

Instruction Manual for Transport System

LIOGUARD®

M-Box Advanced/Premium



Safety system for storage and transport in compliance with the ADR for lithium-ion and lithium-metal cells and batteries

Please read these instructions carefully before use and keep them in a safe and accessible place.

V3.0 (17.06.2021)

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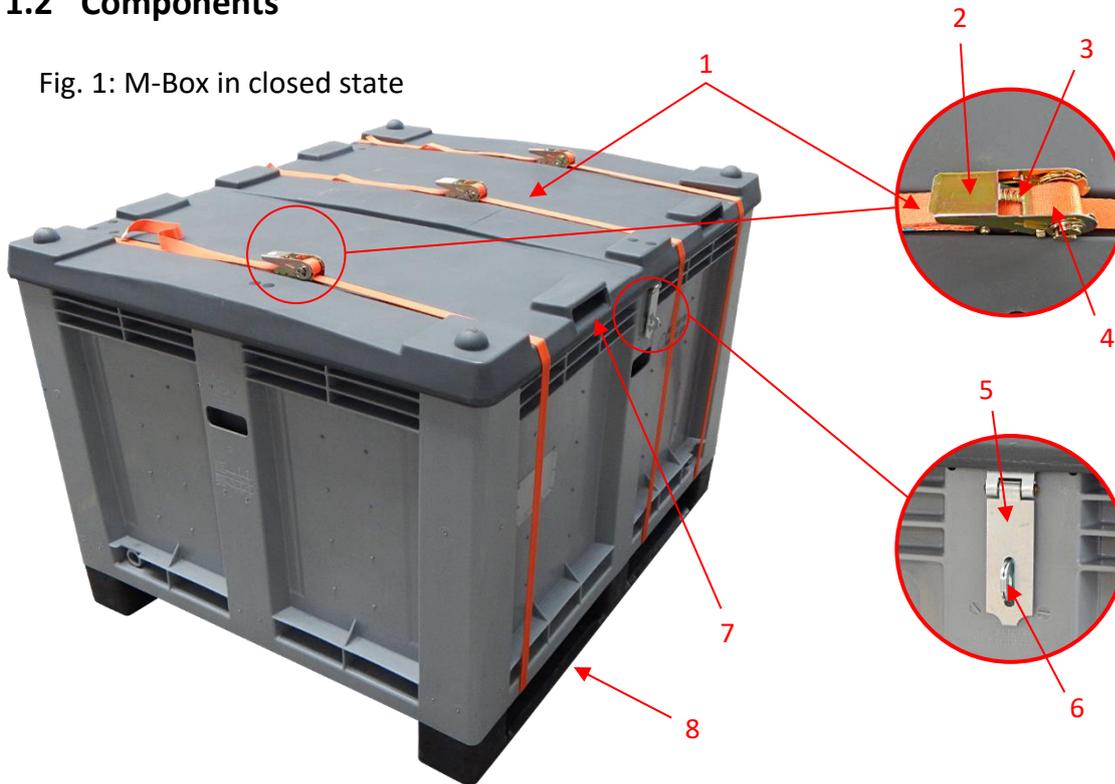
1 Product Description

1.1 Technical data

	M-Box Advanced	M-Box Premium
Exterior / Interior dimensions L x W x H (mm)	1230 x 1030 x 835 966 x 766 x 404	1106 x 906 x 600 1106 x 906 x 600
Basket dimensions L x W x H (mm)	-	981 x 788 x 400
Volume (l)	299	
Empty weight (kg)	83	
max. gross weight VG II (kg)	456	

1.2 Components

Fig. 1: M-Box in closed state



- 1 Tie-down strap
- 2 Locking lever
- 3 Lock slide
- 4 Rotary shaft

- 5 Hasp
- 6 Staple
- 7 Handle
- 8 Guide



Fig. 2: M-Box Advanced in open state



Fig. 2: M-Box Premium in open state (top layer of PE bags removed)

- | | | | |
|----|------------------|----|----------------|
| 9 | Locking slide | 14 | Basket handle |
| 10 | Suspension bolts | 15 | Mesh basket |
| 11 | Lifting eye | 16 | insert |
| 12 | Lid holder | 17 | PE filler pads |
| 13 | Lid holder pivot | | |

2 Safety Instructions

2.1 Proper intended use

The transport container is used for transporting and storing lithium-ion and lithium-metal cells and batteries. The transport container shall be used only in an undamaged and unmodified condition. The integrity of the transport container shall be checked before each use.

