10 Stability and reactivity

Chemical stability:	Stable under recommended storage conditions
Incompatible products:	Do not flood the battery module with water, because electrolysis will form hydrogen. Ex-ception: Only in consultation with the manufacturer and under agreed conditions, a damaged battery module can be submerged in water in a ventilated area to discharge slowly the electrical charge of each cell.
Conditions to avoid:	Exposure to air or moisture over prolonged periods. Exposure to corrosive atmosphere over prolonged periods. Exposure to temperatures > 80 °C (176 °F)
Hazardous decom-position products:	None under normal use. Thermal decomposition can lead to release of irritating gases and vapours, fumes of aluminium or aluminium oxide, nickel oxides, hydrofluoric acid.
Hazardous polymerization:	Hazardous polymerization does not occur.

11 Toxicological information

Under normal condition (storage, operation according to intended use), proper transport etc., the battery modules release no ingredients.

Accidental release: In case of an accidental release of ingredients, refer to the chapters
2. Hazards identification
3. Composition / information on ingredients
4. First aid measures

12 Ecological information

Under normal condition (storage, operation according to intended use), proper transport etc., the battery modules release no ingredients.

European Union (EU): SOLARWATT battery modules do not contain heavy metals listed in the 2006/66/EC (Battery Directive). In most countries, Li-ion batteries are collected and recycled properly so that none of the ingredients will be hazardous waste. The outside material of the battery module is aluminium, which is considered as ignitable only in certain forms (e.g. powder), but not in the form of the battery enclosure made out of continuous casting aluminium with sufficient wall strength to avoid ignition (tested in battery abuse tests with temperatures above 730 °C). In case of an accidental release of ingredients, refer to chapter 3. Composition / information on ingredients

13 Disposal information

Waste disposal method:	The battery module shall not be released into the environment. The battery module must not be disposed of with household waste. The applicable disposal regulations in the respective country must be observed. The battery module is labelled properly with symbols and information according to national regulations in order to collect and dispose/recycle them accordingly. The product manual contains according information.
European Union (EU):	Manufacturing, handling and disposal is regulated in the directive 2006/66/EC. Refer to the product manual for the disposal in different EU countries.
Outside EU:	Consider the local laws and regulations as well as the waste disposal methods mentioned above.
Undamaged battery:	Also the transport for the disposal/recycling must follow the regulations for dangerous goods. Depending on national regulation, the packing instruction may differ from the instruction for new batteries, see next chapter.
Damaged battery:	Damaged Li-ion batteries must be transported under stricter regulations and in a containment required by the national dangerous goods regulation, see next chapter.

14 Transport information

Classification: The battery modules are classified as dangerous good: UN No. 3480 (Li-ion battery), see also next chapter. The battery modules are type proved according to subsection 38.3 of the "UN Manual of Tests and Criteria" and fulfil the additional requirements (short circuit protection, venting device, fuse, manufacturing QM) in order to be compliant with special provision 230 of:

- ADGC (Australian Code for the Transport of Dangerous Goods by Road & Rail)
- ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road)
- ADN (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
- IMDG (International Maritime Code for Dangerous Goods)
- UN Model Regulations (Recommendation on the Transport of Dangerous Goods)

Air freight:	Undamaged battery modules and the carton box fulfil IATA DGR packing instruction 965, but air freight regulations for Li-ion batteries may change on short notice. Contact the manufacturer. For damaged battery modules or battery modules in a damaged packaging, special provisions apply.
Packaging:	The cardboard box is tested as packaging group II and can be used for the transport of new or undamaged Battery flex pack. The packaging of the battery module shall not be damaged during the transport. Do not overheat the battery module during the transport. The prefered transport temperature range is -20 °C to 30 °C. Furthermore the following conditions apply: max. 12 weeks up to 40 °C, max. 7 hours at up to 70 °C, max. 1 hour at up to 80 °C. Frequent temperature changes should be avoided.
Damaged batteries:	Next to visual damage (e.g. crushed enclosure), a battery module is also damaged if a) one or more cells released ingredients or b) one or more cells were overheated. The damaged battery module does not longer meet the requirements according to subsection 38.3 of the "UN Manual of Tests and Criteria". In these cases, the original carton box is no longer sufficient for the transport. Special provisions for damaged batteries of the dangerous goods regulations mentioned above do apply.

15 Regulatory information

Marking	According to the product safety laws and directive, the battery modules are tested, labelled, marked and delivered with the necessary documentation. The CE marking, electrical ratings and environmental conditions (temperature e, humidity).according to the EU directives 2001/95/EC, 2014/35/EU and 2014/30/EU and harmonized standards. The watt-hour rating is according to the requirements for dangerous goods UN No. 3480. The crossed bin symbol is according to EU directive 2006/66/EC. The recycling symbol follows the regulations in several countries outside the EU.
Transport:	According to the dangerous goods regulations, the undamaged battery modules are classified as/for: • UN-No: 3480 • Class: 9 • Shipping name: LI-ION BATTERIES • Dangerous goods class: 9. • Packaging Group: II • Transport category: 2 • Tunnel restriction code: E (see also 14. Transport information)
Water hazard:	Germany: The regulations of the Federal Water Management Act in Germany are not applicable to Li-ion batteries as articles.

