBUS/RTU, MODBUS/TCP and SNMP protocols, and has dry contact output, which is very easy to connect to third-party systems

WEB configuration function

With WEB remote parameter configuration function

With WEB remote real-time data query function

Local data storage

Key data such as alarm records, event records, and discharge records can be saved

High stability

Long-term operation of the product is reliable and stable

Wide range of applications

Suitable for battery monitoring such as UPS/EPS/HVDC/communication power supply

Outward appearance



Specification

Working environment

Operating temperature : -10°C ~ 50°C

Relative humidity : 5% ~ 95%

Atmospheric pressure : 80 ~ 110kPa

Management ability

One collector manages up to six groups of batteries, and the maximum total number of batteries that can be monitored is 360

Power requirements

100 ~ 240VAC(standard) or DC48V(optional) , 15W

Protection

With overvoltage and short circuit protection

Communication interface

With RS485 and 10/100M network port, support MODBUS/RTU, MODBUS/TCP and SNMP protocol

Display

With LCD display, you can view real-time and historical records

Insulation withstand voltage

2000VAC

Installation method

Battery rack installation or In-cabinet installation

Weight

0.6Kg

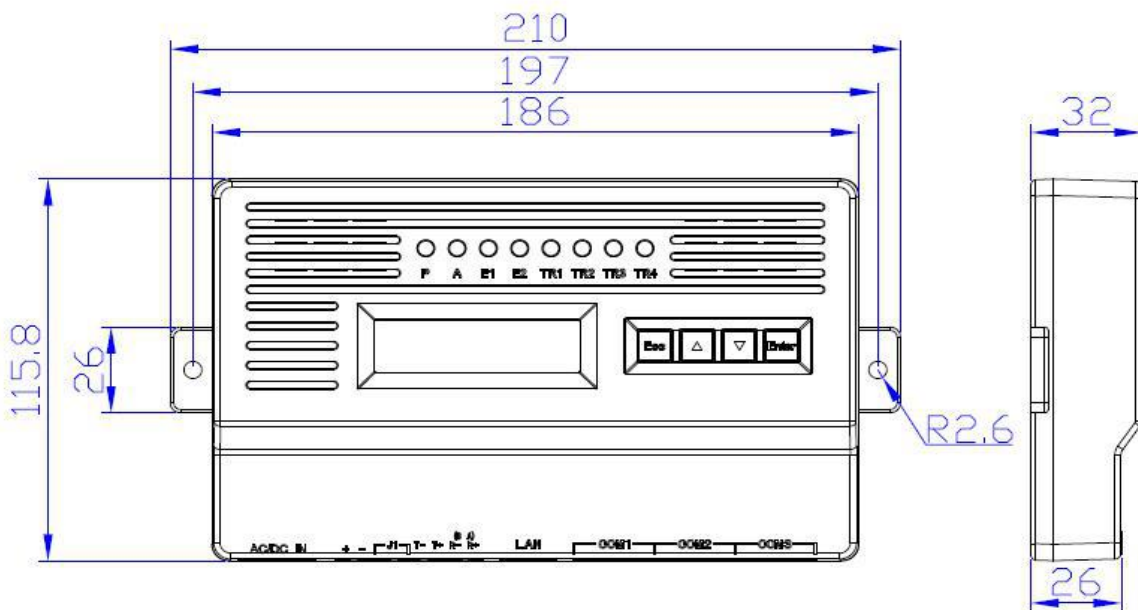
Reliability

Auto restart trigger: built-in WDT

MTBF : 100,000 hours

Size

Unit :mm



3.3 ABAT-S Single Battery Monitoring Module

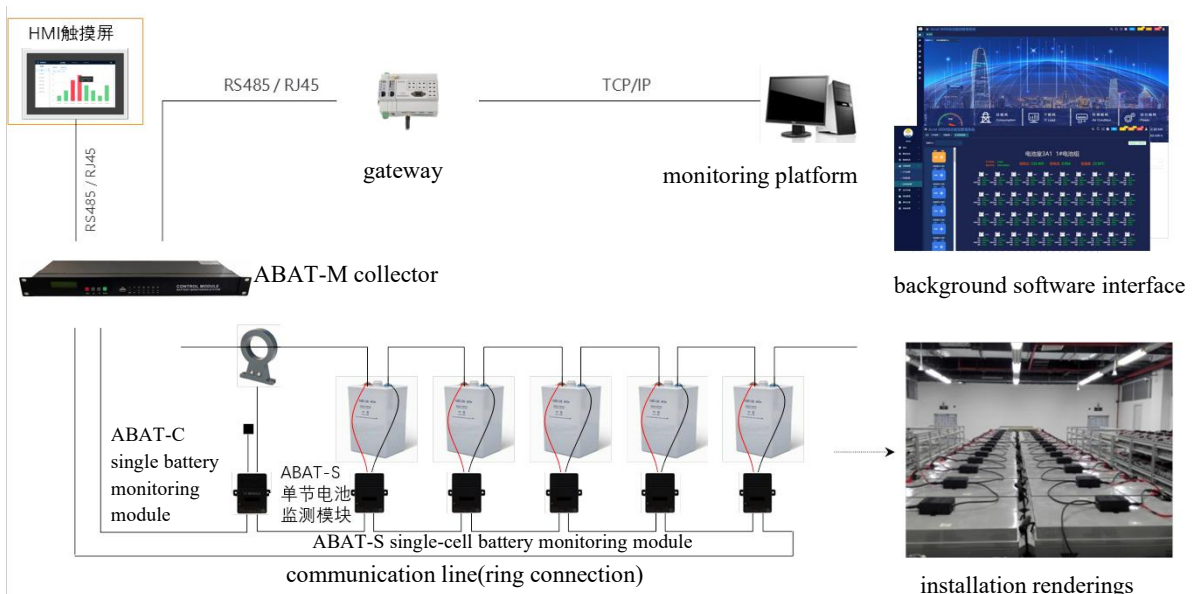
Battery voltage internal resistance temperature monitoring



- **Online monitoring 24 hours a day to find batteries with deteriorated performance at any time**
- **Each module monitors a battery, monitors voltage, internal resistance and negative temperature, in line with ANSI/TIA-942 standard requirements**
- **With photoelectric isolation, support MODBUS protocol, easy access to third-party monitoring system**
- **Using advanced power consumption reduction technology, the operating current is as low as 3mA**
- **The installation is extremely simple, only need to connect one wire to the positive and negative poles, and it can be installed without special training**
- **High performance, reliable and stable**

Introduction

ABAT-S single battery monitoring module (S module for short) is an online battery monitoring sensor, which can be embedded into the existing monitoring system to realize online monitoring of the voltage, internal resistance and battery negative temperature of each backup battery, in line with ANSI/TIA -942 standard requirements. The monitoring system controls and reads data by sending MODBUS commands to the S module, and performs the internal resistance test. Each S module has an address that can be set. The installation and wiring of the S module is extremely simple and convenient. It can be directly attached to the battery, and the detachable connecting wire is used, so that the operation of the battery will not be affected during construction.



