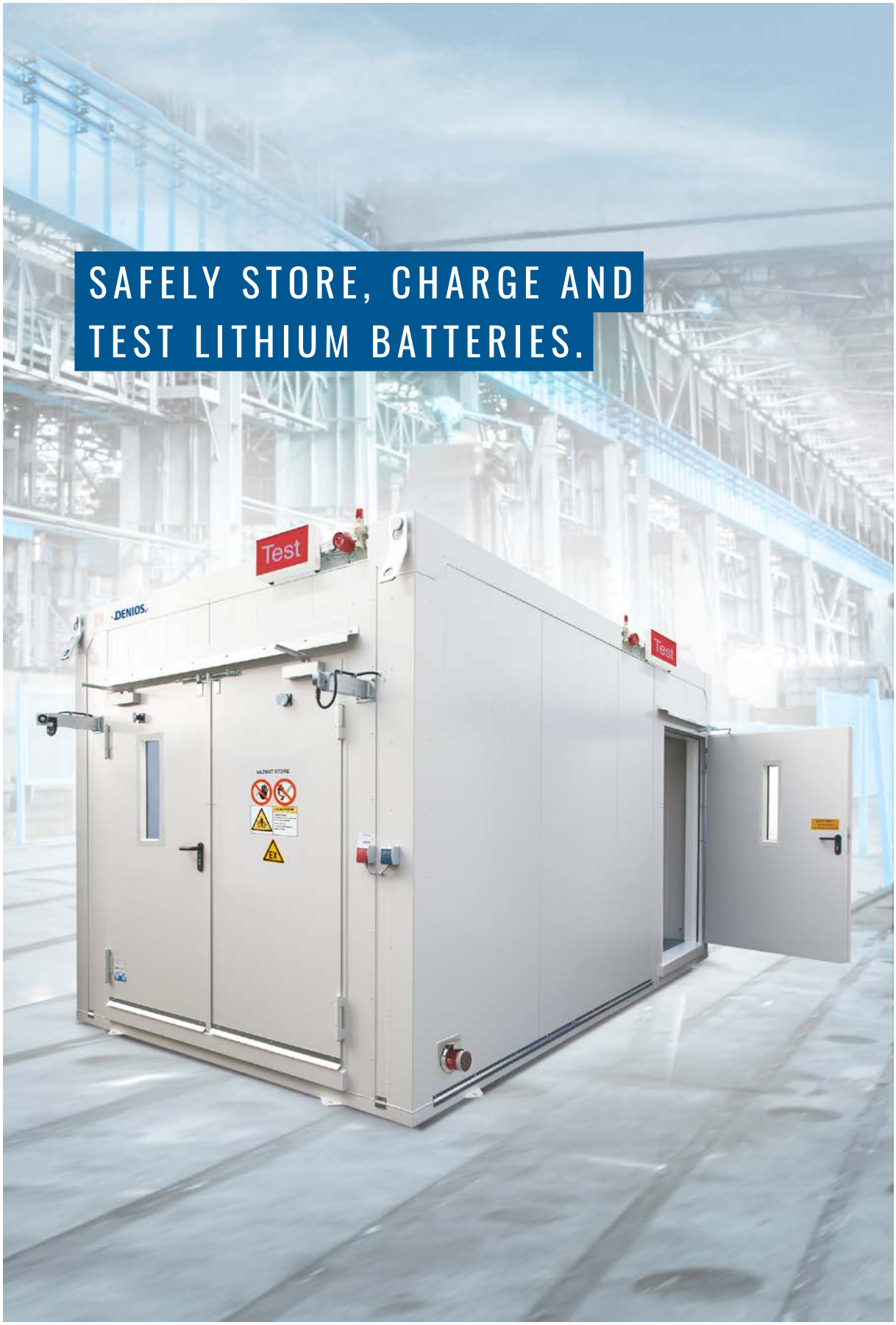
SAFELY STORE, CHARGE AND TEST LITHIUM BATTERIES.

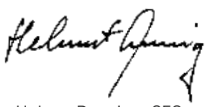


Lithium-based energy storage devices offer high performance with a compact design. This is why they are being increasingly used in applications such as mobile, electronically operated devices or vehicles. Alongside these advantages, this technology also poses safety risks. In particular, there is an increased risk of fire and bursting.
As yet, there is no unified regulation on accident prevention from legislators. Safety measures need to be taken depending on the individual case, to avoid and limit damage and to guarantee insurance cover. This is where DENIOS can help. We offer a comprehensive range of specialist products to ensure your safety. Whether you need to safely store, charge, test or transport lithium energy storage devices.

CONTENTS.

With a fire-rated store from DENIOS, you are taking responsibility for the environment and for work safety.
We will support you with a holistic concept and customised solutions.

Storage and testing of lithium batteries. Customised solutions.


Helmut Dennig – CEO


Alexander Dolipski – COO

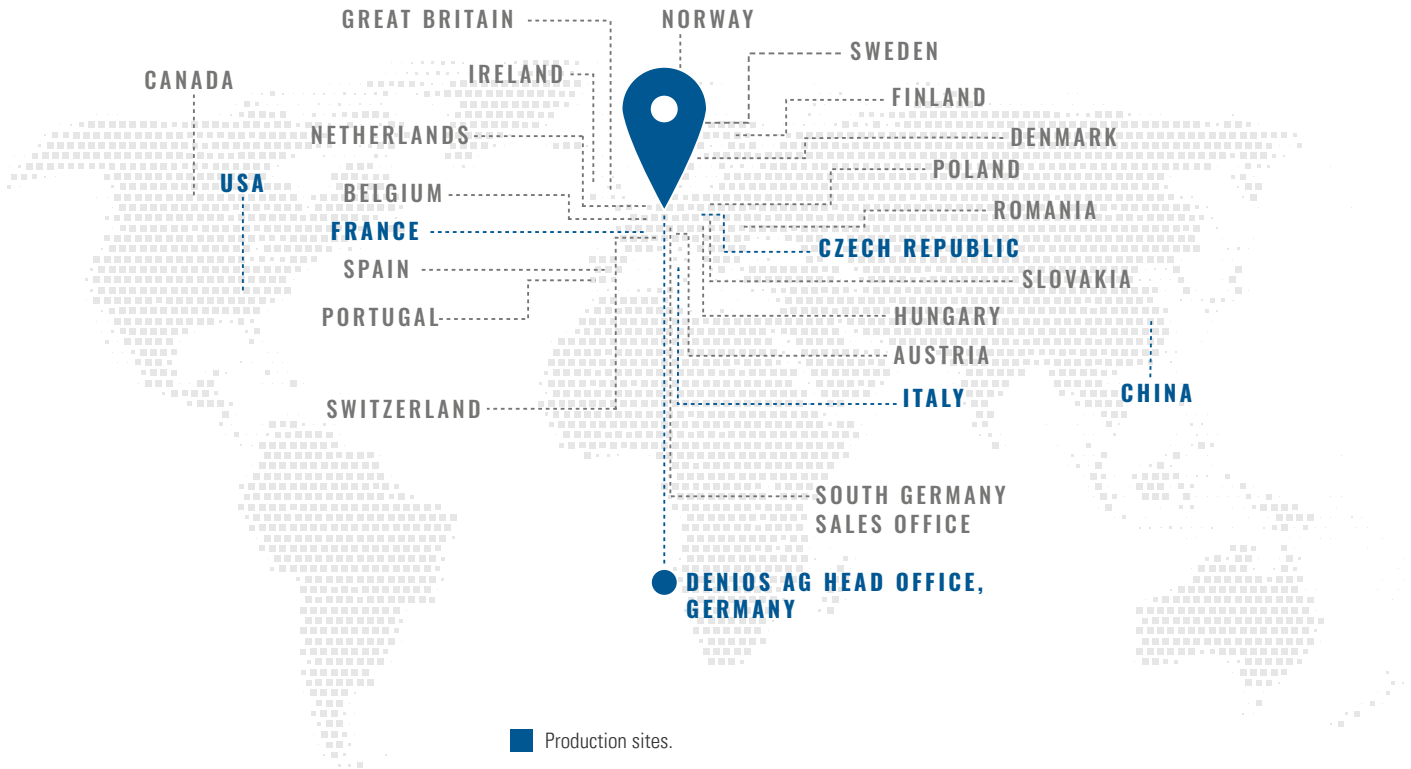

Ansgar Jost – Director Engineered Solutions

WORKING FOR YOU, ACROSS THE WORLD.

PERSONAL SERVICE EVERY TIME. ON SITE EVERY TIME.

Are you looking for an international partner and problem solver for the storage and testing of lithium batteries who is always close at hand? You can rely on DENIOS' experience as a developer and manufacturer. Operating worldwide, we are very familiar with local legislation. We are your one-stop shop for all hazardous materials store services - from personal consultations and on-site analysis to individual product configuration, commissioning and maintenance. Ensuring your project will run smoothly and in accordance with your requirements. Just get in touch.

- Over 1,000 employees.
- More than 20 branches in Europe, Asia and America.
- 6 production sites.
- Approx. 200 million Euro turnover a year.
- Over 35 years' experience.



International customers that trust DENIOS.

BOSCH Bayer DB

It's obvious: only those who have a precise picture of the situation can provide competent and solution-oriented advice. There should be no surprises, especially when planning safety measures for the safe handling of lithium batteries. With an in-depth analysis by our experts on site, costly mistakes can be avoided right from the start.

BMW GROUP

SALZGITTER FLACHSTAHL
Ein Unternehmen der Salzgitter Gruppe

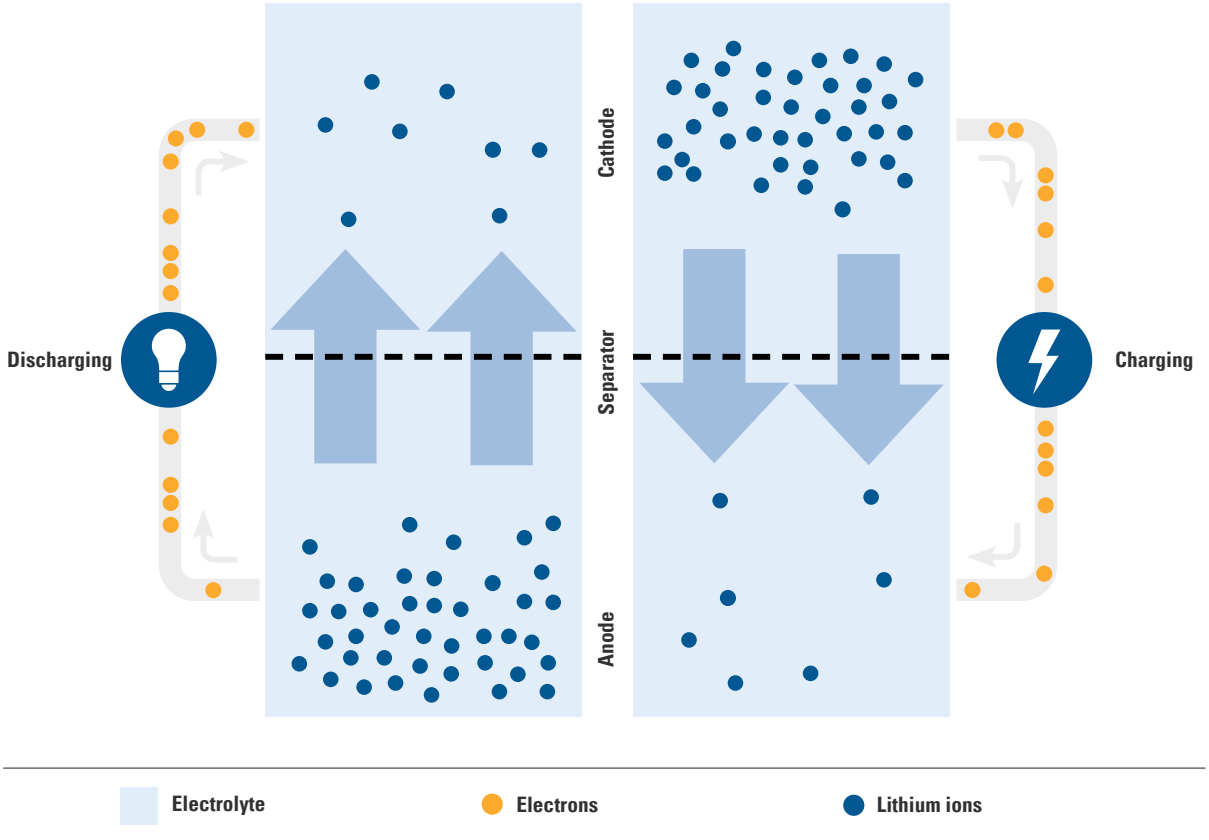
WELL ADVISED WITH EXPERT KNOWLEDGE.

DESIGN AND OPERATION OF A LITHIUM CELL.

Understanding how lithium energy storage devices work is very important to be able to assess their hazard potential. There are many different energy storage systems where lithium is used in a pure or bonded form. Lithium cells are basically divided into primary (non rechargeable) and secondary (rechargeable) cells. A battery pack is made up of several cells depending on capacity. Each lithium cell has a positive and a negative electrode, the anode and the cathode. Between them, there is an ion-conducting electrolyte. This ensures the transport of the lithium ions between the electrodes during the charging and discharging processes.

The best known form of lithium energy storage device is the lithium-ion battery, in which a liquid electrolyte is used. The separator is also an important part of the device. It prevents direct contact between the anode and cathode and therefore prevents a short-circuit. During the discharging process lithium ions and electrons are released on the anode side. The electrons flow through the external circuit and perform the electrical work. At the same time, the lithium ions cross through the electrolyte fluid and the separator over to the cathode. When charging, the process is reversed.

Depending on the system, the design of a lithium energy storage device and the materials used may vary. In a lithium polymer battery the electrolyte is bound in the molecular structure of a polymer foil. There is therefore no need for the special separator. Lithium polymer energy storage devices are only able to generate low discharge currents. The polymer foil however allows for a flat design, which is useful in mobile telephones and laptops for example. The thin film lithium cell is an energy storage device where the electrolyte is replaced by an ion-conductive glass. This allows lithium metal to be used and therefore provides an extremely high energy density. This technology is currently an important part of research into lithium energy storage devices.



Design and operation of a lithium cell.

CHEMICAL PROPERTIES.

While the German Federal Institute for Occupational Safety and Health (BAuA) regards lithium-ion batteries as products under the REACH regulation, the American Occupational Safety and Health Administration (OSHA) classifies batteries as mixtures. In practice, many companies prepare and make available safety data sheets for lithium batteries even without a legal obligation to do so. These usually provide valuable information on battery storage and handling. However, details of chemical composition can often also be found, which provide information on the hazard. Basically a lithium battery can be divided into the anode, electrolyte fluid and cathode.

As a rule, graphite (C) is used as the anode material, which does not have to be labelled according to the CLP regulation.
The electrolyte fluid consists of an organic solvent and a conducting salt. While there is a wide variety of possible solvents, lithium hexafluorophosphate $LiPF_6$ is almost exclusively used as the conducting salt.

Electrolyte fluid = organic solvent + conducting salt $LiPF_6$.

The exact chemical composition of the respective solvent mixture is usually a manufacturer's secret. However, by looking through various data sheets, an overview of the components used can be obtained.
The flashpoints of the solvent components range from +160 °C to partly below 0 °C. This explains the thermal instability of a lithium battery. More information can be found FROM P. 10.

The conducting salt contains, among other things, fluorine (F). If hydrofluoric acid (HF) escapes in an unconcentrated form from a damaged lithium battery, various hazardous situations can arise.
Various materials are used in the cathode, often including iron, manganese, cobalt or nickel. The exact composition of the cathode material significantly determines properties such as lifetime, charging times and performance.

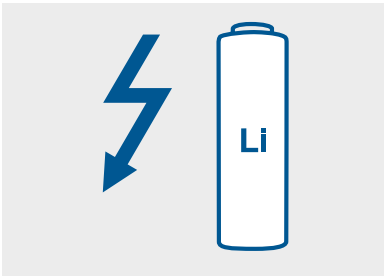
Chemical elements in lithium batteries and their hazard potential.

HAZARDS AND RISKS WHEN HANDLING LITHIUM ENERGY STORAGE DEVICES.

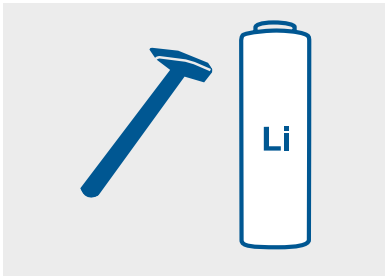
LITHIUM BATTERIES CAN CAUSE A FIRE.

During normal operation, the use of lithium batteries is considered safe. But according to VDE, this only applies as long as everyone handles them properly. As soon as there is a technical fault or a battery is damaged, the situation can quickly become critical. As a result, the German Insurance Association (GDV) calls for lithium batteries to be "treated as a hazardous substance in principle".
The situation becomes especially dangerous when a lithium battery releases its stored energy in an uncontrolled manner. As soon as the heat created exceeds the melting point of the separator, an uncontrollable chain reaction is started, the dreaded "thermal runaway". This results in an explosive burning of the battery. These lithium-ion battery fires are difficult to control, spread quickly. Often, all the fire brigade do in such situations is protect the neighbouring areas.

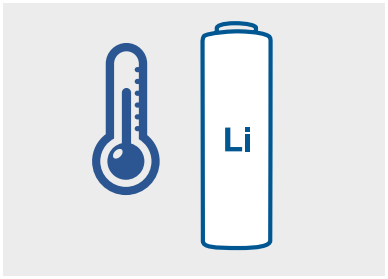
- **Electrical overload**
  when charging and discharging.



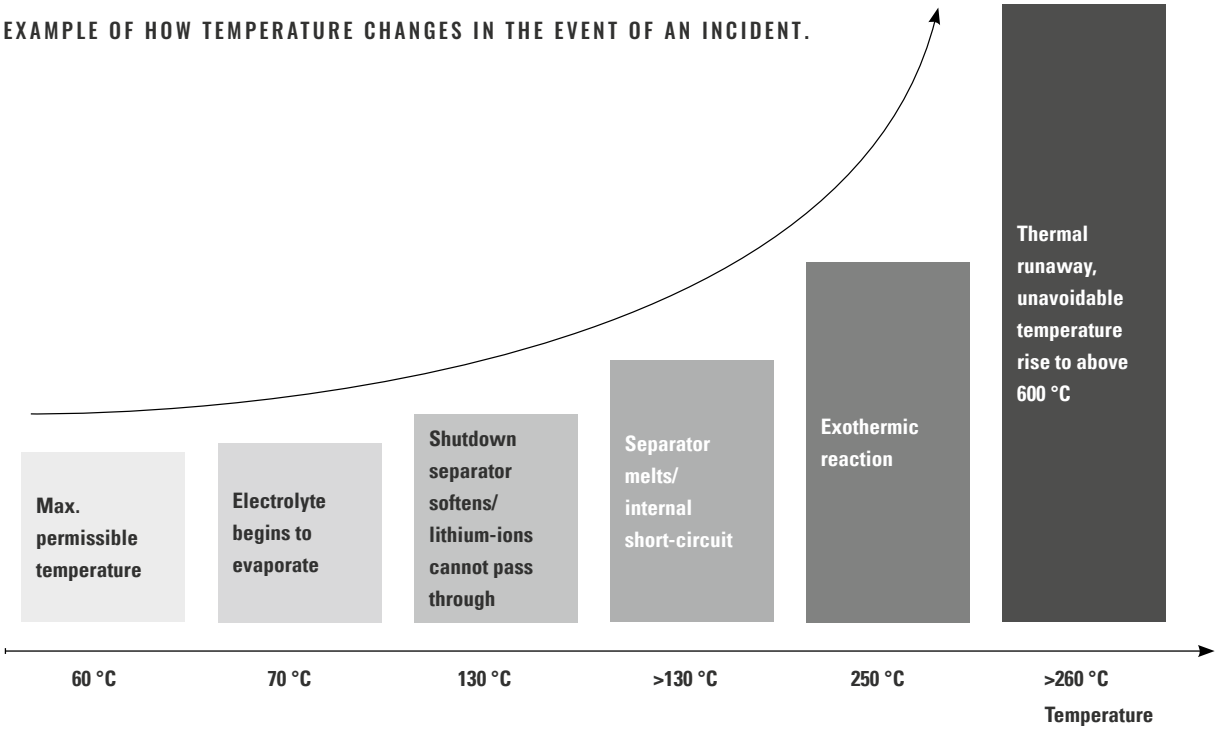
- **Mechanical damage**
  combined with the high energy density of the battery.



