Battery Active Balancer DS Series

Product Specification

Heltec Energy

1. Product Introduction

1.1 Product Overview

The product adopts active equalization technology, using capacitors as carriers to supplement the energy of high-energy batteries to low-energy batteries, and carry out energy conversion in the battery pack to achieve the purpose of improving the difference of battery cells and effectively extending the service life of the battery. A display is configured to view the battery voltage in real time. The equalization circuit has high efficiency, the battery charging and discharging process can be equalized, the equalization speed is fast, and the whole group is completely undifferentiated. With sleep function to extend the battery life, with over-discharge protection function to reduce the accident rate, can be widely used in a variety of series parallel battery scenarios.

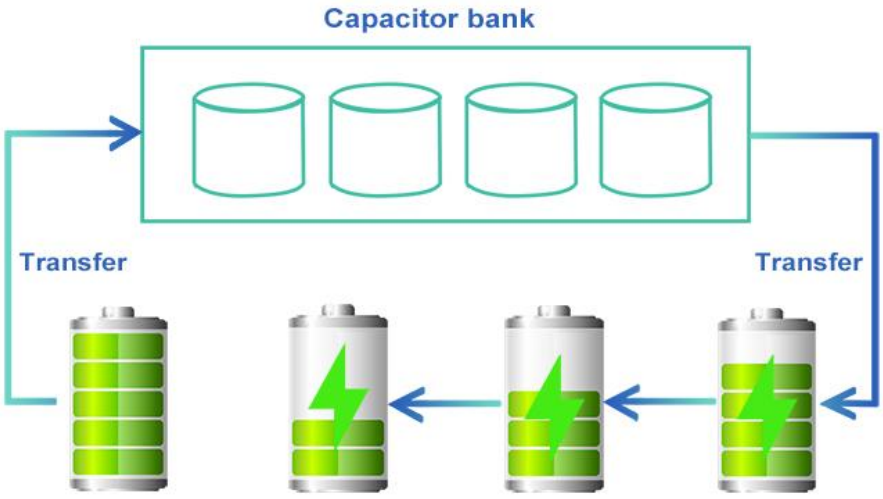


Figure 1 Schematic diagram of product equalization principle

1.2 Product Features

- High reliability
- Made of reliable materials, high safety
- Insulation, moisture-proof, anti-leakage, shock-proof, dust-proof, anti-corrosion, anti-aging,

anti-corona

- Suitable for NCM/LFP/LTO
- Reasonable layout
- Simple installation and easy operation

1.2 Product Function

- The whole group is uniformly balanced without any differences
- Temperature protection function
- Display function
- Automatic low-voltage sleep function
- Over-voltage protection function

