



SUNLIGHT
POWER IS KNOWLEDGE

**Advanced
Technology
Submarine
Batteries —**

Submarine Batteries



Our Company

We operate for 30 years in the global energy storage and power supply markets, offering a wide range of innovative high-quality products and services, covering the high-demanding energy needs of various sectors.

Our Expertise

Being equipped with robust knowhow and cumulative experience in advanced technology systems, we specialize in the design and production of batteries for all types of submarines (eastern and western type), utilizing all available lead-based technologies, according to the strictest international specifications and standards.

Submarine Batteries Portfolio

Our Approach

Aiming to fulfill the performance requirements of each customer and to minimize the total cost of a submarine battery regarding the original cost and the operational expenses during its lifetime, we apply a holistic approach, which is translated into:



High quality battery systems



Added value services & exceptional customer service

- Battery installation, activation and commissioning
- Supervision of capacity tests
- Maintenance assistance
- Logistics services
- Training services for the ship and submarine base's personnel.



In-house turn-key design for a submarine base battery facility



Accessories

Our Production Facilities

Our manufacturing plant, located in Northern Greece, is a core element of our dynamic growth. We have systematically invested in the development of one of the most modern industrial units in Europe.

- High-end production and assembly lines, with state-of-the-art equipment, for:
 - **Advanced Lead-Acid batteries for submarine propulsion**
 - **Silver-Zinc batteries for combat and exercise torpedoes**
 - **Stationary and motive power Lead-Acid batteries (vented type)**
 - **Sealed Lead-Acid batteries (VRLA)**
 - **Battery packs for military and commercial applications**
- Optimum level of safety and quality control in every step of the production
- In-house manufacturing of all the critical components so as to assure the best quality and performance of the final product (plates, pole bridges, containers, rubber lines, etc)
- Advance 3D CAD modeling and Simulation packages implementation
- Continuous R&D to improve performance and product lifetime

- In-house advanced testing facilities (shock test, electrical performance test, environmental tests) and detailed chemical inspections of all the incoming raw materials
- Fully automatic acid dilution plant
- **ISO 9001 | ISO 14001 | ISO 37001**
ISO 19600 | BS OHSAS 18001 certified

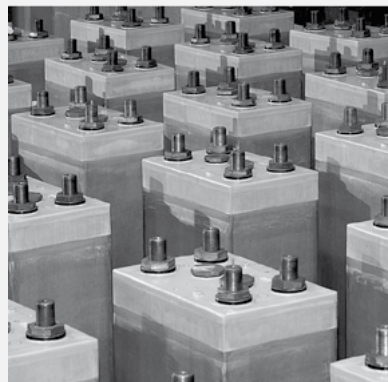


Submarine Batteries Product Features

Applied Technologies

Different types of lead-based technologies are applied for the manufacturing of submarine batteries in order to meet the various demands and sophisticated requirements in terms of energy, performance and reliability. More specifically, the following technologies are available:

- Long plate positive tubular plate / Negative plate lead
- Long plate positive tubular plate / Negative plate copper stretch metal (CSM)
- Double decker positive tubular plate / Negative plate lead
- Double decker positive tubular plate / Negative plate copper stretch metal (CSM)
- Tailor-made cells: all the above mentioned technologies can be adapted to meet the tactical demands of the submarines and meet specific requirements.



Quality Features & Product Benefits



Robust and durable construction



Optimum reliability



Excellent performance both at low (patrolling) and high rate (maneuvering) operation



Long service life



High capacity during discharge



Enhanced charging efficiency



Low gassing



Excellent shock resistance



Recyclable

High Quality Batteries for all Submarine Types

Technical Features

- Very low H₂ evolution during operation.
- Internal cooling system with great efficiency.
- Containers are manufactured in house with a very sophisticated method. The container walls are thinner, which gives the container less weight and more volume, thus more active material for increased performance. The design of the container is verified through successful qualification of various cell types according to international shock test standards for submarine cells.
- Pole bridges are made of electrolytic copper to increase conductivity. The specially designed geometry of the pole bridge ensures maximum heat transfer during the cooling process.
- Cells' plates have excellent dry charge conditions, exhibiting a very low operation temperature during battery activation and charging.
- The improved agitation system inside the cell protects the battery from sulphation problems and increases the electrical performance.
- Each cell is equipped with an easy maintenance service plug, and with a specially designed vent plug with integrated ceramic filter with improved anti explosive capability.