2.2 Hazard potential of lithium ion cells and batteries

With today's manufacturing standards, it can be assumed that lithium-ion cells and batteries, when properly used and handled, are safe. However, damage can lead to an irreversible, destructive reaction, a so-called thermal runaway. Such damage could be, for example:

- mechanical damage
- heat stress
- overcharging
- outer short circuit
- total discharge
- ageing (dendrite formation)

Such damage can cause the cell to heat up, resulting in a decomposition reaction of cell components. This decomposition reaction in turn leads to further heating, which then causes the decomposition process to accelerate uncontrollably. These reactions also lead to the formation of large quantities of toxic and flammable gases, which in interaction with the high temperatures of the cell can lead to severe fire events. This intense release of heat can consequently cause thermal runaway in the adjacent cells, so that under certain circumstances the entire battery reacts.

The escaping gases include carbon monoxide (CO), hydrogen (H₂), carbon dioxide (CO₂) and oxygen (O₂). It is also possible that hydrogen fluoride (HF) escapes, which can react with the air humidity to form hydrofluoric acid. If the escaping reaction gas does not ignite, it can mix with the air oxygen to form an explosive atmosphere.

Due to the high hazard potential ensuing from damage that may not always be visible from the outside, we recommend that returned batteries should always be stored in corresponding safety containers.

2.3 Information about PyroBubbles®

PyroBubbles® are multi-cellular hollow glass spheres, which are not hazardous in their solid form (delivery condition). Continuous contact with high concentrations of respirable dust can impair lung functioning. The general dust limits of 1.25 mg/m³ for respirable (A dust) and 10 mg/m³ for inhalable (I dust) fractions must be observed. An individual time-weighted average must not exceed the value of 3 mg/m³ for the A-dust fraction. For details, refer to TRGS 900 (or respective nationally applicable technical rules for hazardous substances). If the dust concentration at the place of work exceeds the specified occupational exposure limit values, approved and suitable respiratory protection must be used (recommended protection class FFP2).

It is recommended to wear eye protection in the case of dust formation, and to wear gloves in the case of skin contact.

PyroBubbles® that no longer correspond to their condition at the time of delivery, must be disposed of in accordance with the disposal instructions (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**) and shall not be used further, because they no longer meet the requirements with respect to sorption capacity and thermal insulation.

3 Use

Caution

Before each use, check the integrity of the container and the other components.

3.1 Storage

3.1.1 Safety Instructions



Danger

Danger of poisoning due to toxic, partially odourless gases

Injuries ranging from severe to fatal

In the event that the cells or batteries suffer a thermal runaway, leave the hazardous area as quickly as possible.



Danger

Danger of explosion due to explosive gases

Injuries ranging from severe to fatal

In the event that the cells or batteries suffer a thermal runaway, avoid ignition sources. If possible, provide sufficient ventilation.



Warning

Risk of injury from falling parts

Injuries ranging from severe to fatal

When moving transport containers, use only suitable lifting gear attached to the designated lifting points. No person must be allowed to linger within the working area of the lifting gear.

3.1.2 Storage instructions for storage without hazardous goods

PyroBubbles® must be stored in a dry location.

The transport container must be stored protected from direct sunlight, to prevent ageing of the plastic material. The recommended storage temperature is +15°C and +30°C.

3.1.3 Storage instructions for cells and batteries

When storing cells and batteries, the lid of the container must be kept free, so that any reaction gases that may develop can escape and a resulting pressure build-up inside the transport container is avoided.

3.2 Transport

3.2.1 Safety instructions



Danger

Danger of poisoning due to toxic, partially odourless gases

Injuries ranging from severe to fatal

In the event that the cells or batteries suffer a thermal runaway, leave the hazardous area as quickly as possible.