1.3 Application Scenarios



Electromobile



Drone



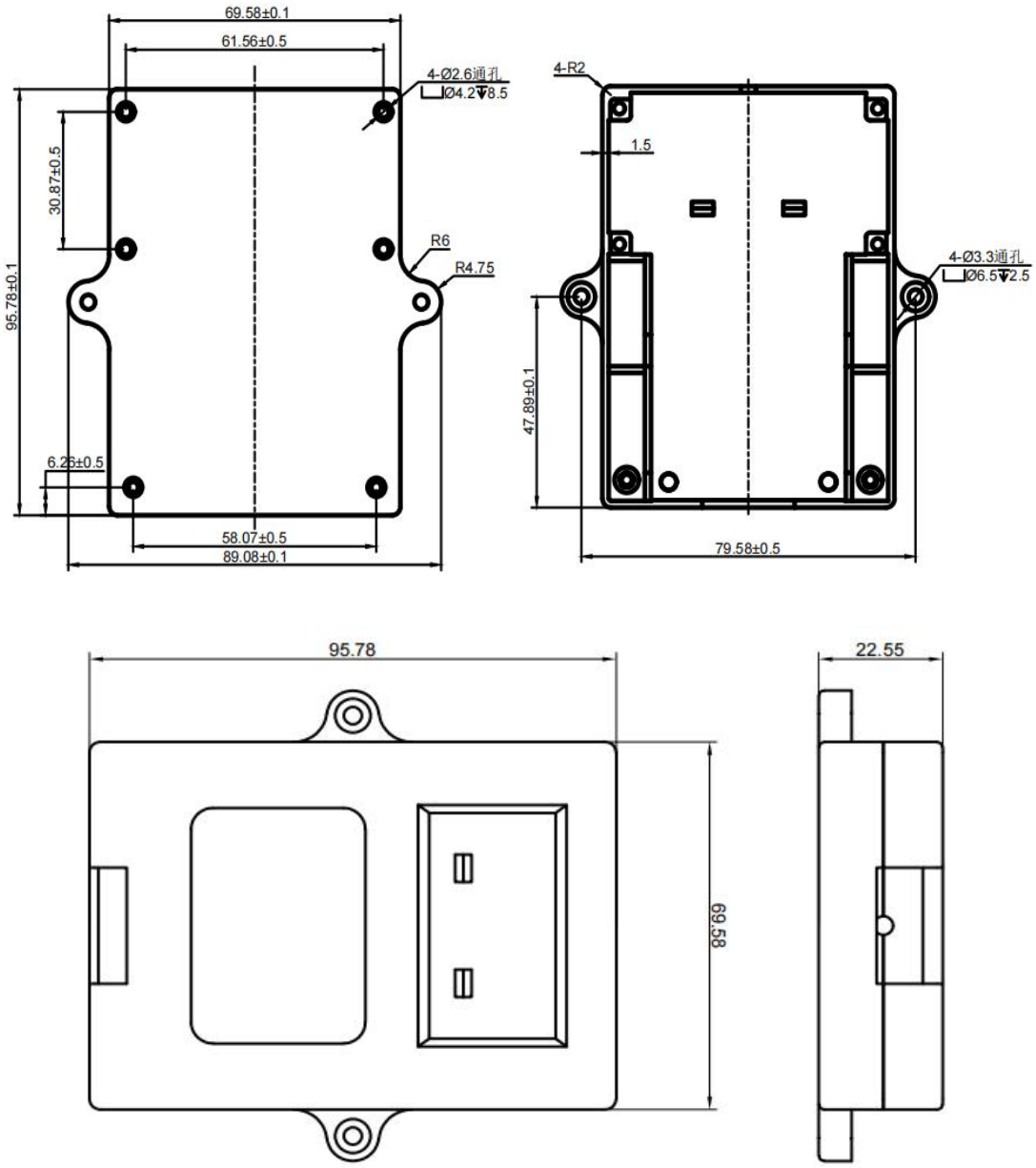
Power tool



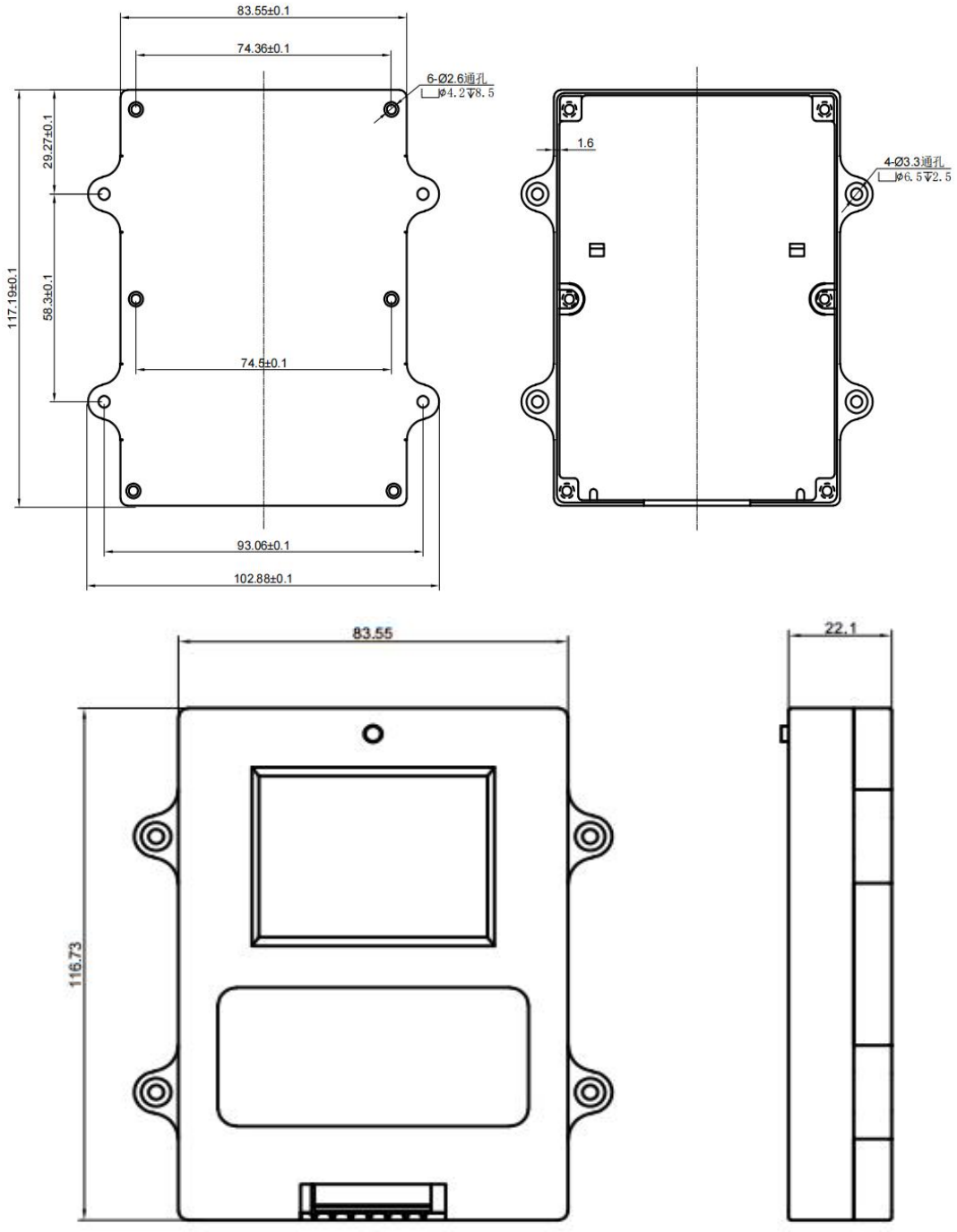
Each battery string

1.5 Exterior dimensional drawing

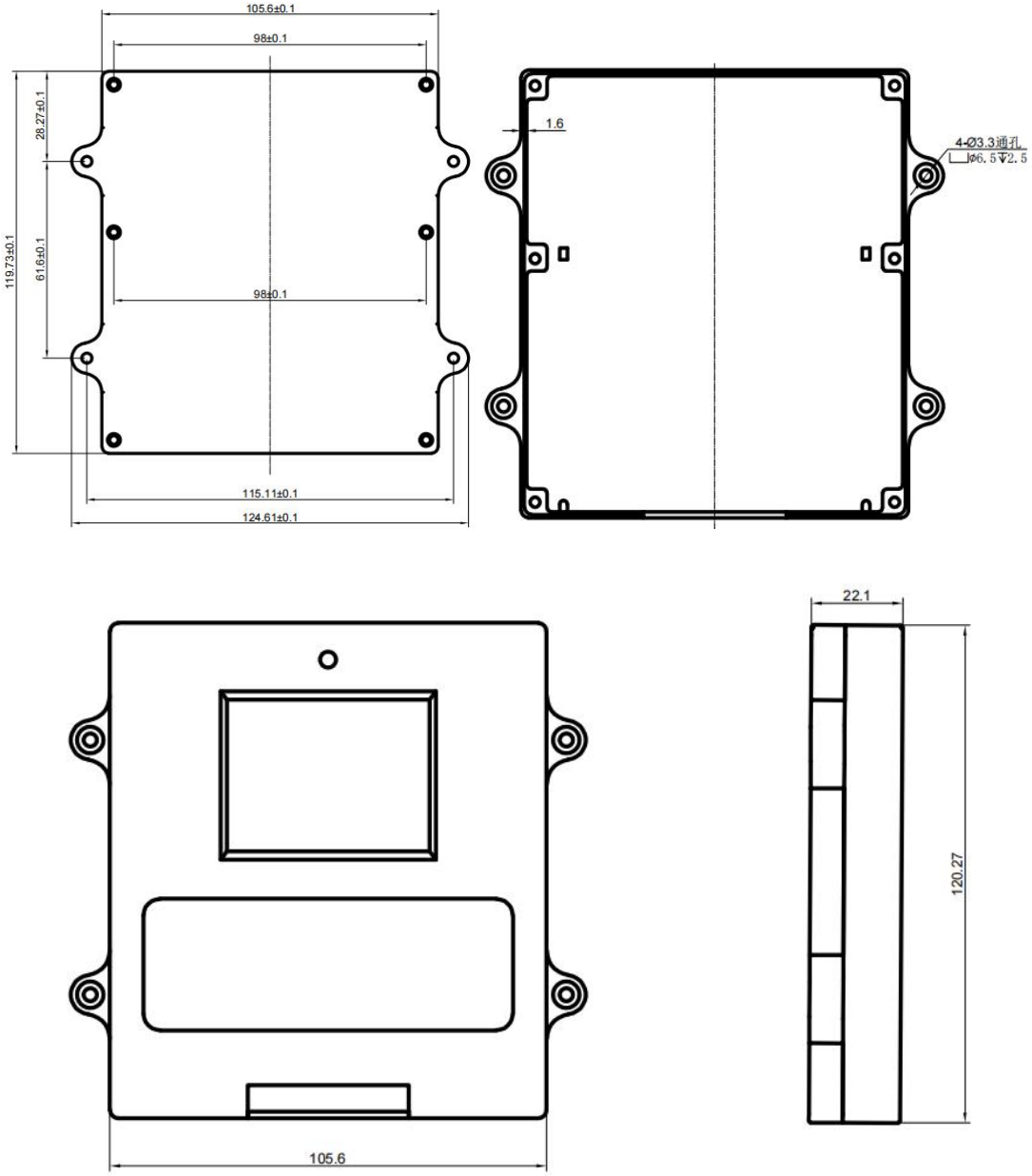
1.5.1 DS0855



1.5.2 DS1004


83.55±0.1
74.36±0.1
6-Ø2.6通孔
⌴Ø4.2↧8.5
29.27±0.1
58.3±0.1
117.19±0.1
74.5±0.1
93.06±0.1
102.88±0.1
1.6
4-Ø3.3通孔
⌴Ø6.5↧2.5
83.55
116.73
22.1

1.5.3 DS0877



*Can be installed according to the size drawing, unit: mm

2. Technical specifications

2.1 Technical Parameter

Functional Item	Argument		
Model Number	DS0855	DS1004	DS0877
Applicable Battery String	4S	6S	8S
Color	Black/Green/Red		
Applicable Battery Type	NCM/LFP/LTO		
Product Size	95.78*69.58*22.55mm	116.73*83.55*22.1mm	120.27*105.6*22.1mm
Ambient Temperature	-10℃~60℃		
Operating Voltage	2.7V~4.5V		
Sleep Voltage	≤1.8V		
Start Adjacent Differential Pressure	≥0.1V		
Resting Current	0.01uA		
Voltage Measurement Accuracy	5mV		
Balancing Technique	Active equalization		
Standby Working Current	6mA		
Equalizing Current	0A~5A		

2.2 Shipping List

List of products and accessories	Quantity/Set	Remark
Balance Instrument	1	
Wiring Adapter Board	1	
Instruction Manual	1	
Equipped Wires	2	1 conversion wire,1 battery wire
Product Certificate	1	

2.3 Test Report

Temperature environment: 25℃

Test equipment: battery simulator GKP-08S05A-1000, clamp meter DE66D-600A

Internal resistance: 13 Mω / root

Load: None

Charger: None

DS series is an active balancer. When using the balancer, the battery is continuously in the process of dynamic balancing. Internal resistance, load, temperature environment, battery type and other environmental factors will affect the balancing effect and current. In order to cover as many application scenarios as possible, the test report designed three cases for testing: test 1 - initial pressure difference of adjacent cells 1V, test 2 - only one string of batteries in the whole group has a high voltage, and test 3 - only one string of batteries in the whole group has a low voltage. Because the balance current is affected by the circuit resistance, the current is only measured by a clamp ammeter.

