User Manual

FOR BATTERIES FROM WS TECHNICALS

WS TECHNICALS

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1. About this manual

This manual contains general information for the safe receiving, installation, use, inspection, storage and disposal of batteries supplied by WS Technicals. Read the manual carefully before installing or using a battery.

This is a general user manual. Product-specific limits and requirements are stated in the product datasheet, product label and any product-specific installation or charger documentation. These documents must always be followed for the battery model in use.

Warning!
Always operate, charge and store the battery within the temperature, humidity, voltage, current and other limits stated in the product-specific documentation.

Keep this manual and the product-specific documentation available for future reference.

For information regarding warranty, liability and other commercial terms, please refer to WS Technicals' applicable Terms and Conditions.

2. Safety information

Warning!
Failure to follow the instructions in this manual and the product-specific documentation may result in personal injury, damage to the battery or damage to connected equipment.

- Do not use a battery that is damaged, deformed, leaking, unusually warm, giving off an unusual odour, producing smoke or behaving abnormally.
- Do not short-circuit the battery.
- Do not dismantle, repair, modify, crush, puncture, open or shred the battery.
- Do not expose the battery to heat, fire, solvents or direct sunlight.
- Do not touch exposed battery terminals.
- Observe the positive (+) and negative (–) markings on the battery and equipment. Never reverse the polarity.
- Use only a charger that is compatible with and approved for the specific battery model.
- Do not mix batteries of different manufacturers, models, capacities, sizes, ages or types in the same system.
- Keep the battery clean and dry.
- Do not connect batteries in series or parallel unless this is explicitly permitted in the product-specific documentation or confirmed in writing by WS Technicals.
- Do not remove the battery from its original packaging until it is required for installation or use.

3. Receiving and inspection

3.1 Unpacking

Inspect the packaging and battery for signs of damage immediately after receipt and unpacking. Check the enclosure, connectors and visible cables before installation.

Do not install or use the battery if damage or abnormal conditions are observed. Contact WS Technicals or the reseller for further instructions.

3.2 Battery dropped or subjected to mechancal impact

Warning!

If the battery has been dropped or subjected to a significant mechanical impact, stop using it immediately.

A significant mechanical impact includes any event that may have caused internal or external damage to the battery, such as a fall from height, a heavy object striking the battery, crushing, deformation, or an impact strong enough to damage the enclosure, connectors or mounting points.

Place the battery in a safe location away from combustible materials and observe it for signs of abnormal behavior, including heat, swelling, leakage, unusual odor, smoke or deformation.

Do not return the battery to service until it has been inspected and approved by WS Technicals or other qualified personnel.

If there is any doubt about the condition of the battery, do not use, charge or transport it. Contact WS Technicals for further instructions.

4. Installation and connection

4.1 Before installation

- Ensure that the battery model, voltage and connectors match the application.
- Review the product datasheet and any product-specific installation instructions.
- Wear appropriate protective equipment, including protective gloves and safety glasses.
- Do not install a damaged battery.
- Ensure that the battery is mounted securely and protected from conditions beyond the limits stated in the product documentation.
- Ensure all cables are correctly rated for the expected current.
- Use a fuse that matches the cables, battery and load.

4.2 Connecting the battery

Warning!
Disconnect or switch off the load before making or changing electrical connections, unless the product-specific documentation states otherwise.

- Connect positive (+) to positive (+) and negative (–) to negative (–).
- Never reverse-connect the power cables.
- Protect the battery and wiring against short circuit.
- Ensure that cables and connectors are properly secured and are not subjected to unnecessary mechanical strain.
- Some applications continue to draw power when not in active use. Disconnect or switch off the load when required to prevent deep discharge.
- Protect the battery from voltage transients that exceed the limits stated in the product-specific documentation.
- Do not route power cables in loops or coils. Where possible, route the positive and negative power cables close together.

4.3 Parallel connection

Warning!
Connect batteries in parallel only when this is explicitly permitted in the product-specific documentation or confirmed in writing by WS Technicals.

- Use batteries of the same model, age and capacity.
- Before connection, ensure that the pack voltages are equal within the tolerance specified in the product documentation.
- Use equal cable lengths from each battery to the load to reduce imbalance.
- Fuse each battery individually.

4.4 Series connection

Warning!
Connect batteries in series only when this is explicitly permitted in the product-specific documentation or confirmed in writing by WS Technicals.

- Do not connect more batteries than permitted for the specific model.
- Do not connect loads to individual batteries within a series configuration.
- Use the total system voltage only.
- Keep connection cable lengths as short as practicable.

5. Charging and operation

5.1 Charging

Warning!
- Use only a compatible charger approved for the specific battery model.
- If the battery uses CAN communication for charging, only use a compatible charger configured according to the product-specific documentation.
- Ensure that charger voltage, charge current, charging profile and termination settings comply with the product-specific documentation.
- Connect charger negative (–) to battery negative (–) and charger positive (+) to battery positive (+).
- Do not connect more chargers to an electrical supply than the supply can safely support.
- Disconnect the charger from the battery when it will not be used for an extended period.