Danger

Danger of explosion due to explosive gases

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Warning

Risk of injury from falling parts

Injuries ranging from severe to fatal

When moving transport containers, use only suitable lifting gear attached to the designated lifting points. No person must be allowed to linger within the working area of the lifting gear.

3.2.2 Transport instructions

During transport, observe the relevant legal regulations. This also applies for any additional markings or labels.

Make sure that the transport containers are securely closed by means of the tie-down straps. Lift the transport container only by means of the guides provided and use only appropriate lifting gear.

When transporting hazardous goods, the space above the transport container must be kept free, so that in the event of a thermal runaway the reaction gases have adequate space to vent.

To increase static friction, non-slip mats must be placed beneath the bearing surface of the transport container. The load is secured by lashing it down with tie-down strap, which are strapped across the lid.

3.3 Opening the transport container

3.3.1 Work procedure



1. The transport container is delivered in a closed condition, secured by means of the tie-down straps.



2. Press the lock slide of a toggle catch in the direction of the locking lever. At the same time, pull the locking lever upwards and move it approximately 180° around the rotary shaft.



3. Pull the tie-down strap out from the rotary shaft of the toggle catch. Next, pull the tie-down strap out from the guides and store the tie-down strap outside of the work area.



4. Repeat steps 2 through 3 for all tie-down straps.



5. Open the lid using the handles of the lid.

Caution

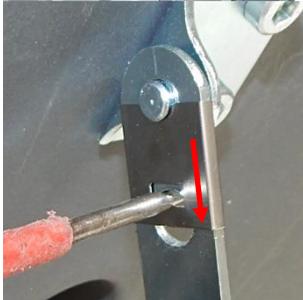
Make sure both lid holders snap into place on the lid holder pivot.

3.4 Inserting and removing the mesh basket (only at Advanced)

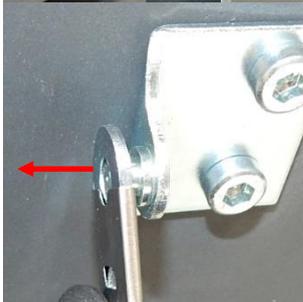
3.4.1 Workflow



1. Open the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**).



2. Push the locking slide on a lid holder downwards.



3. Pull the lid holder from the suspension bolt. Carefully put down the lid holder.



4. Repeat steps 2 and 3 for the other lid holder.

Caution

Securely hold the lid with one hand.



5. Open the lid more than 90°.

Caution

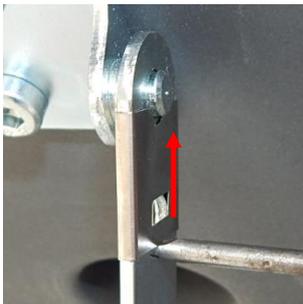
Support the lid to prevent damage to the lid hinges.



6. Remove the mesh basket or place the mesh basket into the transport container with the help of the basket handles provided.



7. Close the lid so that a lid holder can be attached to the corresponding suspension bolts.



8. Push the locking slide into the groove of the suspension bolt.



9. Repeat steps 7 and 8 for the other lid holders.

3.5 Packaging the hazardous goods

3.5.1 Safety instructions



Warning

Danger of poisoning due to toxic substances leaking from the cells or batteries

Injuries ranging from severe to fatal

Use protective equipment suitable for the hazardous goods involved.



Warning

Danger due to high electric voltage

Injuries ranging from severe to fatal

Cover the terminals of the batteries with electrically insulating materials. Wear adequate electrically insulating protective equipment.

Caution

Due to dust formation, the use of respiratory protection is recommended to avoid damage to the respiratory organs (recommended protection class FFP2).

3.5.2 Packaging instructions

The required safety distances between the battery and the mesh basket, resp. the upper edge of the container, depend on the respective battery (design, energy content, condition, etc.). If the minimum distances are not defined in the transport specifications, then, depending on the respective model design, the safety distances described in point 3.5.3 are recommended.