2.3.1 Model Number ： DS0855

Test 1

B1/B3 (V)	B2/B4 (V)	Relative Maximum Pressure Difference(V)	s1 (B1+)/A	s2 (B2+)/A	s3 (B3+)/A	S4 （B4+）/A
4	3	1	-5.24	4.16	-4.78	2.69
3.93	3	0.93	-4.55	3.69	-4.3	2.6
3.86	3	0.86	-4.26	3.4	-3.99	2.43
3.8	3	0.8	-3.91	3.25	-3.67	2.28
3.73	3	0.73	-3.58	2.96	-3.38	2.13
3.67	3	0.67	-3.25	2.66	-3.08	1.97
3.6	3	0.6	-2.91	2.43	-2.78	1.77
3.53	3	0.53	-2.59	2.19	-2.5	1.6
3.47	3	0.47	-2.25	1.93	-2.21	1.44
3.4	3	0.4	-1.92	1.7	-1.9	1.27
3.34	3	0.34	-1.58	1.47	-1.6	1.14
3.27	3	0.27	-1.24	1.2	-1.29	0.96
3.2	3	0.2	-0.86	0.92	-0.94	0.78
3.14	3	0.14	-0.53	0.65	-0.62	0.59
3.02	3	0.02	0.01	0.2	0.01	0.13

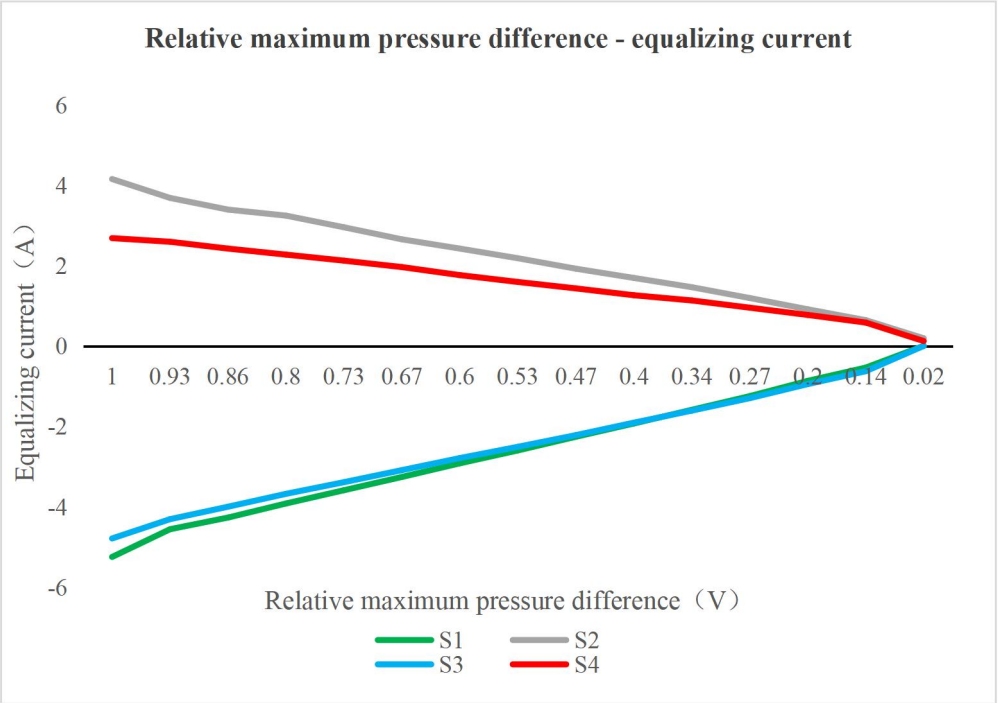


Figure 2-1 4 string tests 1 Relative maximum differential pressure-equalization current diagram

Test 2

B1~B3(V)	B4(V)	Relative Maximum Pressure Difference(V)	s1 (B1+) /A	s2 (B2+)/A	s3 (B3+)/A	S4 （B4+）/A
4	3	1	-0.05	-1.25	-5.24	4.8
4	3.14	0.86	-0.03	-0.98	-4.5	4.11
4	3.2	0.8	-0.02	-0.92	-4.13	3.91
4	3.27	0.73	-0.02	-0.82	-3.81	3.2
4	3.34	0.66	-0.02	-0.76	-3.38	3.2
4	3.4	0.6	-0.02	-0.66	-3.04	2.84
4	3.47	0.53	-0.02	-0.57	-2.7	2.58
4	3.53	0.47	-0.02	-0.47	-2.34	2.03
4	3.6	0.4	-0.02	-0.4	-2	2.03
4	3.67	0.33	-0.02	-0.31	-1.67	1.7
4	3.73	0.27	-0.02	-0.21	-1.32	1.41
4	3.8	0.2	-0.02	-0.13	-0.95	1.1
4	3.86	0.14	-0.02	-0.05	-0.6	0.74
4	3.93	0.07	-0.02	0.03	-0.25	0.46
4	3.98	0.02	0.02	0	0.04	0.25

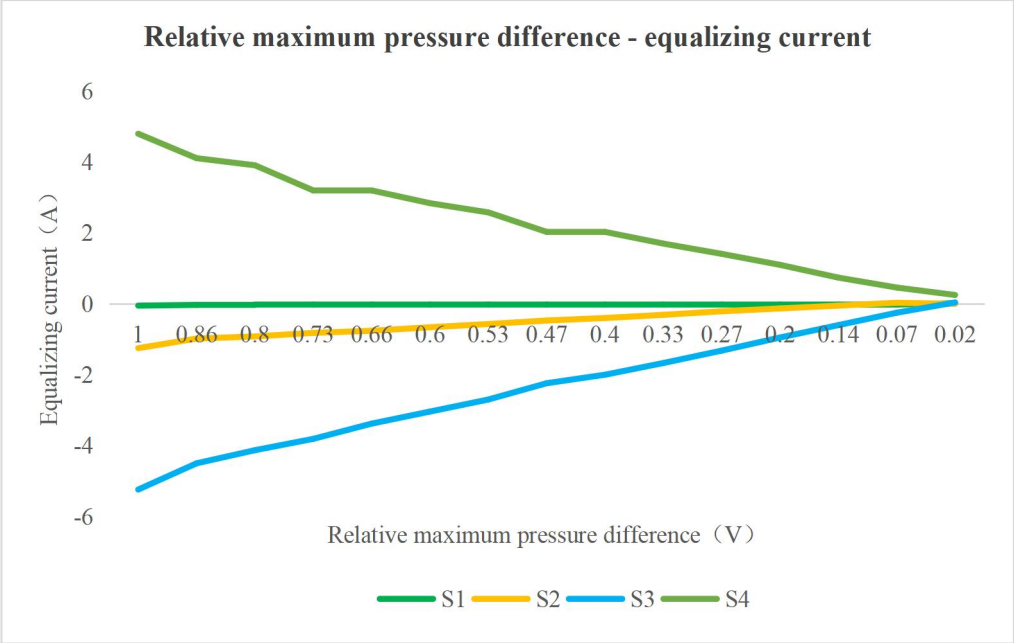


Figure 2-2 4 string tests 2 Relative maximum differential pressure-equalization current diagram

