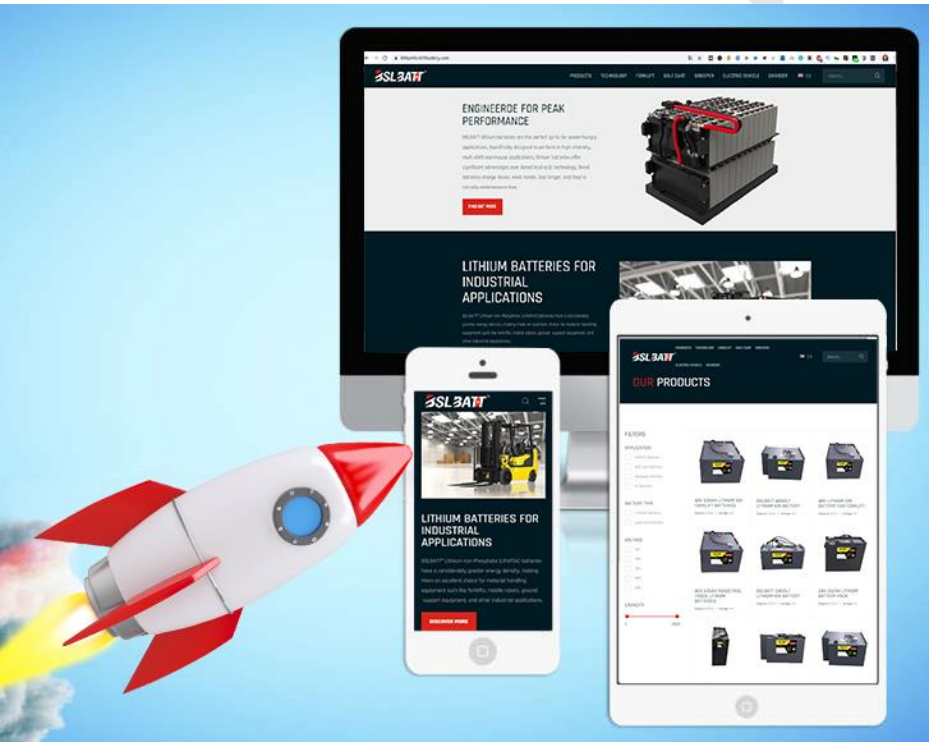
OPTIMUM POWER

Lithium ion Forklift battery

5 YEARS SERVICE
YEARS SUPPORT
5 YEARS Warranty

CONTENTS



01

Design philosophy

Designed To keep You Running

We are committed to helping you find the most efficient and cost-effective battery choice for your application.

Tow tractor

Order Picker

Aerial work platform

Electric -forklift

Pallet truck

Stacker Trucks

02

Lithium-Ion Batteries

Lithium-ion batteries are a type of rechargeable battery. They have a high energy density (meaning that they can store lots of energy), no memory effect (they don’t need to be fully discharged before charging), and a low self-discharge.

Li-ion batteries are growing in popularity for battery-powered electric vehicles, as they’re more energy-efficient than other battery alternatives available, and they don’t produce harmful emissions.

03

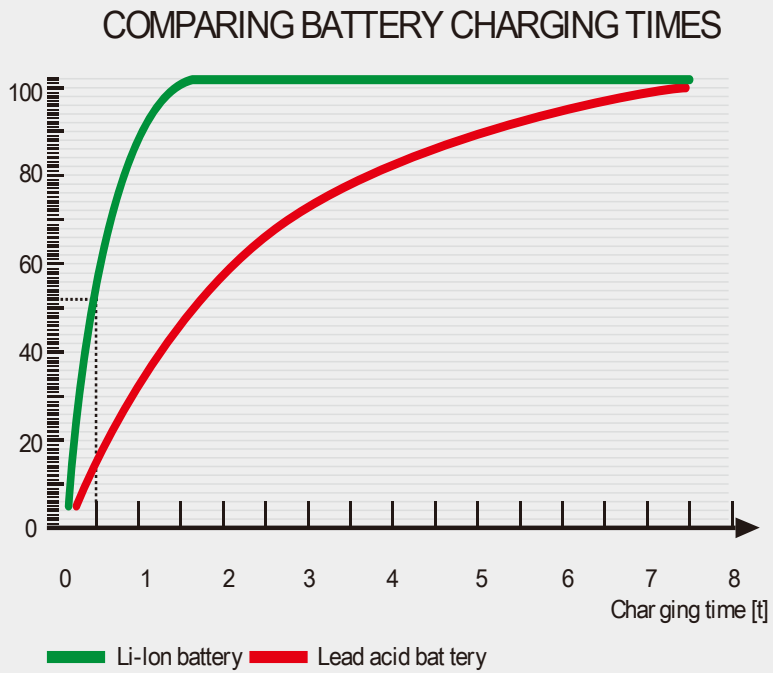
Why choose lithium-ion?

Safety Testing

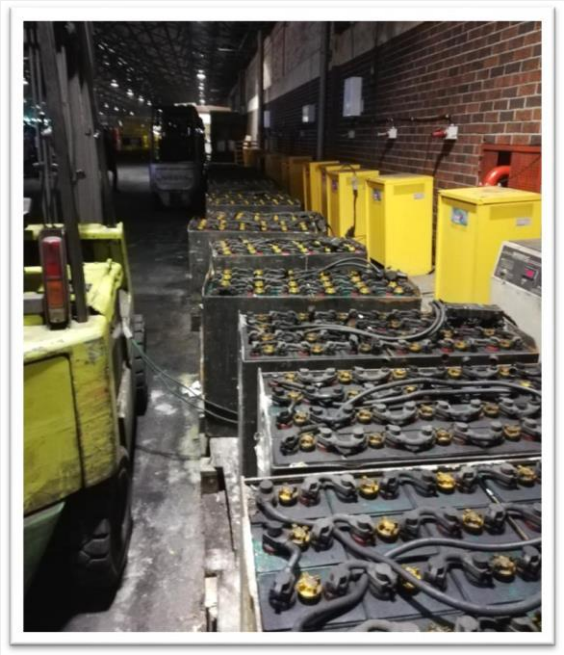
1. Productivity

Fast charging

- Shorter charging times
- “Lunch & Charge” possible
- Economic use of each break
- Use of latest charger technology



