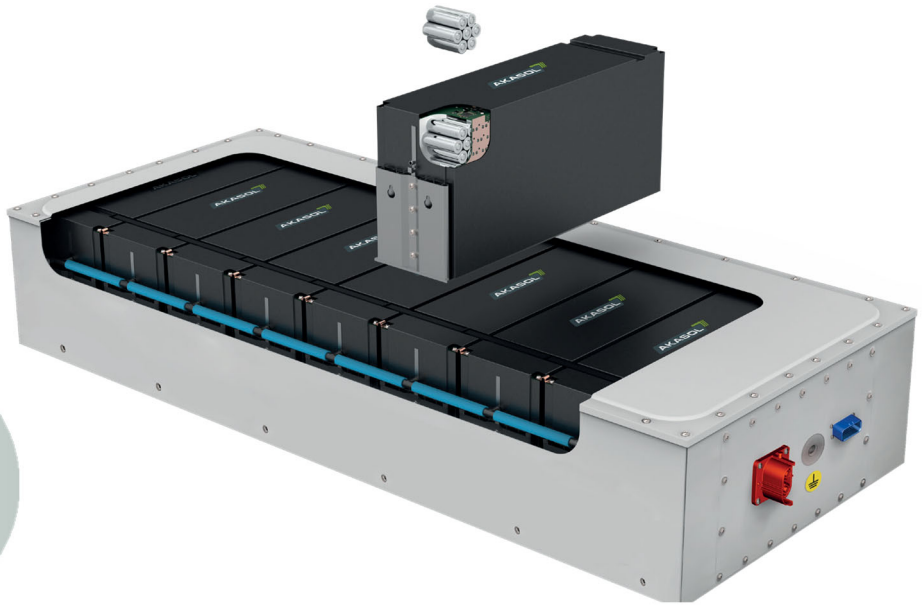
AKASOL

High Performance Battery Systems

AKASYSTEM

9 AKM150 CYC



AVAILABLE
2022

CERTIFIED ACCORDING TO AUTOMOTIVE STANDARDS.

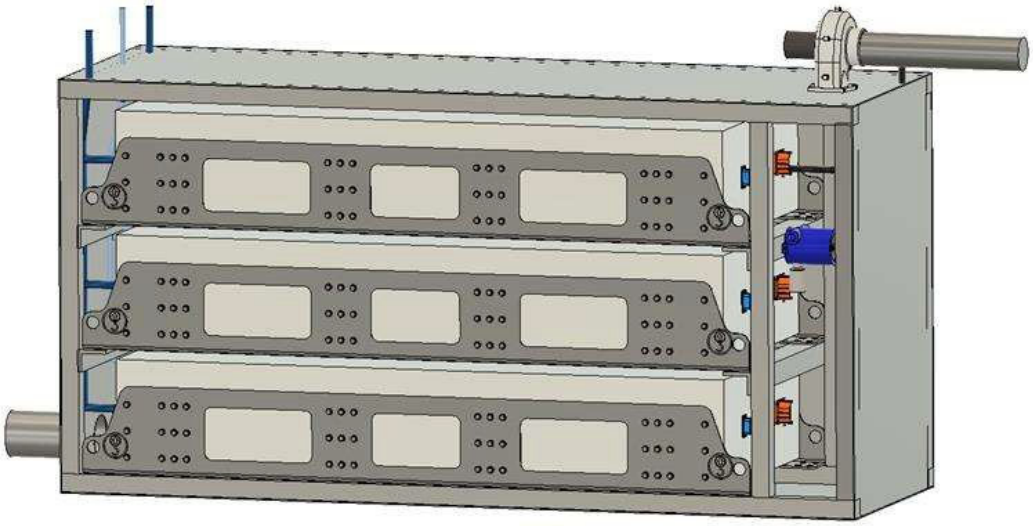
› Development according to ISO 26262 up to ASIL C / EN 61508 SIL 2
› Tested safety (e.g. ECE R10, UN 38.3, ECE R100) and “real world” experience
› Protection classes IP67, IP6K9K
› Serial production, IATF 16949 compliant
› 21700 standard battery cells
› Robust and proven control unit (BMU) with redundant safety system (SCU)
› Multi-level short circuit protection on system level
› Voltage and temperature monitoring
› SOC / SOH analysis

SCALABLE. VALIDATED. DURABLE.

› Freely scalable system with any number of AKASYSTEMs
› Ultra high energy and high energy density
› Easy system connectivity / ready-to-install
› Excellent price-performance ratio
› High cycle life
› Maintenance-free operation
› Active and passive thermal management
› Liquid cooling
› Passive cell balancing
› Robust stainless steel battery case
› Suitable for multi-string systems with monitoring on single-string and full system level
› Designed especially for long-distance traffic

Layout

The figures below show how the battery system can be arranged. (The illustration shows three battery packs. For this project it will be two battery packs). The battery compartment shall be sealed and compliant with DNV-GL standard for battery space.



Battery system

The battery system is a maritime version of a battery system Akasol in Germany and Volvo AB has developed for the bus and train industry. For more information about Akasol, see www.akasol.com. Akasol has signed delivery contracts for their bus battery pack with among others Volvo Trucks in Gothenburg. A dedicated battery assembly factory located outside Frankfurt has been in operation since November 2017.

One benefit of using a standard pack from the bus industry is that spare parts and replacement packs will be available for many years. A requirement in the automotive industry is that spare parts shall be available 10 years after the last unit has left the production line.

The Master BMS is integrated in the PLC based battery controller in the Control cabinet.

Internal communication in the battery acts between the battery packs and the battery controller is by CAN 2.0B.

Certification

The battery system is developed for the bus and train industry. All required certificates for such applications in place. The battery has a valid DNV-GL maritime type approval.

The system will be delivered with product certification according to Lloyd's Register +100 A1 SSC Pilot Mono, HSC, G2A MCH, Hybrid Power, UMS notation.

Battery space

The battery packs shall be installed in a battery space with the following specifications:

- Smoke and gas detection sensors
- Fire extinguishing system

- If a high cell temperature, flammable battery gasses or smoke from a fire are detected by the sensors, a forced ventilation system shall automatically be started. A duct with a fan shall be routed from the top of the battery space to a safe area outside the vessel. The fan shall be "spark-free".

Battery System Summary

- Chemistry: Li-ion, NMC cathode, graphite anode, aluminium cans with inbuilt safety features
- 21700 cylindrical cells
- Energy: 94 kWh *
- Charging power: 70 kW
- Discharge power: 94 kW
- 3 packs form the battery system
- Usable energy: 80% of installed energy
- SoC range for regular use: 15 – 85%,
- Maximum SoC range: 5 – 95%
- System voltage: 540 – 756 V
- Dimensions: 1890x728x310 mm

* *Please note that the theoretical max at high temperatures is 94kWh pr battery pack, but under normal operating conditions, the temperature in the batteries will be around 15-25 degrees which is optimal for the longevity and effect of the battery pack. ZEM testing indicates that at normal operating temperatures, the energy storage capacity is 90kWh.*