- **Thermal overload**
  due to external heat or energy sources.



EXAMPLE OF HOW TEMPERATURE CHANGES IN THE EVENT OF AN INCIDENT.



FIGHTING LITHIUM BATTERY FIRES.

The size of the battery plays a decisive role in fire fighting. Large batteries, for example from burning electric cars, regularly present fire brigades with enormous challenges.

THESE FIRES ARE HARD TO CONTROL. WHY IS THAT?

This question can be answered by looking at the construction of a traction battery. A large traction battery consists of many smaller cells that are connected together.
If a single cell heats up, in the worst case in the middle of the module, the neighbouring cells will also inevitably heat up. This results in a chain reaction that leads to a considerably higher release of energy. If the chain reaction was triggered at the centre of the battery, it is almost impossible to reach it with an extinguishing agent, e.g. water, and thus stop or contain the reaction. If you now try to cool the module, the water only reaches the outer layers or the battery housing.
The situation is different for smaller modules where fewer cells are used. Here, external cooling usually has a direct effect on the reacting cells.
In the summer of 2019, the VdS published leaflet 3856 "Sprinkler protection of lithium batteries". For the first time a differentiation was made by energy content per storage unit and the risk was classified according to the following table:

HAZARD LEVEL (HL)	RISK	ENERGY CONTENT IN KWH / STORAGE UNIT
I	Low	< 1
II	Medium	1.0–50
III	High	> 50

The recommendation is to store a maximum of 50 kWh per storage unit (e.g. one Euro pallet). This is equivalent to Hazard Level II. The sprinkler system must be designed in accordance with VdS CEA 4001. Tests by the American property insurer FM-Global and the German Insurance Association (GDV) have shown that the spread of lithium battery fires in high racks can be prevented by a targeted sprinkler system. However, the findings from the tests are only valid for small lithium batteries packed in cardboard boxes. The sprinkling of large battery units is nevertheless advisable, as although the fire is not usually extinguished at the individual battery, the spread to neighbouring batteries can be slowed, if not prevented.
Powder extinguishing agents such as aerosols suppress the fire at the batteries. Especially with smaller storage volumes, such as safety cabinets or emergency containers, valuable time can be saved. A cooling effect does not take place here, however.
Extinguishing granules, which are often used in transport boxes for faulty lithium batteries, thermally insulate the battery. The extinguishing or insulation effect is immediately active and functions completely autonomously. A prerequisite, however, is that the batteries are surrounded by a sufficient quantity of granules, which greatly restricts handling.

Schematic diagram of a larger, damaged battery module with water cooling by sprinkler system.

Schematic diagram of a smaller, damaged battery module with water cooling by sprinkler system.

SAFETY REGULATIONS ACCORDING TO PERFORMANCE CLASSES.

(VDS 3103: 2019-06)

Low power	Medium power	High power
Computers, multimedia, small electrical devices	Pedelecs, e-bikes, e-scooters, larger garden tools	Automotive, mains-independent large-scale equipment
LITHIUM-METAL ENERGY STORAGE DEVICES:		
≤ 2 g Li per energy storage device	> 2 g Li per energy storage device and ≤ 12 kg gross per energy storage device	> 2 g Li per energy storage device and > 12 kg gross per energy storage device
LITHIUM-ION ENERGY STORAGE DEVICES:		
≤ 100 Wh per energy storage device	> 100 Wh per energy storage device and ≤ 12 kg gross per energy storage device	> 100 Wh per energy storage device and/or > 12 kg gross per energy storage device
General safety regulations:		
■ Observe manufacturer's instructions (technical product data sheets). ■ Protect battery terminals from short-circuit. ■ Protect from mechanical damage. ■ Do not expose to direct and long-term high temperatures or heat sources (including direct sunlight).	■ Ensure structural or spatial separation (min. 2.5 m) from other combustible materials, if there is no automatic extinguishing equipment present. ■ Ensure damaged or faulty batteries are removed immediately from storage and production areas (until they are disposed of store them at a safe distance or in a fire-rated, separate area).	■ Only store batteries with a UN 38.3 test certificate (prototypes should only be stored in exceptional circumstances and with a risk assessment).
GENERAL SAFETY REGULATIONS:		
■ None. Where larger volumes are stored together (volume over 7 m³ or more than six Euro pallets) the notes for medium power batteries apply.	■ Storage in fire-rated separated areas or with a safety distance (spatial separation of 5 m.) ■ Avoidance of mixed storage with other fire accelerant products. ■ Monitoring of the storage area with a suitable fire alarm system with connection to a permanently-manned location. ■ Where fire extinguishing equipment is available: inclusion of information on suitable extinguishing media in the technical product data sheets.	Regulation of protective measures to be agreed with insurers for individual cases, e.g.: ■ Storage in fire-rated separated areas or with a safety distance (spatial separation of 5 m). ■ Separation and limitation of quantities. ■ Automatic extinguishing equipment.

Where larger volumes are stored (area covered < 60 m² and/or height > 3m) the notes for high power batteries apply.

RISK ASSESSMENT PROCESS.

(IN ACCORDANCE WITH THE GERMAN OCCUPATIONAL HEALTH AND SAFETY ACT AND THE HAZARDOUS SUBSTANCE AND INDUSTRIAL SAFETY REGULATIONS)

HAZARDOUS SUBSTANCE:
BATTERIES (E.G. LITHIUM-ION OR LITHIUM-METAL BATTERIES)

RISK ASSESSMENT:

Repeated process

- Which batteries are being handled?
- In what technical condition are the batteries?
- What quantities are being stored / tested?
- What is the risk assessment?

PROTECTIVE MEASURES ACCORDING TO THE STOP PRINCIPLE:

- Substitution check.
  (can the battery be substituted by a non-hazardous alternative?)
- Technical solutions.
- Organizational solutions.
- Personnel-related measures (e.g. PPE).
- Determine and implement protective measures
  (e.g. fire protection concept).

EFFECTIVENESS TEST:

Repeated process

- Were the measures taken successful?
- What didn't work and why?
- How can this be optimised?

DOCUMENTATION:

- Who carried out the risk assessment and when was this done?
- What work areas and activities with hazardous substances are there?
- What hazards can arise during the activity?
- How often is this activity carried out?
- Are there any influencing factors which would increase the intake of hazardous substances into the body?
- Record documentation in writing and store it for the long term.

SAFETY WHEN HANDLING LITHIUM BATTERIES. PRODUCT VARIETY FROM THE MANUFACTURER.

Whether you want to store, test, transport or safely charge lithium batteries - at DENIOS you will find the right system. Our product variety ranges from double-sided fire-rated safety cabinets to turnkey fire-rated stores, and from special extinguishing granules to storage and transport boxes with UN approval. We can also develop individual solutions for you, for example fire-rated dismantling rooms for lithium batteries with a dehumidification system and personnel air lock.


EX
onen Battery

MULTIPLE PRODUCTS FOR LITHIUM BATTERY SAFETY.

FIRE-RATED STORAGE CONTAINER WFP LI-ION.

- WALK-IN FIRE-RATED STORAGE CONTAINER
- FOR SMALLER MODULE SIZES OR ELECTRICAL DEVICES
- STORAGE AREA 6-22 M²

FROM P. 20

FIRE-RATED STORAGE CONTAINER RFP 115 LI-ION.

- COMPACT FIRE-RATED STORAGE CONTAINER
- MINIMUM SPACE REQUIREMENTS
- STORAGE CAPACITY: APPROX. 1-3 EURO PALLETS

FROM P. 26

FIRE-RATED STORAGE CONTAINER RFP LI-ION.

- FIRE-RATED STORAGE CONTAINER WITH SHELVING
- FOR LARGER LITHIUM BATTERIES
- STORAGE CAPACITY: APPROX. 3-24 EURO PALLETS

FROM P. 30

FIRE-RATED STORAGE CONTAINER RFP SD LI-ION.

- FIRE-RATED STORAGE CONTAINER WITH SHELVING WITH SLIDING DOORS
- FOR SIMPLE HANDLING AND MAXIMUM STORAGE CAPACITY
- STORAGE CAPACITY: APPROX. 3-32 EURO PALLETS

FROM P. 34

SAFETY CABINETS FOR LITHIUM BATTERIES.

- SAFESTORE FOR STORAGE
- SMARTSTORE FOR STORAGE AND CHARGING

FROM P. 40

TEST ROOMS FOR LITHIUM BATTERIES.

- TAILOR-MADE SOLUTIONS
- WIDE RANGE OF EQUIPMENT
- PROCESS-DEPENDENT FUNCTIONS

FROM P. 56

EXTINGUISHING AGENTS AND TRANSPORT CONTAINERS.

- PYROBUBBLES® EXTINGUISHING MEDIUM
- TRANSPORT CONTAINER WITH UN APPROVAL

FROM P. 66

EQUIPMENT.

- FIRE AND EXPLOSION PROTECTION
- PREVENTIVE FIRE PROTECTION MEASURES
- PRODUCT HANDLING AND MUCH MORE

FROM P. 74

STORAGE AND TESTING OF LITHIUM BATTERIES.

CUSTOMISED SOLUTIONS.

SECTION I

STORAGE ROOMS.

For the safe storage of lithium batteries of medium to high capacity - even in large quantities - the DENIOS range includes walk-in and compact stores as well as storage containers with shelving. All systems are manufactured with a sturdy, double steel frame design and are approved as an entire system, with fire protection from 90 up to 120 minutes from inside and from outside. Depending on the application, we'll equip your storage room with the appropriate safety features.

FIRE-RATED STORES FROM DENIOS.

NUMBER 1 ACROSS THE WORLD.

THE FIRST AND SO FAR ONLY BUILDING PRODUCTS OF THIS KIND TO BE TESTED AND APPROVED ACCORDING TO EUROPEAN LEGISLATION!

Country-specific, bureaucratic hurdles in the approval procedure are a thing of the past with the new European approval (ETA). DENIOS fire-rated stores are the first and so far only construction products of this kind with official ETA approval / CE marking in accordance with European Regulation (EU) No. 305/2011. In addition, they have been successfully tested and classified as a complete system in a fire test by the French testing institute Efectis, a body designated by the EU.

EXCELLENCE IN FIRE PROTECTION.

How can the safety of hazardous materials stores with fire protection be clearly demonstrated? By not only developing them on the basis of theoretical information from suppliers, but by subjecting them to real fire tests.
Our experience has shown that real fire tests always lead to product improvements. To ensure that the fire resistance required in the event of a fire is also maintained in the event of damage, our products go through a real baptism of fire at an independent testing institute. Step by step, our engineers follow each measurement from the sensors installed on the test object and draw decisive conclusions: do the matched components work or do they still need to be optimised?

For some companies, it is sufficient if the test is completed after the 90 minutes required in Germany. As an international supplier, however, DENIOS goes a step further and tests all products for 120-minute fire resistance in order to be able to guarantee the highest level of protection throughout Europe. Of course, the corresponding evidence for each product is provided in the documentation.

FIRE PROTECTION ANYWHERE.

Risks resulting from the storage of flammable media are the same all over the world. A fire does not care whether it breaks out in a hazardous materials store in Berlin or Beijing. That is why it is so important to have an international perspective on the issue.
Local legislation decides how the risks are to be assessed and prescribes appropriate protective measures. As DENIOS is represented in over 20 countries in Europe, Asia and North America, we are familiar with the local legislation. Our experts on site will design the optimal hazardous materials store for your application.

DENIOS also pools knowledge group-wide in order to channel it into the development of innovative products and equipment, and to continuously improve the advice and services we offer.

FIRE PROTECTION AS A SYSTEM.

The fire protection of a building product is not achieved by individual EI-120 components. Reliable fire protection results from the interaction of all the components in the system as a whole. At DENIOS, you'll receive a certificate with every hazardous materials store demonstrating that the entire system has been successfully tested.
In addition, you'll benefit from our holistic approach: starting with advice, through development and production, to service, we'll find solutions together for your individual application. In this way, fire protection is ensured by a self-contained and coordinated system.

FIRE PROTECTION IN NEW DIMENSIONS.

The challenges you face as a customer drive our innovation. It's our mission to make hazardous materials storage as safe, convenient and efficient as possible.
Initially, DENIOS fire-rated stores were only equipped with wing doors, as sliding doors were not available as an alternative on the market. However, DENIOS recognised the advantages of the sliding door design for everyday work: larger room volume, protection against wind loads and electrical operation from a forklift. Without further ado, an in-house development was started which, in contrast to the attempts of other manufacturers, successfully passed the fire test and was classified as EI_1 60/EI_2 120.

Successful performance of a fire test for different types of fire seals (cable and pipe break-through points).

BROAD-BASED FIRE PROTECTION.

Although legislation provides the framework for protective measures in hazardous materials storage and fire protection, the risk assessment and derivation of concrete measures is the responsibility of the operator of a hazardous materials store. DENIOS is in regular contact with authorities, insurance companies, fire brigades, other operators and safety officers in order to provide you with the best possible support. You'll benefit from a broad network of experts and DENIOS' 35 years of experience as a developer and manufacturer of hazardous materials stores.

RFP SD with sliding doors during fire test. Smoke is emitted from cracks but there is no flashback. In the next few moments, the protective mechanism will take effect and suppress the smoke.

RFP SD WITH SLIDING DOORS FIRE TEST.

15:00 The fire test starts! The oven is brought to over 1,000 °C in just a few minutes.

15:04 The temperature at the outer shell of the room system rises abruptly to 140 °C. Smoke increases from the joints in the door area. Next, the first protective mechanism kicks in.

15:09 The smoke lessens, the protective mechanism works! The external temperature drops below 100 °C. The test is going according to plan so far. We still have 111 minutes to go.

15:16 The sound of hot steel and concrete is impressive! Longitudinal thermal expansion can reach up to 50 mm!

16:01 After 60 minutes, the EI_1 60 qualification is achieved! All sensors are within the tolerance range. No flashback, the test continues. EI_1 60 ☑

16:31 After 90 minutes, the EI_2 90 qualification has now also been achieved! Confidence to reach the next level is growing! EI_1 60 ☑ EI_2 90 ☑

16:49 We are already at minute 109 and still the structure resists the thermal stress of over 1,000 °C. The external temperature is still below the maximum value of 180 °C.

17:02 World first and world class! For the first time, sliding doors withstand the fire test for 120 minutes. We have qualified EI_2 120! EI_2 60 ☑ EI_2 90 ☑ EI_2 120 ☑

WFP-X 14 Li-Ion

WALK-IN FIRE-RATED STORAGE CONTAINER WFP LI-ION.

The WFP Li-Ion walk-in fire-rated store offers almost limitless ways to use the space when storing lithium batteries. Thanks to its fire protection approval, the room system can be integrated directly into your infrastructure without the need for safety distances, either indoors or outdoors.

The product illustrations show optional equipment. We would be happy to create a custom product configuration for you.


WFP-M 6 Li-Ion


WFP-X 6 Li-Ion


WFP-X 10 Li-Ion


WFP-M 14 Li-Ion


WFP-X 22 Li-Ion

WALK-IN FIRE-RATED STORAGE CONTAINER WFP LI-ION.

STORAGE AREA APPROX. 6 TO 22 M².

Do you need a store for smaller sized modules, which don't need a forklift for loading and unloading? You might want to safely store a larger piece of equipment or an electric vehicle (e.g. prototype and test equipment). Does the storage room need to fulfil an additional function - for example as an analysis laboratory, a convenient place to charge batteries or as a temporary store for dispatch or for storing faulty batteries? The walk-in fire-rated hazardous materials store WFP Li-Ion is the convenient solution for all these scenarios.

ETA APPROVED · EFECTIS REI 120 · DIBt F 90 · IBS REI 90

- ETA approval / CE marking according to European Regulation (EU) No. 305/2011.
- Tested and approved as a complete system with 90 minute fire protection (F 90 / REI 90) from inside and outside.
- International designs meeting country-specific legislation (REI 120, REI 60).

PRODUCT DESCRIPTION.

- Install directly next to the external wall of neighbouring buildings or as a fire-rated separate area, e.g. in a production hall.
- Water law tested, one piece, hot dip galvanised 5 mm spill pallet with removable grids **(max. load capacity: 1000 kg/m²)**.
- Long-lasting corrosion protection with fully-galvanised base material and high-quality 2K paint **(RAL 9002, grey-white)**.
- Fire protection panels with high insulation properties (thickness 100 mm, A class material, non-combustible).
- Lockable, self-closing EI_2 90-C fire-rated doors to EN 13501-2, tested in accordance with EN 1634-1, or country-specific design (EI_2 120 or EI_1 60) with a door opening angle of 90 ° / 115 °.
- 1-wing door (W x H: 1,250 x 2,000 mm) or 2-wing door (W x H: 2,000 x 2,000 mm), either on the short or long side of the store in the steps provided.
- For 2-wing doors, a door sequence controller ensures the doors close reliably.
- Removable crane eyes for safe use with a crane and transport safety device.
- Available in two internal heights: clear internal height: WFP-X = 2,500 mm, WFP-M = 2,280 mm.

MODEL	WFP-X 6 LI-ION	WFP-X 10 LI-ION	WFP-X 14 LI-ION	WFP-X 22 LI-ION	WFP-M 6 LI-ION	WFP-M 14 LI-ION
	Internal height = 2,500 mm				Internal height = 2,280 mm	
Storage area [m²]	**6**	**10**	**14**	**22**	**6**	**14**
Containment volume [l]	730	1,150	1,560	2,400	730	1,560
External dimensions* W x D x H [mm]	3,018 x 2,784 x 2,875	4,478 x 2,784 x 2,921	5,938 x 2,878 x 3,009	8,858 x 2,878 x 3,009	3,018 x 2,784 x 2,655	5,938 x 2,878 x 2,789
Internal dimensions W x D x H [mm]	2,580 x 2,560 x 2,500	4,040 x 2,560 x 2,500	5,500 x 2,560 x 2,500	8,420 x 2,560 x 2,500	2,580 x 2,560 x 2,280	5,500 x 2,560 x 2,280
Weight [kg]	2,550	3,260	4,100	5,450	2,490	4,000

Note: Dimensions and weights are approximate and may differ depending on optional equipment. Technical changes reserved.
*Without attachments.

STRUCTURAL ANALYSIS.

The structural calculations for the technical room system are based on Eurocode 3 (DIN EN 1993). The loads on the structure are measured according to Eurocode 1 (EN 1991-1-3) for a characteristic wind load $q_{k,w}$ = 0.585 kN/m² and a ground snow load s_k = 2.5 kN/m². The structure is also designed for earthquake zone 3 according to DIN 4149, EN 1998-1:2004. Available with additional equipment for up to wind load zone 4, terrain category I ($q_{k,w}$ = 1.064 kN/m²) and for up to ground snow load s_k = 5.86 kN/m².