Test 3

B1~B3(V)	B4(V)	Relative maximum pressure difference(V)	s1 (B1+)/A	s2 (B2+)/ A	s3 (B3+)/A	S4 （B4+）/A
3	4	1	0.17	1.4	4.8	-4.09
3	3.93	0.93	0.15	1.32	4.4	-3.81
3	3.86	0.86	0.13	1.18	4.1	-3.58
3	3.8	0.8	0.11	1.08	3.82	-3.29
3	3.73	0.73	0.1	0.99	3.53	-3.06
3	3.67	0.67	0.1	0.86	3.14	-2.78
3	3.6	0.6	0.09	0.8	2.87	-2.56
3	3.53	0.53	0.08	0.7	2.53	-2.27
3	3.47	0.47	0.07	0.66	2.27	-1.98
3	3.4	0.4	0.05	0.55	1.92	-1.7
3	3.34	0.34	0.05	0.47	1.62	-1.6
3	3.27	0.27	0.05	0.44	1.4	-1.18
3	3.2	0.2	0.05	0.36	1.03	-0.84
3	3.14	0.14	-0.05	0.26	0.73	-0.59
3	3.02	0.02	-0.05	0.11	0.13	-0.07

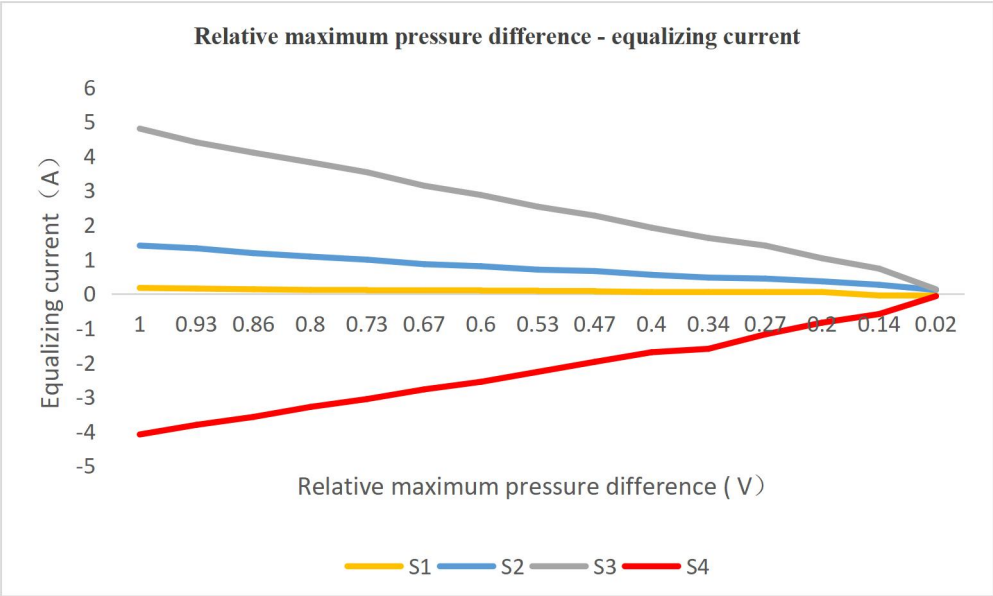


Figure 2-3　4 string tests 3 Relative maximum differential pressure-equalization current diagram

*The measured maximum current can reach up to 5.38A.



*When the maximum current is measured, the temperature is 27.9℃



2.3.2Model Number：DS1004

Test 1

B1/B3/ B5(V)	B2/B4/ B6(V)	Relative maximum pressure difference (V)	s1 (B1+)/A	s2 (B2+)/A	s3 (B3+)/A	S4 （B4+）/A	S5 （B5+） /A	S6 （B6+） /A
4	3	1	-5.01	3.88	-4.15	4.03	-4.57	2.64
3.93	3	0.93	-4.56	3.65	-3.88	3.74	-4.29	2.47
3.86	3	0.86	-4.22	3.43	-3.56	3.54	-3.96	2.31
3.8	3	0.8	-3.92	3.2	-3.32	3.28	-3.65	2.14
3.73	3	0.73	-3.58	2.93	-3.05	2.99	-3.37	1.96
3.67	3	0.67	-3.23	2.67	-2.78	2.75	-3.06	1.8
3.6	3	0.6	-2.9	2.43	-2.44	2.5	-2.76	1.62
3.53	3	0.53	-2.55	2.17	-2.19	2.26	-2.44	1.44
3.47	3	0.47	-2.25	1.9	-1.91	1.98	-2.14	1.28
3.4	3	0.4	-1.91	1.67	-1.63	1.7	-1.8	1.12
3.34	3	0.34	-1.62	1.41	-1.37	1.46	-1.54	0.95
3.27	3	0.27	-1.29	1.13	-1.07	1.16	-1.2	0.76
3.2	3	0.2	-0.93	0.86	-0.77	0.9	-0.89	0.58
3.14	3	0.14	-0.61	0.63	-0.51	0.65	-0.6	0.4
3.02	3	0.02	0	0.14	0	0.13	0	0.1

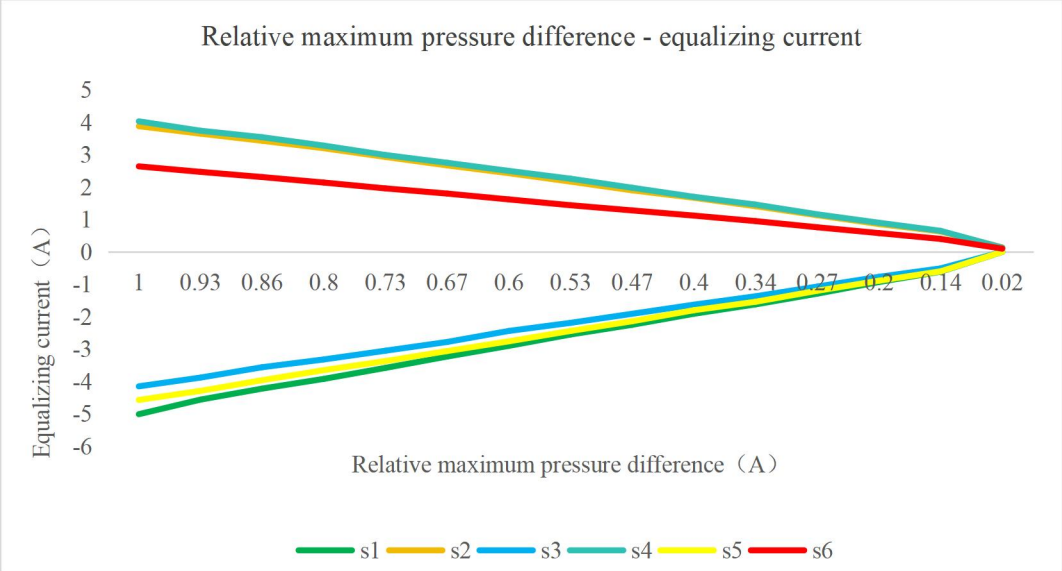


Figure 2-4 6 string tests 1 Relative maximum differential pressure-equalization current diagram