- No charging room needed



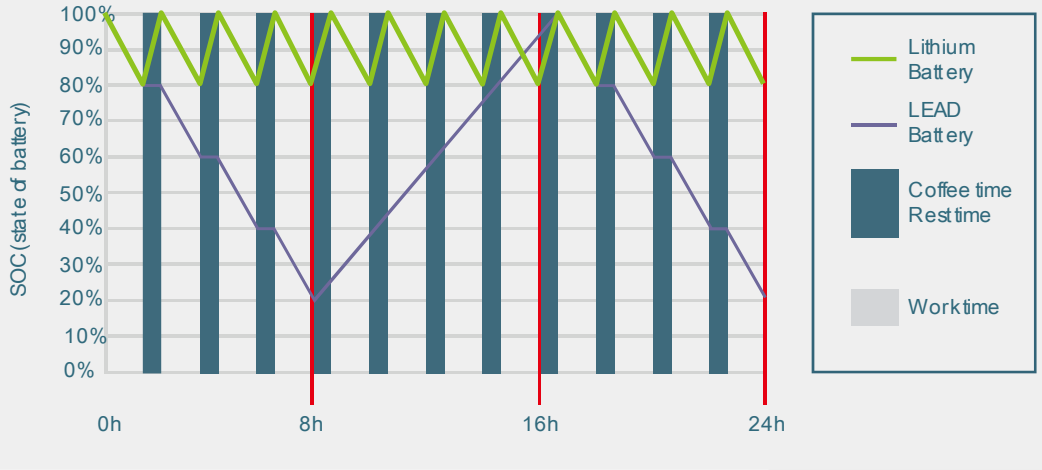
Opportunity charging

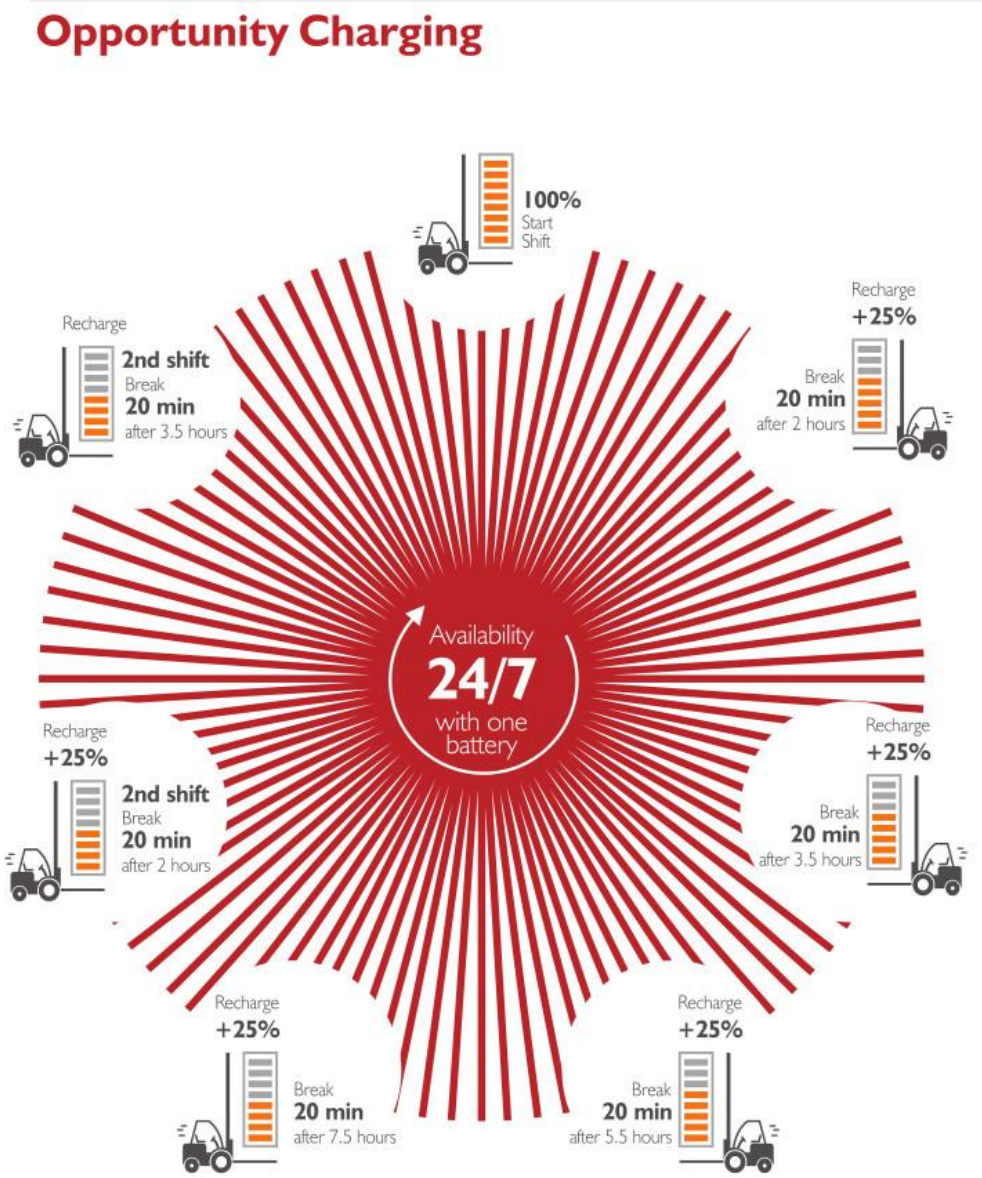
- Constant truck uptime
- Multi-shift availability
- No place-specific charging

The high-performance Li-Ion technology is especially suitable in cases where lead acid batteries are in use and have to be changed in two to three-shift operation.

Lithium-ion batteries do not need to be replaced. By quick opportunity charging any downtime, such as a lunch break, can be efficiently used and the battery is recharged in a very short period of time. opportuniry charging does not affect the battery service life.

Lithium-ion technology supplies constant voltage throughout the entire application time. Accordingly, you can work under full power through several shifts without having to change a battery or do any kind of maintenance at all.





2. Maintenance-Free

Emission-free battery

- No evolving battery gases (hydrogen) and acid
- No need of extraction unit
- Does not contain toxic substances like Cd, Pb or Hg

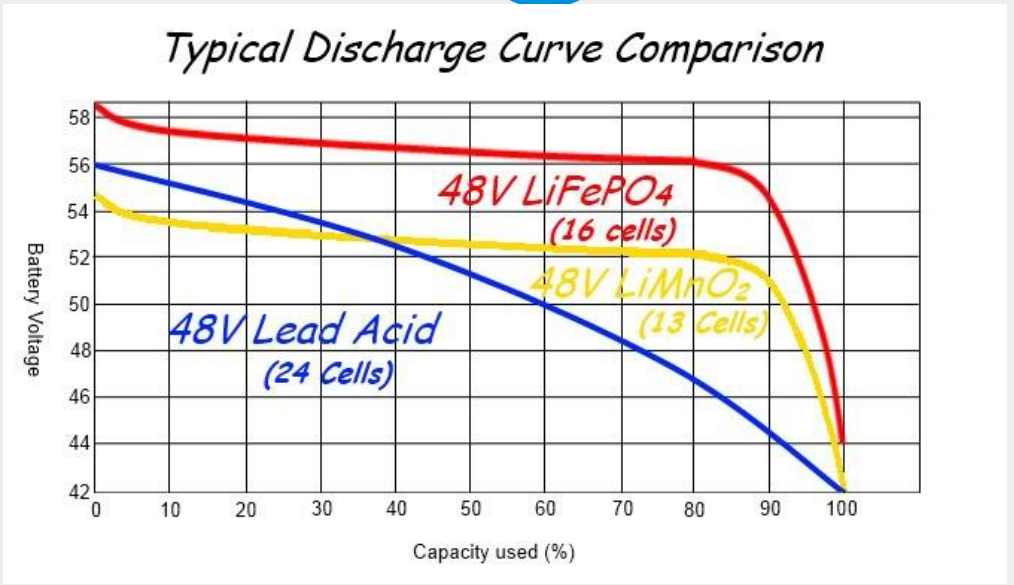
No battery change necessary for most 2-shift applications

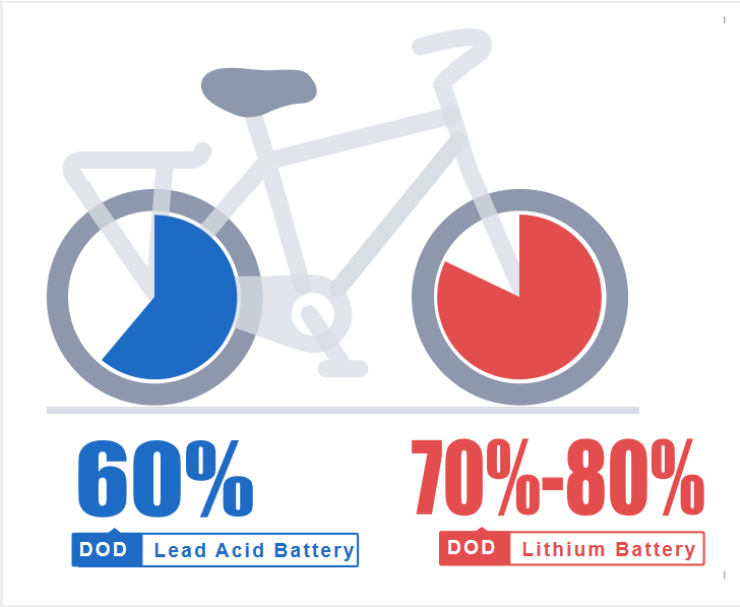
- No second battery necessary
- Higher truck availability
- Cost & time savings
- No need for battery change and charging room

No battery-maintenance needed

- No water-refilling, battery cleanup etc.
- No battery control necessary
- No need of electrolyte circulation

Li-Ion battery PK Lead acid battery





3. Efficient

Longer battery life-time

- 80% DOD% 3500 time full charging cycles with at least 80 % residual capacity
- Afterwards: Several thousand full charging cycles still possible
- Combined with higher battery efficiency an altogether higher usable battery capacity

Safe battery technology

- Self-monitoring via autonomous battery management system
- Safety functions on cell-,moduleand battery level
- Safe control of the truck in any battery status
- Integrated shock sensor

