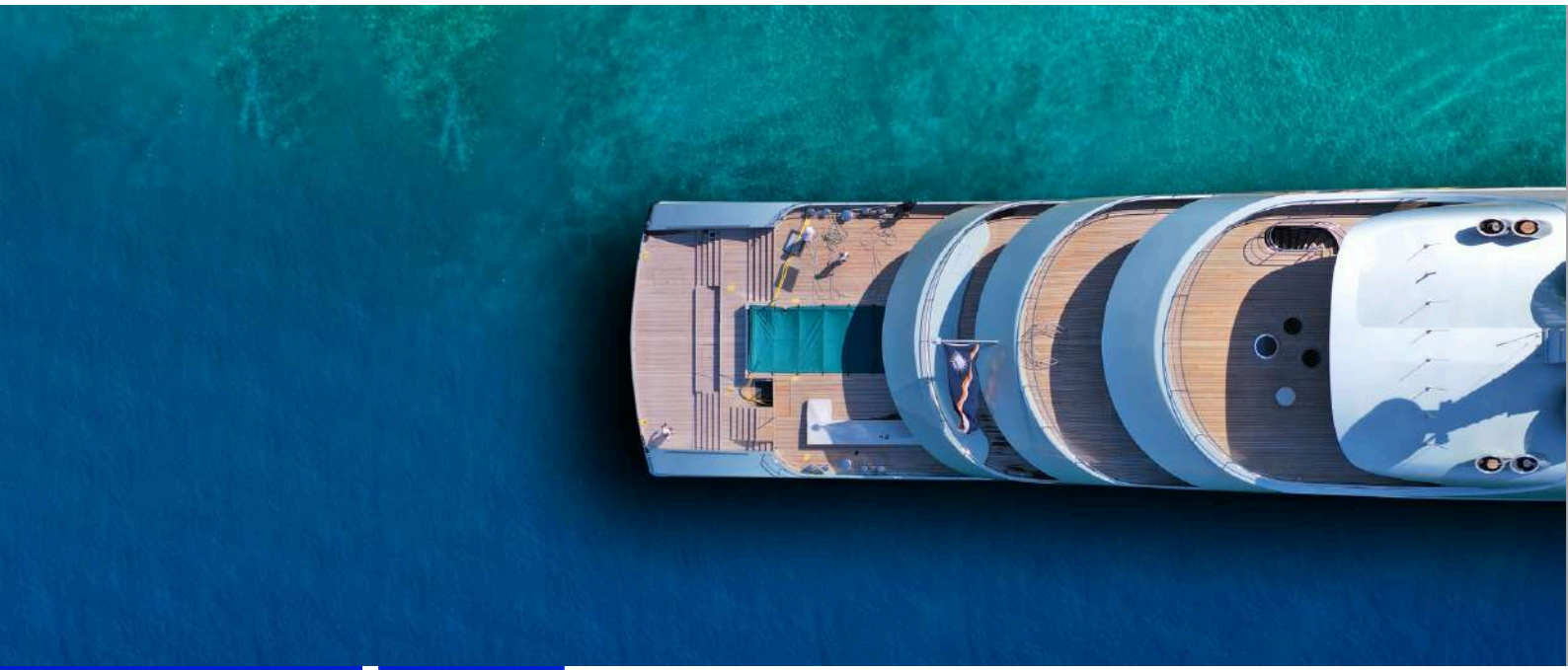
LiVAULT

SAFE STORAGE AND CHARGING OF LITHIUM-ION BATTERIES AT SEA





- CHARGE IN BOX
- AUTOMATIC MONITORING
- THERMAL RUNAWAY COOLANT
- ALARM (AMCS) CONNECTIVITY
- PRE-EMPTIVE DETECTION
- GAS FILTRATION
- AUTOMATIC ISOLATION



TÜVNORD | DMT | RI.SE Research Institutes of Sweden

MANUFACTURED IN EUROPE

TechnoPhysik Group



THE BASICS

The lithium batteries are placed in a container together with the chargers and connected to an internal socket. The door is then securely closed. Now the power supply is switched on and the monitoring electronics control the charging process in the interior of the box.

If the system detects a rise in temperature, it immediately reports a visual and acoustic alarm and switches off charging.