Test 2

B1~ B5(V)	B6(V)	Relative maximum pressure difference (V)	s1 (B1+)/ A	s2 (B2+)/ A	s3 (B3+)/A	S4 （B4+） /A	S5 （B5 +）/A	S6 （B6+）/A
4	3	1	0.14	-0.05	-0.32	-1.25	-5.08	5.13
4	3.14	0.86	0.14	-0.03	-0.28	-1.06	-4.36	4.47
4	3.2	0.8	0.14	0.02	-0.23	-0.97	-4.05	4.15
4	3.27	0.73	0.14	0.02	-0.21	-0.87	-3.67	3.78
4	3.34	0.66	0.14	0.02	-0.18	-0.77	-3.35	3.48
4	3.4	0.6	0.14	0.02	-0.14	-0.7	-3.04	3.18
4	3.47	0.53	0.14	0.02	-0.12	-0.61	-2.69	2.82
4	3.53	0.47	0.14	0.02	-0.09	-0.53	-2.35	2.49
4	3.6	0.4	0.14	0.02	-0.07	-0.44	-1.99	2.15
4	3.67	0.33	0.14	0.02	-0.05	-0.34	-1.65	1.82
4	3.73	0.27	0.14	0.02	-0.03	-0.29	-1.34	1.48
4	3.8	0.2	0.14	0.02	0.02	-0.18	-0.97	1.1
4	3.86	0.14	0.14	0.02	0.02	-0.11	-0.63	0.76
4	3.93	0.07	0.14	0.02	0.02	-0.05	-0.27	0.38
4	3.98	0.02	0.14	0.02	0.02	0.02	0.02	0.16

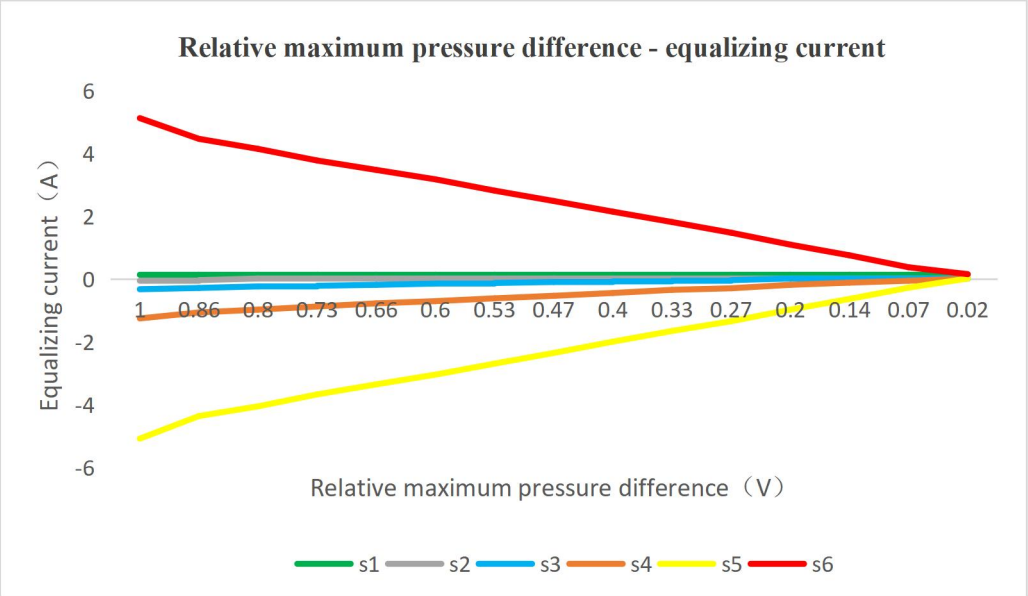


Figure 2-5 6 string tests 2 Relative maximum differential pressure-equalization current diagram

Test 3

B1~ B5(V)	B6(V)	Relative maximum pressure difference(V)	s1 (B1+)/A	s2 (B2+)/A	s3 (B3+)/A	S4 （B4+） /A	S5 （B5+） /A	S6 （B6+） /A
3	4	1	-0.14	0.21	0.41	1.21	5.2	-4.87
3	3.93	0.93	-0.14	0.21	0.38	1.2	5.16	-4.84
3	3.86	0.86	-0.14	0.17	0.36	1.12	4.88	-4.61
3	3.8	0.8	-0.14	0.16	0.3	1.02	4.53	-4.3
3	3.73	0.73	-0.14	0.14	0.27	0.93	4.11	-3.93
3	3.67	0.67	-0.14	0.13	0.26	0.87	3.8	-3.62
3	3.6	0.6	-0.13	0.12	0.22	0.77	3.32	-3.23
3	3.53	0.53	-0.1	0.1	0.18	0.72	2.92	-2.84
3	3.47	0.47	-0.07	0.08	0.17	0.67	2.6	-2.54
3	3.4	0.4	-0.04	0.08	0.13	0.59	2.2	-2.19
3	3.34	0.34	-0.01	0.07	0.1	0.38	1.7	-1.82
3	3.27	0.27	0.02	0.05	0.09	0.37	1.51	-1.46
3	3.2	0.2	0.05	0.05	0.08	0.3	1.14	-1.08
3	3.14	0.14	0.05	0.05	0.05	0.21	0.73	-0.72
3	3.02	0.02	0.05	0.05	0.05	0.08	0.11	-0.13

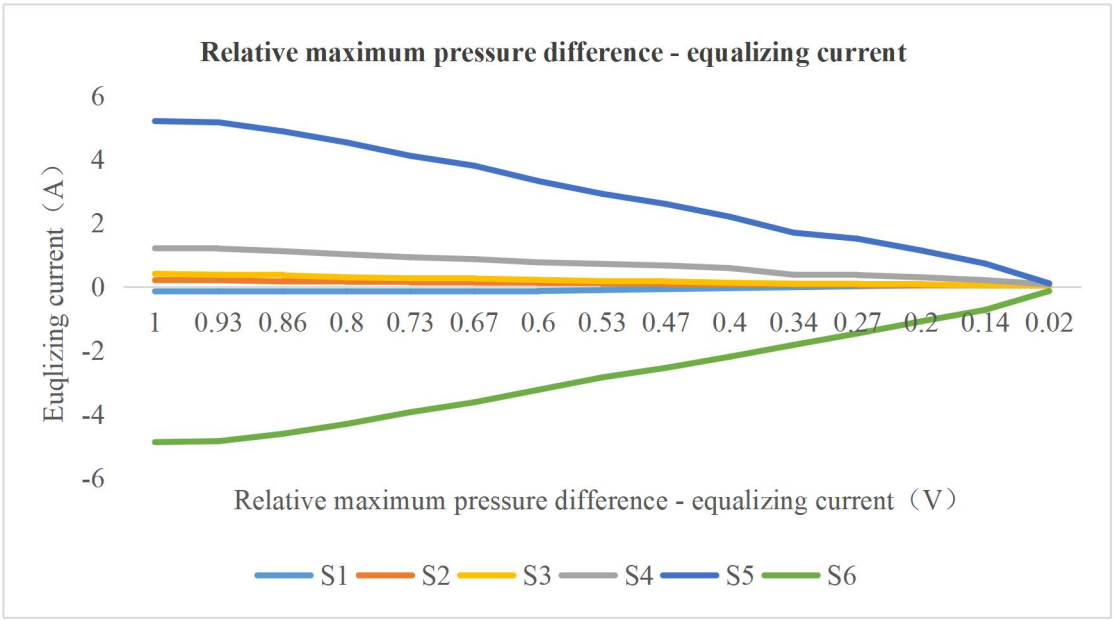


Figure 2-6 6 string tests 3 Relative maximum differential pressure-equalization current diagram