The S module must be converted into a standard RS485 or RS232 interface through a converter before it can be connected to the monitoring system, and the module is directly powered by a battery.

High precision design

The internal resistance measurement error is as low as 1%.

High stability

The long-term operation of the product is reliable and stable.

Strong anti-interference

High anti-interference design can block the ripple interference of high-power and high-frequency UPS.

Single battery internal resistance test

The internal resistance of each battery is automatically and periodically measured by command control.

Single battery negative electrode temperature monitoring

Compared with the temperature of the battery shell, the temperature of the negative electrode is closer to the internal temperature of the battery, which reflects the real changes inside the battery and discovers the thermal runaway battery in time.

Low power design

The current drawn by the S module from the battery is as low as 3mA, which is many times lower than the industry average, and the impact on the battery is almost negligible.

Standard communication protocol

Support standard MODBUS protocol, access development is extremely simple.

Simple and convenient installation

The module can be directly attached to the battery and adopts a detachable connecting wire, which will not affect the operation of the battery during construction.

Wide range of applications

Suitable for UPS/EPS/HVDC, data centers, communications, nuclear power, electricity, military, high-speed rail, subways, airports, factories, government departments, battery manufacturers, fire safety, etc.

Outward appearance

S Module



Specification

Working environment

Operating temperature: $-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$

Relative humidity: $5\%\sim 95\%$

Atmospheric pressure: $80\sim 110\text{kPa}$

Monitoring capability

One S module monitors one battery.

Monitoring range

2V, 6V, 12V batteries, capacity less than 3000AH

Power requirements

Directly draw power from the monitored battery. When the 2V module is working normally, the current absorbed is 7mA, and the maximum is not more than 13mA. When the 6V and 12V modules are working normally, the current is 3mA, and the maximum is not more than 7mA. The current absorption of different modules is very consistent.

