Lithium battery comprehensive testing system

Technical specifications

(For reference，The actual product may be slightly different）

Application areas: Electric automatic vehicle batteries, robot batteries,
AGV batteries, car starter batteries,
Offline testing and quality control of PACK for electric tool batteries,
energy storage batteries, etc

(Test object diagram, for reference only)

1 **Product specifications and models**:

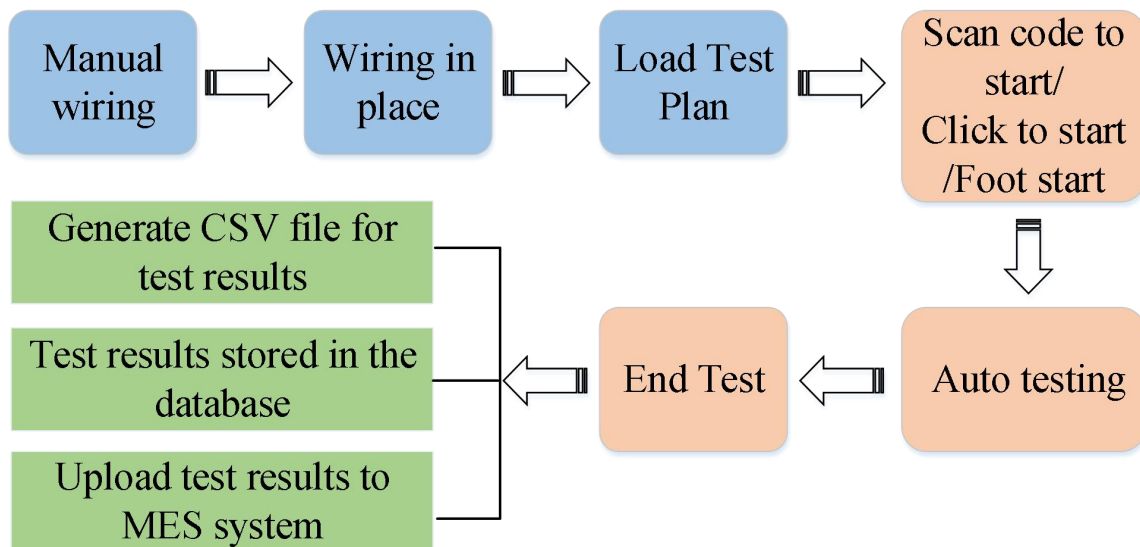| Model	DC- 100V30C200D

2 **Product Overview:**

2.1 **Introduction:**

The lithium battery comprehensive testing system, also known as the lithium battery comprehensive performance testing system, is a device that tests the comprehensive performance of finished and semi-finished battery packs. After manual wiring, the system automatically tests to determine whether it is qualified and records data automatically. Based on ASP.NET The upper computer developed on the platform has powerful data processing capabilities, is stable and reliable, and can save test data in real-time to the database and upload it to the MES system.
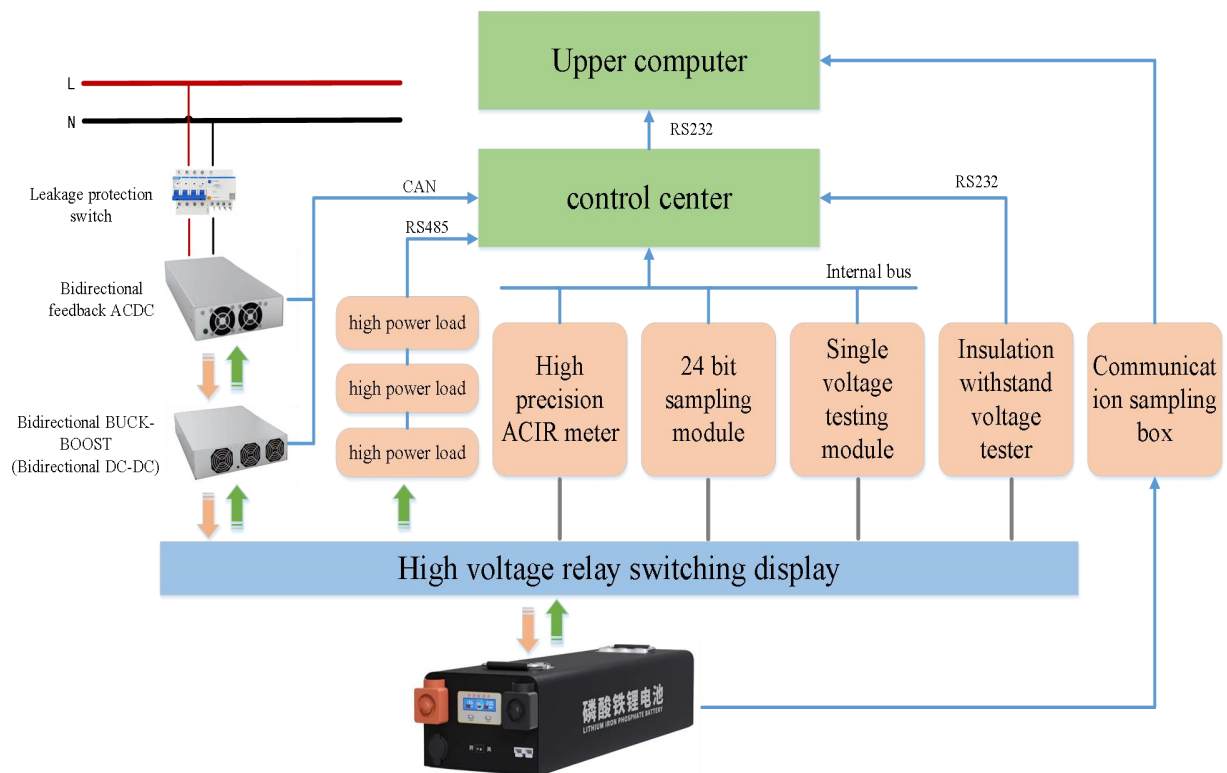
2.2 **Product Features:**