3.5.3 Recommended safety distances

	M-Box
Container, upper edge	10 cm
	Advanced
Basket, base	6 cm
Basket, side walls	
	Premium
Insert, base	1 cm
Insert, side walls	4 cm

3.5.4 Workflow



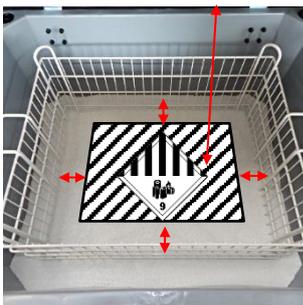
1. Open the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**).



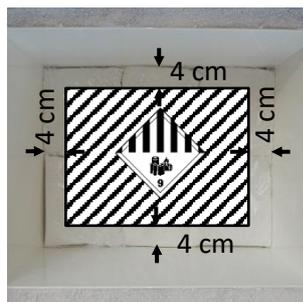
2. At Advanced: Evenly distribute a layer of PyroBubbles® to a minimum fill height of 6 cm above the bottom of the mesh basket.



2. At Premium: Remove all PE filler pads from the transport container. Place at least one layer of PE filling pads into the insert. The insert always remains in the container.



3. At Advanced: Place the hazardous substance in such a way that the recommended minimum distances are guaranteed. When loading multiple batteries, there must also be a sufficient all-round safety distance between the batteries.



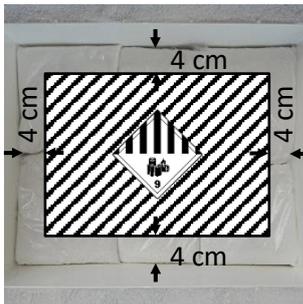
3. At Premium: Place the hazardous substance in such a way that a minimum distance of 4 cm to the insert side walls and 10cm to the upper edge of the container is guaranteed. When loading multiple batteries, there must also be a sufficient all-round safety distance between the batteries.



- At Advanced: Cover the introduced hazardous goods with the PyroBubbles® supplied, filling them up to the upper edge of the container. If you want to place several layers of hazardous goods into the transport container, you need to make sure that there is a sufficient padding thickness between the individual layers.

Caution

Only when the transport container is completely filled with PyroBubbles® is an adequate level of protection ensured.



- At Premium: Enclose the dangerous goods with additional PE filler pads. If you want to place several layers of dangerous goods into the transport container, you need to make sure that there is a sufficient padding thickness between the individual layers. Also, place the dangerous goods into the container in such a way that a minimum distance of 4 cm is ensured to all sides of the insert walls and 10 cm to the container lid.



- At Premium: Fill the transport container up to the top edge with PE filler pads.

Attention

Only when the transport container is completely filled with PE filler pads, is an adequate level of protection ensured.



- Close the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Attention

Make sure that you do not damage the PE filler pads with the lid holder.

3.6 Sealing the transport container

3.6.1 Work procedure



1. Hold the lid with one hand and release the catch of the lid holder pivots by gently pulling it toward the front of the container.



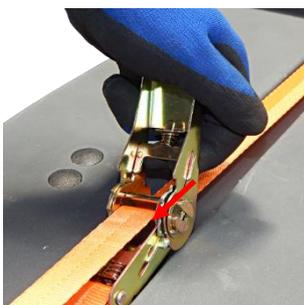
2. Close the lid using the handles of the lid and place the hasp over the staple on the front side of the container.



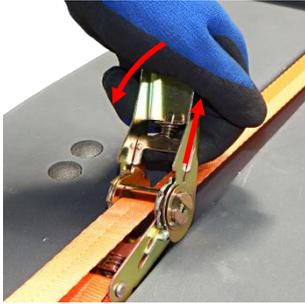
3. Pass a tie-down strap through a front and rear guide, beneath the transport container, and run the tie-down strap into and along the recess provided in the lid.

Caution

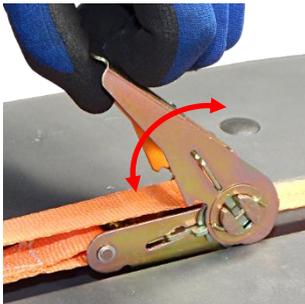
Make sure that the tie-down strap is not twisted.