Reliability

Auto restart trigger: built-in WDT

MTBF: 100,000 hours

Measuring range and accuracy

measurement content	range	precision
cell voltage	2V、6V、12V	$\pm 0.1\%$
monomer internal resistance	50 \sim 65535 $\mu\Omega$	$\pm 2\%$ resolution 1 $\mu\Omega$
negative temperature	$-5^{\circ}\text{C}\sim +99.9^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$

Protection

Measurement circuit and power circuit with two-level protection, with reverse polarity protection and photoelectric isolation

Communication interface

UART port, support MODBUS protocol

Insulation withstand voltage

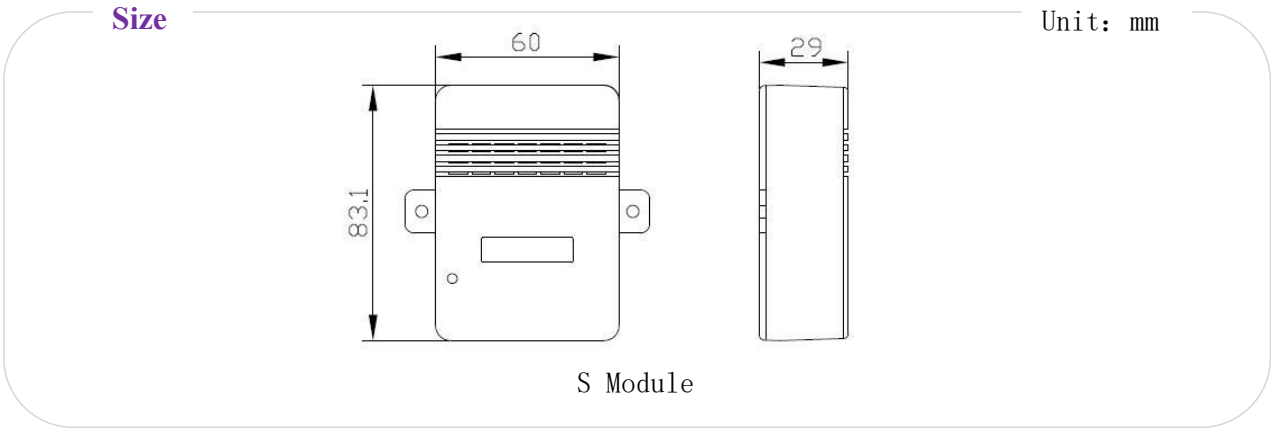
2000VAC

Installation method

Glued directly to the battery or mounted on the fixing bar

Weight

ABAT-S module 80g



3.4 ABAT-C Current Temperature Monitoring Module

Charge and discharge current and environmental monitoring

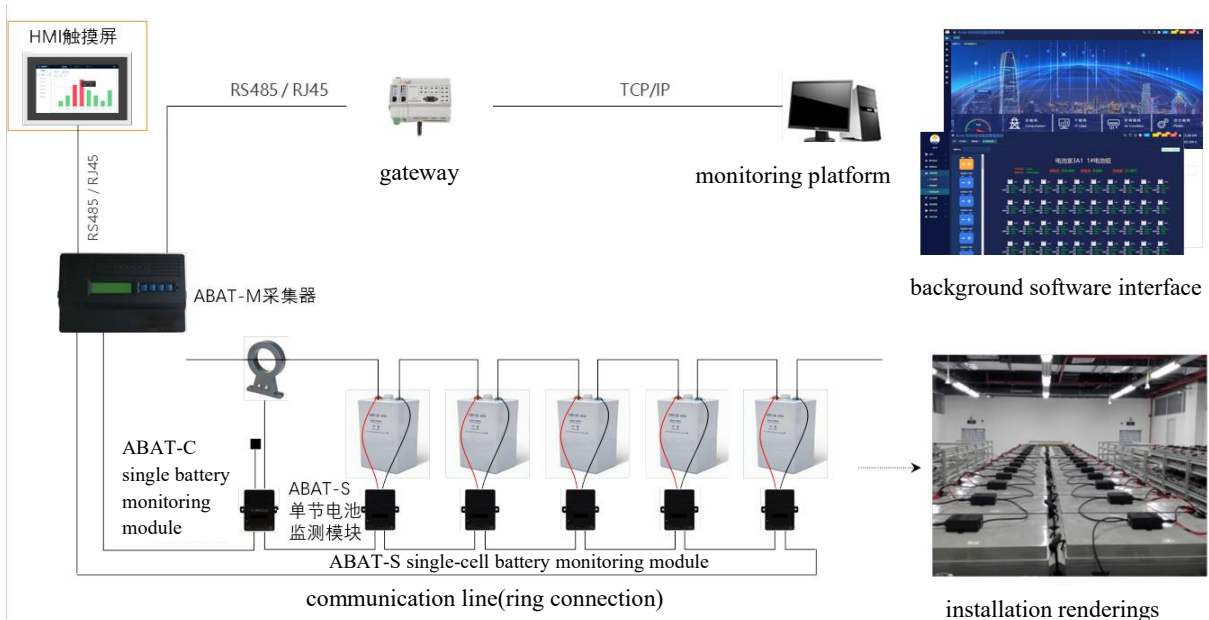


- **Online monitoring of charge and discharge current and environment temperature 24 hours a day**
- **With photoelectric isolation, support MODBUS protocol, easy access to third-party monitoring system**
- **High performance, reliable and stable**

Introduction

The current temperature monitoring module (C module for short) is an online battery monitoring sensor, which can be embedded into the existing monitoring system to realize online monitoring of the charging and discharging current and ambient temperature of the battery pack. The monitoring system controls and reads data by sending MODBUS commands to the C module, each C module has an address that can be set. The installation and wiring of the C module is extremely simple and convenient. It can be directly attached to the battery, and the detachable connecting wire is used, so that the operation of the battery will not be affected during construction.