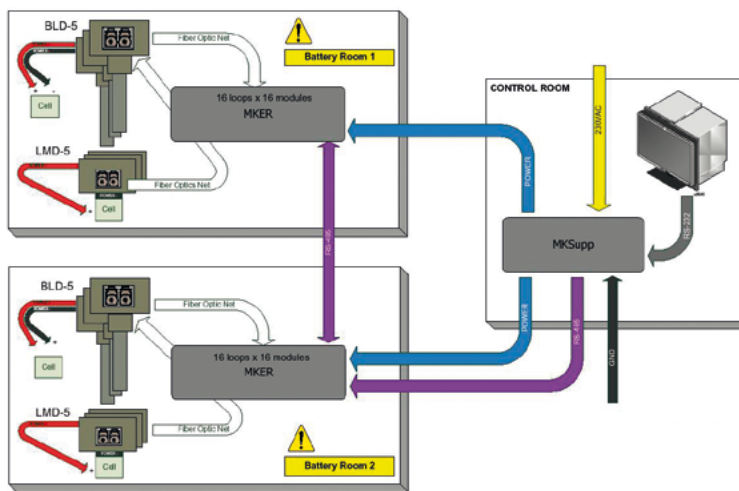
Submarine Batteries Accessories

A series of complimentary products, adding value to submarine's operation

■ Battery Monitoring System (BMS)

The BMS provides a complete and detailed picture of the battery energy and also displays many other critical measurements for the condition of the battery (temperature, electrolyte level, remaining capacity etc.). The alarms and warning capabilities can pinpoint at once a malfunctioning cell, an

overheated issue or any other critical situation. This information, as well as additional special features and performance records, are valuable tools for the design of tactical exercises for the submarine by the Commanding Officers.



BMS
D-Blue-5 System

■ Built in Electrolyte Circulation System

The system provides the uniform distribution of the electrolyte inside the cell, thus keeping the density of the electrolyte homogenous at all times. In this way the performance of the cell increases and cell sulphation phenomena are avoided.

■ Built in Cooling System

The highly effective cooling system provides internal cooling of the poles, reducing the internal temperature of the cell, during maintenance and high-rate operations.

■ Full set of tools, accessories and spare parts on-board

The battery is equipped with full set of tools and accessories, as well as with high-end digital equipment like conductivity meter, hydrogen and oxygen analyzers, density meter, multimeter, insulation tester etc.

Submarine Batteries Accessories

■ Hydrogen Eliminators

Even though our Submarine Batteries are designed to produce a small amount of Hydrogen in submerged condition, a system (certified by BWB) has been developed to eliminate this amount of Hydrogen in the ship's atmosphere. The system in a catalytic chemical reaction (cold combustion), converts the dangerous Hydrogen to drops of distilled water, thus ensuring:

- Safety on board regarding the Hydrogen's accumulation
 - Elimination of Hydrogen starts at as low concentration as 0,15%
 - High conversion rate of Hydrogen
- No electrical energy needed for the operation of the system
- Maintenance free operation

EXCELLENT
PERFORMANCE

OPTIMUM RELIABILITY
ROBUST & DURABLE
CONSTRUCTION

MANUFACTURING
EXCELLENCE

RESEARCH &
DEVELOPMENT

CERTIFIED QUALITY



#1

plant worldwide with dynamic production of motive power and storage energy



500+

clients in 130 countries



Quality & Safety

in every step of the production lines



Innovation

based on experience



GREECE | ITALY | ROMANIA | USA

Contact us: empowerfuture@sunlight.gr

Headquarters Greece T: +30 210 6245400

Sunlight Batteries USA Inc. T: +1 336 579 5109

Sunlight European Battery Assembly (SEBA)
& Sunlight Italy T: +39 045 7651771

Sunlight Industrial SRL Romania T: +40 021 351 77 77

www.systems-sunlight.com