◆ Modular design of the entire machine, strong stability and reliability, and convenient maintenance and upgrading;

◆ Equipped with charge discharge reverse protection and reverse connection prompt function;

◆ The main control chip adopts high-performance ARM, and the equipment runs smoothly and stably;

◆ Adopting a 24 bit ADC, it has higher precision in voltage and current testing than in the industry;

◆ The upper computer software operation interface is concise and clear, the testing step sequence can be edited, and the testing parameters can be adjusted;

◆ The voltage and current are sampled using a four wire system, with high voltage sampling accuracy and good long-term stability;

◆ Support one-dimensional and two-dimensional codes, and support scanning/foot start;

◆ Test data can be automatically saved, and a powerful database facilitates quality traceability.

2.3 Basic testing process：

Manual wiring → Wiring in place → Load Test Plan → Scan code to start/ Click to start /Foot start

Generate CSV file for test results

Test results stored in the database ← End Test ← Auto testing

Upload test results to MES system

2.4 2.4 Product Design Principle Block Diagram:

Upper computer

RS232

control center

CAN
RS485

RS232

Internal bus

L
N

Leakage protection switch

Bidirectional feedback ACDC

Bidirectional BUCK-BOOST (Bidirectional DC-DC)

high power load
high power load
high power load

High precision ACIR meter

24 bit sampling module

Single voltage testing module

Insulation withstand voltage tester

Communication sampling box

High voltage relay switching display

磷酸铁锂电池
LITHIUM IRON PHOSPHATE BATTERY

2.5 system function(Test items)：

Basic functions	
1. Open circuit voltage（OCV）	The battery voltage measured by the device when the battery pack is not being charged or discharged.
2. AC internal resistance（ACIR）	The AC internal resistance of the battery is measured using a four wire measurement method. A sine wave current signal (with a frequency of 1KHZ and a constant current of $\leqslant$ 100mA) is injected into the positive and negative terminals of the battery pack, and a series of processes such as voltage sampling, rectification, and filtering are used to accurately measure the AC impedance of the battery.
3. DC internal resistance（DCIR）	Connect high current discharge loads at both ends of the battery pack, and calculate the resistance value using Ohm's law based on the voltages U1 and U2 at different currents I1 and I2. This equipment adopts the IEC (International Electrotechnical Commission) testing method for fast and accurate testing.
4. Charging activation (Wake Up)	The battery pack needs to be charged and activated when it is in idle, BMS sleep or protection state.
5. Charging voltage	Conduct a charging test on the battery pack based on the set voltage, current, and charging time to check if the charging function of the battery pack is normal.
6. Charging current	(1) Charging voltage: the voltage output by the device to charge the battery pack (2) Charging current: Charge the battery pack according to the set current value
7. Charging drop voltage	(3) Charging voltage difference: the voltage difference between the beginning and end of charging
8. Charging overcurrent protection (OCP)	Charging overcurrent protection refers to the protective measures automatically taken by the BMS in the battery pack during the charging process, when the charging current exceeds the preset safe value, to prevent damage to the battery pack caused by excessive current. This device can test whether the battery pack has charging overcurrent protection function and the specific current value of the protection current.
9. Discharge voltage (load voltage)	Test the discharge function and load capacity of the battery pack based on the set discharge current size and time.
10. Discharge current (load current)	(1) Discharge voltage: The voltage measured during the discharge of a battery pack (2) Discharge current: the current value output by the battery pack during discharge
11. Discharge drop voltage	(3) Discharge voltage difference: the voltage difference between the beginning and end of discharge