ROOF DRAINAGE.

The roof drainage counteracts loads from standing water on the roof. The rainwater is directed via the roof profile to the two short sides of the room and is channeled to an outlet either through the right or left corner profile or through both. From there, it can be directed to a drainage system on site, e.g. via a drainage pipe.

EQUIPMENT OPTIONS.

For maximum comfort and improved safety, we have developed the Communication Bar. You'll have all the important information here at a glance. We will be happy to discuss with you in person which other equipment might be suitable. Our experts will design a customised solution with you on site.
An overview of additional equipment options can be found here FROM P. 72.

Central monitoring and control of all electrical components with the DENIOS Communication Bar.

Video surveillance and recording of the hazard area indoors or outdoors.

CHARGING LITHIUM BATTERIES IN FIRE-RATED STORAGE CONTAINER WFP LI-ION.

SAFETY RULES FOR CHARGING LITHIUM BATTERIES.

When charging lithium batteries, the potential risk is significantly increased compared to storage. This is especially true if the batteries are damaged. The greatest danger is if a short circuit occurs in the battery when fully charged. This is when the stored energy is at its greatest and therefore the effects of thermal runaway are also at their highest SEE P. 8. The self-reinforcing reaction of the lithium battery can lead to bursting. If safety rules are observed and the storage and charging conditions are optimally matched to the stored goods, this risk can be minimised.

THE CARDINAL RULE: DO NOT CHARGE A DAMAGED BATTERY!

VdS recommends that damaged or defective batteries be immediately removed from storage and production areas. However, it should be borne in mind that a defect is often not externally visible and it is therefore not easy to assess the condition of a battery. To be on the safe side, you should always store batteries whose condition is unknown in a separate quarantine store. This store must be taken into account in the operational fire protection design. The compact RFP 115 Li-Ion fire-rated store, for example, can be used as a quarantine store FROM P. 26.

AVOID DEEP DISCHARGE!

The charging of lithium-ion batteries is also critical if they have not been used for a long time or have been fully discharged. They can be permanently damaged by deep discharges, causing a chemical reaction during charging. This is why, for example, garden tools with rechargeable batteries have a trickle charge, which corresponds to a charge level of approx. 30 %. This reduces aging effects and prevents deep discharge.

ONLY CHARGE LITHIUM BATTERIES IN A MONITORED ENVIRONMENT.

Cold or high temperatures and high humidity can also cause damage to the cells. Therefore, only charge lithium batteries under supervision, at room temperature and in a fire-rated location.

ONLY USE CERTIFIED CHARGERS OR CHARGERS FROM THE MANUFACTURER.

In most commercially available rechargeable batteries, the battery management system (BMS) integrated in the manufacturer's charger prevents overcharging and deep discharge.

It is a safety feature that protects the performance of the battery and prevents defects.

The BMS can also be part of the battery itself.

SAFE STORAGE AND CHARGING CONDITIONS.

The fire-rated store WFP Li-Ion already offers safety in case of fire thanks to its certified fire protection. By equipping the unit with air-conditioning technology for outdoor installation FROM P. 78 and monitoring electronics FROM P. 76, additional precautions for preventive fire protection can be taken. With extinguishing technology specially designed for lithium batteries, optimum defensive fire protection is ensured. We recommend using aerosol extinguishing technology FROM P. 86, if there are several storage levels, as the extinguishing agent is then better distributed in the room and over the storage levels.

THE COMPACT SOLUTION FOR INDOOR USE.

Are you looking for a compact solution to safely charge lithium batteries indoors? We recommend the DENIOS SmartStore safety cabinet with 90-minute fire protection from both sides and a fire suppression system.

Safety cabinets for lithium batteries FROM P. 40

COMPACT FIRE-RATED STORAGE CONTAINER RFP 115 LI-ION.

The RFP 115 Li-Ion fire-rated storage container, in combination with a pressure relief system and cooling system, is ideally suited for storing small quantities of lithium batteries.

The product illustrations show optional equipment. We would be happy to create a custom product configuration for you.


ETA
APPROVED
EFECTIS
REI 120
IBS
REI 90

COMPACT FIRE-RATED STORAGE CONTAINER RFP 115 LI-ION.

STORAGE CAPACITY FOR APPROX. 1-3 EURO PALLETS.

Not every company needs a large store to house lithium energy storage devices. Fire-rated storage container RFP 115 Li-Ion offers a sturdy, fire-rated design with minimal footprint. On request, up to three additional shelves can be supplied so that you can make optimum use of the interior space.

ETA APPROVED · EFECTIS REI 120 · IBS REI 90

- ETA approval / CE marking according to European Regulation (EU) No. 305/2011.
- Tested and approved as a complete system with 90 minute fire protection (F 90 / REI 90) from inside and outside.
- International designs meeting country-specific legislation (REI 120, REI 60).

PRODUCT DESCRIPTION.

- The space saving solution for the storage of lithium energy storage devices near to production, as an intermediate store or as a quarantine store.
- Install directly next to the external wall of neighbouring buildings or as a fire-rated separate area, e.g. in a production hall.
- Steel spill pallet with removable hot dip galvanised grids **(max. load capacity: 1,000 kg/m²).**
- Long-lasting corrosion protection with fully-galvanised base material and high-quality 2K paint **(RAL 9002, grey-white)**.
- Fire protection panels (A class material, non-combustible) with high insulation properties.
- Lockable, self closing 1-wing fire-rated EI_2 90-C door to EN 13501-2, tested in accordance with EN 1634-1, or country-specific design (EI_1 60 or EI_2 120) with a door opening angle of 90 ° / 115 °.
- If required with up to three additional shelves.

MODEL	RFP 115 LI-ION
Storage capacity [EP]	**1–3**
Containment volume [l]	220
External dimensions* W x D x H [mm]	1,910 x 1,980 x 2,376
Internal dimensions W x D x H [mm]	1,267 x 1,480 x 1,958
Weight [kg]	1,075

Note: EP = Euro pallet - dimensions and weights are approximate and may differ depending on optional equipment. Technical changes reserved.
*Without attachments.

STRUCTURAL ANALYSIS.

The structural calculations for the technical room system are based on Eurocode 3 (DIN EN 1993). The loads on the structure are measured according to Eurocode 1 (EN 1991-1-3) for a characteristic wind load qk,w = 0.585 kN/m² and a ground snow load sk = 2.5 kN/m². The structure is also designed for earthquake zone 3 in accordance with DIN 4149, EN 1998-1:2004. Available with additional equipment for up to wind load zone 4, terrain category I ($q_{k,w}$ = 1.064 kN/m²) and for up to ground snow load s_k = 5.86 kN/m².

ROOF DRAINAGE.

The roof drainage counteracts loads from standing water on the roof. The rainwater is directed via the roof profile to the two short sides of the room and is channeled to an outlet either through the right or left corner profile or through both. From there, it can be directed to a drainage system on site, e.g. via a drainage pipe.

EQUIPMENT OPTIONS.

DENIOS fire-rated stores WFP and RFP can also be equipped with pressure relief via roof panel. It ensures controlled pressure equalisation in the event of an explosion. Get in touch: we will be happy to discuss your individual requirements in a personal consultation. Our experts will design a customised solution with you on site, offering high levels of safety and maximum convenience. **An overview of additional equipment options can be found from p. 72.**

In the event of an explosion, the pressure is relieved via the roof panel. The weather protection prevents snow loads affecting operation.

Enclosed controls: controls are protected from unauthorised access in the front of the switch cabinet.

RFP 615.30 Li-Ion

FIRE-RATED STORAGE CONTAINER WITH SHELVING RFP LI-ION.

The RFP Li-Ion fire-rated storage container is ideally suited for storing large quantities of lithium batteries or larger battery modules. In the accessible version, they can also be loaded with a high-lift truck.

The product illustrations show optional equipment. We would be happy to create a custom product configuration for you.


RFP 315.20 Li-Ion


RFP 315.30 Li-Ion


RFP 615.20 Li-Ion

FIRE-RATED STORAGE CONTAINER WITH SHELVING RFP LI-ION.

STORAGE CAPACITY FOR APPROX. 3 TO 24 EURO PALLETS.

Fire-rated storage container with shelving RFP Li-Ion is the best option when larger quantities or larger-scale lithium energy storage devices need to be accommodated. Thanks to an integrated heavy-duty rack with adjustable storage levels, optimum use can be made of the interior space, storing lithium batteries individually, in boxes, on pallets or on special carrier frames. The loading surfaces are removable hot dip galvanised grids. The 2-wing doors provide generous, convenient access and facilitate stocking and retrieval.

ETA APPROVED · EFECTIS REI 120 · DIBt F 90 · IBS REI 90

- ETA approval / CE marking according to European Regulation (EU) No. 305/2011.
- Tested and approved as a complete system with 90 minute fire protection (F 90 / REI 90) from inside and outside.
- International designs meeting country-specific legislation (REI 120, REI 60).

PRODUCT DESCRIPTION.

- Install directly next to the external wall of neighbouring buildings or as a fire-rated separate area, e.g. in a production hall.
- On request available with variable shelf heights.
- Water law tested, one-piece, hot-dip galvanised 5 mm spill pallet in the lower storage level.
- Storage levels fitted with removable, hot-dip galvanised grids (**max. load capacity 1,250 kg/m²**).
- Long-lasting corrosion protection with fully-galvanised base material and high-quality 2K paint **(RAL 9002, grey-white)**.
- Fire protection panels with high insulation properties (thickness 100 mm, A class material, non-combustible).
- Lockable, self-closing EI_2 90-C wing doors on the long side meeting EN 13501-2, tested to EN 1634-1 or country-specific design with a door opening angle of 90 ° / 102 °/ 115 °/ 128 °.
- Versions which are accessible underneath are installed on a separately-supplied concrete pad. This means they can easily be loaded with a high-lift truck, for example. In the wide version (RFP 615.20 Li-Ion and RFP 615.30 Li-Ion) the store has two concrete pads of the same size.

MODEL	RFP 315.20 LI-ION	RFP 315.30 LI-ION	RFP 615.20 LI-ION	RFP 615.30 LI-ION
Storage capacity [EP]	**3–9**	**3–12**	**6–18**	**6–24**
Containment volume (l)	1,150	1,150	2,300	2,300
External dimensions* W x D x H [mm]	3,660 x 1,784 x 2,630	3,660 x 1,784 x 3,575	6,882 x 1,784 x 2,649	6,882 x 1,784 x 3,594
Compartment dimensions W x D [mm]	2,917 x 1,440	2,700 x 1,440	2,917 x 1,440	2,700 x 1,440
Upper compartment W x D [mm]	-	2,700 x 1,235	-	2,700 x 1,235
Weight [kg]	2,420	2,980	4,360	5,370

Note: Dimensions and weights are approximate and may differ depending on optional equipment. Technical changes reserved.
*Without attachments.

STRUCTURAL ANALYSIS.

The structural calculations for the technical room system are based on Eurocode 3 (DIN EN 1993). The loads on the structure are measured according to Eurocode 1 (EN 1991-1-3) for a characteristic wind load $q_{k,w}$ = 0.585 kN/m² and a ground snow load s_k = 2.5 kN/m². The structure is also designed for earthquake zone 3 according to DIN 4149, EN 1998-1:2004. Available with additional equipment for up to wind load zone 4, terrain category I ($q_{k,w}$ = 1.064 kN/m²) and for up to ground snow load s_k = 5.86 kN/m².

ROOF DRAINAGE.

The roof drainage counteracts loads from standing water on the roof. The rainwater is directed via the roof profile to the two short sides of the room and is channeled to an outlet either through the right or left corner profile or through both. From there, it can be directed to a drainage system on site, e.g. via a drainage pipe.

EQUIPMENT OPTIONS.

Whether you need a door hold-open device or fire bulkheads for cable systems and pipes - equipment plays a decisive role in the individual product configuration. Our experts will discuss your requirements with you on site and develop a custom-fit solution. **An overview of additional equipment options can be found** from p. 72.

Automatic door closing and hold-open system with upper door closer. The door is held open by an electromagnet as a counter-support. To close the door, the power to the retaining magnet is cut.

Cable box (fire bulkhead) for the passage of cables through the wall of the fire-rated store, while maintaining the fire resistance of the component.

RFP 815.30 SD Li-Ion

FIRE-RATED STORAGE CONTAINER RFP SD LI-ION.

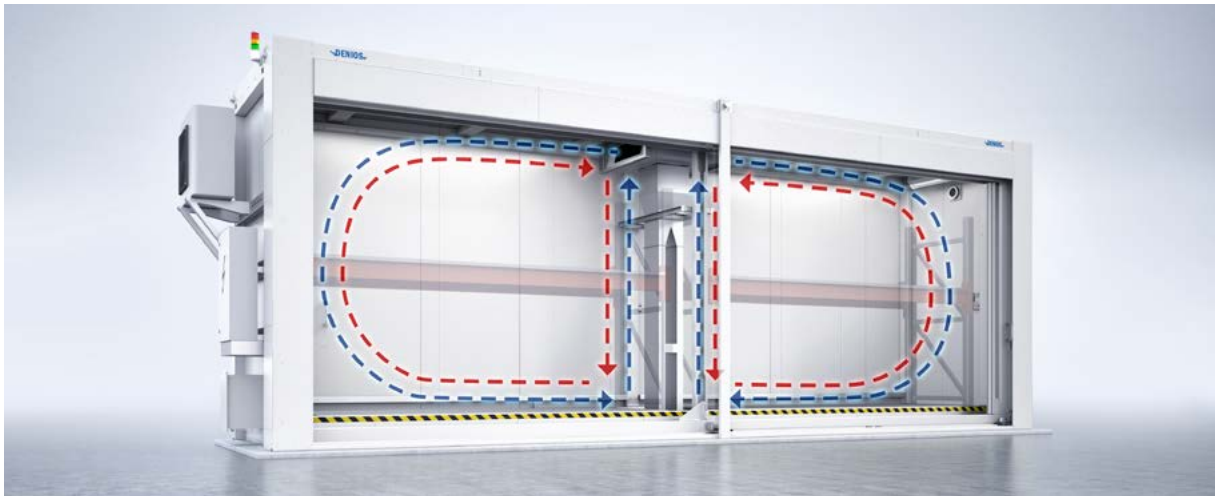
No fire-rated storage container offers more storage capacity for lithium batteries than the RFP SD Li-Ion with large, practical sliding doors. Safe storage is possible, even with indoor installation.

The product illustrations show optional equipment. We would be happy to create a custom product configuration for you.


DENIOS
ETA
APPROVED
EFECTIS
REI 120

FIRE-RATED STORAGE CONTAINER RFP SD LI-ION, WITH SLIDING DOORS.

FOR SIMPLE HANDLING AND MAXIMUM STORAGE CAPACITY.



The RFP SD Li-Ion fire-rated storage container with sliding doors provides fire protection for a large number or large dimension lithium batteries. The larger size of the sliding doors gives you up to 50 % more storage capacity than the wing door variant. In addition, the door opening radius is eliminated, which extends the working area in front of the room system. When installed outdoors, there is therefore no risk of the doors slamming shut unintentionally due to wind loads. In the version with electric sliding doors RFP SD-ED, the doors can be easily opened and closed by remote control from the forklift.

- ETA approval / CE marking according to European Regulation (EU) No. 305/2011.
- Tested and approved as a complete system with 120 minute fire protection (F 120 / REI 120) from inside and outside.

PRODUCT DESCRIPTION.

- The larger sliding doors offer up to 50 % more storage capacity.
- An open sliding door gives easier access to the fire-rated storage container with shelving than a wing door and improves logistical efficiency; when installed outdoors, there is no risk of the doors slamming shut unintentionally due to wind loads.
- The manually or electrically operated fire-rated doors, tested according to EN 16034, close automatically when the fire detectors are triggered.
- Install directly next to the external wall of neighbouring buildings or as a fire-rated separate area, e.g. in a production hall.
- On request available with variable shelf heights.
- Water law tested, two piece, hot dip galvanised 5 mm spill pallet in the lower storage level, with removable grids **(max. load capacity: 1,250 kg/m²)**.
- Long-lasting corrosion protection with fully-galvanised base material and high-quality 2K paint **(RAL 9002, grey-white)**.
- Fire protection panels with high insulation properties (thickness 100 mm, A class material, non-combustible).

MODEL	RFP 815.30 SD LI-ION
Storage capacity [EP]	**8–32**
Containment volume [l]	2 x 1,600
External dimensions* W x D x H [mm]	9,410 x 2,238 x 3,594
Compartment dimensions W x D [mm]	4,000 x 1,440 without shelf 3,900 x 1,440 with shelf (lower compartment) | 3,900 x 1,300 with shelf (upper compartment)
Weight [kg]	7,780

Note: Dimensions and weights are approximate and may differ depending on optional equipment. Technical changes reserved. *Without attachments.

STRUCTURAL ANALYSIS.

The structural calculations for the technical room system are based on Eurocode 3 (DIN EN 1993). The loads on the structure are measured according to Eurocode 1 (EN 1991-1-3) for a characteristic wind load $q_{k,w}$ = 0.585 kN/m² and a ground snow load s_k = 2.5 kN/m². The structure is also designed for earthquake zone 3 according to DIN 4149, EN 1998-1:2004. Available with additional equipment for up to wind load zone 4, terrain category I ($q_{k,w}$ = 1.064 kN/m²) and for up to ground snow load s_k = 5.86 kN/m².

ROOF DRAINAGE.

The roof drainage counteracts loads from standing water on the roof. The rainwater is directed via the roof profile to the two short sides of the room and is channeled to an outlet either through the right or left corner profile or through both. From there, it can be directed to a drainage system on site, e.g. via a drainage pipe.

EQUIPMENT OPTIONS.

With fire-rated stores, safety is of prime importance. Add electric sliding doors with remote control, optional video surveillance or an aerosol extinguishing system to increase safety. Our experts will discuss your requirements with you on site and develop a custom-fit solution.

An overview of additional equipment options can be found from p. 72.

The electric sliding doors of the RFP SD-Li-Ion can be easily opened and closed from the forklift, saving time, with a practical remote control unit.

The aerosol extinguishing system is triggered by temperature and effectively interrupts the chemical combustion process within 4.5 - 15 seconds (depending on model).

CASE STUDY.

E-MOBILITY - SAFE STORAGE OF TRACTION BATTERIES AND LITHIUM BATTERY CELLS.

EDAG BFFT Electronics is the EDAG Group's new brand for electrical and electronic development in the automotive sector. For the E-Drive & Battery product range, the customer required a secure outdoor storage facility for traction batteries and lithium battery cells. The customer had already ordered a turnkey fire-rated store for lithium energy storage devices from DENIOS AG in the past and was very satisfied with it. For the expansion of production an additional room system with some extras was now needed.

PRACTICAL STORAGE LAYOUT AND CONVENIENT EQUIPMENT.

Batteries weighing up to 700 kg and measuring 2,200 x 1,800 x 800 mm (W x D x H) are set via a double-wing door on the room system storage grid. An automatic door closing and hold-open system keeps the door open during loading and unloading. To close the doors, the retaining magnets are disconnected from the power supply by means of a manual release button. In the event of a fire the fire detection system in the room automatically closes the door.
The second, walk-in section of the room is equipped with a 1-wing door and storage shelves to store individual battery modules and cells. Removable grids suitable for pallet trucks form the base.
An LED interior lighting system ensures good visibility in both sections of the room. Further useful features include a 230 V socket and an Ethernet connection.