In the event of a continued increase in temperature, the rapid cooling system sprays TRIDENT, an environmentally friendly coolant over the batteries.

The toxic and explosive mixture of smoke and gas is routed through filters in the exhaust management system so that no toxins or dangerous gas can escape to the outside.

FOR MARINE ENVIRONMENTS

Although most battery manufacturers design reliable BMS systems, lithium batteries are subjected to a range of conditions which will cause stress to the battery despite the build quality.
Moist salty air, sea water, high temperatures, constant use and fast charging during operations lead to a high potential of cell deterioration. Batteries used at sea should always be stored in a SAFE container, equipped to manage all the hazards of a thermal runaway.
The RACLAN marine systems are designed for marine environments and are waterproof to keep your battery safe from external elements. The modules are painted with a fire resistant MED 2014/90 EN paint.









PORTABLE SYSTEM:
RACLAN MARINE SQUARE BOX





HOW IT WORKS

- Put the charger and battery inside the box.
- Plug in the charger to an internal socket.
- Let the electronics take over.
- The box will monitor internal temperature.

IN CASE OF THERMAL RUNAWAY

- Alerts are signalled by visual indicators, an audible 80 dB alarm and to the vessel´s onboard alarm system.
- Power supply to charger will shut Down.
- The automatic cooling process commences, spraying the battery with an integrated cooling fluid to stop thermal runaway propagation.
- Gases are neutralised and cooled through the EXO-FILTER.





CHARGE IN BOX

AUTOMATIC MONITORING

TRIDENT COOLANT SPRAY

AUDIBLE ALARM

GAS FILTRATION

AUTOMATIC ISOLATION

INSTALLED MODULAR SYSTEM:

RAMBSS

(RACLAN Maritime Battery Safety Systems)

(Pre-order for Q1 2026 launch)



HOW IT WORKS

- Put the charger and battery inside the module.
- Plug in the charger to an Internal Socket.
- Let the electronics take over.
- The module will monitor internal temperature and smoke.
- Active cooling fans keep the internal temperature down.
- Internal status can be monitored via visual display.

IN CASE OF THERMAL RUNAWAY

- Alerts and temperature are signalled via the display, Audible Alarm, and via the vessel´s alarm and monitoring control system (AMCS).
- At 50°C: Power Supply to charger will shut down.
- At 90°C or smoke detection: Alerts will be signalled and the inside of the module will completely flood, submerging the batteries with TRIDENT extinguishing agent and fresh water solution.
- Dangerous gasses will vent through the EXO-filter.

CHARGE IN BOX

AUTOMATIC MONITORING

FRESH WATER & TRIDENT COOLANT SPRAY

AUDIBLE ALARM + AMCS CONNECTED

GAS FILTRATION

AIR VENTILATION DURING CHARGING

AUTOMATIC ISOLATION

PRE-EMPTIVE DETECTION

CLICK PLAY TO SEE HOW RAMBSS WORKS

PORTABLE SYSTEM:

RACLAN MARINE SQUARE BOX

Rated Capacity: 3.5 kWh

External Dimensions: 58 x 58 x 40cm

Weight: 40kg



INSTALLED MODULAR SYSTEM:

RAMBSS

(RACLAN Maritime Battery Safety Systems)



RAMBSS – 1
60 X 60 X 50cm 75 (kg)
Rated: 5.25 kWh

RAMBSS – 2
60 X 60 X 75cm 100 (kg)
Rated: 5.25 kWh

RAMBSS – 3
60 X 60 X 152cm 170 (kg)
Rated: 5.25 kWh



GAS EXO SYSTEM

The RACLAN system uses a patented internal EXO filtration system incorporating multiple gas-specific media.

A granular material is used for hydrogen (H_2) absorption, while a high-surface-area mesh filter is used to neutralise hydrogen fluoride (HF) and volatile organic compounds (VOCs).

These materials work in sequence to neutralise, cool, and condition the gas stream prior to discharge. Only cooled, non-hazardous gas is vented from the unit.

Gas concentrations and system performance are verified as part of the TÜV Nord certification process.





TRIDENT COOLANT/EXTINGUISHING AGENT

Trident is recognised as the most effective extinguishing agent for combating lithium battery thermal runaways. Its effectiveness comes from its cooling properties, which cool burning cells and prevent the chain reaction common in thermal runaways. Trident's innovative water-based formula is 100% ecologically safe.

