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1 Scope

This document describes how to handle the goods of a project, the packing, markings, storage and preservation. Where applicable specific handling instructions are provided.

2 Packing

2.1 PV modules

The PV modules will be placed on heat treated pallets in an upright position in a cardboard box, in compliance with ISPM 15



Packing of PV modules inside cardboard, cardboard protectors placed between solar module frames for extra protection.



Fully filled cardboard.



Cardboard with PV modules, labelled and marked. The cardboard box is on top covered with an oversized PE foil, to avoid ingress of water, wrapped with foil and finally secured with plastic lashing straps.



Series of packed PV modules, maximum stack height is 2 pallets for cardboard box.

2.2a: packing of PV modules (example)

2.2 Packing of batteries

2.2.1 EnerSys batteries

The battery cells will be placed on heat treated pallets, in compliance with ISPM 15 with on top a PE foil, finished with shrink foil and tied together. Shock absorbing material will be placed in between cells.



Battery cells are positioned and fixed with cardboard beams and with lashing straps on an EUR-pallet.



Battery cells are sealed with wrapping foil.



Series of packed battery cells.





2.2a: packing of EnerSys batteries (example)

2.2.2 Saft batteries

All wooden materials for packaging have been treated in compliance with ISPM 15.

Standard packaging for shipping road and sea;

The material of the standard boxes is WBP (Wood Board Plywood) of 6mm thickness, placed on a pallet model frame, with insert of corrugated cardboard and filling of polystyrene. Top and bottom seals with locking tongues, which make it easy to reopen and close the packages. Smaller items or battery accessories are sealed in PE (polyethylene) plastic to prevent any loss of content that might occur during normal conditions of carriage. See illustrations below.

 <p>Batteries are placed in an upright position with polystyrene filling.</p>	 <p>Fibre board battens are placed in between and on top of the batteries.</p>
 <p>Polystyrene is placed on top of the batteries.</p>	 <p>Final packing including labels and markings.</p>

2.2b: standard packing of Saft batteries (example)

Special packing for air transport (optional);

For air freight of batteries Saft uses NEFAB boxes made of birch plywood with water resistant adhesive, 5-ply. Thickness of material is 6mm. The boxes consist of three parts, bottom, top and side boards that are put together with clamber bands and steel profiles. Top and bottom seals with locking tongues, which make it easy to open and close the packages.



A strong plastic bag is placed in the NEFAB box. The battery cells with polystyrene plates are placed in this bag to fix it correctly.



The plastic bag is sealed to prevent leakage.



The package is closed, labelled and marked.

2.2c: packing for air transport of Saft batteries (example)

2.2.3 Sonnenschein batteries.

Cardboard boxes (standard).

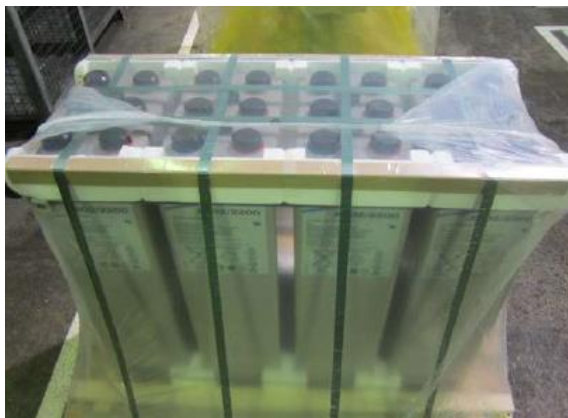
All wooden materials for packing have been treated in compliance with ISPM 15.



Battery cells are positioned with polystyrene forms on an EUR-pallet and strapped on top.



Battery cells fixed with lashing straps and wooden beams on the EUR-pallet.



Battery cells are sealed with PE foil.



Final packaging by adding cardboard on the EUR-pallet, secured with lashing straps, labelled and marked.

2.2d: cardboard packing of Sonnenschein batteries (example)

Wooden boxes (optional).

All wooden materials for packing have been treated in compliance with ISPM 15.



Battery cells are positioned and fixed with wooden beams on an EUR-pallet, strapped on top with cardboard in between.



Side walls of NEFAB package is mounted.