WS Technicals lithium batteries use a constant-current/constant-voltage charging method. The exact voltage, current and termination requirements must be taken from the documentation for the specific battery and charger.

Charge the battery only at the maximum continuous charge current specified in the product datasheet.
Whether the battery may be charged while connected to or operating the application depends on the system design. Follow the product-specific documentation.

5.2 Operation and discharge

- Do not exceed the continuous or peak discharge limits stated in the product datasheet.
- Operate the battery only within the specified environmental limits.
- Monitor the state of charge and prevent deep discharge.
- If the Battery Management System repeatedly disconnects the battery or the battery behaves abnormally, stop using it and contact WS Technicals.
- State of charge (SoC) and battery temperature may affect the allowable charge and discharge rates. Always follow the limits specified in the product documentation.

5.3 Sleep mode and deep-discharge protection

Caution!
Some battery models may enter sleep mode when no charge, discharge or active communication is detected. The function and delay vary between battery models. Refer to the product-specific documentation.

The Battery Management System may disconnect discharge when the battery reaches its undervoltage protection threshold. This protection is a safety measure and must not be used as the normal method for ending discharge.

If the battery has entered deep-discharge protection or cannot be charged normally, take it out of service and contact WS Technicals. Do not open the battery, attempt to measure individual cell voltages or attempt to recover a deeply discharged battery unless instructed to do so by qualified personnel at WS Technical.

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6. Inspection and cleaning

6.1 Inspection and performance monitoring

Disconnect the battery from the load and charger before inspection. Never dismantle the battery; it contains no user-serviceable parts.

- Check the battery regularly for damage, deformation, loose parts, leakage, unusual odour, unusual heat, damaged connectors or abnormal operation.
- Check the state of charge regularly, especially during infrequent use and storage.
- Monitor runtime and charging time. A noticeable drop in runtime or an unexpected increase in charging time may indicate ageing or damage.
- Take the battery out of service if it shows signs of wear, damage, abnormal performance or if the service-life limits in the product-specific documentation have been reached.

Service-life and inspection requirements vary by battery model and must be taken from the product-specific documentation.

6.2 Cleaning

Clean the battery only with a soft, dry cloth. Do not use liquids, solvents or abrasive cleaning materials.

7. Storage

When the battery is not in active use, store it in a clean, dry and well-ventilated location.

- Store the battery at temperatures below 40°C, unless a lower maximum storage temperature is specified in the product datasheet.
- For long-term storage, store the battery at approximately 40% state of charge, unless otherwise stated in the product datasheet.
- Check the battery state of charge regularly during storage and recharge it according to the interval stated in the product datasheet.
- Disconnect loads or equipment that may continue to draw power during storage.

Caution!

- Data communication can prohibit the BMS from entering sleep mode and will eventually deplete the battery pack beyond recovery.
- Do not store a depleted battery.
- Protect the battery from heat, fire, direct sunlight, moisture, dust, impact and short circuit.

8. Emergency

Warning!

In the event of abnormal battery behaviour, such as overheating, smoke, fire or mechanical damage, stop using the battery immediately and follow the instructions in this section.

8.1 Smoke or fire

- In case of fire, call the local fire and rescue services.
- Do not inhale fumes.
- Disconnect the load or charger if this can be done safely.

- If possible without touching the battery directly or inhaling fumes, move the battery outside to a location where a possible fire cannot spread.
- If the battery cannot be moved, a fire blanket, water or another appropriate extinguishing method may be used to prevent propagation.

8.2 After an abnormal event

Do not return a battery to service after smoke, fire, significant impact, overheating or another abnormal event until it has been assessed and approved by qualified personnel.
If there is any doubt about the condition or safety of the battery after an abnormal event, contact WS Technicals for further instructions.

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9. Disposal

Dispose of batteries in accordance with all applicable laws and regulations. Batteries may be returned to the reseller or WS Technicals at the user's expense, subject to applicable transport and handling requirements.

9.1 Undamaged end-of-life battery

- Take the battery out of service.
- Protect the terminals against short circuit using suitable insulation.
- Follow local regulations and WS Technicals' instructions for collection, transport and disposal.
- Discharge the battery only if this is specifically required and can be done safely in accordance with WS Technicals' instructions.

9.2 Damaged or potentially unsafe battery

⚠ **Warning!**

- Do not attempt to discharge a battery that is damaged, swollen, leaking, overheated, producing smoke or otherwise abnormal.
- Isolate the battery in a safe location and protect it against short circuit where this can be done safely.
- Contact WS Technicals or an authorised waste handler for instructions before transport or disposal.

10. Contact information

In case of doubt, contact WS Technicals by email or telephone:

Email: wstech@wstech.dk

Telephone: +45 88618388