Higher efficiency compared to lead acid

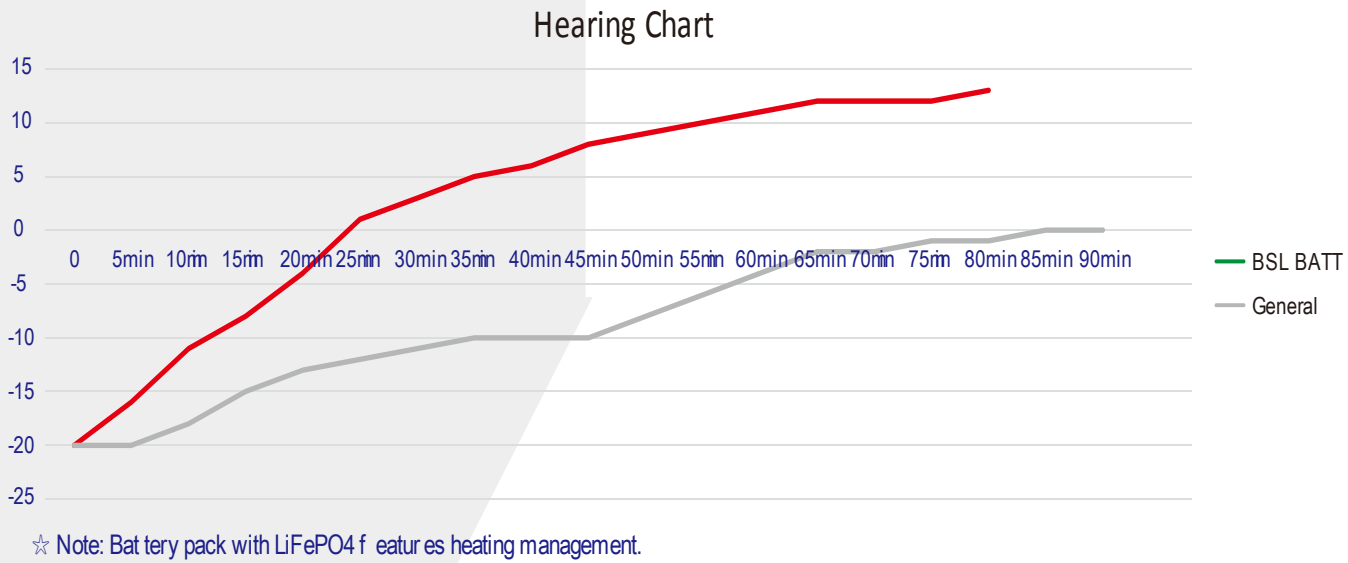
- Up to 30 % higher electrical efficiency
- Less energy losses
- Less heat development inside battery
- Full usability down to 5 % State of Charge (SoC)

4.Perfect Performance In Cold Area

Battery Pack Heating Management

BSLBATT battery pack with heating management during the discharge process, the temperature rises from - 20℃ to 0℃ only takes 25-30 minutes.

General battery pack during the discharge process, the temperature rises from - 20℃ to 0℃ will take 85-90 minutes.



☆ Note: Battery pack with LiFePO4 features heating management.

04

Battery Group Intelligent Charger Introduction

Mastering Charging Technology

Higher stability, greater conversion rate
Sino-German joint venture, originating from the world's first German charging technology
Shanghai Jiaotong University Cooperation Institute of Industry, Education and Research
National High-Tech Enterprise

Smart Adaptation Compatible

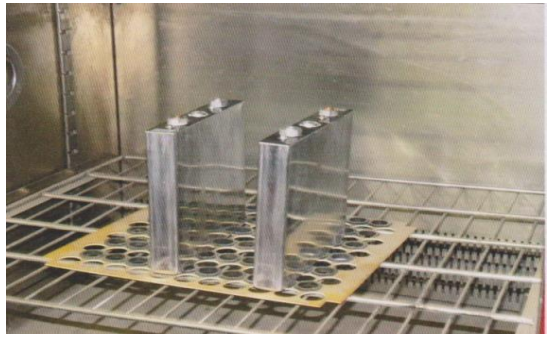
Adopting new high-efficiency three-phase APFC circuit topology, the power factor is greater than 0.99, the high-frequency switching power supply adopts full-bridge phase-shift soft-switching technology, advanced digital current sharing technology, which effectively improves the current sharing accuracy and anti-interference, fool-like operation, The information such as the amount of charge, the charging voltage, the charging current, and the running status are displayed in real time, and the RS-484 networking communication interface can be reserved.

Smart Adaptation Compatible

Fully automatic charging function: full microcomputer control, can adjust charging mode at any time
Touch screen display function: real-time display of charging status, charging process at a glance
Temperature control function: real-time monitoring of the whole machine and module temperature, complete temperature control function
Soft start function: input pre-charge and input soft start can effectively prevent input over current and extend the life of the whole machine

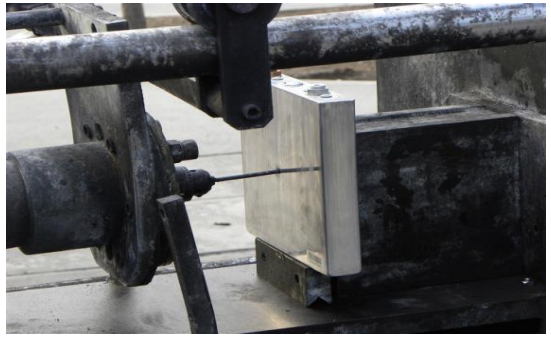
Cell Safety Performance Measure

Destructive Testing (LiFePO4 – Cells)



Single Cell Heating

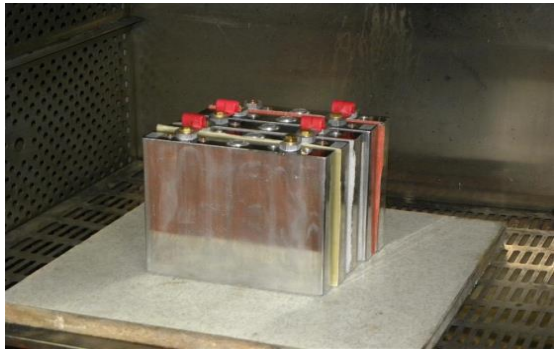
Single Cell Short Circuit



Single Cell Nail Test

Single Cell Extrusion

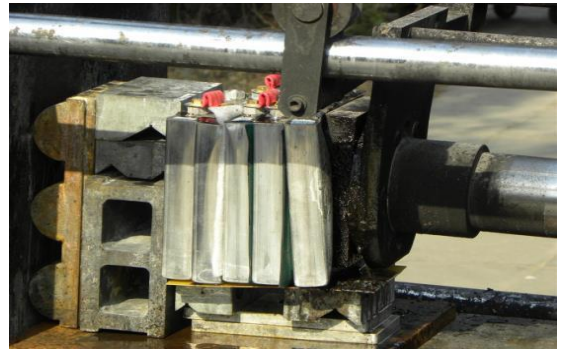
Destructive Testing (LiFePO4 - Module)



Module Heating

Module Short Circuit

Module Nail Test

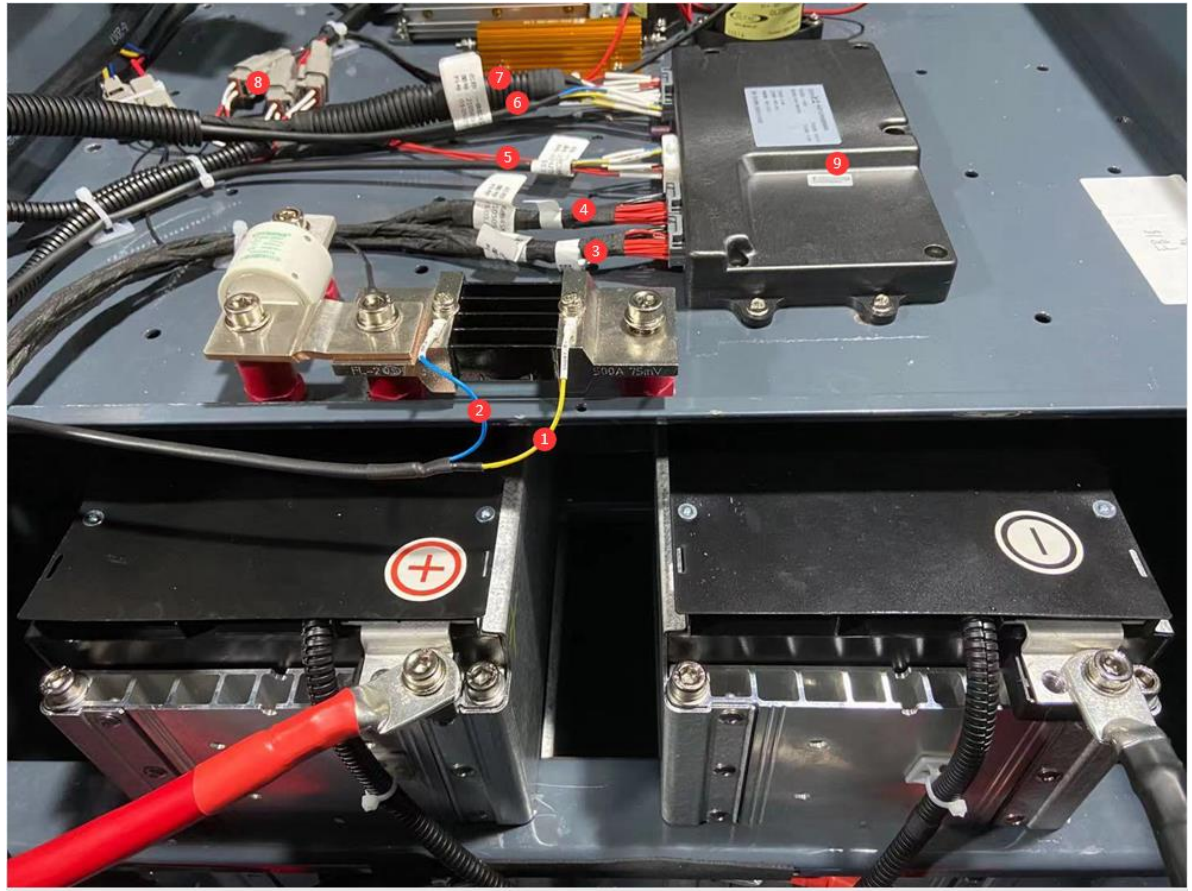


Module Extrusion

Forklift LiFePO4 Battery Model Construction

- Adopting automotive-grade modular design ideas, series products are highly versatile;
- The main frame of the structure adopts aluminum extrusion and sheet metal riveting to enhance the mechanical strength and have higher vibration resistance;
- Use 3000W welding power aluminum bar, low-voltage wiring harness adopts ultrasonic welding/laser welding; higher flow capacity and reliability;
- Compatible with the modular design of the wiring harness (FPCB flexible cable and AWG wiring harness), the modular plug is foolproof and simplifies the assembly process, which improves production efficiency;
- The module bracket design reserves the cell expansion gap; it is more conducive to cell life and heat dissipation requirements;
- Automotive-grade insulation design, adding the module cover/power insulation platform, the insulation level is higher; it is beneficial for the module to be used in high-voltage scenarios

- 采用汽车级模块化设计思路，系列产品通用性高；
- 结构主框架采用铝挤与钣金铆接形式，增强机械强度，有更高的抗振性；
- 采用3000W焊接动力铝排，低压线束采用超声焊/激光焊；过流能力与可靠性更高；
- 兼容线束模块化设计（FPCB软排线与AWG线束），模块插头既防呆又简化组装工序，提高了生产效率；
- 模组支架设计，预留了电芯膨胀间隙；更有利于电芯寿命使用和散热要求；
- 汽车级绝缘设计，增加模组上盖/动力绝缘台，绝缘等级更高；有利于模组用于高压场景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7
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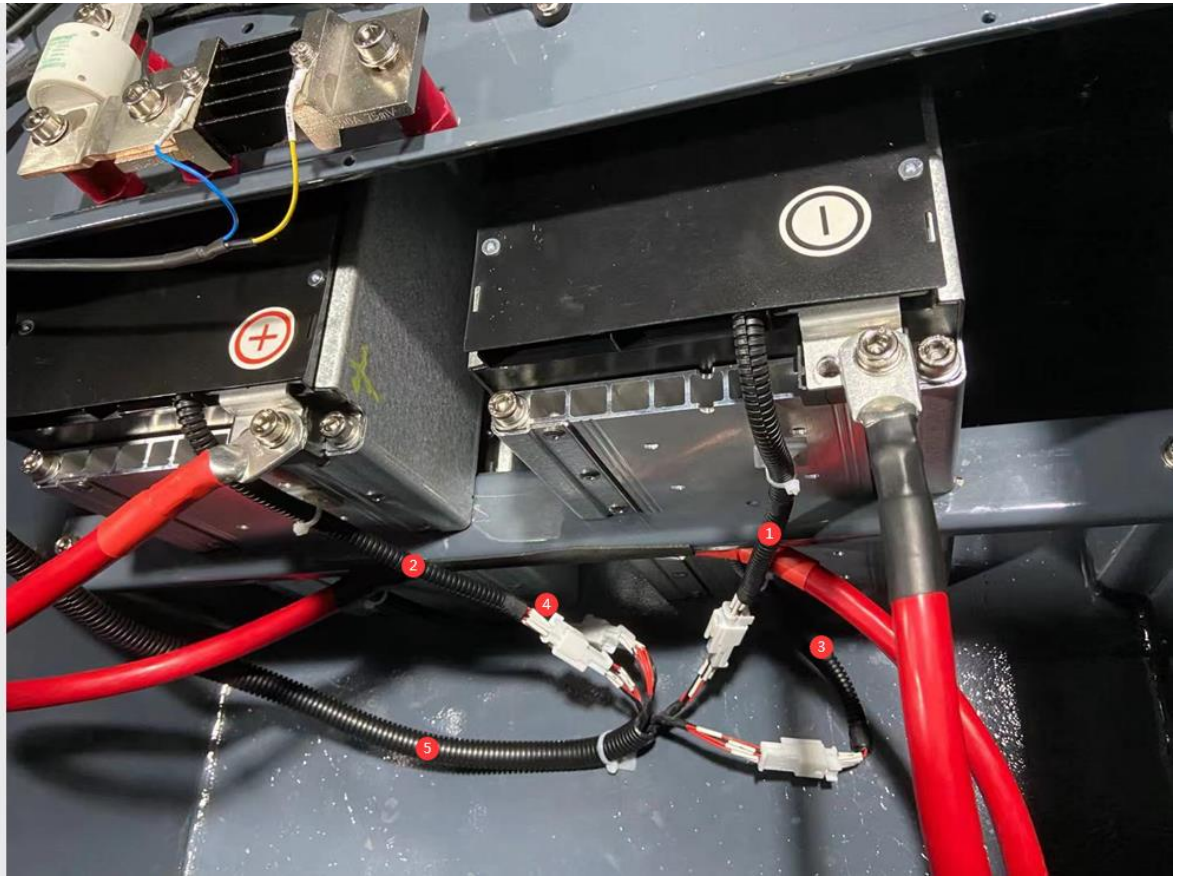
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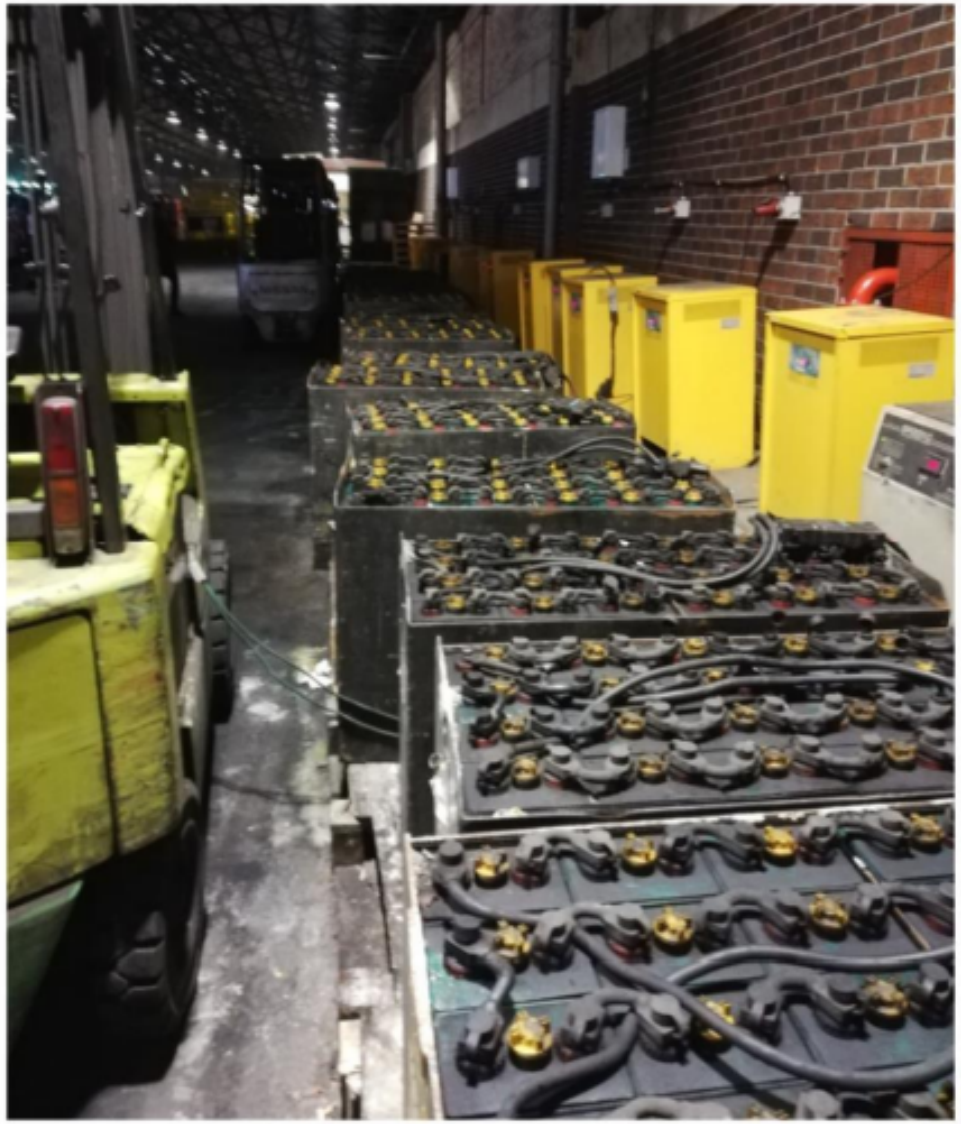
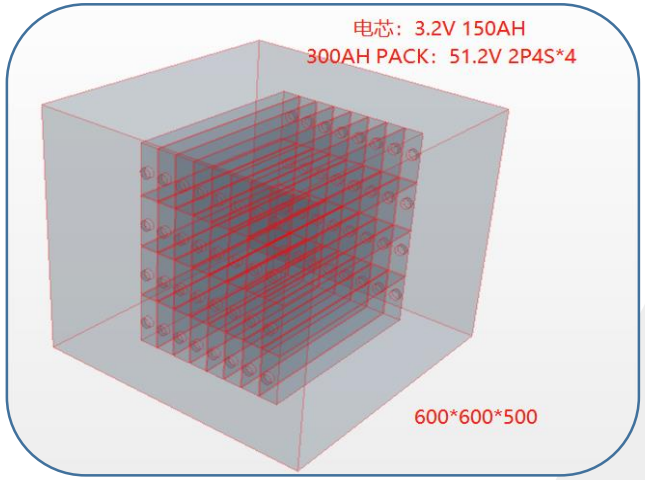
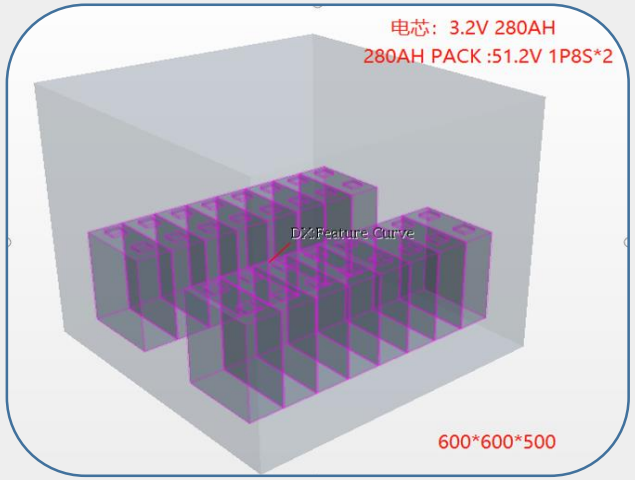
Forklift LiFePO4 Battery Construction

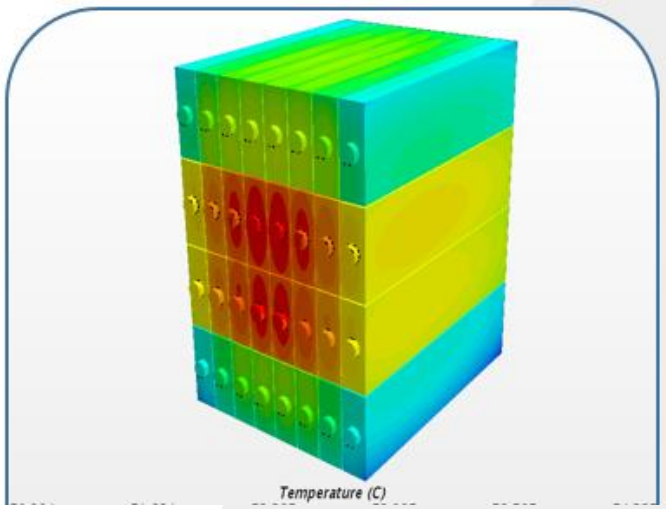


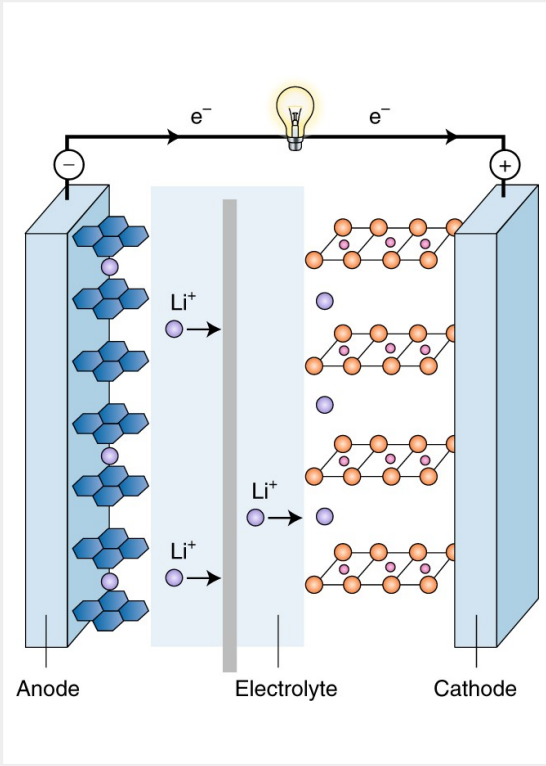
Battery Pack heat radiation



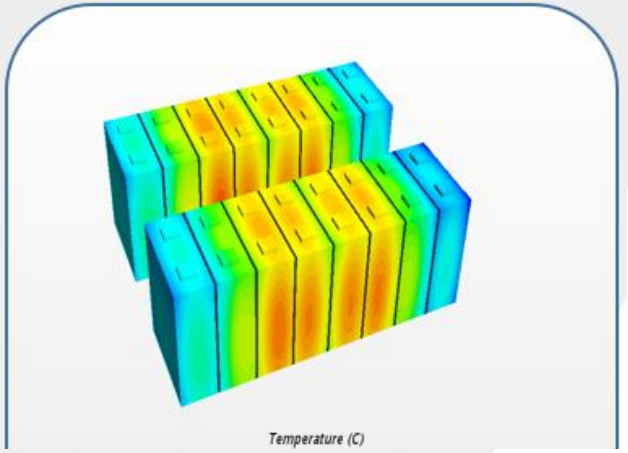


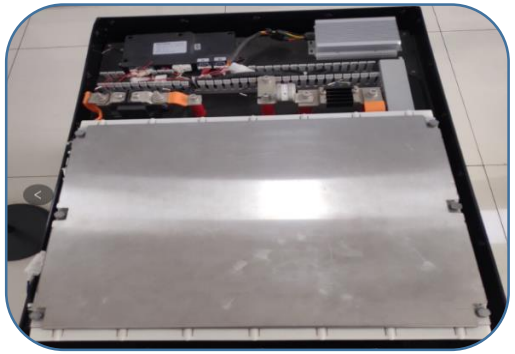
THE OTHER





BSL BATT





Product List

- 25.6V [24V]
- 38.4V [36V]
- 51.2V [48V]
- 76.8 [72V]
- 83.2V [80V]
- 96V [96V]
- CHARGER
- 200-1000Ah

Display-CANBUS system

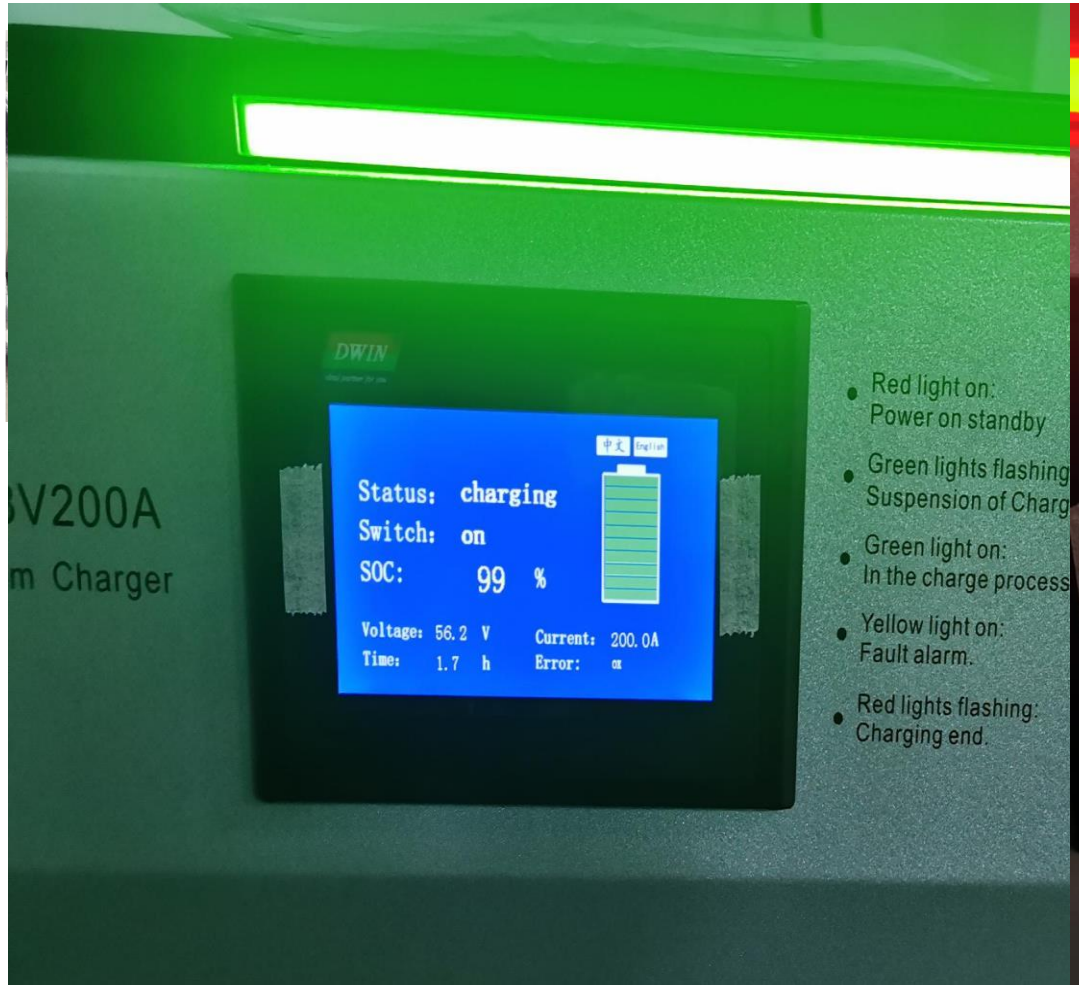
Product List

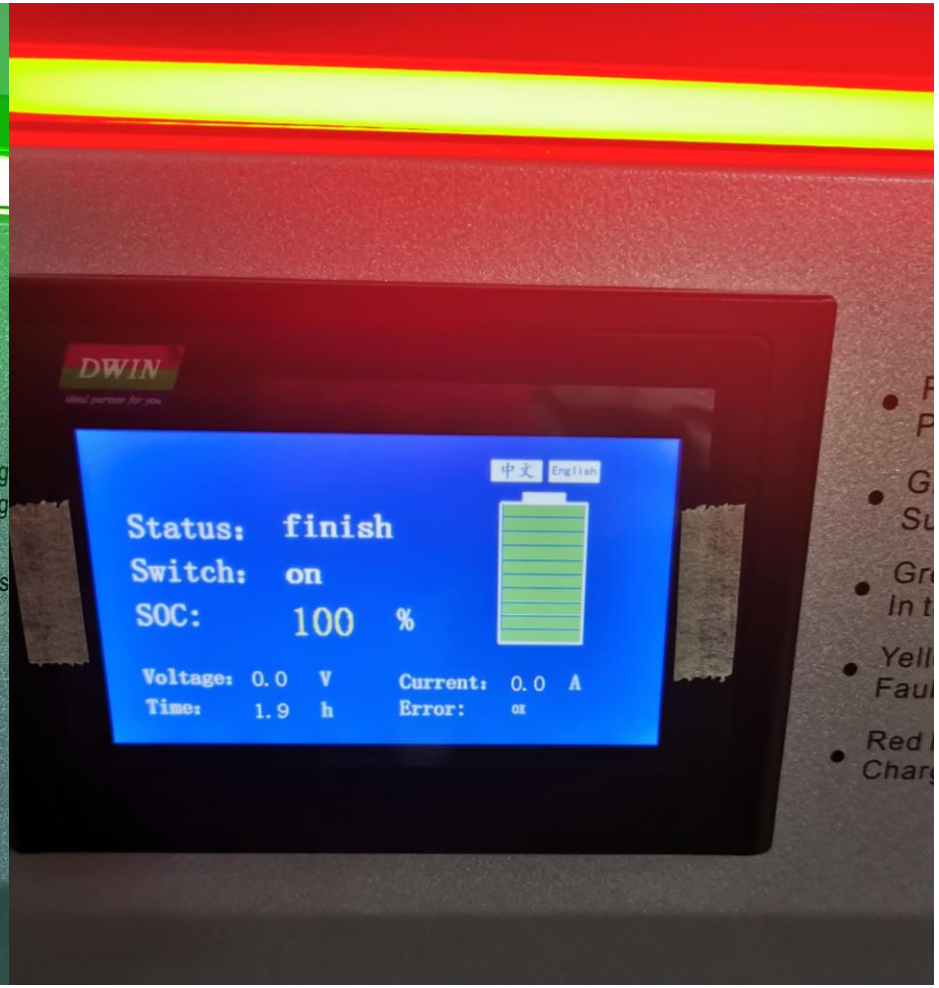
Buzzer : Beep when lack of power

SOC can be customized

- **25%: “!” in LCD display**
- **15%: Buzzer start beeping**
- **10%: Cut- Off directly (90% DOD)**

Product List





24V	48V	80V	150V
24V 50A	48V 100A	80V 100A	150V 100A
24V100A	48V 150A	80V 150A	150V 150A
24V 150A	48V 200A	80V 200A	
24V 200A	48V 300A	80V 300A	

06

Cloud Platform

IOT platform: GPRS+GPS

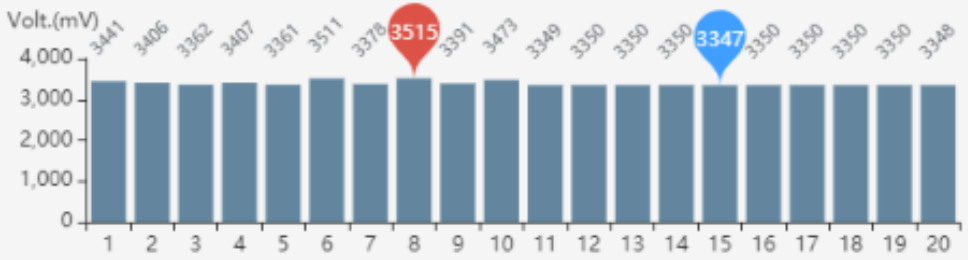
Real-time monitoring

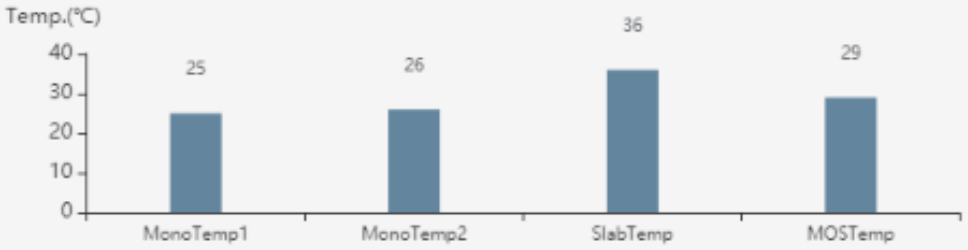
Factory engineers in China , customers from all over the world, can read the data through the Internet.

Easy for communication, and fast to analyze and find the solution if battery have any problems.

CLOUD | Metrics | Location | Records | Alarms | OTAs | DTU

Legend : No Communication Unbalance Balancing





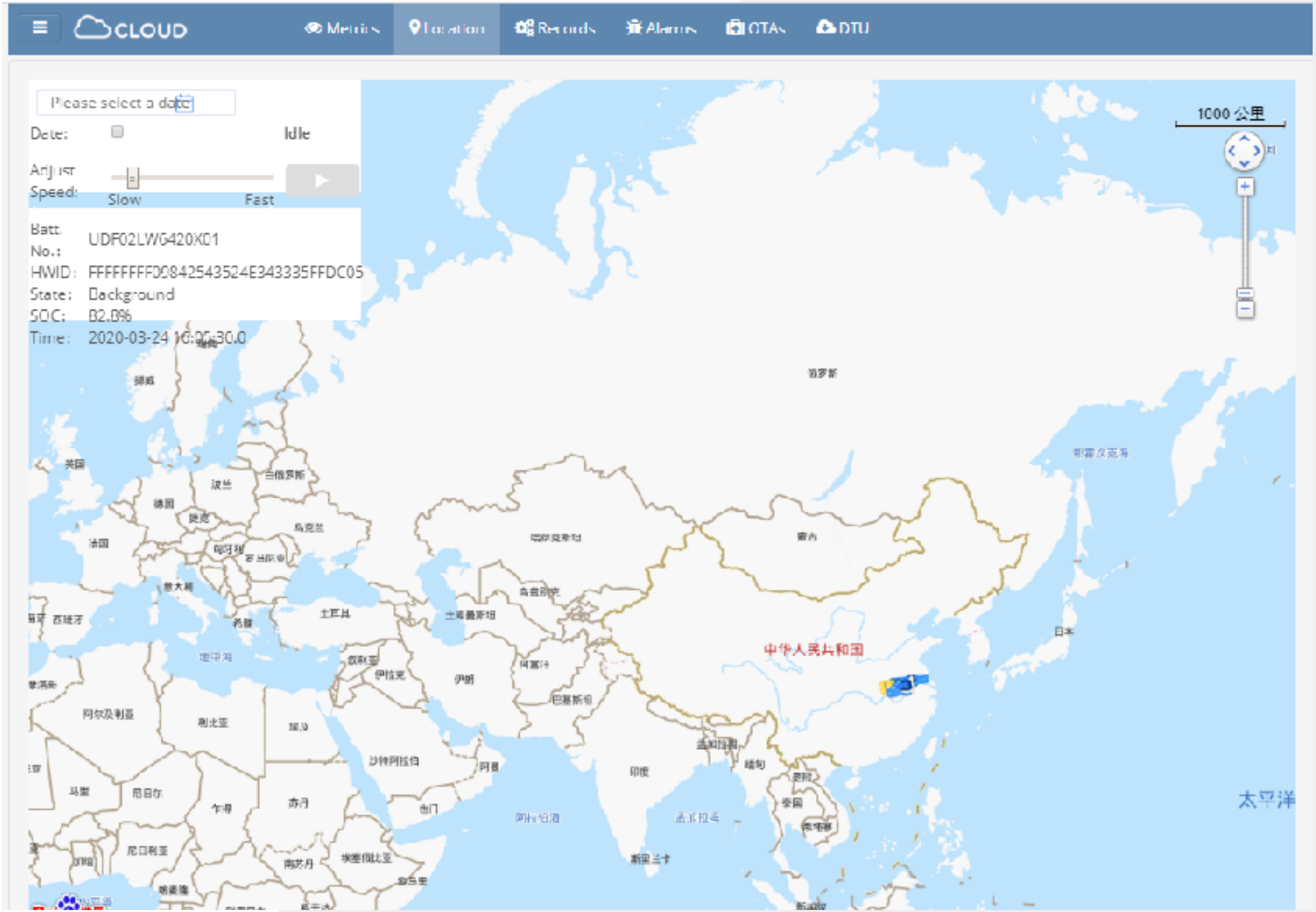
State	Background	**Device Time**	2020-03-24 16:04:20
SOH	99.9%	**Up-Time**	289h45m9s
Batt. Type	LFP	**Nom. Cap.**	20Ah
Chg MOS	break off	**Dchg MOS**	break off
Pre-Chg MOS	break off	**Heat MOS**	break off

SW Ver.	1.1.2	**HW Ver.**	0
FWID	-	**BurnID**	-
HWID	FFFFFFFF09842543524E343335FFDC05		
SCID	d14278546852a8eb27c4		

IMEI	867881042881925	**CCID**	89860408121880147808
PLMN	46000	**Signal Ind.**	30
LAC	22114	**CID**	18480961
Longitude	117.267861E	**Latitude**	31.763233N
City	合肥市	**Speed**	0km/h

Total Cycles	13	**Total Mileage**	1280Km
Total Chg Dur.	87.17h	**Total Dchg Dur.**	114.50h
Total Chg Cap.	16.62KWh	**Total Dchg Cap.**	13.01KWh

GPS


CLOUD
Metrics
Location
Records
Alarms
OTAs
DTU
Please select a date
Date:
Idle
Adjust Speed:
Slow
Fast
Batt No.:
UDF02LW0420X01
HWID:
FFFFFFFF00842543524E343335FFDC05
State:
Background
SOC:
82.0%
Time:
2020-03-24 16:25:30.0
1000 公里
中华人民共和国
太平洋

Record

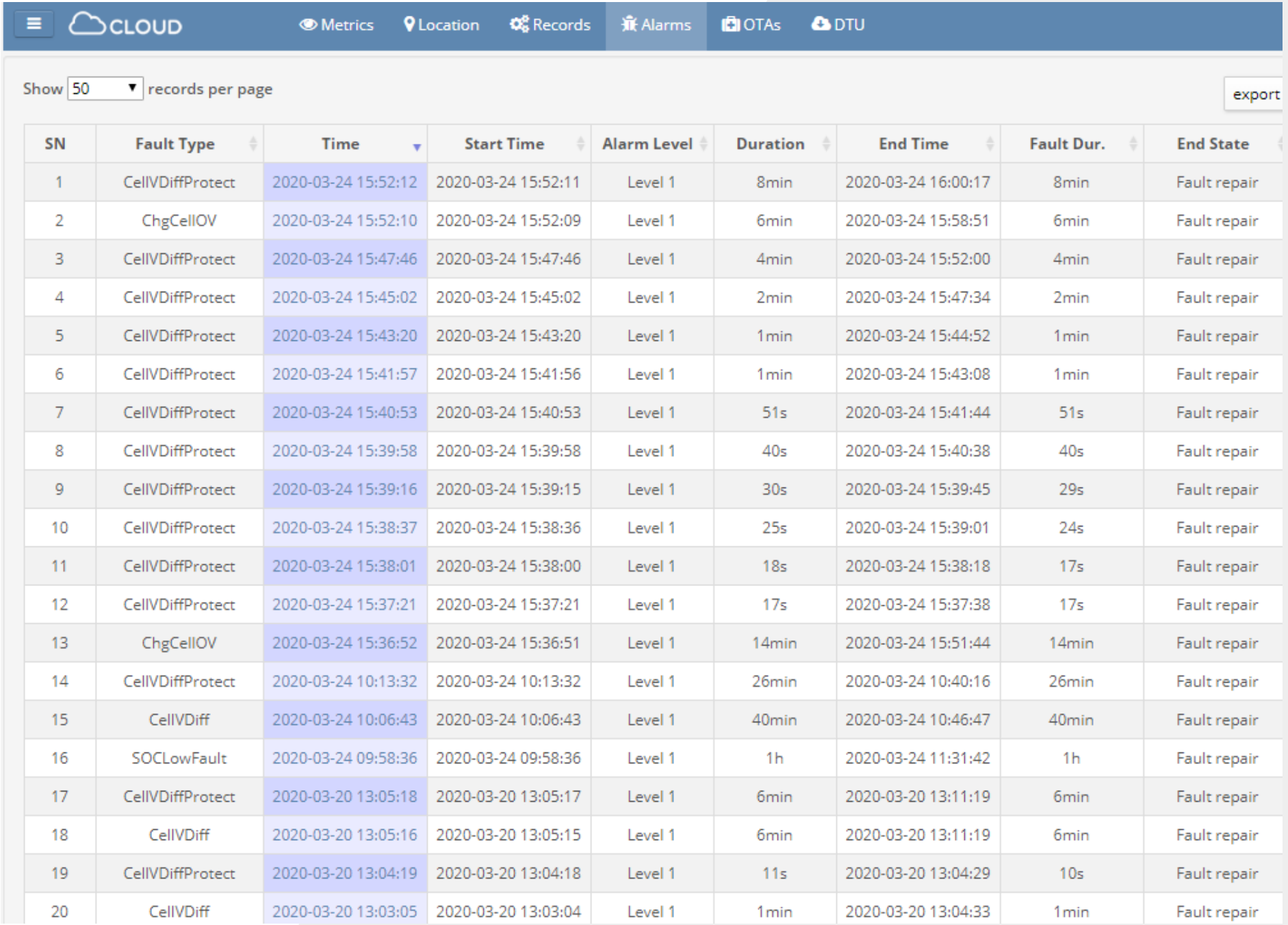
CLOUD | Metrics | Location | Records | Alarms | OTAs | DTU

Show 50 records per page

export

SN	State	Start Time	End Time	Start SOC	End SOC	Duration	Total Dur.
1	charging	2020-03-24 10:46:59	2020-03-24 15:37:21	14.6%	81.8%	2904min	915h
2	discharge	2020-03-24 08:42:28	2020-03-24 10:13:32	17.5%	12.4%	911min	2124h
3	discharge	2020-03-23 08:42:50	2020-03-23 19:25:00	38.5%	18.5%	6422min	2109h
4	discharge	2020-03-20 13:11:32	2020-03-20 18:37:41	53.1%	43.0%	3261min	2002h
5	discharge	2020-03-20 11:05:13	2020-03-20 11:15:44	53.2%	53.2%	105min	1947h
6	discharge	2020-03-20 10:52:17	2020-03-20 10:58:48	53.2%	53.2%	65min	1945h
7	discharge	2020-03-19 11:58:37	2020-03-20 10:48:41	98.9%	53.3%	13701min	1944h
8	charging	2020-03-19 09:11:54	2020-03-19 11:56:03	87.9%	98.9%	1642min	866h
9	discharge	2020-03-18 18:15:07	2020-03-18 18:25:37	89.1%	89.1%	105min	1716h
10	charging	2020-03-18 15:51:34	2020-03-18 18:15:07	55.9%	89.1%	1435min	839h
11	discharge	2020-03-18 14:59:37	2020-03-18 15:07:23	51.5%	20.6%	78min	1714h
12	discharge	2020-03-09 13:54:11	2020-03-09 18:30:36	71.3%	50.7%	2764min	1713h
13	discharge	2020-03-09 09:08:56	2020-03-09 13:22:40	84.2%	71.3%	2537min	1667h
14	discharge	2020-03-07 07:39:27	2020-03-07 07:59:27	87.0%	86.9%	200min	1624h
15	discharge	2020-03-06 15:00:43	2020-03-06 18:51:04	99.9%	87.6%	2303min	1621h
16	charging	2020-03-06 08:29:46	2020-03-06 13:29:05	26.0%	99.9%	2993min	814h
17	discharge	2020-03-05 13:46:22	2020-03-06 07:34:01	99.9%	23.9%	10677min	1583h
18	charging	2020-03-05 10:55:10	2020-03-05 13:41:15	54.8%	99.9%	1661min	764h
19	discharge	2020-03-05 10:50:59	2020-03-05 10:55:10	54.7%	54.8%	42min	1405h
20	charging	2020-03-05 08:38:40	2020-03-05 10:50:59	24.1%	54.7%	1323min	737h

Alarms



SN	Fault Type	Time	Start Time	Alarm Level	Duration	End Time	Fault Dur.	End State
1	CellVDiffProtect	2020-03-24 15:52:12	2020-03-24 15:52:11	Level 1	8min	2020-03-24 16:00:17	8min	Fault repair
2	ChgCellOV	2020-03-24 15:52:10	2020-03-24 15:52:09	Level 1	6min	2020-03-24 15:58:51	6min	Fault repair
3	CellVDiffProtect	2020-03-24 15:47:46	2020-03-24 15:47:46	Level 1	4min	2020-03-24 15:52:00	4min	Fault repair
4	CellVDiffProtect	2020-03-24 15:45:02	2020-03-24 15:45:02	Level 1	2min	2020-03-24 15:47:34	2min	Fault repair
5	CellVDiffProtect	2020-03-24 15:43:20	2020-03-24 15:43:20	Level 1	1min	2020-03-24 15:44:52	1min	Fault repair
6	CellVDiffProtect	2020-03-24 15:41:57	2020-03-24 15:41:56	Level 1	1min	2020-03-24 15:43:08	1min	Fault repair
7	CellVDiffProtect	2020-03-24 15:40:53	2020-03-24 15:40:53	Level 1	51s	2020-03-24 15:41:44	51s	Fault repair
8	CellVDiffProtect	2020-03-24 15:39:58	2020-03-24 15:39:58	Level 1	40s	2020-03-24 15:40:38	40s	Fault repair
9	CellVDiffProtect	2020-03-24 15:39:16	2020-03-24 15:39:15	Level 1	30s	2020-03-24 15:39:45	29s	Fault repair
10	CellVDiffProtect	2020-03-24 15:38:37	2020-03-24 15:38:36	Level 1	25s	2020-03-24 15:39:01	24s	Fault repair
11	CellVDiffProtect	2020-03-24 15:38:01	2020-03-24 15:38:00	Level 1	18s	2020-03-24 15:38:18	17s	Fault repair
12	CellVDiffProtect	2020-03-24 15:37:21	2020-03-24 15:37:21	Level 1	17s	2020-03-24 15:37:38	17s	Fault repair
13	ChgCellOV	2020-03-24 15:36:52	2020-03-24 15:36:51	Level 1	14min	2020-03-24 15:51:44	14min	Fault repair
14	CellVDiffProtect	2020-03-24 10:13:32	2020-03-24 10:13:32	Level 1	26min	2020-03-24 10:40:16	26min	Fault repair
15	CellVDiff	2020-03-24 10:06:43	2020-03-24 10:06:43	Level 1	40min	2020-03-24 10:46:47	40min	Fault repair
16	SOCLowFault	2020-03-24 09:58:36	2020-03-24 09:58:36	Level 1	1h	2020-03-24 11:31:42	1h	Fault repair
17	CellVDiffProtect	2020-03-20 13:05:18	2020-03-20 13:05:17	Level 1	6min	2020-03-20 13:11:19	6min	Fault repair
18	CellVDiff	2020-03-20 13:05:16	2020-03-20 13:05:15	Level 1	6min	2020-03-20 13:11:19	6min	Fault repair
19	CellVDiffProtect	2020-03-20 13:04:19	2020-03-20 13:04:18	Level 1	11s	2020-03-20 13:04:29	10s	Fault repair
20	CellVDiff	2020-03-20 13:03:05	2020-03-20 13:03:04	Level 1	1min	2020-03-20 13:04:33	1min	Fault repair

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