Wooden beams are mounted on top of the battery cells and fixed on the side walls of the NEFAB package.



The package is closed, secured with lashing straps, labelled and marked.

2.2e: wooden packing of Sonnenschein batteries (example)

2.2.4 Hoppecke batteries.

Cardboard boxes (standard).



Battery cells are positioned on an EUR-pallet, covered with a PE foil and strapped on top.



Battery cells with cardboard supports between cells and walls of cardboard box.



Top-side view of cardboard without cover.



Final packing, secured with straps, labelled and marked.

2.2f: cardboard packing of Hoppecke batteries (example)

Wooden boxes (optional).

All wooden materials for packaging have been treated in compliance with ISPM15.
The NEFAB boxes are made of approx. 6mm 5-ply plywood.



Battery cells are positioned with wooden beams on an EUR-pallet, strapped on top with cardboard in between.



Side walls of NEFAB package is mounted.



The package is closed, with standard markings added, secured with lashing straps. This photo is without labels and markings.

2.2g: wooden packing of Hoppecke batteries (example)

EUR-pallet only.
For local transport.



2.2h: packing of Hoppecke batteries for local transport (example)

2.3 Cables

Cables will be supplied on wooden drums.

Wooden drums (reels) with a diameter up to $\pm 0.7\text{m}$ will be packed in wooden case(s) as described in the packing section of other materials section 2.4.

These “small” individual drums will not be closed all around with wood.

Wooden drums (reels) with a larger diameter than the cable drum will be packed as described below. The cable on the drums is protected against damaging by using wooden beams on the outside of the drum, drum placed on a wooden floor panel for easy lifting by forklift.



2.3 a: wooden drum (example)

All wooden materials for packing have been treated in compliance with ISPM 15.

2.4 Other materials packed at TSS NL (battery boxes, control boxes, installation materials)

Materials of standard packing:

- Top and sides made of 9mm plywood, heat treated in compliance with ISPM 15.
- Bottom construction shall be made of wooden support beams 75x100mm, 22mm and 12mm plywood.

Construction/model (example):



2.4a: Standard wooden cases (example)

- All parts of the wooden case are screwed outside together for easy opening crate at the border for inspection by for example customs.
- No (metal) strapping is used as it might damage the wooden case.

No strapping is required due the design of this case, the design offers sufficient strength from itself.

2.5 Packing at ASIND Middle East.

Materials of standard packing in Middle East.

Note: this is slightly different compared to the way of packing done in the Netherlands, this because of the availability of materials.

Sides made of 9mm plywood, heat treated in compliance with ISPM 15.



Loose panels of wooden crate.



Open crate.



Wooden crate with open cover of cardboard or without cover.



Wooden crate closed with 4 side access for pallettruck.

2.5.a: Wooden crates at ASIND UAE (example)

2.6 Options (specials)

2.6.1 Sea freight packing (with foil inside)

Oversized PE foil on inside of cover to avoid water ingress from top and on inside of side panels.



2.6.1a: Oversized PE foil on cover of wooden cases (example)

3 Shipping

3.1 Markings

Clear marking (minimal 2 sides).

With pictograms

- Umbrella: protect against rain
- Glass (fragile): handle with care
- Arrows: this side up



3.1a: standard marking

All packages shall have a weatherproof marking/tag with shipping marks (See appendix 5.4). Two markings will be added to each crate or package.

Packing list will be provided in a waterproof pouch, securely fastened and clearly visible on the outside of the crate or package.

3.2 Packing list

- The packing list will be prepared according the provided template (if applicable).
- The packing list mentions which materials have been packed (item by item).
- Gross weight (total weight not exceeding 2500 Kg for a wooden case).

3.3 Stuffing material & transport

The whole shipment will be stuffed the most secure way inside a dedicated 20 or 40 feet (high cube), sea container to avoid any damage during transport.

4 Storage & preservation procedure

4.1 At delivery

- Immediately upon delivery, examine for possible damage caused by transport and/or handling.
 - Damaged packing material (e.g. cases) can indicate rough handling. Make a descriptive note including photos for expeditor and a copy for the supplier on delivery receipt before signing.
 - If battery cells are found to be damaged, request an inspection by the carrier and make a damage claim.
 - Within 15 days of receipt open all cases and fully inspect for damage. If damage is noted with photos included, request an inspection by the carrier. Delay in notifying the carrier may result in loss of right to reimbursement of damages.
- Open front panel of cabinets and inspect for concealed damages within the cabinets.