The system topology is as follows:



The C module must be converted into a standard RS485 interface through a converter before it can be connected to the monitoring system, and a current transformer needs to be additionally configured. The module needs to be powered by external DC12V.

High stability

The long-term operation of the product is reliable and stable.

Strong anti-interference

High anti-interference design can block the ripple interference of high-power and high-frequency UPS.

Standard communication protocol

Support standard MODBUS protocol, access development is extremely simple.

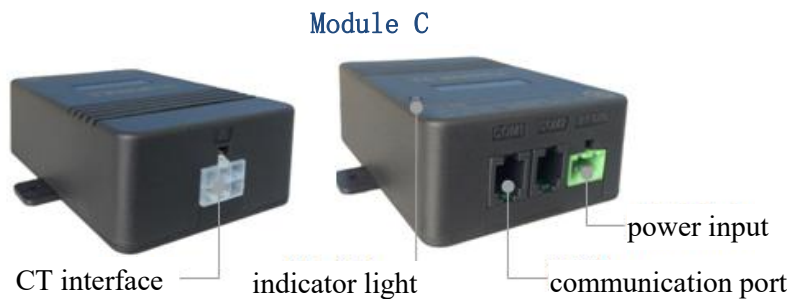
Simple and convenient installation

The module can be directly attached to the battery and adopts a detachable connecting wire, which will not affect the operation of the battery during construction.

Wide range of applications

Suitable for UPS/EPS/HVDC, data centers, communications, nuclear power, electricity, military, high-speed rail, subways, airports, factories, government departments, battery manufacturers, fire safety, etc.

Outward appearance



Specification

Working environment

Operating temperature: -5°C~50°C
 Relative humidity: 5%~90%
 Atmospheric pressure: 80~110kPa

Monitoring capability

A C module monitors the charge and discharge current and environment temperature of a group of batteries.

Monitoring range

2V、6V、12V battery groups

Power requirements

DC8~13V, 1W

Protection

Measurement circuit and power circuit with two-level protection

Communication interface

UART port, support MODBUS protocol

Measuring range and accuracy

measurement content	range	precision
charge and discharge current	0 ~ 1000A(standard)	±1%
ambient temperature	-5°C~+99.9°C	±1°C