COORDINATED AIR CONDITIONING TECHNOLOGY.

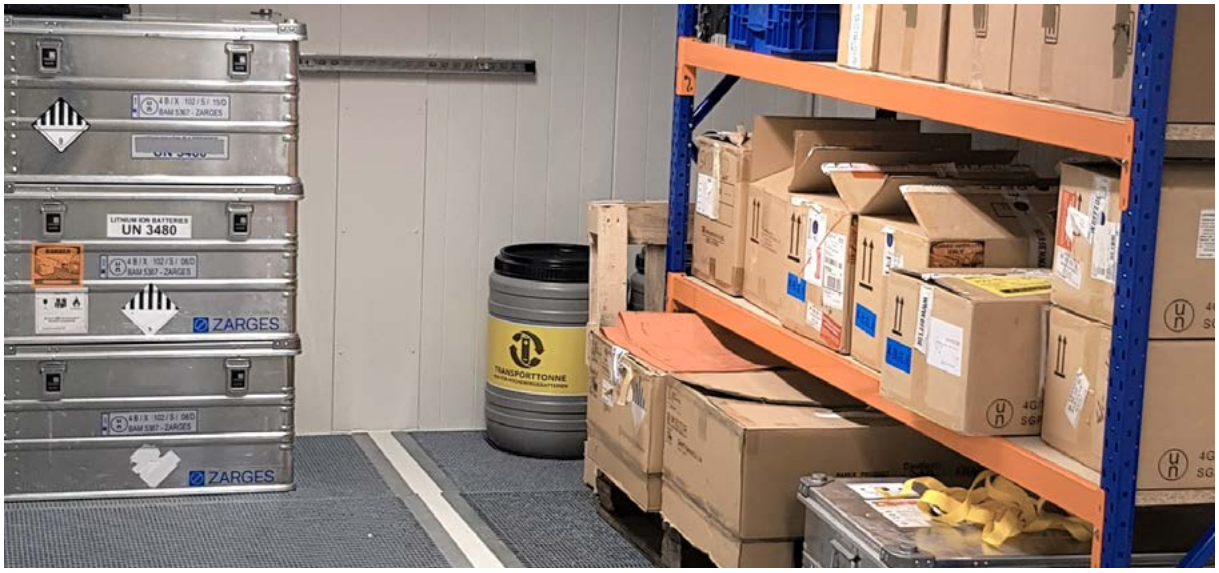
The climate in the room is adjusted to the legal requirements for air quality and temperatures of 22 °C +/-2 K all year round. Excellent energy efficiency is ensured by the high insulation thickness of the fire protection panels of 100 mm and an interplay of air conditioning, heating and technical ventilation, all optimally coordinated by control technology. The air conditioning system is a heat exchanger with CFC-free refrigerant. An electric finned tube heater serves as a supporting heater for the air conditioning system. A circulating air fan distributes the temperature-controlled air evenly throughout the room system. The system is designed for 0.4-times air exchange, which is achieved by technical ventilation. Air inlet and extraction openings are protected from the weather and secured by fire protection flaps.

FURTHER CASE STUDIES.

Looking for a lithium room to suit your needs? Contact us and we will analyse your individual needs. We have already developed many tailor-made solutions for our customers. Selected case studies from recent years can be found on our website.

WWW.DENIOS.DE/PRAXISBEISPIELE-LITHIUM

The entire room system has F 90/REI 90 fire protection from inside and outside with a classification report from Institut für Brandschutztechnik und Sicherheitsforschung (IBS), the German Institute for Fire Protection Technology and Safety Research. In order to accommodate the large drive batteries weighing up to 700 kg and the small battery cells in a practicable way in one room system, the room is divided into two sections: one accessible and one that can be loaded with a forklift truck.



PERMANENT STATUS RECORDING WITH EMAIL ALARM.

All safety-relevant components of the room system are recorded by sensors in the system control and stored for 12 months. Supplementary information on running times and maintenance intervals provides a comprehensive overview. The modern, user-friendly control panel is connected to the high-performance controller via Modbus. This maintains its function even if the control panel fails. The control software developed by DENIOS and coordinated hardware components are optimally designed for the application. The mail server included in the project scope of delivery is controlled via modem and enables fast intervention in the event of a fault by means of real-time alerts.

FIRE EXTINGUISHING TECHNOLOGY IN THE EVENT OF AN INCIDENT.

The room system is equipped with a semi-fixed water extinguishing system for which DENIOS was responsible for project planning, installation and documentation in accordance with VdS CEA 4001. Thermal runaway can be prevented by cooling the lithium storage medium as early as possible and for a sufficiently long time. If the reaction is already advanced, cooling can prevent or stop a chain reaction.

TRANSPORT AND ASSEMBLY.

The turnkey room system was developed by DENIOS at its production site in Bad Oeynhausen, North Rhine-Westphalia. This was immediately followed by transport, installation and commissioning, as well as customer training by the experienced DENIOS service personnel. DENIOS provided the lifting equipment and tools required for the process alongside the installation material and anchoring technology for fixing to the substrate, all of which were perfectly matched to the application. Only the on-site connections were made by the customer.

FUTURE EXPANSION MEASURES.

In addition to the now sufficient storage capacity, the customer plans to add a test environment in the near future. This will initially comprise a room system with test chambers and a room system with measuring station. The DENIOS test rooms are perfectly suited to this purpose from p. 56.

STORAGE AND TESTING OF LITHIUM BATTERIES.

CUSTOMISED SOLUTIONS.

SECTION II

SAFETY CABINETS.

Even if you only store and charge small quantities of lithium batteries of small to medium capacity, an effective safety design must be provided.In cooperation with our customers and based on our many years of experience, DENIOS has developed a new generation of safety cabinets: SafeStore and SmartStore. SafeStore is optimally designed for the storage of lithium batteries. SmartStore is ideal for monitored charging of batteries and as a quarantine store for condition monitoring of critical lithium batteries.

SafeStore: for the storage of lithium batteries.

SAFETY CABINETS FOR LITHIUM BATTERIES.

With the integral 3-stage warning/fire suppression system, the SmartStore and SafeStore-Pro cabinets offer a high level of safety when loading and unloading lithium-ion batteries. A fire starting in the cabinet is immediately recognised. Connecting the warning/fire suppression system to a permanently manned building control system or fire control centre also ensures that appropriate measures can be taken quickly.

SmartStore: for the monitored charging of batteries.

EN 14470-1
TYPE 90

SAFESTORE STORAGE CABINETS.

90 MINUTES FIRE PROTECTION FROM INSIDE AND OUTSIDE.

Passive storage can be used to store new or used lithium-ion batteries can be stored for a set period of time. SafeStore hazardous substances cabinets offer a safe and attractive option for companies looking to take this approach: building on the tried-and-tested technology of our DENIOS hazardous materials cabinets, we have developed a sophisticated system to address the special potential risks associated with the storage of lithium batteries. With fire protection from inside and out, they eliminate any chance of a dangerous thermal runaway developing. Our recommendation: Store new and used batteries separately (on separate shelves) in the SafeStore hazardous materials cabinet.

Lithium battery storage cabinet SafeStore, 6 shelves, width 1200 mm.

Lithium battery storage cabinet SafeStore, 6 shelves, width 600 mm.

Lithium battery storage cabinet SafeStore, 3 shelves, width 1200 mm.

Lithium battery storage cabinet SafeStore, 3 shelves, width 600 mm.

PRODUCT FEATURES.

- All-round protection: 90 minutes fire protection from the outside to the inside (type 90) in accordance with EN 14470-1.
- Over 90 minutes of fire resistance when exposed to fire from the inside out, in accordance with EN 1363-1.
- With liquid-tight floor spill pallet (powder-coated sheet steel).
- For the containment of any leaks from burning batteries.
- Permanently self-closing doors with high-quality, oil-damped door closers.
- Doors can be locked with profile cylinder (closing system compatible) and lock indicator (red/green).
- With adjustable feet for use on uneven floor surfaces.
- Extremely robust construction with scratch-resistant textured paint finish: body colour in anthracite grey (RAL 7016), wing doors in gentian blue (RAL 5010).
- Air extraction connection (NW 75) fitted in the roof of the cabinet.
- The shelves are height adjustable.

MODEL	SAFESTORE-123-L	SAFESTORE-124-L	SAFESTORE-125-L	SAFESTORE-126-L
Equipment	3 shelves, Floor spill pallet	4 shelves, Floor spill pallet	5 shelves, Floor spill pallet	6 shelves, Floor spill pallet
Containment volume [l]	33	33	33	33
External dimensions W x D x H [mm]	1,193 x 615 x 1,953	1,193 x 615 x 1,953	1,193 x 615 x 1,953	1,193 x 615 x 1,953
Internal dimensions W x D x H [mm]	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647
Weight [kg]	469	479	490	499
Order number	261991	261992	261993	261994
ACCESSORIES				
Order number Additional shelves	276033	276033	2276033	276033

MODEL	SAFESTORE-63-L	SAFESTORE-64-L	SAFESTORE-65-L	SAFESTORE-66-L
Equipment	3 shelves, Floor spill pallet	4 shelves, Floor spill pallet	5 shelves, Floor spill pallet	6 shelves, Floor spill pallet
Containment volume [l]	22	22	22	22
External dimensions W x D x H [mm]	599 x 615 x 1,953	599 x 615 x 1,953	599 x 615 x 1,953	599 x 615 x 1,953
Internal dimensions W x D x H [mm]	450 x 522 x 1,647	450 x 522 x 1,647	450 x 522 x 1,647	450 x 522 x 1,647
Weight [kg]	292	297	302	307
Order number	263604	263605	263606	263607
ACCESSORIES				
Order number Additional shelves	277855	277855	277855	277855

THE SAFETY CONCEPT OF SAFESTORE PRO AND SMARTSTORE.

	EVENTS	SYSTEM REACTIONS	FOLLOWING MEASURES
WARNING	If the internal temperature rises above **50 °C**, the warning/fire suppression system sends a warning notification to the central control centre. **Possible reasons:** Temperature build-up due to battery charging. Ventilation system failure.	**Visible and audible alarms** Warning light (red LED) activated and constantly illuminated; operating indicator (green LED) goes out. Slow-beep alarm triggered. **Potential-free switching contact** Alarm forwarded to building control system.	The warning is not an indicator of immediate danger. The system can be inspected immediately by qualified in-house personnel, then any further measures that prove necessary can be taken. When the internal temperature drops below 50 °C again, the system returns to normal operation. The visible and audible alarms will be shut off.
ALARM STAGE 1	**Alarm stage 1** is triggered when the smoke detector senses that smoke is beginning to develop in the cabinet. **Possible reasons:** Smoke detection without simultaneous temperature rise.	**Visible and audible alarms** Warning light (red LED) activated and constantly illuminated; operating indicator (green LED) goes out. Medium-beep alarm triggered. **Potential-free switching contact** Alarm forwarded to building control system.	The system can be inspected immediately by specialist personnel (e.g. the fire brigade), then any further measures that prove necessary can be taken. If the smoke detector does not detect any further smoke development inside the cabinet, the system can be put back into normal operation by briefly disconnecting it from the mains voltage.
ALARM STAGE 2	**Alarm stage 2** is triggered if, once the smoke detector has already been activated (Alarm stage 1), the temperature sensor registers a temperature greater than 70°C inside the cabinet. **Possible reasons:** Fire.	Visible and audible alarms. The warning light (red LED) changes from permanently illuminated to flashing. Fast-beep alarm sounds. In the SafeStore Pro model, the technical ventilation is switched off and the socket strips are disconnected from the mains at the same time. **The fire suppression system is triggered.**	If this happens, the entire system can then only be inspected by authorised asecos service technicians and, if possible, put back into normal operation. In such situations, the fire suppression unit and the smoke detector must be replaced as a minimum.

REACT QUICKLY IN THE EVENT OF FIRE.

With the integral 3-stage warning/fire suppression system, the SmartStore and SafeStore Pro cabinets offer a high level of safety when storing and charging lithium-ion batteries. If a fire ignites in one of the cabinets, the system will detect it immediately so that staff can be evacuated right away. Connecting the warning/fire suppression system to a permanently manned building control system or fire control centre also ensures that trained emergency response teams

- Are alerted quickly and on site within a short time,
- Can take further measures immediately, after an initial evaluation of the situation
- can remove the cabinet from the building for example. This prevents further damage to buildings and injury to people.

The cabinets are equipped with a transport base for fast transportation. The cabinets are automatically disconnected from the power supply during transport. Once the cabinet is in a safe place outside the building, the emergency services can determine what further measures are necessary.

STORAGE CABINETS SAFESTORE PRO.

WITH 3-STAGE ALARM SYSTEM.

SafeStore-Pro storage cabinets extend the basic SafeStore principle with a 3-stage warning/fire suppression system. A fire starting in the cabinet is immediately recognised so that preventive measures can be taken without delay.

SERVICE & MAINTENANCE.

Inspections in accordance with DGUV Regulation 1 / §14 BetrSichV / §4 ArbStättV, with test report:

- Functional inspection and maintenance of mechanical parts.
- Safety inspection.
- Test of fire-protection technical usability (DIN 12925/EN 14470 cabinets only).
- Technical ventilation inspection.
- Visual inspection.

MODEL	SAFESTORE-123-LP	SAFESTORE-124-LP	SAFESTORE-125-LP	SAFESTORE-126-LP
Equipment	3 shelves, Floor spill pallet	4 shelves, Floor spill pallet	5 shelves, Floor spill pallet	6 shelves, Floor spill pallet
Containment volume [l]	33	33	33	33
External dimensions W x D x H [mm]	1,193 x 615 x 1,953	1,193 x 615 x 1,953	1,193 x 615 x 1,953	1,193 x 615 x 1,953
Internal dimensions W x D x H [mm]	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647
Weight [kg]	474	484	494	505
Order number	263600	263601	263602	263603
ACCESSORIES	**Order number**			
Relay module	275800	275800	275800	275800
Telecommunications module	277406	277406	277406	277406
Additional shelves	276033	276033	276033	276033

We strongly recommend that the cabinets are sited at ground floor-level so that evacuation can take place quickly in the event of an incident.
In addition to this, we recommend setting up a maintenance agreement for all cabinets fitted with a fire suppression system.

WWW.DENIOS.DE/SERVICE-WARTUNG

SMARTSTORE STORAGE CABINETS.

FOR THE SAFE CHARGING OF LITHIUM BATTERIES.

PRODUCT FEATURES.

- 90 minutes fire protection from the outside to the inside.
- With technical ventilation.
- With tested, liquid-tight spill pallet (powder coated sheet steel), for containment of any leaks from burning batteries.
- Doors can be locked with profile cylinder (closing system compatible) and lock indicator (red/green).
- Electronic control incl. potential-free alarm contact to the building management system.
- Each storage level is equipped with a high-quality socket strip including metal housing and 10 earthed sockets. The socket strips are already fitted to the rear wall of the cabinet.
- Total output for SmartStore socket strips:
  Max. total output = 3.68 kW - as standard, 230 V, 1-phase, 16 A fuse
  Max. total output = 11.04 kW - optional, 400 V, 3-phase, 3 x 16 A fuses.

MODEL	SMARTSTORE-123-L	SMARTSTORE 124-L	SMARTSTORE 125-L	SMARTSTORE 126-L
Equipment*	3 shelves, Floor spill pallet	4 shelves, Floor spill pallet	5 shelves, Floor spill pallet	6 shelves, Floor spill pallet
Containment volume [l]	33	33	33	33
External dimensions** W x D x H [mm]	1,193 x 615 x 2,224	1,193 x 615 x 2,224	1,193 x 615 x 2,224	1,193 x 615 x 2,224
Internal dimensions W x D x H [mm]	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647	1,050 x 522 x 1,647
Weight [kg]	490	502	514	526
Order number	261995	261996	261997	261998
ACCESSORIES	**Order number**			
400 V adapter	267275	267275	267275	267275
Relay module	275800	275800	275800	275800
Telecommunications module	277406	277406	277406	277406

*The positions of the shelves and socket strips are fixed and cannot be altered. **Height incl. ventilation unit.

ORDER AT THE SAME TIME.

Delivery free to place of use for Li-Ion cabinets SafeStore Pro and SmartStore, order no. 267-392,

Order now at: www.denios.de

SAFETY CONCEPT.

The **SafeStore Pro** and **SmartStore** models have, in addition to fire-resistant, passive fire protection from outside and inside, a high-quality 3-stage warning/fire suppression system inside the cabinet.
Furthermore, depending on the version, the SmartStore charging cabinet is equipped with up to 60 slots for charging lithium-ion batteries safely and in a monitored environment.

Integrated technical ventilation.

Fire suppression system.

Operation indicator (green LED) and warning light (red LED).

* Number of sockets may vary by country.

The SmartStore storage cabinet offers fire protection from the outside to the inside (type 90) in accordance with EN 14470-1 and has a high-quality, 3-stage warning/fire suppression system.

Socket strip with metal housing and earthed sockets.

Smoke detector and temperature sensor.

The perforated shelves in combination with the steel spill pallet prevent any possible loss of liquid.

SMARTSTORE COMPACT.

THE SPACE-SAVING VERSION.

The proven Smartstore safety concept is also used in the Smartstore Compact. The safety cabinet for storing and charging lithium batteries also features a space-saving design.

SmartStore Compact 4 shelves.

Underbench cabinet SmartStore UB.

PRODUCT FEATURES: SMARTSTORE COMPACT.

- With smoke detector and alarm forwarding.
- Equipped with height-adjustable, perforated shelves and 2 socket strips (up to 20 sockets arranged vertically). Depending on the setting height, slots can be covered by the shelf.
- Ready to connect to the mains power supply.
- With adjustable feet for use on uneven floor surfaces.
- With liquid-tight spill pallet (powder coated sheet steel).

PRODUCT FEATURES: SMARTSTORE UB.

- With a height of 78 cm, the underbench cabinet can be flexibly integrated under worktops.
- Drawer lockable to protect against unauthorised access and theft.

MODEL	Equipment	Containment volume Floor spill pallet [l]	External dimensions* W x D x H [mm]	Internal dimensions W x D x H [mm]	Weight [kg]	Order number
SMARTSTORE COMPACT	4 shelves, floor spill pallet	22	599 x 615 x 1953	450 x 522 x 1647	299	271906
ACCESSORIES	**400 V adapter**					267275
	Telecommunications module					277406
SMARTSTORE UB	1 drawer tray, 1 pull-out shelf	-	592 x 570 x 780	470 x 450 x 580	130	279887
ACCESSORIES	**Telecommunications module**					277406
	Castor set					279886
	Additional smoke detector mounted on the outside					280975

*The positions of the shelves and socket strips are fixed and cannot be altered. **Height incl. ventilation unit.

SMARTSTORE BASIC AND SMARTSTORE PREMIUM.

WITH LOCKER SYSTEM.

The SmartStore Basic and SmartStore Premium charging cabinets are equipped with a locker system in powder-coated sheet steel - for separate storage of batteries, protected from unauthorised access. Individually lockable lockers with numbering and 2 sockets per locker. A pair of keys is supplied on a key fob for each locker, including 1 master key. Load capacity per locker: 25 kg.

SmartStore Basic.

SmartStore Premium.

PRODUCT FEATURES.

- Integrated locker systems allow batteries and devices to be stored separately and protected against unauthorised access.
- Safe, easy charging of batteries in the fire-rated cabinet interior via high-quality, ready-to-use earthed sockets.
- Thanks to the integrated transport base, the cabinet can be evacuated immediately in the event of damage and moved to a safe location outdoors.
- Built-in smoke detector for fire detection and forwarding of the alarm to the building management system.
- Optionally available with remote signalling module for alarm forwarding.