12. Discharge overcurrent protection (OCP)	Discharge overcurrent protection refers to the protective measures automatically taken by the BMS in the battery pack during the discharge process, when the discharge current exceeds the preset safe value, to prevent damage to the battery pack caused by excessive current. This device can test whether the battery pack has discharge overcurrent protection function and the specific current value of the protection current.
13.Short circuit Protection Test	Battery short circuit protection refers to the automatic protective measures taken by the BMS in the battery pack when a direct connection (i.e. short circuit) occurs between the positive and negative poles of the battery pack, quickly cutting off the circuit current and preventing dangerous situations such as battery overheating and explosion. This device can test whether the battery pack has short-circuit protection function and the action time of short-circuit protection.
14. Foot switch Start	Mechanical foot switch, which replaces manual operation with foot stepping, improves work efficiency and safety.
15. Scan Code Start (Barcode Record)	By scanning one-dimensional and two-dimensional codes to activate the device for testing, the convenience and intelligence of the device can be improved. The scanned barcode is saved together with the test results in the database, and the test results can be queried and traced based on this barcode in the later stage.
16. MES system connection	After the testing is completed, the test results of this device can be easily and quickly uploaded to the MES system (Manufacturing Execution System).

3 Technical Indicators:

| model	DC- 100V30C200D
Power	1. Charging power 3KW 2. Discharge power 20KW
AC input interface	1. Input single-phase AC220V ± 10% 2. Input current:17A 3. Frequency 50Hz
Measure voltage range	$\pm$100V
Charging voltage range	0~100V
Discharge voltage range	8~100V
Charging current range	0.1~30A

Charging OCP range	0.1~30A
Discharge current range	0.1~200A
Discharge　OCP range	0.1~200A
Voltage accuracy	±0.05% of F.S±0.05% of F.D
Charging Current accuracy	±0.1% of F.S±0.5% of F.D
Discharge Current accuracy	±0.1% of F.S±0.2% of F.D
Charging and discharging time	0~20S
Overcurrent delay time	0~20S
Discharge　OCP Current accuracy	±1A
Charging OCP Current accuracy	±1A
Voltage resolution	1mV
Current resolution	1mA
Voltage and current detection sampling	Four wire connection
data save mode	Save data as a CSV file
AC Internal Resistance (ACR)	1~20000mΩ
DC Internal Resistance (DCIR)	1~20000mΩ（Customizable discharge current and time）
Short circuit protection time	1~10000us
Communication	Serial port (RS232)
power-off protection	Automatically disconnect the electrical connection between the battery and the device after an unexpected power outage of the AC input
Emergency stop function	Pressing the emergency stop will disconnect the electrical connection between the battery and the device, and turn off the load power of the device
Cooling method	Forced air cooling

Size (W * D * H)	65*75*120cm(The desktop height of the operating platform is 0.75 meters)
Ambient temperature	-20°C~50°C
Ambient humidity	10-90%RH

4 computer software

4.1 Software architecture

The upper computer software architecture of the system is as follows, based on the modular design concept, divided into 5 large modules. The interface is concise and clear, easy to navigate, and users can easily browse and switch between different functional modules. The upper computer of this system is based on ASP NET platform development has extremely high stability, reliability, and scalability.
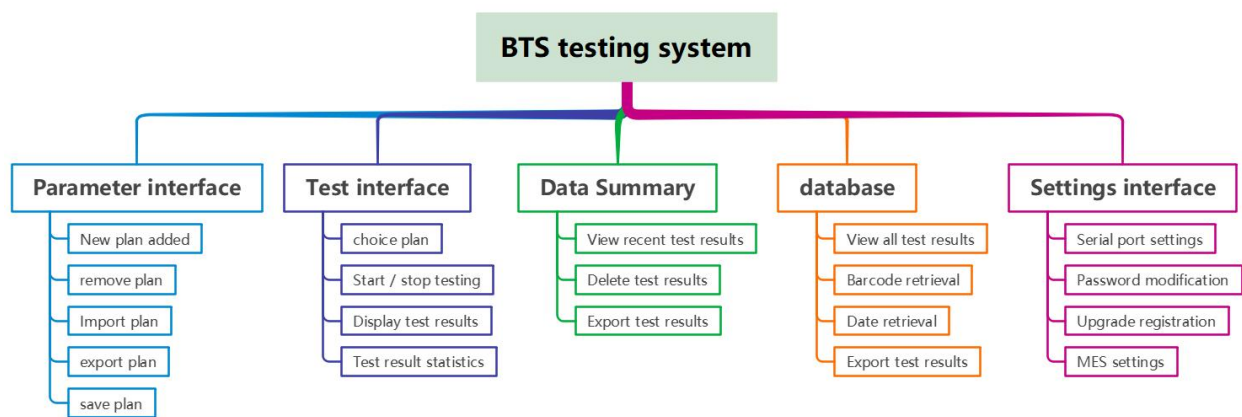
4.2 Login interface