This part describes how to protect the equipment during a long storage period when the solar power system is not in use nor installed.

Note:

Carrying out the preservation procedure needs to be performed by the client. Failure to (timely) comply with this procedure may compromise the life expectancy of the battery and will void the warranty on the materials delivered.

4.2 Material storage

4.2.1 General

Selected storage area should be a clean, dry and well ventilated location.

4.2.2 PV modules.

In order to protect PV modules, they should be stored in their original packing in a dry and well ventilated room at temperatures between 0 °C and 45 °C.

4.2.3 Battery cells lead acid.

Store the batteries at a dry, clean and preferable cool and frost-free location. Do not expose the battery cells to direct sunlight.

Limit values for storage conditions: temperature range -20 °C to +45 °C, humidity <90%.

The storage period should not exceed 12 months at 20 °C (6 months at 30 °C, 3 months at 40 °C), at which time a charge provision must be made, according to the Installation Operating Manual (IOM) of the batteries. Failure to comply with these recommendations may compromise the life expectancy of the battery and will void the battery cells warranty.

Storage at higher temperatures should be avoided, as it will affect the battery lifetime negatively.

A commissioning charge is required before putting the batteries in operation, in line with the IOM manual.

4.2.4 Battery cells NiCd.

Store filled batteries at a dry, clean, well ventilated space on open shelves and cool location (0 °C to +30 °C). Storage at higher temperatures may result in capacity losses.

Do not expose the battery cells to direct sunlight.

Under these conditions, filled and charged batteries, can be stored for a maximum of 24 months from date of shipment from factory.

Storage at higher temperatures should be avoided, as it can result in loss of capacity of the battery.

This can be up till 5% per 10 °C above +30 °C per year.

A commissioning charge is required before putting the batteries in operation, in line with the IOM manual.

5 Handling procedure

This part mentions specific handling instructions for PV modules, batteries and enclosures.

There are no specific instructions for other supplied equipment.

5.1 PV modules

- Never use the junction box to carry the PV modules as this might cause serious damage to the module. Always carry the PV modules by the frame.
- Be careful not to damage PV modules during installation. Although the front of the solar module is made of a high impact resistant glass plate it may break if handled roughly.
- Always cover the PV modules with an opaque material during installation and do not create short circuits between the terminals. PV modules produce DC energy when exposed to sunlight, thus beware of sparks occurring when bare wires are accidentally short circuited as this could cause hazardous situations.
- Always read the installation manual before installation of the PV modules.

5.2 Batteries

- Remove all personal jewellery and use isolated tools when handling batteries.
- Battery cells should be unpacked with care. Never short circuit the battery terminals, because these units are capable of discharging at very high currents. This will always result in an hazardous situation which could cause personal injury as well as damaged or completely burned batteries, battery poles, connectors and wiring.
- Wear isolating gloves when installing or working with batteries.
- Read the installation manual before installing the batteries.
- Do not install batteries next to devices that generate heat.
- Do not lift batteries by their terminals or tamper with post seals or cell valves. If lifting is required use the lifting tool designed for these batteries.
- Clean the outside surface of the battery and the outside of the battery enclosure with water and soap only. Do not use solvents for this.

- In case of fire it is advised to use a
 - a. F-500 extinguisher
 - b. Foam fire extinguisher
 - c. CO₂ fire extinguisher
 - d. Or DRY-CHEMICAL extinguisher (not recommended due to residual/environmental damage caused by the silicone)
 - e. Sand.


5.3 Enclosures with electrical equipment

- Handle the enclosures with care until they are properly mounted.



Appendix

5.4 TSS shipping marking



[Company name]
Attn. [...]
[address 1]
[address 2]
[address 3]
Phone [...]

PROJECT NAME : ...
P.O. No. : ...
TSS-ref. : nnnnnPLInn

Description : ...
Collo No. : .. of ..
Gross Weight : ... kg
Dimensions (LxWxH) : ... X ... X ... cm