MODEL	Equipment	Containment volume Floor spill pallet [l]	External dimensions* W x D x H [mm]	Internal dimensions W x D x H [mm]	Weight [kg]	Order number
SMARTSTORE BASIC	7 lockers	12	599 x 615 x 1.953	450 x 522 x 1.647	307	277480
SMARTSTORE PREMIUM	5 lockers	-	599 x 615 x 1.953	370 x 440 x 265	375	Coming soon
ACCESSORIES	**Telecommunications module**					277406
	400 V adapter					267275

*The positions of the shelves and socket strips are fixed and cannot be altered. **Height incl. ventilation unit.

CASE STUDY.

SAFE STORAGE OF LITHIUM BATTERIES FOR UNDERWATER ROBOTICS.

Lithium energy storage devices such as batteries are now used in a wide variety of applications, including underwater robotics. Kraken Power GmbH, a specialist in this field, deliberately wanted to invest in improved safety when handling lithium batteries in order to better meet the various requirements for storage and handling. The company chose DENIOS as its partner for this project.

CHALLENGE AND PROJECT.

Lithium batteries have a high risk potential. The causes of self-ignition are manifold and are mostly due to an invisible defect. The German Association of Insurers (VdS) recommends increased safety precautions, such as storage in separate fire protection areas, even for medium-power batteries and damaged energy storage devices.

In order to ensure insurance cover and minimise the risk of fire, Kraken Power GmbH uses the special range of products from DENIOS AG for the safe storage of lithium energy storage devices. Kraken Power also needed convenient handling for the separate storage of the lithium modules during production. In order to avoid unnecessary detours during storage, the SafeStore safety cabinet with fire protection on both sides was selected, which could be placed directly at the production site.

THE PERFECT SOLUTION.

With the SafeStore from DENIOS, Kraken Power GmbH has received a new generation of safety cabinets with 90 minutes fire protection from inside and outside and equipment components specially designed for the safe storage of lithium batteries.

What's special: conventional safety cabinets are only designed for fire protection from outside to inside. SafeStore also protects against overheating or smoke development inside during storage. Fire resistance is 90 minutes from the inside to the outside and was proven by an additional fire test according to EN 1363-1. If a fire breaks out outside the cabinet, "SafeStore" also withstands 90 minutes from the outside and is classified according to EN 14470-1 as Type 90.

In addition, a liquid-tight floor spill pallet safely contains any leaks from burning batteries. An integrated, self-closing door mechanism also ensures permanent fire protection.

Kraken Power GmbH, founded in 2016 and based in Bentwisch near Rostock, develops and produces pressure-neutral batteries, drives and electronics for underwater robots, which are sold worldwide. The focus is on uncomplicated and cost-effective technologies for the construction of and application in mechanical, electrical and electronic systems that can tolerate a hydrostatic pressure of 600 bar.
Based on this technology, Kraken Power develops various electric drive and energy supply systems with lithium polymer cells, making it a leading organisation in this sector.

RESULT AND CUSTOMER BENEFIT.

With SafeStore, Kraken Power has a state-of-the-art safety solution with fire protection on both sides for the storage of lithium modules, uniting fire and insurance protection with economic efficiency. Furthermore, the increased safety requirements, which insurers also place on the storage of lithium energy storage devices, were taken into account.

WOULD YOU BE INTERESTED IN A SIMILAR SOLUTION?

Do you need a safe storage environment for your lithium batteries?

Contact us to arrange an appointment! +49 5731 753 455 | VERKAUF@DENIOS.DE

STORAGE AND TESTING OF LITHIUM BATTERIES.

CUSTOMISED SOLUTIONS.

SECTION III

TEST ROOMS.

Newly developed lithium energy storage devices or products with built-in lithium batteries such as domestic appliances, tools or electric vehicles have to be thoroughly tested before they are approved for sale. The planning of a safe test environment must take many customer-specific aspects into account. For this reason lithium test rooms are almost always designed to customer-specific specifications. We will be happy to support you in determining your needs.

SAFE TESTING OF LITHIUM BATTERIES.

The commercial, application-specific safety and fire protection design is the basis for planning a safe test environment. Many additional aspects such as space requirement, installation conditions, data capture for customer-specific evaluations etc are also considered when designing a room. The variety of DENIOS products makes it possible to construct lithium test rooms precisely to your specifications.

The product illustrations show optional equipment. We would be happy to create a custom product configuration for you.

WFP-X 22 as module dismantling room with dehumidification system and personnel air lock.

NEEDS ANALYSIS AND PROJECT ADVICE.

Groundbreaking solutions are created when customer and manufacturer work closely together. Close cooperation is our top priority. Our experts will support you from the very start, with end-to-end project management. Right from when our quote is given, a direct contact will be at your side. A broad team of specialists will develop a tailor-made solution according to your specifications: holistically and competently. "Made by DENIOS" represents the highest levels of quality, all from one supplier.

NEEDS ANALYSIS AND ADVICE – THE FOUNDATION OF YOUR SAFE TEST ENVIRONMENT.

What do your risk assessment and fire protection design say? Which test procedures will be carried out? How will the test environment be integrated into your infrastructure and work processes? Well-directed questions help our engineers clarify what your optimum design could look like. Space requirements, installation location (indoors or outdoors), equipment, safety equipment – your individual requirements profile will be created from our needs analysis. You'll benefit from our expertise as fire safety experts, which we will pass on to you and will use to create your design, allowing your employees and equipment to be protected in the best way possible.

In the automotive field, the EUCAR Hazard Level is used for classifying risk when testing lithium energy storage devices. This information is generally included in the risk assessment. The safety design which results from this analysis will then determine suitable equipment for your test room.

PROFESSIONAL PROJECT MANAGEMENT.

Our aim is the precise implementation of your project, on-time, ensured by our specialist personnel. We will create an individual room system, customised to your individual requirements, in a step by step process in accordance with our integrated service concept.
In addition to the Factory Acceptance Test (FAT), you can also check the progress of the production phases in person.
We have many years of experience with legislation, approval authorities and insurers and will work alongside you throughout the project. We will create a plan together to gain approval for your test environment's structural, environmental, Ex and fire protection aspects - a vital prerequisite for insurance.
After the project has been completed you will receive comprehensive project documentation as well as tested structural analysis calculations. Even when your equipment is up and running you can still rely on us. Our Customer Service Department will ensure that your investment retains its value. With a service and maintenance plan which is tailored to you and your product, we guarantee a high quality, long lasting solution.

THE EUCAR HAZARD LEVELS (DESCRIPTION OF PRINCIPLE)			
LEVEL 0	No effect, no impairment	LEVEL 4	Discharge / loss of mass > 50 %
LEVEL 1	Passive safety	LEVEL 5	Fire or flames, fire
LEVEL 2	Defect / damage	LEVEL 6	Bursting, flying parts
LEVEL 3	Leak / loss of mass < 50 %	LEVEL 7	Explosion of the cells

PRODUCT FEATURES AND EQUIPMENT.

DENIOS prides itself on building rooms which perfectly meet your requirements and offer the highest levels of safety. A standard solution often lacks the optimum features for testing lithium energy storage devices. This is why we manufacture test environments almost exclusively to customer-specific requirements. A benefit for you: during design and production we can take advantage of many proven standard modules. This means you'll be able to benefit from the combination of cost-effective standard production and individual design.

SIMULATION - THE CORE FUNCTION OF YOUR TEST ROOM.

The simulation of loading situations for lithium energy storage devices requires various process-dependent functions to be available in the test environment. Alongside individual equipment options, test rooms from DENIOS offer the possibility of simulating or supporting various loading situations:

- Simulation of extreme environmental conditions by loading up to the permitted temperature limits (e.g. -20 °C to + +60 °C) as well as testing behaviour during temperature variations.
- Effect of increased humidity on the test pieces, e.g. formation of condensation.
- Loading with minimum and maximum power supply, looking at upper and lower voltage limits.
- Shock testing.
- Acoustic tests (shaker).
- Corrosion and corrosive gas testing.
- Electromagnetic compatibility testing.
- Battery cyclic conditioning.
- Long term loading tests.
- Altitude simulation.

AND SIZE? WHATEVER SIZE YOU WANT!

The variable dimensions of the test room mean that it can be designed exactly for the space you have available and the required application. Designed as a compact solution, the test room can be set up at countless locations to save space. The low net weight means that its position can also be easily changed (e.g. following internal re-organisation). Large-scale solutions are also possible, from combined storage and test facilities to multi-room complexes with covered-over logistics and access areas.

CONNECTION-READY TO TURNKEY SOLUTIONS - WE'LL DO EVERYTHING FOR YOU.

We are happy to complete the system with your equipment. Or fit your own internal equipment on our premises.

EQUIPMENT OPTIONS.

Use our comprehensive equipment options to customise your test system - for increased safety and comfort FROM P. 72. If you are looking for a standard room solution, take a look at our systems for storing lithium energy storage devices FROM P. 16. These can also be used for testing, if no customer-specific adjustments need to be made.

CASE STUDY.

TEST STAND FOR STATIONARY ENERGY STORAGE DEVICES.

Voltavision GmbH in Bochum, Germany is an independent R&D company, operating test equipment for high technology systems in the electromobility and renewable energy sectors. The size of the units tested ranges from lithium-ion batteries for electrical equipment right up to "large" energy storage systems. It was for these large applications that Voltavision and DENIOS developed a test room together, which had a customised test room volume and allowed testing of lithium energy storage devices over a wide temperature range.

CHALLENGE AND PROJECT.

The energy revolution needs rethinking - in many respects. More and more energy is supplied by renewable sources such as wind farms or solar installations. Energy is often produced at sites and at times of the day when it can't be used directly. This also means that electrical energy storage devices are becoming an increasingly relevant issue. Extensive tests, in which the effects of different environmental influences on the service life of the modules are analysed, are therefore all the more necessary. Although professional bodies have made many recommendations, there are no laws or regulations in the proper sense which constructors and operators can use as guidance. Safety designs are therefore based more on insights than standards.

Based on the risk assessment, a separate fire compartment was necessary in this case, which was realized by enclosing the test stand. A fire-rated system which would resist a fire load from inside or outside for 90 minutes was required. Standard climate control chambers available on the market did not meet this requirement.

WOULD YOU BE INTERESTED IN A SIMILAR SOLUTION?

Do you need to test large lithium energy storage devices at various temperatures? And without any major construction work within existing company buildings? **Our room systems offer the perfect solution. Contact us to arrange an appointment!**

+49 5731 753 455 | SALESBERATERES@DENIOS.DE

THE PERFECT SOLUTION.

Working together, Voltavision and DENIOS developed a fire-rated test stand (F 90/ REI 90) for stationary energy storage devices. Very large batteries, within the permitted test volume of up to 30 m³, can be subjected to defined thermal and electrical conditions. A temperature range of -20 °C to +60 °C, for example for artificial ageing processes, can be simulated under standardised test conditions. The batteries are analysed for cycling stability and calendar life. In addition, a comprehensive safety design was taken into account in the planning. The inclusion of corresponding sensors allowed continuous room monitoring. Whether it's gas detection or temperature sensing - accident prevention is vital!

A pressure relief panel in the roof area allows controlled pressure equalisation in the event of an emergency. High performance technical ventilation also removes any harmful and potentially explosive gases. And if the worst should happen, contaminated cooling water is collected in a spill pallet. An acid resistant, anti-static inliner gives an additional level of safety. A separate connection is provided for emptying the WHG spill pallet. This ensures that cooling water can be properly disposed of.

RESULT AND CUSTOMER BENEFIT.

The result of this intensive cooperation is an innovative, turnkey solution offering repeatable measurement results at any time! All this was done without a separate climate chamber in the test room!

CASE STUDY.

LITHIUM CELL MANUFACTURER RELIES ON SAFETY FROM DENIOS.

Manufacturers of lithium-ion cells are expanding worldwide. In order not to waste valuable time when setting up new production facilities, the focus is on modular and turnkey solutions. A lithium cell manufacturer commissioned a test room from DENIOS to carry out product tests. The closed system had national technical approval, 90 minutes fire protection from inside and outside, a working environment that is climatically adapted to the sensitive technology and customer-specific equipment for demanding activities.

INTEGRATED DEHUMIDIFICATION MINIMISES THE RISK OF FIRE.

In order to ensure high product quality, the manufacturer plans to conduct regular tests. This also includes the dismantling of the lithium cells into their basic components. As contact with humidity in the air is sufficient for lithium compounds to catch fire, these tests must take place in a controlled working environment. In close cooperation with the customer, DENIOS has created a self-contained, technical room system for these demanding activities. A customer-specific solution has been developed on the basis of the standardised hazardous materials store WFP-X 22 Li-Ion, which already has F 90 fire protection and flexible equipment options.

The equipment is adapted to suit the planned activities and the room system is divided into an entrance and a dismantling area. The dismantling area is connected to a dehumidification system to keep humidity low and reduce the risk of fire to a minimum. Air conditioning generates a constant 20 °C +/- 2 K. A partition wall with a personnel air lock separates the two areas.

Access authorisation is controlled by the level of humidity in the entrance area so as not to influence the climate in the dismantling room when the door is opened. An additional exit door in the working area serves as an escape route in an emergency. Four mobile hand-held fire extinguishers are mounted in different places for quick access.

SAFETY IS IN EVERY COMPONENT.

All components of the test room are designed for safety. Windows in the doors and in the outer walls as well as video surveillance offer visual control from outside, ensuring additional personal safety. The exterior cladding, including the windows and the cable and pipe breakthrough points, is fire-resistant (F 90).
The floor is antistatic and resistant to chemicals. Emergency lighting makes it possible to complete work with care, even during power failures. Emergency signalling can be triggered by three manual call points and two fire detectors. Both audible and visible signals are given. In the event of an accident, further protective measures are provided by a complex control system.

ONE ORDER - FULL SUPPORT.

For the dismantling workstation, the customer opted for a DENIOS AT Compact worktable with air extraction. The work surface is specially made of plastic for this application. Powerful fans ensure an airflow from the environment towards the extraction vents. With air speeds up to 0.5 m/s at the entry, harmful substances and emissions in the work area are safely captured, effectively retained and extracted.
The Compact worktable's folding front safety screen protects employees from emissions. A gas detector signals an alarm as soon as a hydrogen concentration is detected.
Three additional worktables without air extraction for hazard-free activities extend the working area. Several 230 V sockets and dimmable LED lighting complete the individual room equipment.

As a rule, many different trades and contractors are involved in construction projects. This means there is always a risk of coordination problems and information gaps. As a supplier and manufacturer of turnkey technical room systems, DENIOS has all the required expertise in-house. In the project described, the customer benefited from a central contact person right from the start. A project engineer coordinated the entire project for the customer, from requirements analysis to turnkey delivery.
With direct communication and internal coordination between the various departments, the customer's requirements were recorded and implemented with no loss of information. The joint discussion made a decisive contribution to the production of a meaningful and economical concept. The customer also made the decision to award the project to DENIOS because of our market leading position in hazardous material storage, our existing fire protection approvals and extensive references for storage and test rooms for lithium energy storage devices, going back many years.

STORAGE AND TESTING OF LITHIUM BATTERIES.

CUSTOMISED SOLUTIONS.

SECTION IV

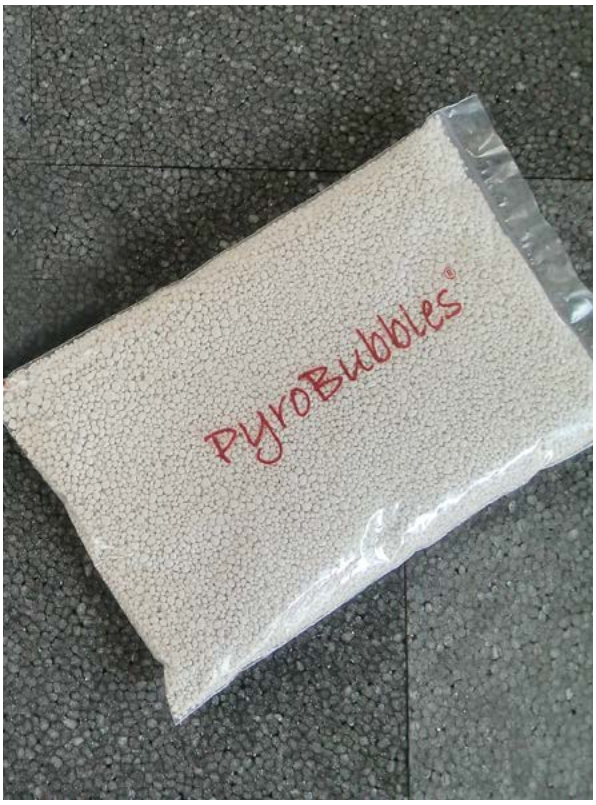
TRANSPORT CONTAINERS.

Damaged batteries are considered dangerous goods for transport. DENIOS offers suitable transport and storage containers with UN approval, either in metal or plastic. PyroBubbles® are used as the ideal filling agent.

PYROBUBBLES® EXTINGUISHING AGENT AND FILLER.

100% ENVIRONMENTALLY-FRIENDLY.

Pyrobubbles® are an extinguishing media which has been positive tested by MPA Dresden according to DIN EN 3-7 for solid and liquid combustible substances (fire classes A, B, D and F). The hollow glass granules are classified as building material class A1 (DIN 4102). The product is very light and highly suited for use as an inert filler. After a fire has been extinguished, the extinguishing granules can be simply collected up again and for the most part reused. PyroBubbles® are also excellent for preventive fire protection, especially for filling hollow spaces, cable ducting and installation shafts (horizontal and vertical) when used as a bulk good.



PYROBUBBLES®.

- Ideal filler for storage and transport of lithium-ion batteries (UN 3480, UN 3090), consisting mainly of silicon dioxide with an average grain size of 0.5 to 5 mm.
- Non-combustible building material (A1, DIN 4101, EN 13501).
- 100% environmentally-friendly.
- Absorbs electrolytes (tested by the German Federal Institute for Materials Research and Testing).
- Low thermal conductivity and electrically insulating.
- Approx. 8-10 times lighter than sand (approx. 230 kg/m^3).
- Specific heat capacity of just 0.7 kJ/(K-kg), porosity of 85 %.
- Mounting provides vibration protection.
- PyroBubbles® float on the surface of liquids and are particularly suitable for fighting liquid fires - regardless of polarity.

PYROBUBBLES® FILLER.

The PyroBubbles® filler material in conjunction with UN certified stainless steel containers is one of the safest systems to handle and transport lithium-ion batteries. It has been approved by the relevant authorities (German Federal Institute for Materials Research and Testing, BAM) as a packaging method for the transport of damaged and dangerously reactive lithium-ion batteries.

PACKAGING METHOD FOR TRANSPORT.

Lithium batteries are considered dangerous goods. They are therefore subject to the dangerous goods regulations. In ADR and RID, they are assigned to the following UN numbers as dangerous goods in Class 9 (various hazardous substances and articles) (UN approvals for batteries in equipment are not listed here):

- UN 3090: Lithium metal batteries (including lithium alloy batteries)
- UN 3480: Lithium-ion batteries (including lithium-ion polymer batteries)

PyroBubbles® are temperature resistant to approx. 1100 °C. At higher temperatures they begin to melt and form a closed, thermally insulating layer around the seat of the fire.

LITHIUM BATTERY TRANSPORT BOX IN STAINLESS STEEL.

PYROBUBBLES® FILLER.

PRODUCT DESCRIPTION.