*The measured maximum current can reach 4.8A



*When the maximum current is measured, the temperature is 30℃



2.3.3Medol number：DS0877

Test 1

B1/B3/B5/B7(V)	B2/B4/B6/B8(V)	Relative maximum pressure difference (V)	s1 (B1+) /A	s2 (B2+) /A	s3 (B3+) /A	S4 （B4+）/A	S5 （B5+）/A	S6 （B6+）/A	S7 （B7+）/A	S8 （B8+）/A
4	3	1	-2.8	2.02	-2.42	2.18	-2.37	2.07	-2.5	1.24
3.93	3	0.93	-2.55	1.89	-2.23	2.04	-2.17	1.93	-2.31	1.1
3.86	3	0.86	-2.35	1.75	-2.06	1.91	-2.01	1.81	-2.17	1.01
3.8	3	0.8	-2.22	1.62	-1.93	1.8	-1.9	1.67	-2.03	0.97
3.73	3	0.73	-2	1.5	-1.78	1.61	-1.74	1.53	-1.84	0.86
3.67	3	0.67	-1.86	1.36	-1.63	1.46	-1.61	1.38	-1.71	0.77
3.6	3	0.6	-1.66	1.22	-1.47	1.30	-1.45	1.24	-1.52	0.7
3.53	3	0.53	-1.5	1.09	-1.31	1.2	-1.3	1.11	-1.36	0.64
3.47	3	0.47	-1.33	0.96	-1.15	1.1	-1.13	0.99	-1.21	0.55
3.4	3	0.4	-1.14	0.8	-0.99	0.92	-0.98	0.85	-1.04	0.5
3.34	3	0.34	-0.95	0.7	-0.83	0.79	-0.84	0.7	-0.88	0.42
3.27	3	0.27	-0.77	0.6	-0.67	0.65	-0.67	0.6	-0.7	0.33
3.2	3	0.2	-0.6	0.42	-0.53	0.49	-0.52	0.42	-0.54	0.23
3.14	3	0.14	-0.43	0.24	-0.39	0.39	-0.38	0.24	-0.36	0.14
3.02	3	0.02	-0.1	0	-0.09	0	-0.08	0	-0.05	0

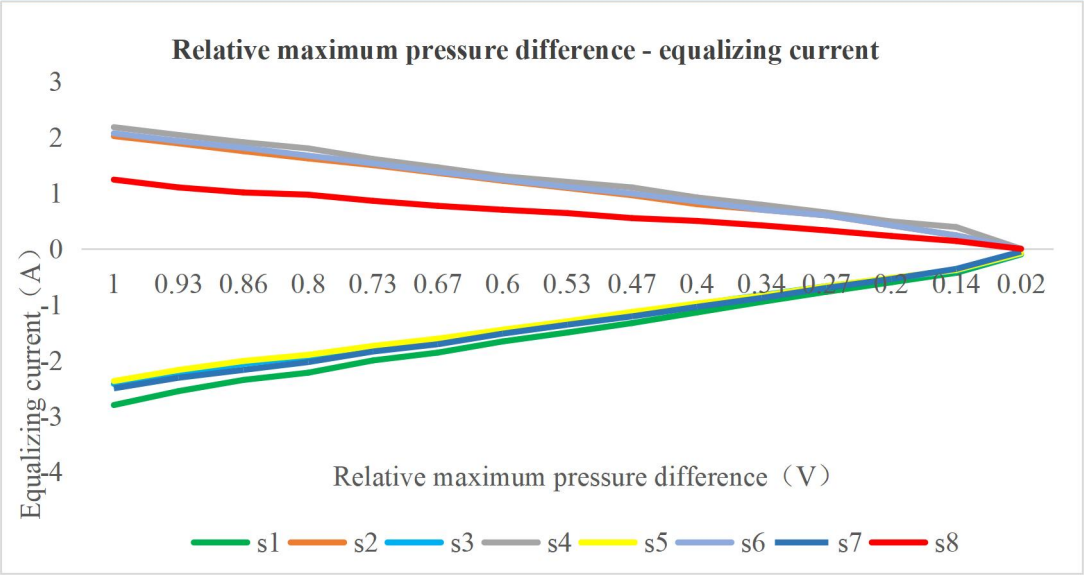


Figure 2-7 8 string tests 1 Relative maximum differential pressure-equalization current diagram

Test 2

B1~B7(V)	B8(V)	Relative maximum pressure difference(V)	s1 (B1+)/A	s2 (B2+)/A	s3 (B3+)/A	S4 （B4+）/A	S5 （B5+）/A	S6 （B6+）/A	S7 （B7+）/A	S8 （B8+）/A
4	3	1	0.05	0.05	0.05	-0.15	-0.19	-0.91	-5.27	5.46
4	3.14	0.86	0.02	0.02	0.02	-0.14	-0.14	-0.85	-4.97	5.1
4	3.2	0.8	0.02	0.02	0.02	-0.13	-0.13	-0.78	-4.57	4.7
4	3.27	0.73	0.02	0.02	0.02	-0.1	-0.12	-0.7	-4.2	4.3
4	3.34	0.66	0.02	0.02	0.02	-0.07	-0.08	-0.61	-3.83	3.96
4	3.4	0.6	0.02	0.02	0.02	-0.06	-0.08	-0.57	-3.46	3.62
4	3.47	0.53	0.02	0.02	0.02	-0.05	-0.06	-0.47	-3.05	3.23
4	3.53	0.47	0.02	0.02	0.02	0.02	-0.05	-0.43	-2.72	2.89
4	3.6	0.4	0.02	0.02	0.02	0.02	0.02	-0.33	-2.3	2.45
4	3.67	0.33	0.02	0.02	0.02	0.02	0.02	-0.28	-1.91	2.05
4	3.73	0.27	0.02	0.02	0.02	0.02	0.02	-0.22	-1.51	1.66
4	3.8	0.2	0.02	0.02	0.02	0.02	0.02	-0.14	-1.12	1.24
4	3.86	0.14	0.02	0.02	0.02	0.02	0.02	-0.09	-0.75	0.89
4	3.93	0.07	0.02	0.02	0.02	0.02	0.02	-0.05	-0.3	0.45
4	3.98	0.02	0.02	0.02	0.02	0.02	0.02	0	-0.07	0.18

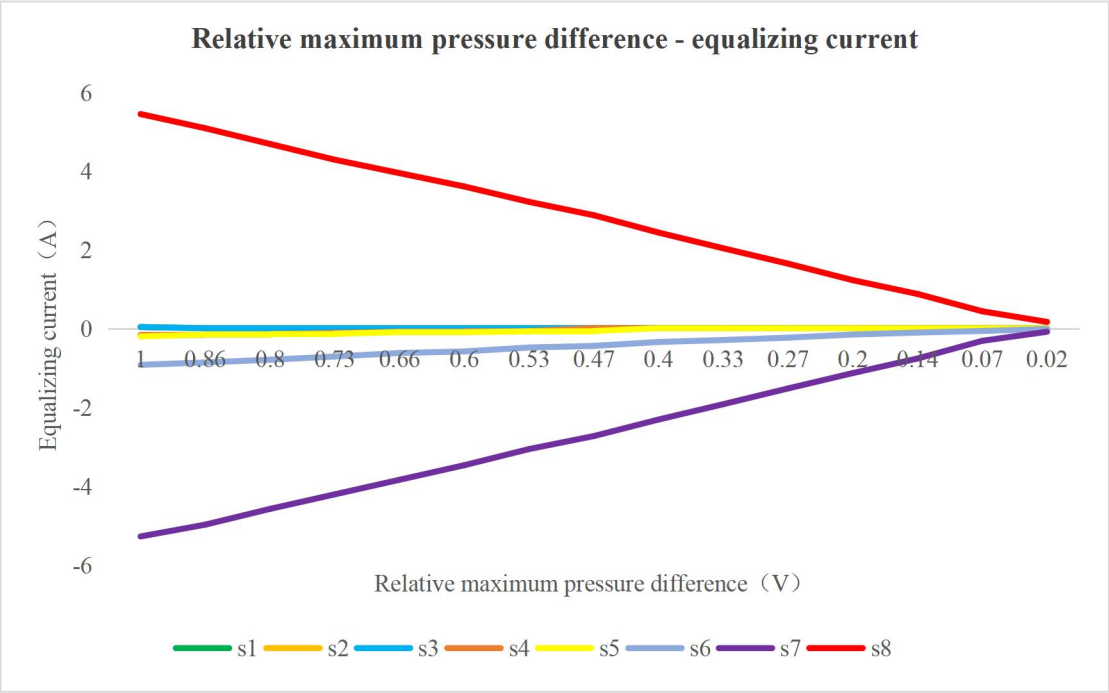


Figure 2-8 8 string tests 2 Relative maximum differential pressure-equalization current diagram