Insulation withstand voltage

2000VAC

Installation method

Glued directly to the battery or mounted on the fixing bar

Weight

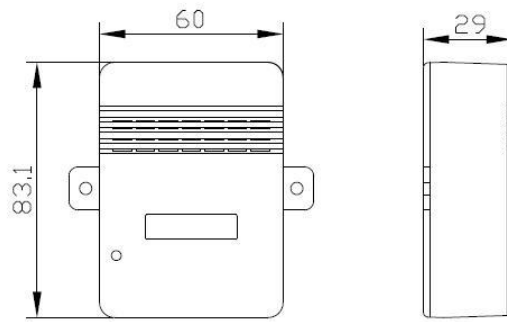
75g

Reliability

Auto restart trigger: built-in WDT
 MTBF: 100,000 hours

Size

Unit: mm



Module C

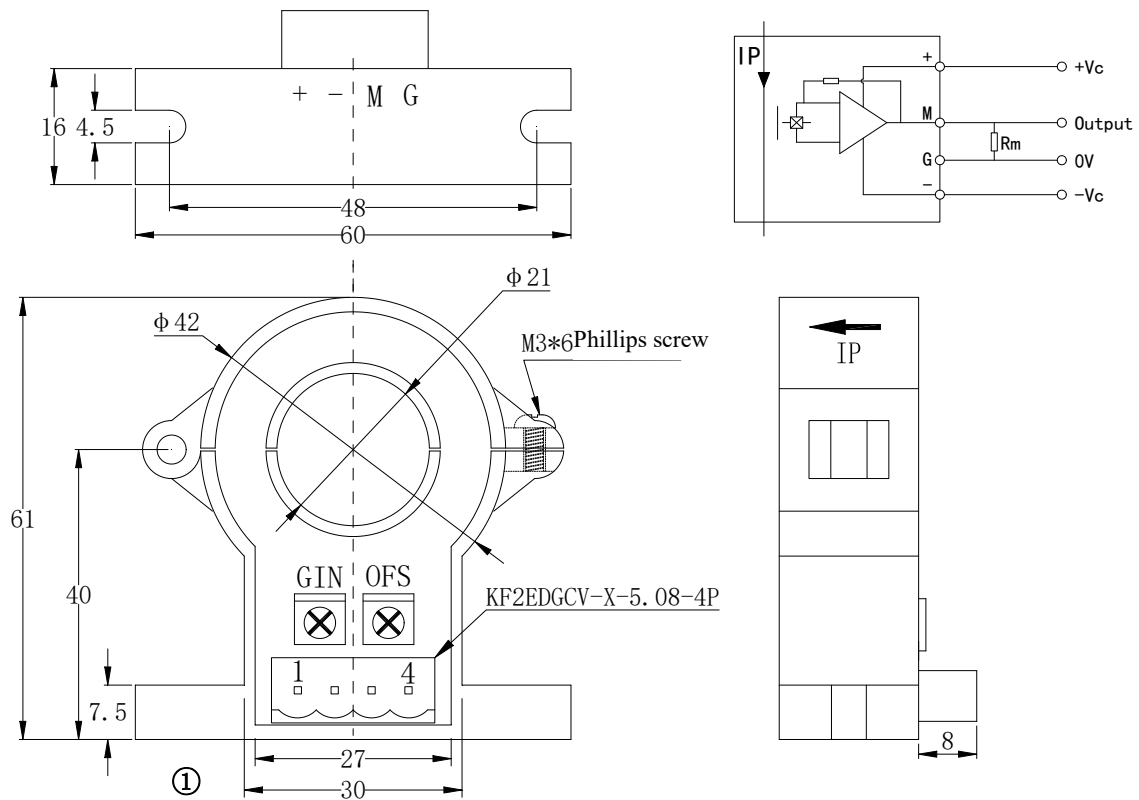
Matching Hall Current Sensor

1) Open Loop Hall Current Sensor ABAT-CS-210

IP=500A



Mechanical dimension



① The first supplier 7.5mm, the second supplier 6mm. By default, the two are shipped randomly in batches. Please note if you have special requirements.

Electrical data ABAT-CS-210

Unless otherwise stated, environmental parameters are @ $T_A = 25\text{ }^\circ\text{C}$, $R_L = 10\text{ k}\Omega$

Type	ABAT-CS-210
I_P (Rated input)	$\pm 500\text{A}$
I_{PM} (Measure range)	$\pm 1000\text{A}$
V_{OUT} (Rated output voltage)	$\pm 4\text{V}$
V_O (Offset voltage)	$\pm 20\text{mV}$
V_C (Supply voltage)	$\pm 12\text{VDC} \sim \pm 15\text{VDC}$ ($\pm 5\%$)
V_D (Galvanic isolation)	50Hz, 1min, 3KV
R_M (Load resistance)	$\geq 10\text{K}\Omega$
ε_L (Linearity)	$\leq 1\%\text{FS}$
X (Overall accuracy)	$\pm 1\%$
V_{OUT} (Offset voltage drift)	$\pm 0.5\text{mV}/^\circ\text{C}$
V_{OUT} (Amplitude voltage temperature drift)	$\leq 0.1\%/^\circ\text{C}$
I_C (Current consumption)	$\leq 15\text{mA}$
T_R (Response time)	$< 7\mu\text{s}$
BW (Frequency bandwidth-3db)	DC \sim 25KHz
di/dt accurately followed	$> 50\text{A}/\mu\text{S}$
T_A (Ambient operating temperature)	$-40 \sim +85^\circ\text{C}$
T_S (Ambient storage temperature)	$-40 \sim +125^\circ\text{C}$
M (Mass)	$\approx 65\text{g}$