- Safety system for storage and transport in accordance with Special Provision 376 ADR for damaged and faulty (Packaging Instructions P 908 and LP 904) as well as unsafe lithium-ion batteries (Packaging Instructions P 911 and LP 906).
- Certified, tested and with UN approvals. Scientifically supported by real fire tests.
- Can be reused as a system in the long term. Easy handling, with safety valves, secured with quick release fasteners.
- Type approval: Packaging group 1 (ADR, RID, ICAO, IMDG).
- Stackable and lockable, no crane eyes, can be accessed from all sides by industrial trucks.
- No additional inner packaging required.
- Also available in special dimensions on request.
- Pyrobubbles® is an extinguishing media positive tested by MPA Dresden according to DIN EN 3-7 for solid and liquid combustible substances (fire classes A, B, D and F).
- Transport of prototypes according to SV 310, P 910 and LP 905.

MODEL	S-BOX X1	S-BOX X2	M-BOX X1	M-BOX X2	XXL BOX
Equipment	4 paper bags of PyroBubbles®	6 paper bags of PyroBubbles®	10 paper bags of PyroBubbles®	16 paper bags of PyroBubbles®	50 paper bags of PyroBubbles®
External dimensions W x D x H [mm]	799 x 599 x 734	799 x 599 x 1,114	1,199 x 799 x 792	1,199 x 799 x 1,252	2,500 x 1,484 x 1,029
Internal dimensions W x D x H [mm]	676 x 476 x 580	676 x 476 x 960	1,076 x 676 x 640	1,076 x 676 x 1,100	2,376 x 1,356 x 808
Maximum dangerous goods load [kg]	66	110	155	360	400
Maximum gross weight [kg]	160	240	350	630	1212
Volume [l]	187	309	466	800	2603
Order number	261759	261760	261761	261762	261763

LITHIUM BATTERY TRANSPORT BOX IN PP.

PYROBUBBLES® FILLER.

PRODUCT DESCRIPTION.

- Application for e-bike batteries, power tools, laptops and mobile batteries, electric car batteries, electric vehicle batteries, etc.
- Safety system for storage and transport in accordance with Special Provision 376, Packing Instruction 908 ADR for damaged and defective lithium-ion batteries. For transport for recycling purposes as defined in Special Provision 377, Packing Instruction 909, for non-damaged and non-defective lithium-ion batteries or those with EOL (End of Life) status.
- Tested boxes, with UN approval.
- Transport of prototypes according to Special Provision 310, Packing Instructions P 910, LP 905.
- Safe protection against thermal runaway, and exothermic reactions, thus preventing damage to the environment.
- Permanently reusable, easy handling.
- Operating temperature from -20 to +80 °C, storage temperature 15-30 °C.
- Pyrobubbles® is an extinguishing media positive tested by MPA Dresden according to DIN EN 3-7 for solid and liquid combustible substances (fire classes A, B, D and F).

MODEL	S-BOX X1 ADVANCED	S-BOX X2 ADVANCED	XS-BOX 1 ADVANCED	XS-BOX 2 ADVANCED
Equipment	Metal basket, 1 paper bag of PyroBubbles®	Metal basket, 2 paper bags of PyroBubbles®	Metal basket, 1 paper bag of PyroBubbles®	Metal basket, 1 paper bag of PyroBubbles®
External dimensions W x D x H [mm]	600 x 400 x 295	600 x 400 x 441	400 x 300 x 235	400 x 300 x 285
Internal dimensions W x D x H [mm]	492 x 292 x 196	492 x 292 x 341	298 x 198 x 135	297 x 195 x 190
Maximum dangerous goods load [kg]	30	24	7	6
Maximum gross weight [kg]	45	45	13	13
Volume [l]	28	49	8	11
Order number	261769	261771	261765	261767

LITHIUM BATTERY TRANSPORT BOX IN PLASTIC.

SUITABLE FOR USE IN ACCORDANCE WITH SV 310 OR SV 376 ADR 2021.

PRODUCT DESCRIPTION.

- For the storage and transport of defective or damaged lithium-ion batteries. Functionality verified using real fire tests.
- X-coded packaging, also suitable for use in accordance with SV 310 or SV 376 ADR 2021.
- Developed in accordance with the latest hazardous goods regulations (ADR 2021, P 911) issued by the German Federal Institute for Materials Research (BAM). Also approved for the transport of critical lithium-ion batteries in the process definition.
- Easy handling and fast packing with LogBAGs (non-combustible according to DIN 4102 and EN 13501-1).
- Leak management for possible electrolyte leakage.
- High flexibility in battery dimensions.
- Areas of application: power tools e.g. for construction and gardening equipment, consumer electronics, e.g. for electronics or model making, e-mobility, e.g. for e-bikes or e-scooters.
- Suitable for cells and batteries under UN numbers 3090 and 3480.

MODEL	LITHIUM BATTERY TRANSPORT BOX S1
Maximum load hazardous goods [kg]	**20**
Maximum gross weight [kg]	30
External dimensions W x D x H [mm]	600 x 400 x 340
Internal dimensions W x D x H [mm]	480 x 280 x 180
Material	Plastic
Order number	275798

LITHIUM BATTERY TRANSPORT BOX IN ALUMINIUM.

APPROVAL FOR THE TRANSPORT OF CRITICALLY DEFECTIVE LITHIUM BATTERIES.

PRODUCT DESCRIPTION.

- For the safe storage and transport of defective or damaged lithium batteries according to ADR SV 376, P 908.
- High-quality special container in aluminium, high stability with three fully welded aluminium profile frames.
- With fireproof padding and absorbent material in textured glass fibres.
- Dust-free internal fittings.
- Approval for the transport of critically defective lithium batteries in accordance with P 911, SV 376 and German Federal Institute for Materials Research.
- Fire test successfully passed: no spread of flames to neighbouring batteries. Temperature at the container surface remains below 100 °C.
- Max. gross mass of the dangerous goods load: 65 kg.
- Can be used for up to three lithium batteries (UN 3480) each up to 814 Wh.

MODEL	LITHIUM BATTERY TRANSPORT BOX SAFE K470
Maximum gross weight [kg]	**65**
Capacity [l]	30
External dimensions W x D x H [mm]	600 x 600 x 250
Internal dimensions W x D x H [mm]	550 x 550 x 220
Material	Aluminium
Order number	272301

STORAGE AND TESTING OF LITHIUM BATTERIES.

CUSTOMISED SOLUTIONS.

SECTION V

EQUIPMENT.

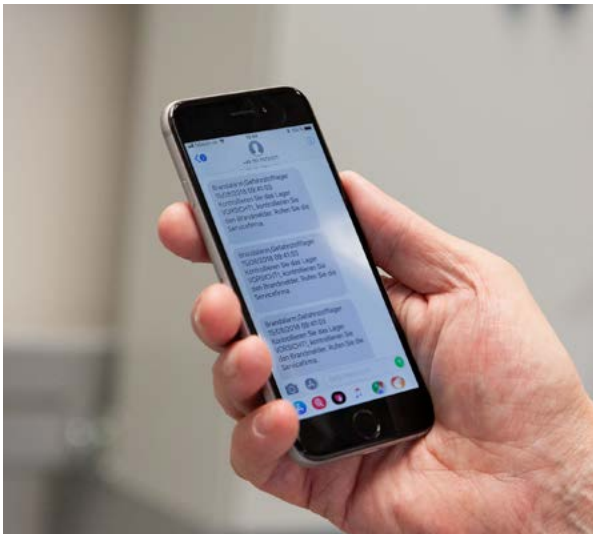
We aim to optimise your store or test room for lithium batteries to exactly meet your requirements in an uncomplicated and efficient manner. That is why we have already integrated the corresponding modules into our extensive equipment program. Choose suitable options for your safety and convenience from a wide range of proven components.

EQUIPMENT FOR FIRE-RATED STORES.

MODERN WORKING ENVIRONMENT. INNOVATIVE ROOM SOLUTIONS.

Safety requirements for fire-rated stores are becoming increasingly stringent. But is safety the only requirement for a fire-rated store? When looking at the modern working environment, it's clear that digitalisation is bringing significant change to work processes, complexity is increasing and climate change is making us change our approach. But what kind of influence does this have on storage and process technology? We have set ourselves the goal of helping to promote the development of a modern work environment. In the new DENIOS equipment range for technical room systems you'll find numerous options for creating a future-oriented workplace.

Think Green: use your green fingers and increase the insulation value of your hazardous materials store at the same time. A living layer of insulation for the roof of the store makes a significant contribution to the environment, increasing insects, retaining rainwater and binding fine dust. The attractive appearance also increases the sense of well-being.



The advent of digitalisation: keys, knobs, switches, paper? The modern world of work hasn't been that way for a long time: digital access systems, touch panels, video monitoring, database services for condition monitoring or warehouse management and much more, have changed work processes, making them safer and more efficient. Digitalisation is also making its way into storage and process technology at DENIOS.

DIGITAL SERVICES.

The storage of hazardous substances is subject to strict regulations and laws for reasons of work safety and environmental protection. Planning, organising and operating a hazardous materials store entails a multitude of challenges and obligations for the operator. The digital services from DENIOS offer reliable and convenient support for these tasks.

WWW.DENIOS.DE/DIGITALE-SERVICES


Aktuell :
15.8°C
DENIOS
CAUTION
EX
DENIOS

SECURELY NETWORKED. CONDITION MONITORING FOR HAZARDOUS MATERIALS STORES.

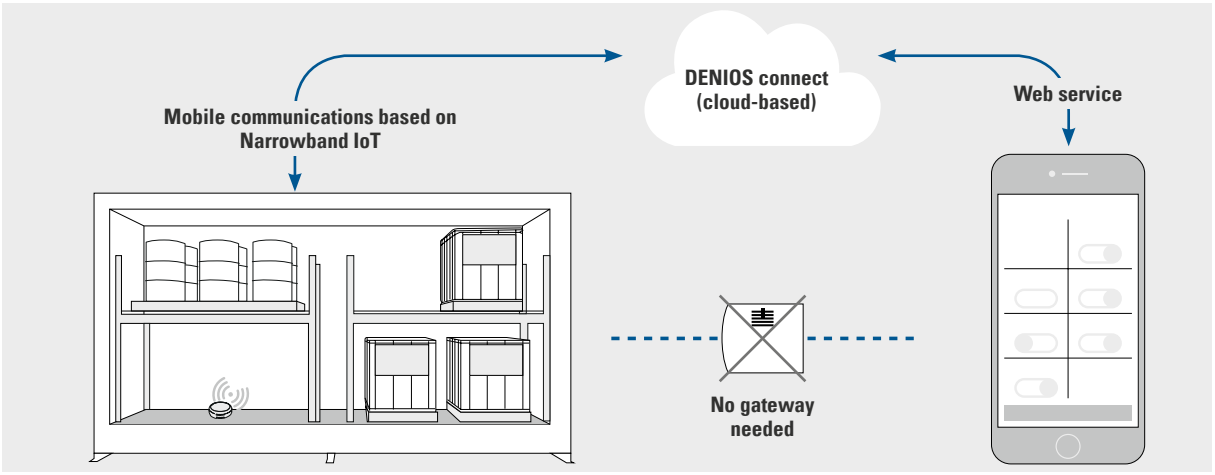
WEB APP FOR A NEW LEVEL OF SECURITY - ANYTIME, ANYWHERE.

As an operator, you know that you must regularly check the proper condition of your fire-rated store, as required by law. This inspection must comply with the specific requirements of the Industrial safety regulation (BetrSichV) for the risk in question, e.g. in the case of fire and explosion hazards. DENIOS connect offers you optimum support so that you can complete all the necessary checks properly - with the help of practical data transmission and intelligent condition monitoring solutions.

Regardless of whether you are on the move on your company premises or on standby duty: the active DENIOS connect sensors permanently monitor the status of your technical room system. If there is a leak, smoke or other fault, DENIOS connect sends you an alarm - in real time as an SMS or e-mail on your smartphone, tablet or desktop PC. You can react immediately, saving valuable time and any subsequent costs for rectifying the situation. The incident report documenting the event can be easily downloaded as a PDF. In addition, a reminder function ensures that you never miss a maintenance appointment.

STATE-OF-THE-ART MOBILE COMMUNICATIONS TECHNOLOGY: NARROWBAND IOT.

DENIOS connect is a user-friendly, cloud-based web app. It has been tested according to the latest security criteria and complies with the strict rules of the General Data Protection Regulation. NarrowBand IoT, currently the most efficient mobile network technology for applications such as DENIOS connect, is used for data transmission. Independent of your company network, you will have access to the relevant data and alarm messages from your hazardous materials store at any time and from practically anywhere in the world. Narrowband IoT is based on LTE and uses the associated 3GPP security mechanisms. The technology is specially designed for smaller data volumes and dispenses with unnecessary LTE functions. It therefore offers particularly cost-effective and reliable mobile communication.



WEB APP - QUICK AND SIMPLE TO ACTIVATE.

The DENIOS connect web app can be activated in just a few steps. When you purchase a DENIOS connect product, you will receive a login code to enter when registering for your company account. The assignment of admin and user roles as well as passwords are easy to manage in the application itself.

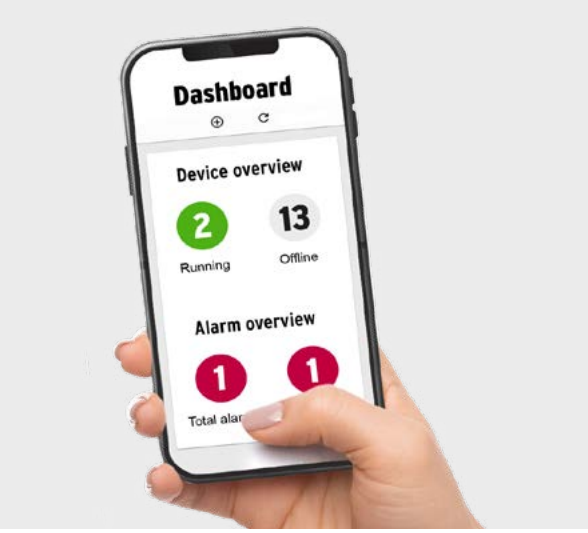
All your products are clearly displayed in the DENIOS connect user interface. Recipients for the alarm messages can be saved and the type of notification: SMS and/or e-mail. For the message text, choose from predefined details or select the "Free text" option. In addition, you'll have access to dashboards and detailed information on your networked DENIOS products.

If there are several room systems on your premises, you will of course be informed of the exact location for the alarm message in the event of a malfunction.

MEASUREMENTS FOR CONDITION MONITORING.

Permanent status recording, alarm configuration and notifications by SMS and/or email are possible for the following safety-relevant components of the technical room system:

- Room temperature.
- Air conditioning system (operating / fault).
- Technical ventilation (operating / fault).
- Heating (operating / fault).
- Door control unit / fire alarm (fault).
- Door (open / closed).
- Central power supply (operating / power failure).
- Gas sensor (fault).
- Leak sensor (fault).
- Upcoming maintenance (info).

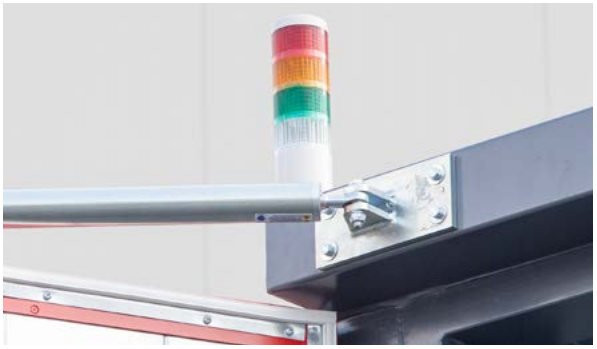


SPILLGUARD® CONNECT LEAK RECOGNITION.

The first warning system of its type: fully autonomous, operational at the push of a button and suitable for fitting to any type of spill pallet, at any time. SpillGuard® connect safely detects dangerous leaks and sends a leak warning message via SMS and/or email to your smartphone, tablet or desktop PC. You can react immediately, saving valuable time in cleaning up the leak as well as any subsequent costs.

THE ON-SITE WARNING.

DENIOS connect transmits data and signals that are also available to view on site at the hazardous materials store at any time. This gives you comprehensive warning as soon as there is a problem. For example, use the DENIOS Communication Bar (see **Control technology**, p. 79) to get a quick overview of all important condition variables on the easy-to-use touch screen. The alarm function can be provided using visible warning lights and/or audible sirens.



TEST DENIOS CONNECT – LIVE.

See the advantages of DENIOS connect technology for yourself in a live demonstration.

Get more information and book a free consultation: +49 5731 753 455 | WWW.DENIOS.DE/CONNECT

AIR CONDITIONING TECHNOLOGY.

www.denios.de/glt/klimatechnik

In this context, we consider air conditioning technology to be the heating, ventilation, air conditioning and cooling technology used to regulate the internal climate. A reliable air conditioning system for heat or frost-sensitive stored goods is required in many industrial areas, for example to protect stored containers from the damaging effects of temperature.

AIR CONDITIONING SYSTEM.

Item No. 274656

- For all insulated DENIOS hazardous materials stores and fire-rated stores.
- In the standard design, internal temperatures of +5 °C at an external temperature down to -15 °C, or an internal temperature of +25 °C at an external temperature up to +35 °C are achieved.
- Also available in Ex proof design (for internal area only).

FINNED TUBE HEATERS.

Item No. 274655

- For all insulated DENIOS hazardous materials stores and fire-rated stores.
- With integral safety temperature limiter to prevent overheating.
- Available in Ex and nEx proof versions.
- For larger room systems, recirculated air heating can also be used.

TECHNICAL VENTILATION.

Item No. 274846

- For effective cross-ventilation of the hazardous materials store.
- Weatherproof housing for outdoor installation.
- Air inlet and extraction openings protected from the weather by mesh and secured by fire protection flaps for fire-rated stores.

AIR EXTRACTION MONITORING.

Item No. 272088

- Explosion protected airflow monitor (pressure switch).
- Monitoring the effectiveness of technical ventilation in accordance with TRGS 510 Annex 5 Para. 2 (6).
- Suitable for gas, mist, vapour and dusts in zones 1, 2, 21 and 22 (non-aggressive media).

CONTROL TECHNOLOGY.

www.denios.de/glt/steuerungstechnik

The control technology, which is optimally matched to DENIOS storage and process technology, records, processes and compares actual measured values with setpoint values using state-of-the-art sensor technology. If there are deviations from the setpoint value or a fire occurs, an alarm is triggered visually and audibly. In addition, automatic locking or extinguishing systems are activated, for example. All information is clearly displayed on the operating and display elements.

COMMUNICATION BAR.

Item No. 274651

- For DENIOS walk-in fire-rated storage container WFP Li-Ion.
- Developed by DENIOS.
- Modern, central control unit for all electronic components of the technical room system incl. access control via RFID.

BASIC CONTROL SYSTEM.

Item No. 274657

- Acquisition and processing of current measurement data.
- Switching logic optimally matched to DENIOS storage and process technology.
- More details can be found on our website.

COMFORT CONTROL SYSTEM.

Item No. 274658

- Acquisition and processing of current measurement data, which is saved for 12 months.
- Modern touch panels/displays for indoor or outdoor use with high operating comfort.
- More details can be found on our website.

ENCLOSURE OF OPERATING ELEMENTS.

Item No. 274855

- Enclosed controls and operating elements are protected from unauthorised access in the front of the switch cabinet.
- Access is restricted as the control cabinet is locked with profile half cylinders.

MAKING USE OF THE SPACE IN WALK-IN STORES.

www.denios.de/glt/begehbare-lager

The walk-in room system offers almost limitless ways to use the space. The inner room can be fitted with built-in shelving or the floor can be used for storage. Mounting rails can be used to make attachments to the walls, e.g. for attaching loading devices.

SHELVING.

Item No. 274848

- Available in three different widths (750, 1,000 and 1,300 mm) and a depth of 500 mm.
- Shelf load with an evenly distributed load: 250 kg, bay load: 800 kg.

MOUNTING RAILS.

Item No. 274857

- Mounting rails for fixing on-site installations (e.g. loading devices) to the interior wall of the room.
- With toothed C-profile.
- Profile width, rail length and spacing as required.

PARTITION WALLS.

Item No. 274831

- Create different placement / storage / climate / temperature areas in the same room system.
- Different substances can be placed / handled separately from each other in compliance with the law / temperature requirements.
- For smaller quantities, it's a cost-effective alternative to separate room systems.

STORE, LOAD OR TEST.

Depending on the usage concept, various safety measures must be taken. Let our experts advise you free of charge.

Call us for a free consultation! +49 5731 753 455

MAKING USE OF THE SPACE IN STORAGE CONTAINERS WITH SHELVING.

www.denios.de/glt/regallager

When we talk about "customised solutions", our custom planning capability is also reflected in the great variety of our storage containers with shelving. For example, you can choose different shelf heights, a variable number of storage levels or an extra-deep design.

ADJUSTABLE SHELF HEIGHTS.

Item No. 274830

- For DENIOS fire-rated shelving systems RFP Li-Ion.
- Height-adjustable shelf unit with removable grids and shelf guard.
- Choose any number of shelves between 1 and 4.
- Enables optimum use of the space for different types of stored goods.

PARTITION WALLS.

Item No. 274831

- Create different placement / storage / climate / temperature areas in the same room system.
- Different substances can be placed / handled separately from each other in compliance with the law / temperature requirements.
- For smaller quantities, it's a cost-effective alternative to separate room systems.

EXTRA DEEP DESIGN.

Item No. 274832

- The extra-deep design of the shelving system offers an increased storage capacity and more space for bulky goods.
- In combination with access from both sides, the room system is easy to load.
- In the extra-deep version, the shelving system can also be created as a fully or partially walk-in room system.

IN PRACTICE: A CLEVER COMBINATION OF STORAGE CONTAINER WITH SHELVING AND WALK-IN SPACE.

As an engineering expert for future mobility, our customer EDAG Group also deals with the electrification of vehicles. For the E-Drive & Battery product range, the company required a secure outdoor storage facility for traction batteries up to 700 kg and small lithium battery cells. In order to accommodate the various stored goods in one room system, the store is divided into a walk-in section and one that can be loaded with a forklift truck.

Read the full report here WWW.DENIOS.DE/EDAG

ROOM ACCESS.

www.denios.de/glt/raumzugang

When planning room access, you should consider various aspects: in addition to high security with electronic access systems or hold-open systems for fire doors, convenient operation plays an important role. Smooth work processes can be guaranteed by using remote controls and ramps to ensure barrier-free access to the hazardous materials store for lifting and transport tools.

DOOR HOLD-OPEN SYSTEM.

Item No. 272097

- For fire-rated stores with wing doors from DENIOS.
- The door is held open by an electromagnet as a counter-support.
- When the door closing button is operated or if there is an alarm, the power to the electromagnet is cut and the door closes.

EXTERNAL LIGHTING WITH MOTION DETECTOR.

Item No. 274840

- External lighting with motion sensor.
- For brightness and motion-dependent lighting control.
- Large detection range.

DOOR REMOTE CONTROL.

Item No. 274839

- For DENIOS fire-rated storage container RFP SD-ED Li-Ion.
- The electric sliding doors can be easily opened and closed from the forklift, saving time, with a practical remote control unit.

COMMUNICATION BAR.

Item No. 274651

- For DENIOS walk-in fire-rated storage container WFP Li-Ion.
- Developed by DENIOS.
- Modern, central control unit for all electronic components of the technical room system incl. access control via RFID.

PRODUCT HANDLING.

www.denios.de/glt/produkthandling

DENIOS develops products to make every hand movement and step even safer and more comfortable for your employees. This is the only way to increase work safety in everyday operations. In our equipment range you'll find efficient solutions for handling pallets and heavy battery modules, which facilitate handling and enable optimum use of the storage space.

OVERHEAD CRANE BEAM.

Item No. 274-821

- Crane system for lifting and transporting heavy loads within the room system.
- Suspended pushbutton attached for operation on the move.
- Mechanical slip clutch as overload protection.

SUPPORT RAILS FOR PALLETS.

Item No. 274828

- Facilitate the positioning of pallets in the racking system.
- Full-length support rails.
- Enable exact positioning and thus optimum use of the available space.

ROLLER CONVEYORS FOR EURO PALLETS.

Item No. 274820

- Container/pallet transport by driven rollers or lifting and lowering roller conveyor (gravity conveyor).
- Adapts to suit the task exactly.
- Low maintenance and wear-free.

TRANSPORT AND QUARANTINE CONTAINERS.

DENIOS transport containers for hazardous goods are suitable for storing and transporting damaged, defective and unsafe lithium batteries in accordance with Special Provision 376 ADR. They can also be used for transport for recycling purposes: in the sense of Special Provision 377 for non-damaged and non-defective lithium-ion batteries or those with EOL (End of Life) status or for transporting prototypes in accordance with Special Provision 310.

The product range for transport and quarantine containers can be found FROM P. 64.

TEST BENCH FOR LITHIUM BATTERIES.

The AT Li-Ion worktable offers the highest level of personal safety during testing procedures on lithium-ion batteries. A water basin integrated into the table and a smoke extraction system enable immediate evacuation of the working area in case of battery failure. Due to its sturdy construction, the worktable is optimally designed for use in a tough industrial environment and is also ideal for use in a laboratory.

FIRE PROTECTION.

The liquid-permeable work surface of the test bench is mounted above a water basin and can be lowered into the basin by a motor in an emergency. High-quality actuators ensure a rapid lowering speed of up to 50 mm/s. The lithium battery is covered and cooled by the water bath. The water can flow out of the basin via the centrally located drain with stopcock.

SMOKE EXTRACTION.

The smoke extractor can be switched on in an emergency or triggered by a smoke detector. Alternatively, the workstation can be permanently ventilated to provide continuous employee and room protection.

The horizontal displacement flow applied allows the air to flow from the inlet opening to the extraction vents. This ensures an air speed of up to 0.5 m/s at the free cross-section at the inlet opening.
In this way, improved workplace protection for both people and the room can be ensured.

EASE OF USE.

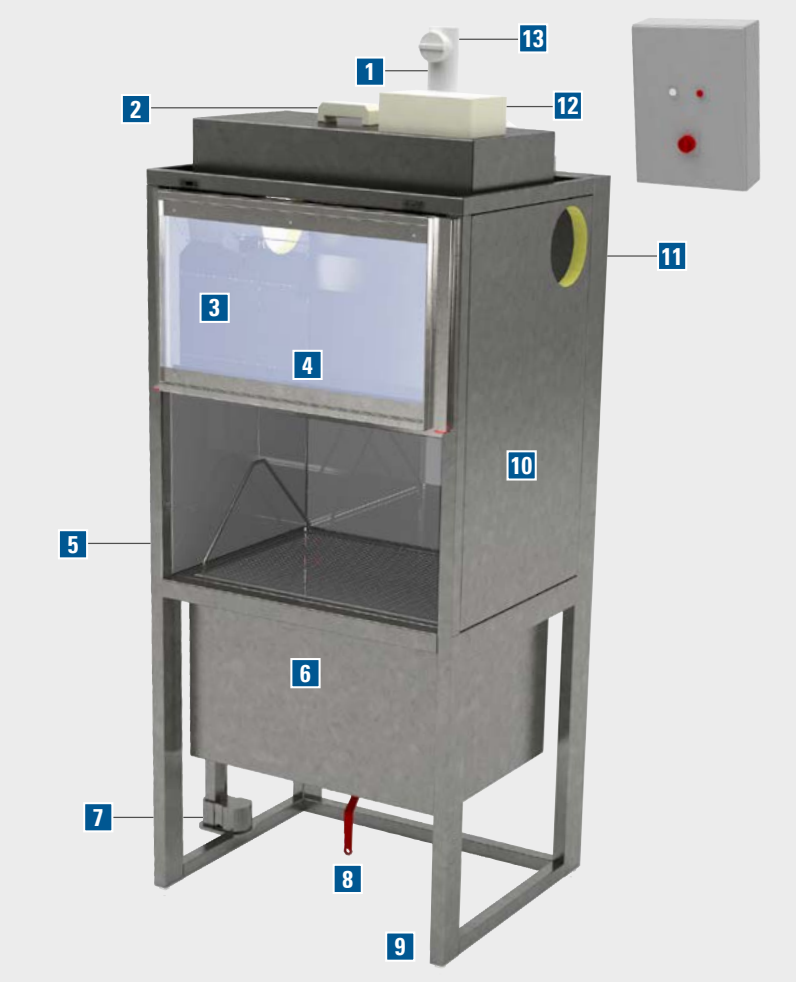
Well thought-out concepts: DENIOS designs ensure outstanding work safety and user-friendliness.

- Easy-to-clean material and high-quality workmanship: stainless steel design (corrosion-free) and cleanly welded joints with flat ground seams.
- Safe handling and placement of even bulky objects on the worksurface.
- Manually hinged front safety panel in safety glass allows unrestricted access to all working materials even in the safe position and also serves as a splashguard.
- Separate, fixed worksurface for measuring equipment and tools.
- Height adjustable feet (30 mm).
- Flush-mounted LED workstation lighting with diffuser for uniform illumination, protection class IP 65.

EMISSION CONTROL.

The hinged safety panel and the smoke extraction function protect your employees from emissions, such as toxic smoke gases, even in the event of rapid smoke and flame formation. The system is designed for passive smoke extraction. On request, a fan can be connected for active smoke extraction.

1. Collector duct
2. Equipotential bonding rail
3. Front flap with emergency window
4. Extraction vent
5. Lowering device stroke 410
6. Immersion basin approx. 200 litres
7. Lowering motor
8. Ball valve
9. Height-adjustable feet
10. Side wall panel
11. Cable duct
12. Terminal box
13. Butterfly valve DN 80



ON-SITE CONNECTION.

The system is prepared for connection to an on-site air extraction network (connection diameter DN 80). Suitable exhaust fans, filter technology etc. can also be found in our equipment range. All components are connected to each other in accordance with VDE regulations via equipotential bonding for connection to on-site earthing.

ADDITIONAL OPTIONS.

Extraction fans, integrated filter technology, Ex proof design etc. – with a wide range of additional options we can meet your individual requirements.
Let our engineers show you how an optimised worktable solution could work.

+49 5731 753 455 | SALESBERATERES@DENIOS.DE

FIRE PROTECTION.

www.denios.de/glt/brandschutz

For flammable and oxidising media, legislators require compliance with the strictest fire protection regulations to protect people and the environment. You should get information in good time on the various requirements and define the measures which will give the best possible protection from the risks of fire.

FIRE BULKHEADS.

Item No. 274654

- For the DENIOS walk-in fire-rated stores WFP Li-Ion and the DENIOS fire-rated shelving systems RFP Li-Ion.
- Fire-rated bulkheads for breakthrough points in fire-rated store walls.
- For cable installations and pipes or ventilation pipes as well as ducts (fire protection flaps).

AEROSOL EXTINGUISHING TECHNOLOGY.

Item No. 272075

- For the DENIOS walk-in fire-rated stores WFP Li-Ion and the DENIOS fire-rated shelving systems RFP Li-Ion.
- Extinguishing technology with aerosol according to EN 15276-1, without addition of water.
- Significant cost savings as there is no need for fire water retention systems according to AwSV.

EXTINGUISHING SYSTEM.

Item No. 274844

- Semi-fixed extinguishing systems for supply by the fire brigade.
- Designed according to the VDS guideline for operation with water or low expansion foam.
- Pipe dimensioning according to hydraulic calculation of the sprinkler pipe network.

EXTINGUISHING WATER EXTRACTION.

Item No. 274845

- Targeted drainage of the extinguishing water from the spill pallet.
- Suction nozzle for emptying the spill pallet with on-site pump.
- The pipe break-though points through the side wall of the fire-rated storage container are fire-resistant with F 90 approval.

POWDER EXTINGUISHERS.

www.denios.de/feuerloescher

- Fast flow extinguishers.
- Ideal for areas which cannot be monitored by a person.
- Trigger automatically when exposed to heat.
- For fire classes A, B and C.
- 6 kg extinguishing medium.
- Trigger temperature +79 °C. Operating range to -30 °C.

HANDHELD POWDER EXTINGUISHER.

www.denios.de/feuerloescher

- High quality, low maintenance dry chemical powder extinguisher in accordance with EN 3.
- For fire classes A, B and C.
- Various sizes and extinguishing agent units available.

FIRE ALARM

Item No. 272077

- Protection of a fire-rated storage container is dependent on early recognition of any fire.
- DENIOS fire detectors contain approved multi-sensors that detect smoke and fire quickly and reliably.
- Integrated into the control technology of the room system, further protective measures can also be mapped.

THINK ABOUT MAINTENANCE NOW.

DENIOS fitters are qualified to maintain fire doors and gates and are also qualified to test and assemble fire protection flaps and fire protection elements. We'll remind you when regular maintenance is due and make sure it's carried out.

Book your free consultation now: +49 5731 753 216

OUTDOOR INSTALLATION.

www.denios.de/glt/aufstellung-im-freien

Extreme weather conditions are becoming more frequent. This must be taken into account in the design and statics of a room system that will be installed outdoors. DENIOS room systems are stable and resistant to the effects of external forces. Additional equipment also offers protection from the elements for both personnel and products.

STATICS FOR INCREASED LOADS.

Item No. 274847

- Increased statics for DENIOS fire-rated stores WFP Li-Ion and RFP Li-Ion.
- Up to wind load zone 4, terrain category I (q_w = 1.064 kN/m²) and for up to ground snow load s_k = 5.86 kN/m².

EXTENDABLE ENTRANCE CANOPY.

Item No. 272975

- For DENIOS walk-in fire-rated storage container WFP Li-Ion.
- Practical, extendable canopy for the entrance area for bad weather protection.
- Assembly takes place in the DENIOS plant and is therefore an integral part of the turnkey system.
- On site, the canopy is extended and locked in place.

ROOF HEATING.

Item No. 272100

- Heating of the roof surface helps to prevent a build up of snow.
- Can be installed with an external temperature sensor and a controller.
- Optional heated rain channels remain frost-free even in sub-zero temperatures ensuring optimum drainage.

GREEN ROOFS.

Item No. 272073

- For DENIOS walk-in fire-rated storage container WFP Li-Ion.
- Use your green fingers and increase the insulation value of your hazardous materials store at the same time.
- A living layer of insulation for the roof of the store makes a significant contribution to the environment, increasing insects, retaining rainwater and binding fine dust.

RECONDITIONING CHECK.

www.denios.de/aufbereitungs-check

- Free check of the material condition, function and equipment of your hazardous materials store by our certified service personnel with manufacturer's expertise.
- Free initial consultation for reconditioning and preventive maintenance by our service technicians.

STRUCTURAL ANALYSIS. SAFE UNDER EVERY LOAD.

Protected in wind and weather. To ensure that DENIOS hazardous materials stores always stand firm wherever they are, we test them beyond the normal load limits. In addition to extensive theoretical calculations, we carry out long-term tests and practical trials. In this way, we ensure that the statics for our hazardous materials stores can withstand external forces from wind, snow and earthquake loads. The regional load differences are shown in the form of load zones on our website.

WWW.DENIOS.DE/LASTENZONEN

OTHER PRODUCT AREAS. DENIOS STORAGE AND PROCESS TECHNOLOGY.

DENIOS manufactures safe and environmentally friendly storage technology in steel, as well as heat chambers and fume cupboards for process technology. Products are designed to suit the storage or process medium and the associated activities. Based on standardised systems, customers can choose individual elements from our wide range of equipment. Custom solutions can be created in all product areas. You'll benefit from excellent customer support - on site where needed.

HAZARDOUS MATERIALS STORAGE TECHNOLOGY.

In the field of hazardous materials storage technology, we offer hazardous materials stores and fire-rated stores - approved by the DIBt for the legally compliant storage of flammable, toxic, oxidising or water-polluting substances. Our team of experts will handle the complete planning and realisation process for you - for example for your new solvent store, paint supply room, waste store and much more!

WWW.DENIOS.DE/GEFAHRSTOFFLAGERTECHNIK

THERMOTECHNOLOGY.
EFFICIENT HEATING, MELTING OR COOLING.

Whether heating, cooling, tempering, melting or drying: we offer customised thermotechnology solutions for all industrial sectors that work with temperature-sensitive substances. Solutions for small requirements and for large volumes. Whether heating or melting up to 150°C, frost-free storage or cooled down to -25°C – with DENIOS you've got the right equipment for all your needs.

WWW.DENIOS.DE/THERMOTECHNIK

CONTAINMENT SYSTEMS. TECHNICAL VENTILATION SYSTEMS FOR CAPTURING HAZARDOUS SUBSTANCES IN THE WORKPLACE.

Work and production processes in many areas of industry and the chemical and pharmaceutical sectors require the handling of substances or materials which produce hazardous emissions while being processed. DENIOS worktables and multi-task workstations offer personal, product and room protection at the highest level, with explosion protection as an option.

WWW.DENIOS.DE/CONTAINMENT

TECHNICAL SAFETY ROOMS. SENSITIVE TECHNOLOGY SAFELY HOUSED.

High quality technical equipment and electrical installations are needed in all industries. For reasons of space, the technology is often used not just inside fixed buildings. Mobile solutions are in demand for frequent infrastructure changes or for outdoor applications. This is where DENIOS technical safety rooms (TSR) are used – e.g. on the roof of a hospital or administration building, inside a substation, in a port terminal or on a railway line. Our fire and vandal-protected room systems house emergency power systems for uninterruptible power supplies, power generators (e.g. diesel generators or fuel cells) as well as radio and energy technologies in a flexible manner. Many other applications, such as the testing of lithium energy storage devices can be created.

SERVICE & MAINTENANCE FROM DENIOS. EVERYTHING FROM ONE SUPPLIER.

Proper regular maintenance and servicing of a fire-rated store is needed to ensure permanently safe operation that complies with the law at all times. It also ensures that your fire-rated store retains its value. Only qualified and certified fitters and technicians are legally allowed to service and maintain fire-rated stores. At DENIOS we're your service partner, with the all the expertise of a developer and manufacturer - reliable, competent and always at your side.


DENIOS
Technical Service
DENIOS

OFFICIALLY CONFIRMED: OUR TEAM HAS ALL REQUIRED CERTIFICATIONS.

Fire protection is a very sensitive area and must therefore comply with a large number of legal requirements. In order to be allowed to carry out services - especially on electrical systems and fire and explosion protection devices - the specialist must be appropriately qualified.

The DENIOS service team has a very broad base and is also ideally equipped to handle complex requirements. We have all the qualifications and certifications required to service and maintain a fire-rated store. The use of DENIOS specialists ensures that you can benefit from our comprehensive expertise as a manufacturer for all service options.

We not only know the technical criteria of the individual components, but we also understand the interaction of all the factors involved - ensuring the holistic, safe functioning of your fire-rated store.

Whether maintenance, repair or spare parts: we'll be happy to carry out a non-binding consultation at your location, free of charge, including a professional inventory. On this basis, we can then organise customised service from our team for you.

CERTIFICATIONS OF THE DENIOS SERVICE-TEAM.