The login interface can select three languages: Simplified Chinese, Traditional Chinese, and English. User management includes three types of users, corresponding to different operation permissions, which are defined as follows:

(1) Operator: Can operate the testing interface, view data summaries, and view databases. This permission only allows basic operations and viewing test results, and cannot perform parameter settings or other operations.

(2) Technician: Can operate the testing interface, view data summary, view database, set execution plan parameters, set serial communication parameters, modify operator and technician passwords, etc.

(3) Administrator: The manufacturer reserves a debugging interface to view parameters when the device is running abnormally.

4.3 Main interface（Testing interface）

After setting the parameters and saving them, the system actively jumps to the testing interface. In the testing interface, different testing schemes can be selected based on different models and batches of batteries. After selecting the solution, click "Start Testing", and the system will automatically complete the testing and display the test results as shown in the following figure. When the test results are incorrect or errors such as battery reverse connection are detected, the system will stop the test and report an error. In emergency situations, you can click "stop testing" or press the emergency stop button.

SerialNumbe	TestOption	Actual Value	Test Result	MinValue	MaxValue	Unit
1	NoLoad Vlot	50.028	√	39	55.9	V
2	Charge Volt	54.54	√	39	55.9	V
3	Charge Cur	9.997	√	8	12	A
4	Charge △V	1.289	√	0	220	V
5	Charge DCR	128.938	√	5	1000	mΩ
6	Discharge Vol	41.747	√	39	55.9	V
7	Discharge Cur	20.005	√	16	24	A
8	Discharge △V	8.803	√	0	220	V
9	DCR	377.61	√	5	1000	mΩ
10	ACR	302.45	√	5	1000	mΩ
11	NoLoad Vlot	49.763	√	39	55.9	V
	Plan1--ExportingUS					

4.4 Data Summary Interface

The data summary interface will display the test results of all battery packs tested by the most recent test plan. Provide the function to delete a test result when the technician has permission. The test results are arranged in reverse chronological order, and the final test result is placed in the first row for the convenience of customers to view.

4.5 Excel file

The test results will be automatically saved as an Excel file, and the system will classify the test result files. The "OK" and "NG" files will be stored separately. The Excel file is named after the barcode name and the test time.

5 List of Main Accessories

NO	Main components	MAker	number	unit
1	resistance tester	Self-developed	1	PCS
2	Testing System Software	Self-developed	1	PCS
3	Industrial computer	AOC	1	PCS
4	Charging power	Self-developed	1	PCS
5	Discharging power	Self-developed	1	PCS
6	DC contactor	SANNUO	4	PCS
7	relay	HONGFA	14	PCS
8	chassis	Self-developed	1	PCS
9	power supply	Taiwan Mingwei	4	PCS

10	Code scanning gun	Guangzhou Wangbai	1	PCS
11	Leakage switch	chnt	1	PCS
12	current sensor	ZHONG HUO	1	PCS
13	fuse	US Littelfuse	1	PCS
14	Main CPU	US TI	1	PCS
15	Slave CPU	ST(Italy)	1	PCS
16	Isolation module	MORNSUN	3	PCS
17	Bidirectional ACDC power supply	Topology	1	PCS

6 Shipping List:

Number	specific configuration	quantity
1	lithium battery comprehensive testing system (with industrial computer)	1 set
2	Integrated testing system upper computer software	1 PCS
3	Software manual	1 copy
4	code scanning guns	1 set
5	Foot switch	1 set
6	Battery test connection wire	1 set

7 After sales service:

(1) 1 year warranty for the entire equipment; Lifetime maintenance;

(2) Video guided installation or on-site installation and usage training;

(3) If the equipment malfunctions during use, a preliminary solution will be provided within 4 hours, and if necessary, after-sales personnel will arrive at the site within 48 hours(Within China);

Party A (seal):   Party B (seal):

Technical leader: Technical leader:

Date: Date: