

LE300 SMART BATTERY SYSTEM



- BOS → Balance of Storage Systems
- German developer and manufacturer of smart hybrid solutions for energy storage
- With our technologies, large parts of the off-grid community in developing and industrialized countries have access to high quality, durable and affordable energy solutions.
- Founded in 2014
- Over 25,000 LE Smart Battery Systems(SBS) sold since 2016
- Engineering team and external series production in Germany allows great flexibility in customer solutions and high responsiveness.
- Worldwide sales of solar battery systems for areas without a (reliable) power grid, also for mini grids and health clinics.





HS SYSTEMS

- All-in-One Solar UPS
- Pure lithium solution (LiFePO4)
- „Business“, „Power“ and „Home“



LE 300 SMART BATTERY SYSTEM

- Lithium „backpack“ for lead acid battery systems
- Installed in parallel

SMART BATTERY SYSTEM – THE PRODUCT



LE300 SBS is a battery module with 12 V capacity and 25.6 Ah (328 Wh).

LiFePO₄ - the safest lithium cells on the market

90% depth of discharge (23 Ah / 295 Wh usable)

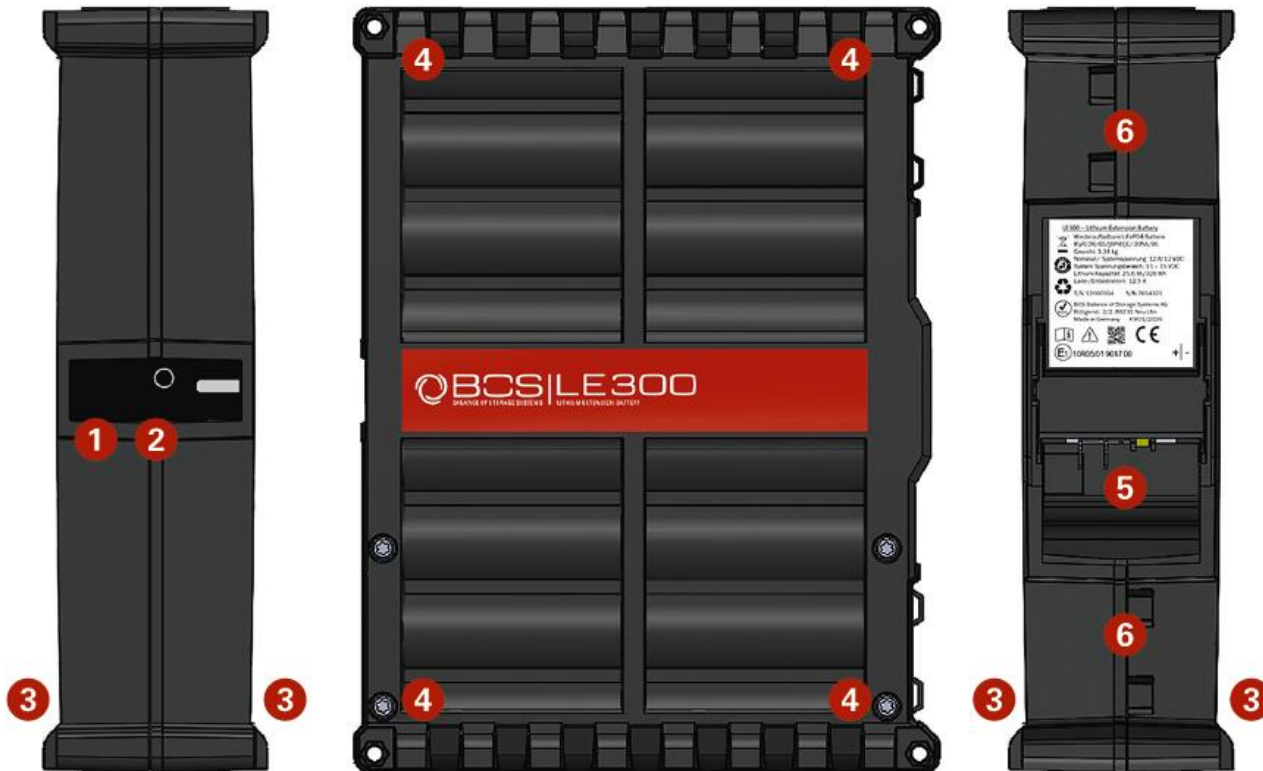
Connects in parallel to lead-acid batteries in new or existing systems

Both battery types form a hybrid with many advantages that combine the best properties of both.

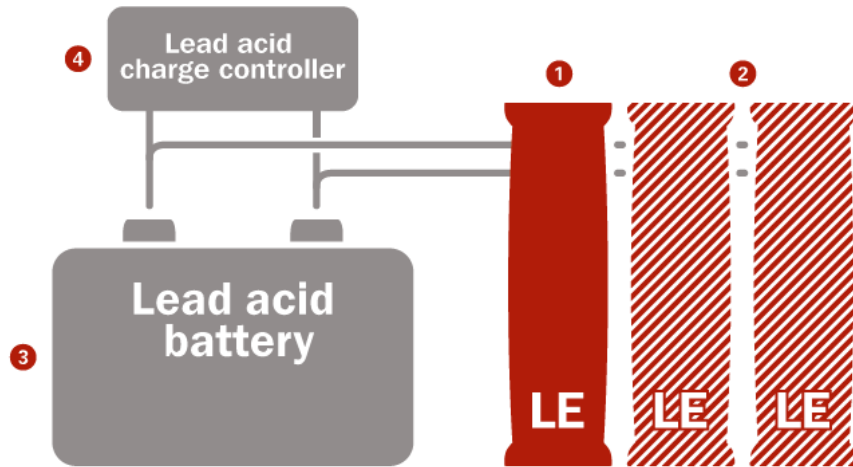
Certified for use in vehicles



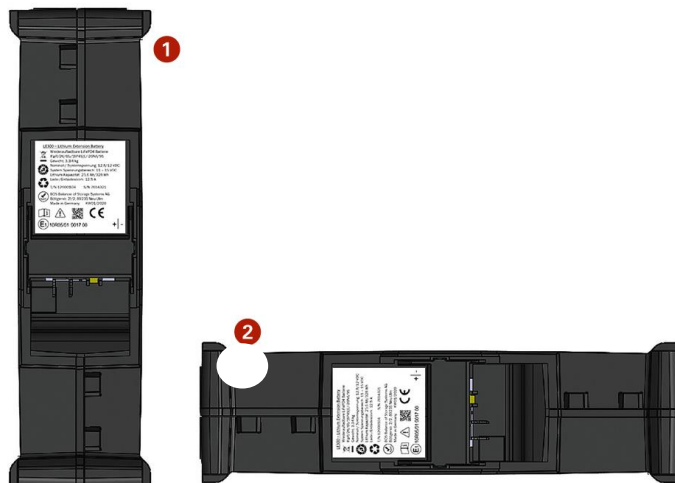
PRODUCT COMPONENTS



1	Charge status trend indicator and flashlight
2	Button
3	Mounting nose for standard lead mounting clips
4	Mounting holes for mechanical parallel connections / fastening on mounting plates (optional)
5	Cable connections
6	Cable strain relief loops

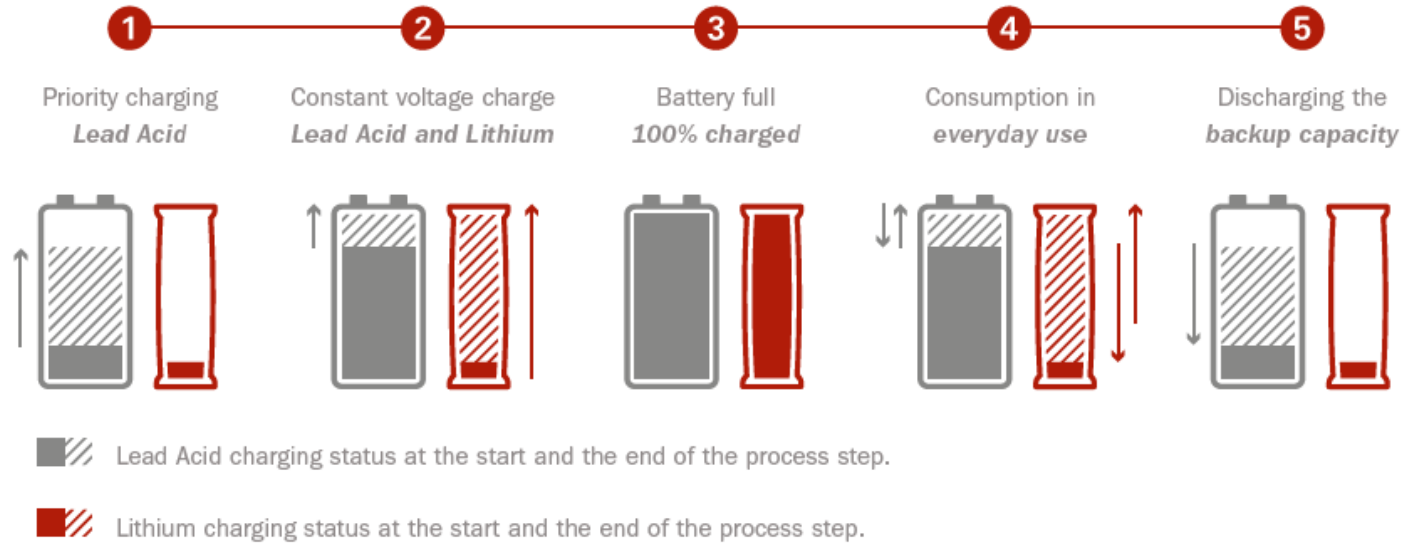


1. LE300 lithium battery (12 V, 25 Ah each) with LED display
2. Modular and scalable: up to 24 LE300 SBS can be connected to a 12 V and 24 V system.
3. Lead acid battery. LE300 SBS and lead battery are connected in parallel.
4. The existing charge controller can continue to be used.



Vertical and horizontal installation possible.

HOW THE LE300 SBS WORKS



Lithium for regular cycles, lead acid as a backup

When both batteries are empty, the lead-acid battery is given charging priority.

When the lead-acid battery is almost full, its charging speed will be reduced. The LE300 is now charged and continues to charge the lead-acid battery at its speed. Relevant to avoid losses in solar systems and also to charge more efficiently on the power grid.

When loads are used, the LE 300 discharges first and always keeps the lead-acid battery as full as possible.

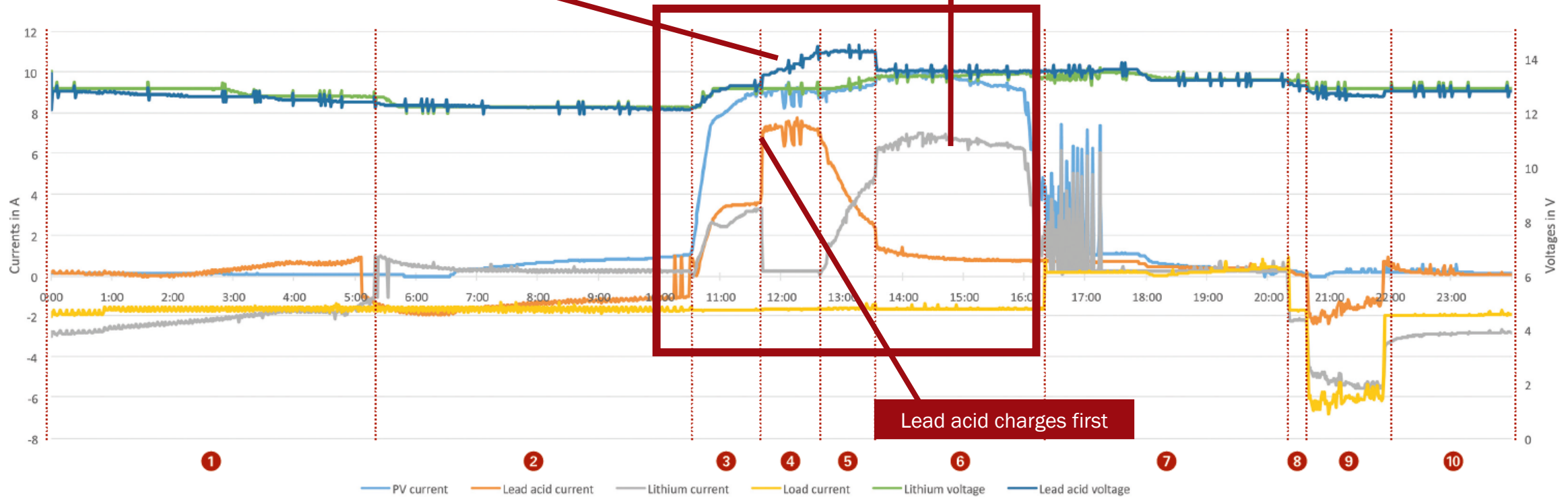
If you use many loads at the same time, both batteries will be discharged in parallel to avoid a very hard discharge of both batteries.

LE300 FUNCTIONALITY

Charging voltage is boosted up to charge lead-acid battery faster.







LE300 starts charging once lead-acid battery is almost full, thus absorbing losses due to slow lead charging.

SUNNY DAY WITH INVERTER/CHARGER AND AC GRID RECHARGING BETWEEN 4.30 PM AND 8.30 PM

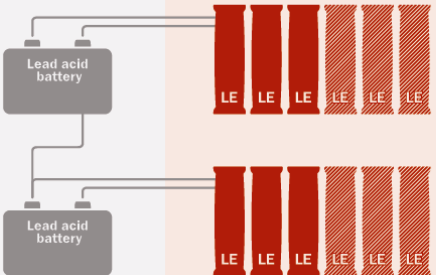


Lead acid charges first

SCALING THE LE300 SBS

95 Ah / 800 Wh 12 V			+ 51.2 Ah / 600 Wh 12 V
180 Ah / 1.5 kWh 12 V			+ 307.2 Ah / 1.8 kWh 12 V
			expandable up to a max. of 24* + 1.2 kWh / 14.4 kWh 12 V



2x 12 V in serial connection		expandable up to a max. of 2x12* + 1.2 kWh / 14.4 kWh 2x 12 V in serial connection
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LE300 SBS – most important USPs



- **Lithium output with an existing lead charging structure:** Significant system optimization - simple and comparatively inexpensive.
- **Plug & Play:** Installation possible within a few minutes in most applications.
- **Double redundancy:** Replacement lead batteries are available everywhere, individual LE300s also work if a module fails.
- **Protection of the lead battery and winter resistance:** This is only discharged when the LE300 Smart Battery System is heavily loaded or when the charge level is low. At the same time, it is charged with priority and kept full for months even if it is not charged (overwintering). Extension of the service life up to 10 years.
- **More efficient charging:** If lead batteries are 80% charged, they charge much more slowly. Then the LE300 can be charged and at the same time deliver slow charging currents to the lead battery. The result is a longer range with the same charging time.
- **Charging even at sub-zero temperatures:** Pure lithium batteries are difficult to charge at sub-zero temperatures. LE300 Smart Battery System has an integrated heater, which is supplied with small amounts of electricity by the lead battery and enables charging even when it is cold.
- **Installation possible in any position:** spatial flexibility
- Enables **online monitoring** in the existing battery system
- **E1 certification** for use in vehicles, furthermore CE and UN38.3 (transport safety lithium).

COMPARISON MATRIX



	Lead acid battery	Lithium batteries	LE300 Smart Battery System
Weight & size	Heavy and large in volume	Smaller and lighter	Variable, depending on the lead / lithium ratio. Generally speaking, space savings are desirable.
Price	Low initial investment, charging technology available in many applications. In the long term, expensive with frequent battery changes	High initial investment, charging technology has to be purchased in many applications. Amortization through long service life.	Higher initial investment than lead acid but significantly lower than pure lithium system. Lead charging technology remains. Amortization through long service life.
Lifespan	Theoretically 8 years In practical use often only 1-3 years	3 to 20 years	Lead-acid battery achieves theoretical service life, the entire system is designed for a service life of 8-10 years.
Availability of spare parts	Very high availability of replacement batteries	Low availability of replacement batteries	Lead-acid batteries are sufficient to guarantee functionality. As a modular system, the LE300 Smart Battery System makes a complete failure unlikely.
Installation	Simple, since charging technology is already available in many applications.	Time-consuming, because in many cases the charging technology has to be renewed and configured.	Simple, since charging technology is already available in lead applications. Plug & Play and specific cable sets available.
Installation position	Open batteries upright, closed batteries partially independent of position.	Any position possible, depending on the housing	LE300 Smart Battery System can be installed in any position
Charge (speed)	Charges slowly from 80% charge level - it takes a long time to fully charge.	Charges evenly to 100% full. Shorter loading times possible.	LE charges while lead-acid batteries are slowly being fully charged. The entire charging current is used and shorter charging times are possible.
Temperature behavior	Bad performance at sub-zero temperatures (voltage, efficiency) but nothing breaks	Charging below 0 ° C leads to destruction, discharging below -10 ° C also.	Heating of the Li battery while the lead battery is being charged. Discharge to -10 ° C possible, below this only the use of the lead battery.

BATTERY TECHNOLOGIES IN COMPARISON

	Lead acid battery	LiCoO ₂	LiFePO ₄
Gravimetric energy density Wh / kg	<50	110-180	80-120
Service life (cycles)	Approx. 500 depending on the depth of discharge	300 - 5000	2000-5000
Flammability	No direct flammability	Thermal runaway, as oxygen is released when the separating layer is broken. Fires from 150 °C can hardly be stopped.	No thermal runaway, as no oxygen is released when the separating layer is broken. Fires almost impossible. Flammability above 300 °C.
Risk of explosion	Outgassing of hydrogen and oxygen in the event of overcharging	May explode in extreme conditions	Do not explode in extreme conditions.
Environmental hazard	Lead, sulfuric acid	Various heavy metals	Lithium, iron and phosphate
Economics	Low initial investment, but short lifespan	Economical with a very long runtime and number of cycles	Li / Pb ratio allows an economic optimum

USE CASES