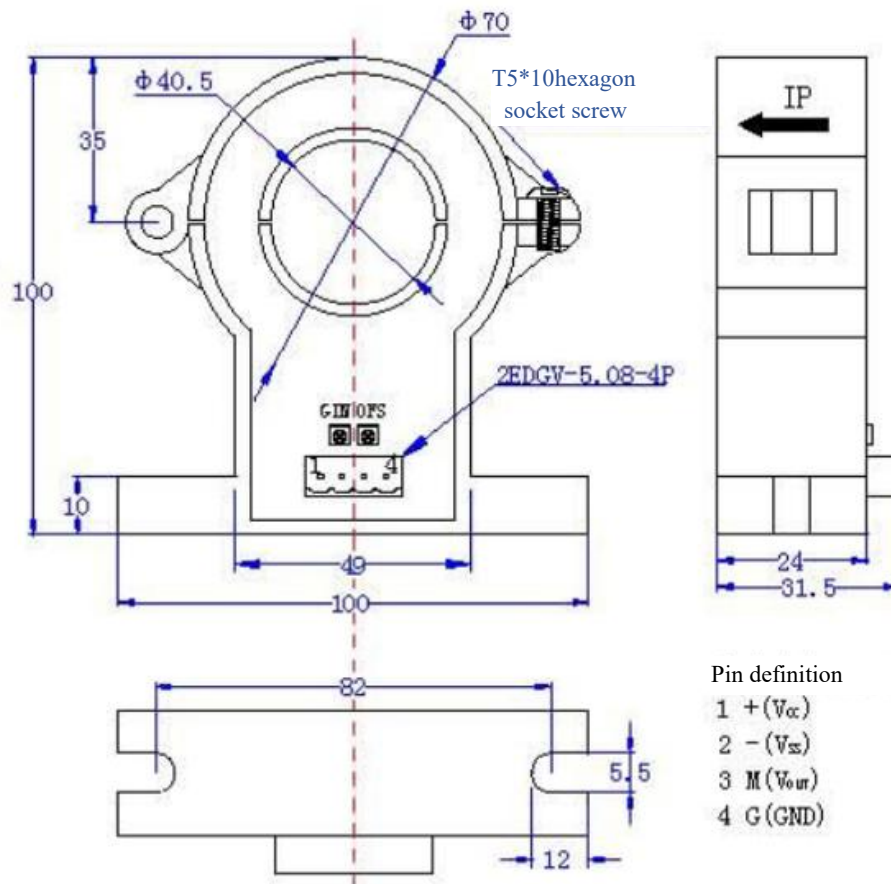
Standards

SJ 20790-2000; JB/T 7490-2007

2) Open Loop Hall Current Sensor ABAT-CS-405
 IP=500A



Mechanical dimension



Electrical data ABAT-CS-405

Unless otherwise stated, environmental parameters are @ $T_A = 25\text{ }^\circ\text{C}$, $R_L = 10\text{ k}\Omega$

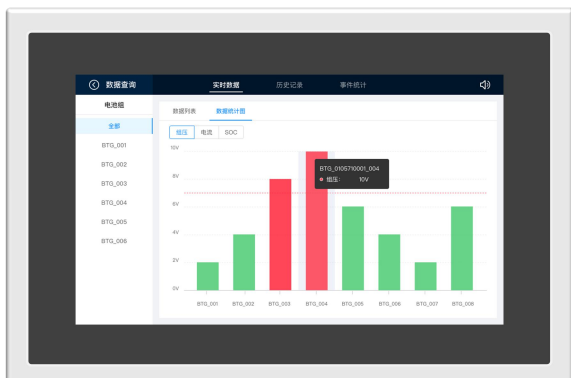
Type	ABAT-CS-405
I_P (Rated input)	$\pm 500\text{A}$
I_{PM} (Measure range)	$\pm 1000\text{A}$
V_{OUT} (Rated output voltage)	$\pm 4\text{V}$
V_O (Offset voltage)	$\pm 20\text{mV}$
V_C (Supply voltage)	$\pm 12\text{VDC} \sim \pm 15\text{VDC}$ ($\pm 5\%$)
V_D (Galvanic isolation)	50Hz, 1min, 3KV
R_M (Load resistance)	$\geq 10\text{K}\Omega$
ε_L (Linearity)	$\leq 1\%\text{FS}$
X (Overall accuracy)	$\pm 1\%$
V_{OUT} (Offset voltage drift)	$\pm 0.5\text{mV}/^\circ\text{C}$
V_{OUT} (Amplitude voltage temperature drift)	$\leq 0.1\%/^\circ\text{C}$
I_C (Current consumption)	$\leq 15\text{mA}$
T_R (Response time)	$< 7\mu\text{s}$
BW (Frequency bandwidth-3db)	DC \sim 25KHz
di/dt accurately followed	$> 50\text{A}/\mu\text{S}$
T_A (Ambient operating temperature)	$-40 \sim +85^\circ\text{C}$
T_S (Ambient storage temperature)	$-40 \sim +125^\circ\text{C}$
M(Mass)	$\approx 65\text{g}$

Standards

SJ 20790-2000; JB/T 7490-2007

3.5 ABAT-D Touch Screen

Local display control expansion

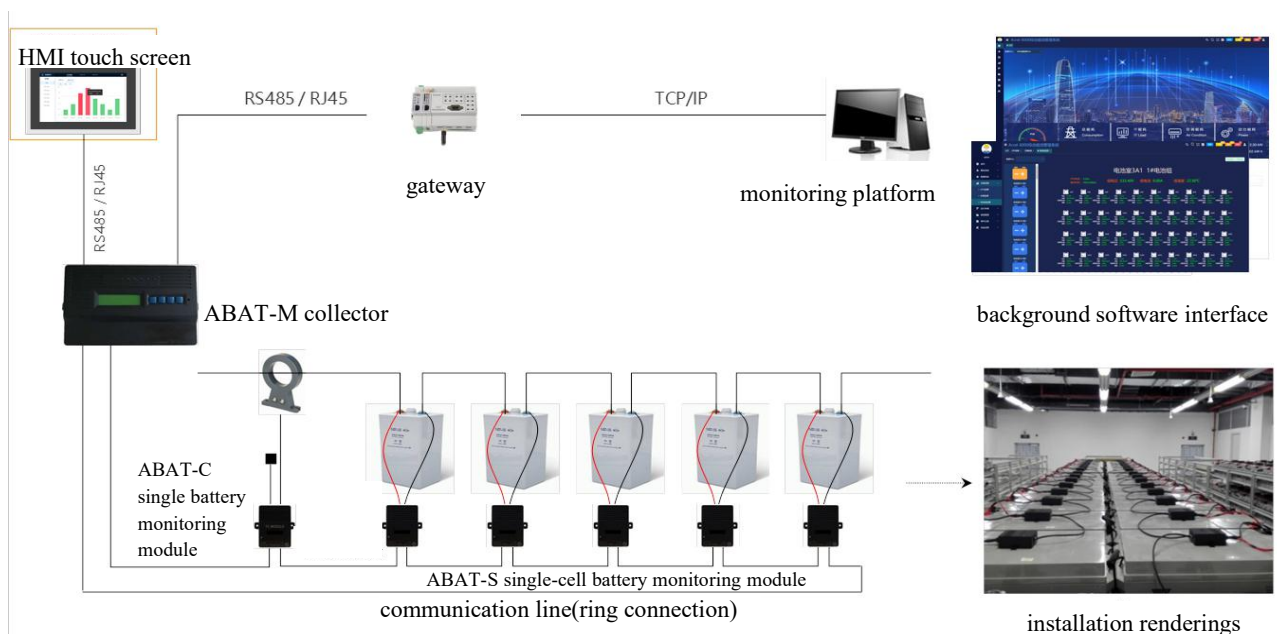


- Real-time data, alarm information, event query and statistics
- Diversified graphic display such as curve chart, column chart, ring chart, etc.
- RS485 serial port / RJ45 network port / USB port
- 8~28VDC wide voltage input
- Embedded installation
- 7-inch industrial-grade capacitive touch screen

Systematic introduction

As an optional module, ABAT-D-07 touch screen is connected to the collector through the serial port or network port to realize the expansion of the local display and control of the battery monitoring system. As a 7-inch capacitive touch screen, the touch screen adopts the Android system and has a built-in APP. The interface is clear and easy to control. It can query the real-time data, alarm records, chart display and event records of the battery monitoring system.