Teat 3

B1~B7(V)	B8(V)	Relative maximum pressure difference(V)	s1 (B1+) /A	s2 (B2+) /A	s3 (B3+) /A	S4 （B4 +）/A	S5 （B5+） /A	S6 （B6 +）/A	S7 （B7 +）/A	S8 （B8+） /A
3	4	1	-0.17	0.05	0.05	0.19	0.39	0.95	5.03	-4.87
3	3.93	0.93	-0.16	0.05	0.05	0.18	0.31	0.88	4.84	-4.8
3	3.86	0.86	-0.16	0.05	0.05	0.15	0.27	0.82	4.53	-4.43
3	3.8	0.8	-0.15	0.05	0.05	0.13	0.22	0.75	4.24	-4.23
3	3.73	0.73	-0.13	0.05	0.05	0.11	0.19	0.7	3.9	-3.85
3	3.67	0.67	-0.11	0.05	0.05	0.09	0.17	0.61	3.51	-3.56
3	3.6	0.6	-0.09	0.05	0.05	0.07	0.15	0.53	3.19	-3.2
3	3.53	0.53	-0.07	0.05	0.05	0.05	0.13	0.46	2.86	-2.83
3	3.47	0.47	-0.05	0.05	0.05	0.05	0.11	0.41	2.54	-2.5
3	3.4	0.4	0.05	0.05	0.05	0.05	0.08	0.33	2.21	-2.17
3	3.34	0.34	0.05	0.05	0.05	0.05	0.07	0.25	1.88	-1.85
3	3.27	0.27	0.05	0.05	0.05	0.05	0.05	0.18	1.45	-1.45
3	3.2	0.2	0.05	0.05	0.05	0.05	0.05	0.11	1.12	-1.08
3	3.14	0.14	0.05	0.05	0.05	0.05	0.05	0.06	0.78	-0.74
3	3.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.21	-0.12

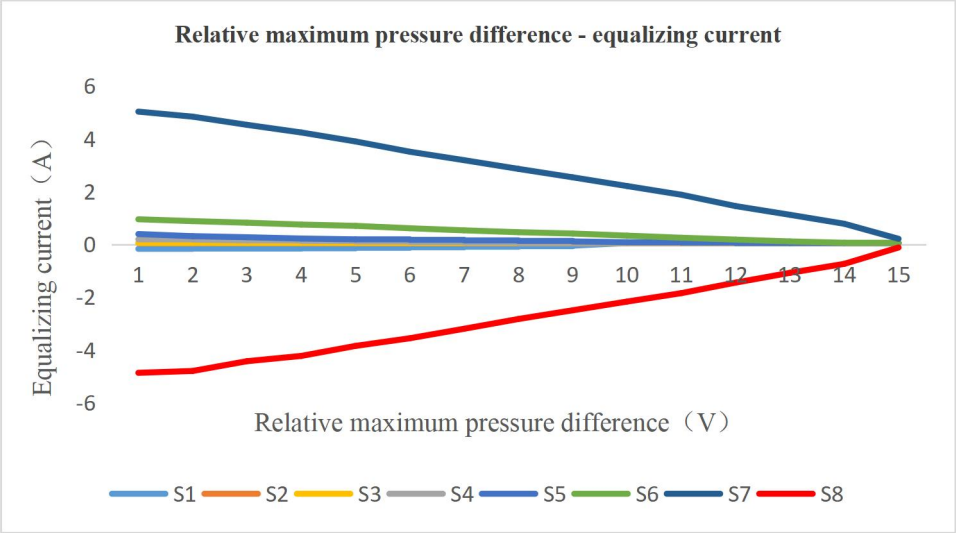


Figure 2-9 8 string tests 3 Relative maximum differential pressure-equalization current diagram

*The measured equalization current is up to 5.3A



* When the measured maximum current is reached, the temperature is 25.9℃



3. Operation Instruction

3.1 Component Introduction

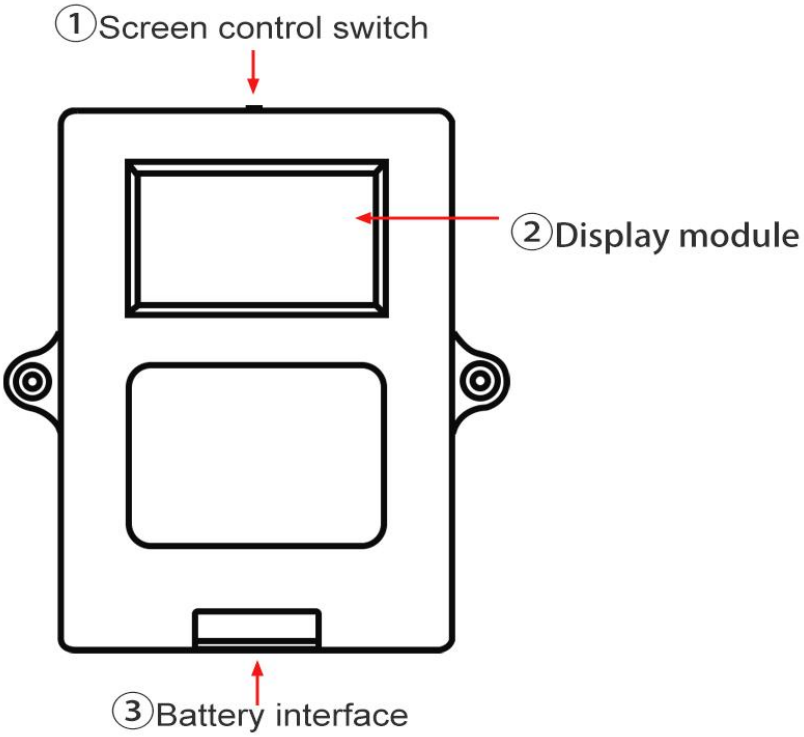


Figure 3-1 Component description

As shown in Figure 3-1, ① the screen control switch can control the screen to be steady on/off, ② the display module displays each battery voltage and the total voltage, and ③ the battery is connected from the battery port.

Display screen Displays the battery status of each string.