PRE-EMPTIVE DETECTION

Using temperature and infrared smoke detection, it identifies earliest signs of thermal runaway and automatically isolates power to the charger, providing proactive safety.

AUTOMATIC TEMPERATURE MONITORING

The Raclan systems are equipped with internal temperature sensors.
The sensor will detect overheating during charging and cut off power to the charger.
If overheating is detected, the suppression system will initiate, spraying coolant to stop the thermal runaway propagation.

BACKUP BATTERY

During charging, the systems are externally connected to an on-board power supply.
In the event of a power cut, or during transportation, the containers will continue to keep the vessel safe.
An internal backup battery will continue to monitor and will maintain enough power for alarms and coolant spraying for up to 90 days.





FULL SUBMERSION DURING THERMAL RUNAWAY

(RAMBSS ONLY)

The RAMBSS modules use a combination of integrated TRIDANT coolant fluid and fresh water submersion to fight thermal runaways of higher capacity batteries.

The RAMBSS modules are installed with a fixed on-board fresh water connection.

In the event of a thermal runaway, the compartment will flood, completely submersing the burning battery in a fresh water & TRIDENT solution.

After the battery is extinguished, the module should remain closed until drained and removed by fire services.

HAZARDS OF A THERMAL RUNAWAY

FIRE

Lithium batteries burning at over 1000°C are hot enough to melt aluminium and burn away even high-temperature composite materials.
Traditional extinguishers and onboard fire-fighting systems cannot extinguish lithium fires and if flames are extinguished, an explosive vapour cloud will be produced.
2-3m jets of flame can be emitted from a burning lithium battery in all directions, igniting other batteries and materials in the vicinity.

BATTERY EXPLOSION

Fully charged Lithium batteries in thermal runaway will likely encounter a sudden and uncontrolled release of stored energy often in the form of a fireball explosion.
Battery cells and particle projectiles travel at over 300 meters per second.

VAPOUR CLOUD EXPLOSION (VCE)

Batteries in thermal runaway, particularly those that do not ignite or explode will release a vapor cloud consisting 25%-50% of hydrogen, which could explode inside or outside any container.
A vapour cloud explosion could be ignited with the smallest of energy sources, including electric ventilation fans, electric doors or hatches, or a light switch.

TOXIC GAS

The gases produced during a thermal runaway consist of: Hydrogen, Carbon Monoxide, Hydrogen Fluoride, Hydrogen Chloride, Hydrogen Cyanide, Ethane, Methane, Sulphur and Nitrogen oxides.
These gases as well as being flammable and explosive are highly toxic and some can enter the body through skin and eyes.
The toxic residue will coat everything nearby resulting in a costly cleanup operation putting a vessel out of operation for weeks, even if there was no fire.
HEPA and Carbon Filters are ineffective for gas



M/Y Siempre: Toy Battery Fire



M/Y Kanga: Toy Battery Fire



M/Y Atina: Water Toy Battery Fire

RACLAN MARINE SQUAREBOX ONLY

Testing fulfilled according to TUV NORD - DMT Test Program: Nr.: M02/22

✔ EXPLOSION PROOF

✔ FIRE CONTAINMENT

✔ REMOVAL OF DANGEROUS GASES

(RAMBSS ONLY)

LLOYDS REGISTER DESIGN APPRAISED

LLOYDS REGISTER D.A.D.: "*A Verified container as part of an arrangement compliant to MGN 681 (M)*"

LLOYDS REGISTER TYPE APPROVAL

IN PROCESS

RI.SE INSTITUTE SWEDEN

TESTING FULFILLED ACCORDING TO UL-1487 & UL-9540A Battery Enclosures

EU DECLARATION OF CONFORMITY: Conformal to the following directives and standards

Machinery Directive 2006/42/EC
EN 60204-1:2018

Battery Directive 2006/66/EC
IEC 62133-2:2017

Radio Equipment Directive (RED)
EN 300 328 V2.2.0 (2017-11)
EN 301 489-1 V2.2.3 (2019-11)
EN 301 489-17 V3.2.4 (2020)
EN IEC 61000-6-3:2021
EN IEC 62368-1:2020

RoHS Directive 2011/65/EU + (EC) 2015/863
EN IEC 62321-2:2022

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