The system topology is as follows :



Performance parameters

main control performance parameters

operating system	Android 6.0
CPU	ARM architecture, 8 cores 2GHZ
running memory	1G
storage	8G

display performance parameters

colour	260,000 colors, 18bit palette RGB
display size	154.21(width)X85.92(height)
resolution	1024X600Pixel
backlight mode	LED
backlight brightness	250nit(adjustable)
perspective	full view
touch form	capacitive

Outward appearance

Front



Back



Technical Specifications

Working environment

Operating temperature: -10°C~50°C

Relative humidity: 5%~95%

Atmospheric pressure: 80~110kPa

Management ability

Each monitoring unit manages up to 15 collectors

Power requirements

The DC 8~28V is generally powered by the collector, and can also be powered by an external power source, and the power is less than 7W.

Communication interface

RS485 / LAN

Operating system

Android 6.0

CPU

ARM architecture, 8 cores 2.0GHZ

Running memory

1G

Storage

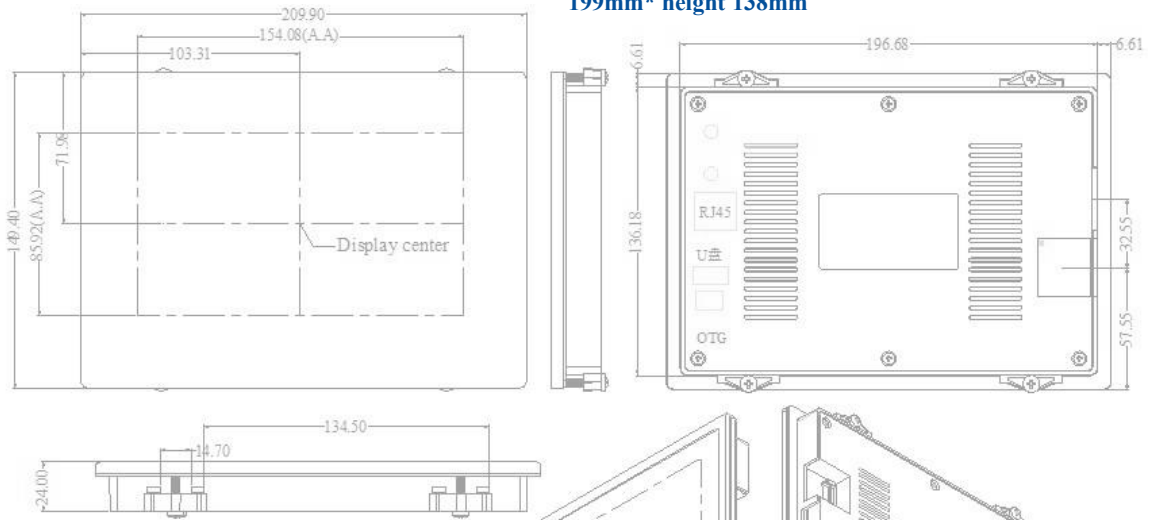
8G

Installation method

embedded

Size

Opening Dimensions of Embedded Installation : length
199mm* height 138mm



P2 pin number	pin name	pin type	explanation
1	V	POWER	DC12V power input positive
2	RX3	IN	RS232 data input
3	TX3	OUT	RS232 data output
4	RX2	DATA	RS485 data positive
5	TX2	DATA	RS485 data negative
6	G	G	public place

skills requirement:

- 1、unit: mm
- 2、unspecified tolerance ± 0.3

Part of the interface display



3.6 Acrel-8000 Integrated Energy Efficiency Management System

Systematic introduction

Acrel-8000 integrated energy efficiency management system is a power monitoring and energy efficiency analysis product. The system is mainly composed of power supply system monitoring, air conditioning equipment monitoring, battery management, environmental monitoring, system integration and other functions.

Function introduction

Power supply system

Monitor the voltage, current, power, power factor, harmonic content, frequency, load rate of equipment power consumption, power utilization efficiency, etc. of the cabinet or UPS power supply.

Air conditioning equipment

Monitor the switching, cooling, heating, humidification, dehumidification, supply air and return air temperature and humidity of air-conditioning equipment.

Battery management

Monitor the voltage, internal resistance, fault and node temperature of each battery.

Environmental monitoring

Monitor the ambient temperature and humidity, air quality, water leakage status and other parameters of the data room.

System integration

Combining the above functions, it provides a convenient and easy-to-use, simple and beautiful monitoring system.

Part of the interface display



The home page displays the current data center PUE value, total energy consumption, IT energy consumption, air conditioning energy consumption, and other energy consumption.



Monitor battery pack voltage, current, floating current, pack temperature. Voltage, internal resistance, temperature of a single cell.

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