Our employees have up-to-date specialist knowledge and also regularly take part in further training. This allows us to react quickly to your requirements. Of course, we will always observe any company-specific safety regulations at the installation site. Here you will find an example of our qualifications for service on and in the fire-rated store:

- SCC training.
- Qualified person for fire-rated doors and gates as well as specialist for hold-open systems.
- Expert for testing and assembling fire protection flaps and fire protection elements according to DIN 4102 and DIN 18017.
- Qualified person in electrical and mechanical explosion protection.
- Welding test certificate.
- Driving licence for motor-driven industrial trucks according to DIN 15140 (combustion engine and electric drive) and operator's licence for aerial work platforms.
- Measurement/testing technology seminar on electrical systems (DGUV V3, DIN VDE 0100, DIN VDE 0701-0702).
- Dangerous goods training according to 1.3 ADR and § 6 GbV.
- Qualified electrician for specified activities.
- Expert for the testing of electrical systems (DGUV V3, DIN VDE 0100, DIN VDE 0701-0702).
- Expert on refrigeration and air-conditioning systems and heat pumps. (Category EG 303/2008, EG 842/2006, § 5 ChemKlimaschutzV).

The DENIOS service team is your reliable partner. Advice at the ready, hands-on and always with a solution.

MORE HIGHLY QUALIFIED OFFERS FOR SAFETY & SERVICE.

Do you have other company equipment to maintain besides your fire-rated store? Feel free to contact us, our portfolio of services is wide-ranging and is regularly expanded.

WWW.DENIOS.DE/SERVICE-WARTUNG

MAINTENANCE FROM DENIOS.

WHY PROFESSIONAL AND REGULAR SERVICE IS SO IMPORTANT.

Operating a fire-rated store comes with a number of challenges and obligations. Regular inspection, maintenance and servicing of the fire-rated store and its individual components is not only required by law, but also ensures the long-term serviceable condition of the entire room system.
Operators who fail to comply with these obligations risk high fines and, in the event of damage, the loss of insurance cover. In addition, operators must also carry out inspections that are not directly mandated by law in order to maintain the fire-rated store. For example this includes checking the roof drainage, to make sure it is not blocked. At DENIOS, we provide you with competent support and advice in all matters relating to prescribed and required maintenance activities.

THE DENIOS MAINTENANCE SERVICE COVERS:

- One-off inspection or maintenance contract.
- Trained and certified service technicians.
- On-site repair of defects and damage, where possible. Large scale repairs will be quoted for and carried out separately.
- Preparation of service reports and inspection records.
- Fitting the test sticker(s).
- Travel costs and small consumables are always included in the maintenance price.

YOUR ADVANTAGES.

- Legal compliance.
- Maintenance of your insurance protection including limitation of company liability in the event of a loss.
- Avoidance of costly repairs with regular maintenance.
- Minimised risk of downtime and extended product life.
- Maintenance appointment reminder from DENIOS.
- Safety for your employees and your company.

Ingo Schlutter, Head of Quality and Service, DENIOS AG, and his team will ensure that you comply with all the legally specified maintenance intervals. We will proactively contact you and will be happy to carry out all the necessary inspection, maintenance and servicing work for you. Professional and reliable.

INSPECTION PROCESS.

Our DENIOS service team completes the legally compliant testing procedure as a holistic process and checks each prescribed criterion conscientiously and professionally.

CONDITION MONITORING.

We check your fire-rated store for damage inside and outside and identify possible problems in the way it operates. We pay special attention to the installation conditions: our experienced technicians check statics and mountings as well as safety distances and accessibility. We also check for contamination, especially in spill pallets, ventilation grilles and roof drainage.

COMPLIANCE INSPECTION.

Compliance with the legally prescribed protective measures is carefully checked by us. The presence of the legally required markings is also examined as part of the compliance inspection. Organisation in the store is also an inspection criterion.

FUNCTIONAL TEST.

DENIOS specialists precisely check the locking mechanisms of doors and gates as well as fire protection flaps. We also inspect the technical ventilation and check the operation of the electrics and control technology. In addition, fire detection is tested, and the heat exchangers on heaters and air-conditioning units are also examined.

TEST REPORT AND STICKER.

After completion of all required inspections, the responsible inspector fills out and stamps the service booklet in accordance with the regulations. If the fire-rated store can be successfully approved, he issues the corresponding inspection sticker.

INSTALL. COMMISSION. STAY SAFE.

You can rest easy with DENIOS: we'll take care of the safe delivery and professional assembly and commissioning of your room system. We also take care of regular maintenance and servicing on request.

TRANSPORT TO THE INSTALLATION SITE.

Our worldwide logistics network ensures smooth travel arrangements for delivery. Whether we use our own DENIOS flat bed trailer or a trusted freight forwarder, we ensure your room system is transported safely and arrives on time. Even special transport (extra wide or extra high) and overseas deliveries are no problem. We will take care of all the arrangements including obtaining the necessary special permits. Appropriate transport packaging is of course ensured. If required we can also provide suitable lifting equipment for unloading and final assembly.

INSTALLATION AND COMMISSIONING.

DENIOS technicians will ensure the professional installation of your room system and will work with you to complete the Site Acceptance Test including all installation and operational tests. Our standardised solutions can be commissioned immediately, as they have General technical approval; for customised projects approval from the authorities needs to be obtained. Right from the design and production phase, we take care of contact with the responsible authorities so that individual acceptance can proceed smoothly. Our specialist personnel will then instruct the users directly on the product and comprehensive product documentation will be handed over. DENIOS room systems: set up, commission, stay safe!

The delivery of a DENIOS fire-rated store takes place as a heavy transport by low loader.

A crane is usually used to install a fire-rated store outdoors.

A SYSTEM THAT GROWS TO MEET YOUR NEEDS.

CHANGES AND EXTENSIONS TO YOUR FIRE-RATED STORE.

With a DENIOS solution, you're in the best place. Right from the start, all with comprehensive support. Right from the planning and production stages, we take into account your requirements as well as current laws, standards and necessary certifications down to the smallest detail. If you need to make changes during operation or if you need to expand, we'll remain your first point of contact.

Do you need a comprehensive overview of all the electrical components in your fire-rated store? You would like to introduce an access control via RFID scan instead of conventional keys? Do you want to rely on modern, automated leak detection and thus raise safety standards even further?

No problem: thanks to our expertise as a manufacturer and developer, we can recommend components that can be perfectly integrated into your existing system. We also take into account how any changes made need to be checked for legal compliance.

INTEGRATION INTO THE OVERALL SYSTEM.

From a technical point of view, new equipment is only effective if it is optimally integrated into the overall system. That's why DENIOS specialists check the static criteria very carefully before making any changes, as well as the continued smooth operation of the electrics and control technology. This way, you're on the safe side.

EQUIPMENT OPTIONS.

Increase the safety of your fire-rated store by installing video surveillance or an aerosol extinguishing system, for which fire water retention is not needed. There are hardly any limits to the range of equipment options. In a personal consultation on site, our experienced advisors can analyse your individual requirements with you and coordinate all the details.

An overview of further equipment options can be found from p.72.

Video surveillance and recording of the hazard area indoors or outdoors.

The aerosol extinguishing system is triggered by temperature and effectively interrupts the chemical combustion process within 4.5 - 15 seconds, depending on model.

SERVICE FOR REPAIRS AND SPARE PARTS.

When it comes to professional repairs and suitable spare parts, you'll benefit from our holistic range of services as a manufacturer of state-of-the-art fire-rated stores: a repair is not just replacing a defective part with a new one. The focus is always on the coordinated interaction of all components of the overall system. Only an experienced service team from the manufacturer and developer can offer you this kind of quality. With DENIOS, you'll receive every service from a single source and thus ensure the ideal prerequisites for safe, reliable and legally compliant operation of your fire-rated store.

Our service technicians are equipped with modern equipment to ensure repairs or replacement as quickly as possible.


Li-ion

Get in touch to arrange a consultation: +49 5731 753 455
www.denios.de

ADVICE FROM DENIOS. PROFESSIONAL AND INDIVIDUAL.

The potential danger of lithium batteries should not be underestimated. This makes it all the more important to have a competent partner at your side when planning and developing a suitable store or test room. Our experienced consultants are there for you at any time and can visit your company to carry out an in-depth analysis and offer advice. Contact us to arrange an appointment.

STORAGE AND TESTING. THE HOLISTIC VIEW.

DENIOS has been developing and producing safe and legally compliant products for over 35 years. But that's not all. We always take a holistic and forward-looking view of your task. With individual advice, an understanding of local legislation, a wide range of products and qualified service, you'll receive a complete portfolio of services from a single source and can rely on a competent partner at your side throughout the entire product life cycle.

ALWAYS AT YOUR SIDE.

There are many things to consider when storing and testing lithium batteries. That's why our experts are always there for you, providing personal, competent support and advice every step of the way.

Project request
You are welcome to send us your project enquiry without obligation by calling **telephone number** +49 5731 753 455 **or by e-mail to** SALESBERATERES@DENIOS.DE stellen. We will get back to you as soon as possible.

Needs analysis and free, on-site advice
To ensure that the project runs smoothly without any surprises, it is important that our technical experts get a precise picture on site and analyse your individual requirements with you in detail.

Planning & Project management
Reliability in planning is important for both sides, which is why we'll give you a binding delivery date. For a project, a direct contact will coordinate the project and ensure adherence to deadlines.

Production
Whether standard or customised solution, thanks to state-of-the-art production and excellent quality management, you'll receive a wide range of high-quality products.

Transport, assembly & commissioning
Thought of every detail? Let us handle transport & installation. We'll check the conditions on site in advance so that everything runs smoothly on the day of commissioning.

Service & maintenance
After commissioning, you as the operator are responsible for the maintenance and proper condition of the system. We support you with our services to comply with your obligations.

Contact us for more information!

PASSING ON KNOWLEDGE.

PRACTICAL INFORMATION AND TRAINING.

Shared knowledge is valuable and has a long-term value - for individuals and the common goal: how are lithium batteries stored, charged and tested safely to protect people and the environment? The varied information available from DENIOS includes informative newsletters and practical guides to comprehensive reference books on the storage of hazardous substances. In our DENIOS Academy, you and your employees can also take part in practical training courses - at your premises or online as a webinar.

IN-HOUSE TRAINING COURSES.

- Personalised training on the topics of "environmental protection and work safety" at your company.

ONLINE TRAINING COURSES.

- In addition to classic in-house training courses and classroom events, you can also book all the essential training courses at the DENIOS Academy as online seminars.

OPEN TRAINING COURSES.

- Seminars and training for fire protection or safety officers: learn about important legislation and always stay up to date.

DISCOVER OUR DIGITAL SEMINAR OFFER NOW.

- High flexibility with regard to venue and time.
- No travel and accommodation costs.
- Certified courses and qualifications.
- Proof of training is provided by certificates of participation with VDSI points.

DENIOS ACADEMY

WWW.DENIOS.DE/ACADEMY

DENIOS HAZMAT MANUAL.

Your guide to safe hazardous material storage: this expert reference book provides valuable tips on working with and handling hazardous substances as well as an overview of current regulations and laws:

Environmental liability and environmental protection law, Emission protection law, Occupational health and safety law, Water law, Chemical law and Public building law.

WWW.DENIOS.DE/FIBEL

DENIOS GUIDES.

Our practice-oriented guides provide answers to your questions, explained in an understandable and competent manner. Get expert tips on hazardous materials handling, work safety, explosion protection and many other areas of everyday operations.

WWW.DENIOS.DE/MAGAZIN

THE DENIOS NEWSLETTER.

Subscribe to our newsletter and stay up to date: find out all about new offers, products and services. Benefit from tips, advice and the expertise of the DENIOS Academy.

WWW.DENIOS.DE/NEWSLETTER

PARTNERSHIP IS OUR MOTTO.

KEY ACCOUNTS AT DENIOS.

DENIOS Key Account Managers are there for you in person, wherever you are in the world and will work alongside you. As a client, you'll benefit from individual support and our expertise in local legislation. With a dense, international network of sales and production locations, you'll receive the products you need promptly and cost-efficiently.

Our e-procurement partners:

SAP Ariba

HUBWOO A PROACTIS COMPANY

emeplato

onventis CLOUD PROCUREMENT NETWORK

E-PROCUREMENT.

SAFE PURCHASING AT DENIOS.

With 15 years of experience in e-business, DENIOS AG is the professional partner for major customers. Or to put it another way: e-procurement comes as standard, in 14 languages, with more than 200 active electronic catalogues and over 14,000 items. As a developer and manufacturer, we offer the largest range in the field of safety-relevant business equipment and work safety. And we go one step further: everything is adapted to your individual requirements, country-specific and legally compliant. At the same time, as a major customer you'll benefit from framework agreements, confirmation of conditions, audit security and a purchasing advantage with exclusive conditions.

YOUR ADVANTAGES.

- With more than 14,000 items, the largest product range in the field of operational environmental protection, directly from the manufacturer.
- Product selection individually tailored to your needs.
- Over 15 years experience in e-business and over 200 catalogues in various formats.
- Available internationally, in 14 languages.
- Additional information available as a PDF download to help you use our products in compliance with the law.
- Standards such as BMEcat, eCl@ss, UNSPSC.
- EDI interfaces for fast document exchange.
- OCI interface for integration of the DENIOS online shop into your ERP system.

RECOMMENDED BY SAP ARIBA.

As an expert in e-business, we have been part of the Ariba Network for years. This digital marketplace with trading partners from 190 countries, does USD 3 trillion worth of business. DENIOS is the first company from the environmental technology sector to be recommended as a preferred supplier.
Discover what we can do. And feel free to contact us so you can benefit from our offering as a professional partner for environmental protection and work safety in Ariba.

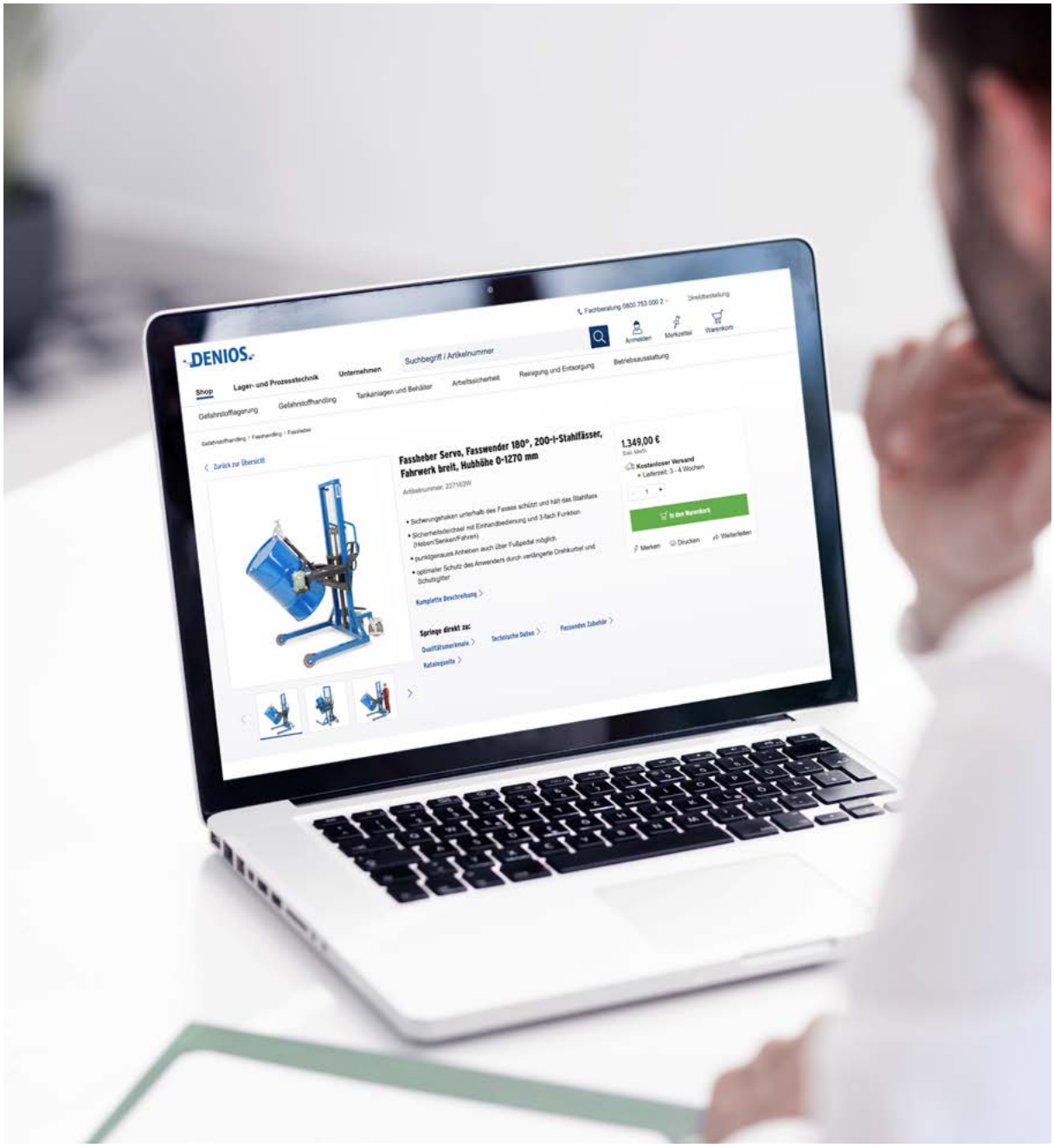
Contact us for more information!
TEL.: +49 5731 753 460
EMAIL: KEYACCOUNT@DENIOS.DE

WPS proactis veenion® make your order poet NEWTRON

YOUR SHOP FOR HAZARDOUS SUBSTANCE SAFETY.

OVER 14,000 PRODUCTS CAN BE ORDERED DIRECTLY.

When it comes to hazardous materials safety, industries from all over the world rely on DENIOS products. Today, our range comprises more than 14,000 products. It all started with a simple but innovative product idea: the spill pallet. In over 35 years, we have developed numerous other innovations: you'll find a quality product in our product range for every daily task, for every application and for almost every conceivable requirement.

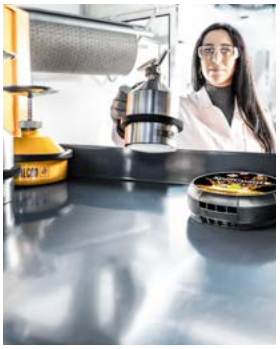


HAZARDOUS MATERIALS STORAGE.

- Spill pallets.
- Dispensing stations.
- Spillage decking.
- Hazardous substance storage and safety cabinets.

HANDLING HAZARDOUS MATERIALS.

- Absorbent materials.
- Leak management.
- Drum handling.
- Gas cylinder handling.



FUEL TANKS & TRANSPORT CONTAINERS.

- IBCs.
- Drums.
- Canisters.
- Safety containers.

CLEANING AND DISPOSAL.

- Parts cleaning and washing tables.
- Surface cleaning.
- ASF and ASP containers.
- Waste oil containers.

WORK SAFETY.

- Safety barriers and impact protection.
- Personal Protective Equipment.
- Emergency showers and eye wash stations.
- Workplace matting.

PRODUCTION AND OPERATION EQUIPMENT.

- Transport and storage containers.
- Shelving.
- Transport and lifting equipment.
- Equipment cabinets and lockers.

VISIT THE DENIOS ONLINE-SHOP NOW!

Get to know the entire DENIOS product range in our online shop and order directly. Thanks to extensive search functions, you can quickly find the right product to meet your requirements.

Take a look at our offers now! WWW.DENIOS.DE

STAY IN TOUCH!

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