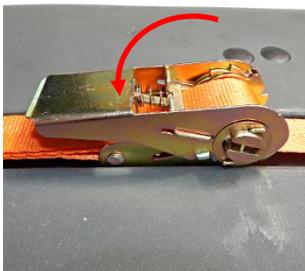
4. Pass the loose end of the tie-down strap through the rotary shaft of the toggle catch and pull the tie-down strap tight.



5. Press the lock slide of the toggle catch in the direction of the locking lever. At the same time, move the locking lever by approximately 90° around the rotary shaft.



6. Move the locking lever without pressing the lock slide up and down several times until the tie-down strap is firmly clamped.



7. Press the locking lever downwards.



8. Repeat steps 3 through 7 for the remaining tie-down straps.

3.7 Removing the hazardous goods

3.7.1 Safety instructions

If the transport container shows any signs of deposits, discolouration or a piercing smell, you must assume that the electrolyte has leaked or there has been a thermal runaway in the battery.



Danger

Danger of poisoning due to toxic, partially odourless gases and toxic substances
Injuries ranging from severe to fatal

In the event of electrolyte leaking from the cells or batteries, or a thermal runaway, the transport container must be opened only by personnel wearing protective equipment appropriate to the type of hazardous substance involved.



Danger

Danger of poisoning by inhalation of contaminated dust
Injuries ranging from severe to fatal

In the event of electrolyte leaking from the cells or batteries, or a thermal runaway, the transport container must be opened only by personnel wearing protective equipment appropriate to the type of hazardous substance involved.



Warning

Danger of explosion due to explosive gases
Injuries ranging from severe to fatal

In the event that the cells or batteries suffer a thermal runaway, avoid ignition sources. If possible, provide sufficient ventilation.



Warning

Danger due to high electric voltage
Injuries ranging from severe to fatal

Cover the terminals of the batteries with electrically insulating materials. Wear adequate electrically insulating protective equipment.

3.7.2 Work procedure for Advanced

Variant 1

1. Open the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**).
2. Remove the PyroBubbles® by skimming or vacuuming them off until the battery is visible.
3. Remove the batteries.

Variant 2

1. Open the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden**

- werden.).
2. Use a suitable lifting device to remove the mesh basket from the container (see steps **Fehler! Verweisquelle konnte nicht gefunden werden.** 1 through 9). The PyroBubbles® remain in the container while the hazardous goods remain in the mesh basket.
 3. Remove the batteries.

3.7.3 Work procedure for Premium

1. Open the transport container (see section **Fehler! Verweisquelle konnte nicht gefunden werden.**).
2. Remove the PE filler pads until the battery becomes visible. The insert must remain in the transport container.
3. Remove the battery.

4 Maintenance and Repair

4.1 Maintenance

4.1.1 Safety instructions



Warning

Danger of poisoning due to toxic substances that have leaked from the cells or batteries

Injuries ranging from severe to fatal

Use protective equipment suitable for the hazardous goods involved.

4.1.2 Maintenance and Cleaning Instructions

Contamination by substances leaking from the cells or batteries on to the transport containers must be removed. For this purpose, use only cleaning materials that do not attack the material of the transport container (HDPE).

PyroBubbles® can generally be reused, provided that they show no visual changes and the granules are odour-neutral.

4.2 Repairs

Do not use damaged transport containers; they no longer meet the requirements of the approved type. Repairs shall be made exclusively by the manufacturer or by a specialist authorized by the manufacturer.

5 Waste Disposal/Environmental Protection

The materials used in manufacturing the transport container are recyclable and can be recycled through commonly available recycling programs.

Uncontaminated PyroBubbles® can be forwarded to recycling programs for building materials.



Danger

Danger of poisoning by inhalation of contaminated dust

Injuries ranging from severe to fatal

Wear protective equipment suitable for the respective contamination.

Contaminated PyroBubbles® must be properly disposed of in accordance with the applicable national regulations and in accordance with their respective contamination.

6 Contact Information

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