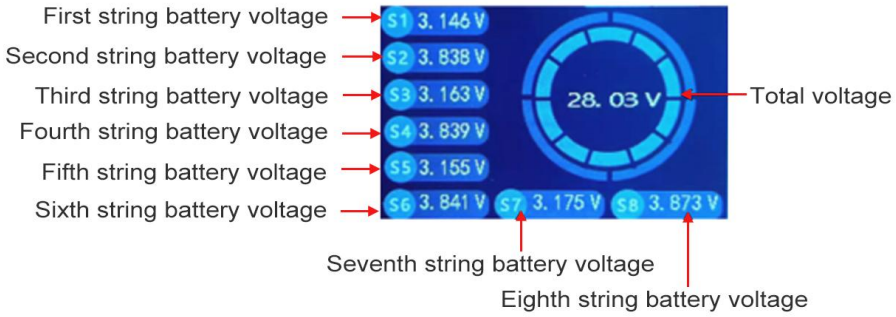


Figure 3-2 Screen

3.2 Instructions for Use

Install the battery string according to the wiring diagram, connect the series battery string to the equalizer, and pay attention to the direction of the positive and negative battery terminals。

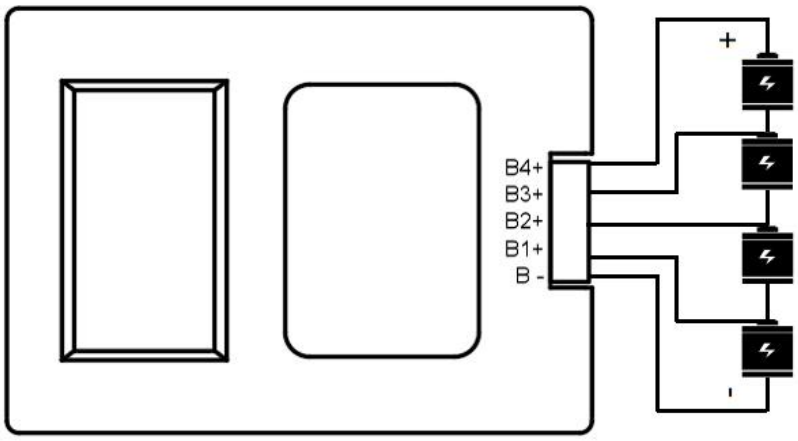


Figure 3-3 four-string cable connection

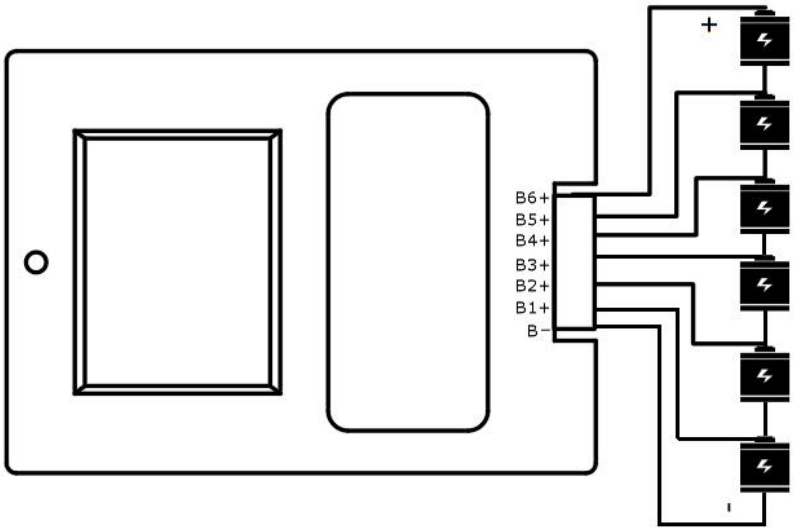


Figure 3-4 6-string cable connection

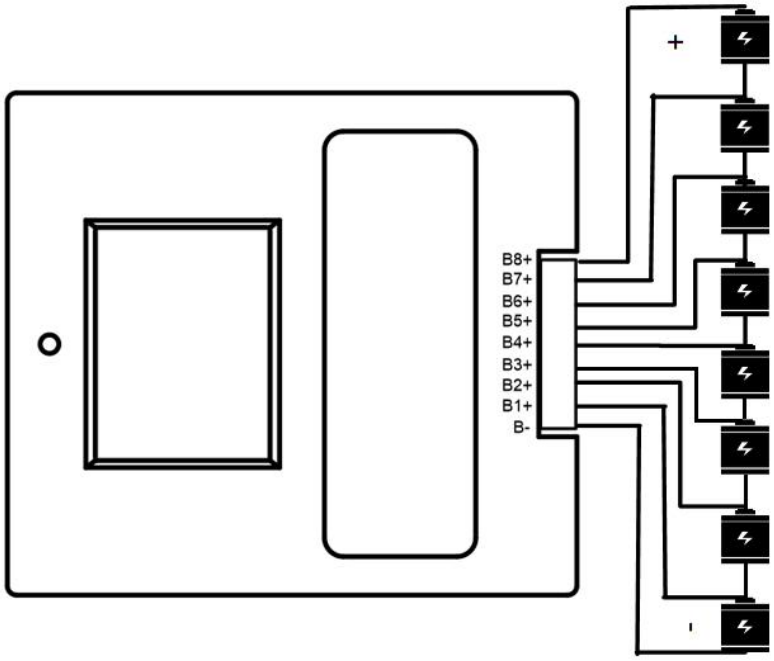


Figure 3-5 8-string cable connection

Connect the battery to the serial port according to the wiring diagram. The screen lights up and displays the voltage status of each battery string.

The equalizer detects the differential pressure of the battery and continues to equalize when the differential pressure of the battery is greater than 0.1V until the differential pressure of the battery is less than 0.03V. The top flap button can control the display module to be off/steady on. Display module Figure 3-2 shows the screen.

* Due to the internal resistance of the battery cell bar, there is a certain error between the voltage displayed after the battery is connected to the equalizer and the voltage measured after the equalizer is removed, which is normal.

* When using the connection between the battery pack, try to use a larger cross-sectional area and a shorter wire connection to achieve a better balance effect.

* In the final stage of balancing, it is normal for the pressure difference to be smaller and the balancing current to be smaller and the balancing time to be longer.

* In the normal use of the battery pack, the equalizer basically does not heat, when the pressure difference is too close to 2V, the equalizer runs with excess current heavy load, which will produce some heat.

4. Matters needing attention

- Before connecting the equalizer, verify that the cable is connected properly and that the first battery negative terminal is connected correctly to B-. Power on the protection board only after confirming the error. Otherwise, serious consequences such as abnormal operation or even burning may occur.
- During use, be sure to follow the design parameters and conditions of use, shall not violate the parameters of this manual, otherwise it is easy to damage the balance board, and then damage the battery.
- Take appropriate measures to discharge electrostatic discharge during the testing, installation, contact, and use of the product.
- Pay attention to the lead, soldering iron and tin residue during use to avoid damage to the product.
- If there is any abnormal situation, please stop using immediately, contact us to return the original repair or ask professional maintenance personnel to repair.

5. After-sales service commitment

Our company always adhere to the quality, safety, customer satisfaction as the first, in order to protect the rights and interests of customers and provide the best after-sales service, special commitment is as follows:

1. We promise that all the design, production, quality inspection, testing and acceptance processes of our company comply with the "National Electrical Equipment Safety Technical Code" GB19517-2023.

2. We promise that all design, production, quality inspection, testing and acceptance processes of our company comply with GB50055-2011 "General Electrical Equipment Distribution Design Code".

3. We promise that all the design, production, quality inspection, testing and acceptance processes of our company shall comply with GB/T50063-2008 "Electrical Measuring Instrument Device Design Code for Electric Power Devices".

4. We promise to take full responsibility for after-sales service and ensure

communication and coordination with customers at all times in all after-sales matters.

5. We promise to respond to the customer's after-sales service request within 24 hours, and arrange a special person to follow up.

6. We promise that for ordinary problems, we will solve them within 3 working days after receiving customer complaints; for complex problems, we will give detailed investigations and solutions within 5 working days.

7. We promise that we will provide after-sales certification services for all products to ensure that the quality and performance of products meet the promise.

The company is committed to the improvement of quality and reliability, but in general, electrical products will have the probability of failure. Depending on the environment and conditions of use, the durability will also vary. Products have been designed to avoid excessive use caused by abnormal heat, smoke, and even personal accidents, fire accidents, social damage and so on.

We will be happy to serve you.

Chengdu Heltec Energy Technology Co., LTD., your trusted battery protection and health management experts!