16 Other information

Date of regulations:	The edition/version/issuing or validity date of the laws, directives, regulations and Standards in this document is according to its issuing date.
Issued by:	Solarwatt GmbH
Issuing date:	June 2021
Contact:	solarwatt.com/contact
Note:	This safety data sheet provides information for safety and health in a unified structure related to the battery modules listed under chapter 1.1. This data sheet is not sufficient for the installation, operation or other topics, which are provided in the product data sheets, installation instructions, handling instructions or other documents provided for the battery modules and related Solarwatt storage system components. For these topics, refer to the related documents, which are available under solarwatt.com.

---------- End of Safety Data Sheet ----------

Safety Data Sheet

SOLARWATT®

1 Identification of the product and the manufacturer

1.1 Product

Trade name:	SOLARWATT Battery flex pack
Electrochemical classification:	Li-ion with carbon bases anode (negative, carbon) and metal oxide based cathode (positive, metal oxides)
Recommended use:	Li-ion battery module (battery module) for use within SOLARWATT Battery flex storage systems.
Model names:	SOLARWATT Battery flex top pack 1.3 (2.4 kWh, 30 A) SOLARWATT Battery flex middle pack 1.3 (2.4 kWh, 30 A)
Total weight:	25 kg
Energy capacity (gross):	2.7 kWh

1.2 Manufacturer / Importer

Manufacturer:	Solarwatt GmbH Maria-Reiche-Str. 2a 01109 Dresden Germany	Contact: Thomas Richter Phone: +49 351 8895 234
Importer Italia:	Solarwatt Italia SRL 35100 Pavova	Contact: Paolo Lusiani Phone: +39 049 825 82 62
	ufficiotecnico@solarwatt.com	

1.2 Legal Disclaimer

With few regional exceptions, safety data sheets are only required for certain substances and mixtures, but not for batteries, which are classified as "articles". Therefore, the battery modules listed under 1.1 of this SDS are not within the scope of most regulations on chemicals.

Therefore, the information in the following chapters is provided for three cases as far as applicable:

1. Undamaged battery modules without release of cell ingredients The battery ingredients have no hazard potential as long as the cells remain sealed. The sealed cells are protected by the continuous casting aluminium battery enclosure and the battery management system. The battery as a product passed comprehensive safety tests in accredited test laboratories and is designed to make a release of its chemical components as unlikely as possible. In an intact state, the information for storage (unclassified), transport (classified as dangerous goods) and disposal (classified as batteries and dangerous goods UN3480) is relevant.
2. Damaged battery modules with an accidental release of ingredients In case of massive mechanical, thermal, electrical or chemical external influences, misuse, disassembling etc. (e.g. fire from outside), hereinafter also referred as "mistreatment", ingredients of the Li-ion cells could be released.
3. Special cases because of the electrical charge of damaged and undamaged batteries Different to chemical substances, the cells within a Li-ion battery have an electrical charge (usually 3.00 - 4.17 V per cell) and can cause an electrolysis if the battery module is filled with e.g. flood water, which can form hydrogen. The electrical charge can also produce heat. Note: Voltage cannot be measured directly at the terminals of the Battery flex pack, since the battery module will only be switched on once it has been installed in the Battery flex storage system.

For all countries:

The information provided in this document is correct to the best of our knowledge and experiences at the publication date of this document. The information does not represent any contractual warranties of product properties. The information is not considered as a warranty or quality specification.

European Union (EU):

According to the Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), the batteries mentioned in this document are neither substances nor mixtures. Batteries are considered as "articles". Thus, the products mentioned under 1.1 of this SDS are not within the scope of this regulation and the obligation to provide a SDS according to Article 31 of the regulation does not apply. This SDS is a voluntary service for our customers.

2 Hazards identification

Case 1: The ingredients have no hazard potential as long as the cells remain sealed. The battery module consists of hermetically sealed Li-ion cells, which are protected by a Battery Management System (BMS) and a robust aluminium enclosure, which has passed mechanical tests (crush, vibration, shock, drop, ingress) according to IEC 62619, IEC 60529, sub-section 38.3 of the "UN Manual of Tests and Criteria" and other standards.

#04571 | Rev 1 | 18.10.2022

Case 2: In case of cell rupture, massive battery mistreatment, external fire etc.:
The cell ingredients will be released out of the cells. Depending on the temperature and the kind of mistreatment, the electrolyte or a mixture of flammable and non-flammable gases may be released out of the battery:

- The flammable gas can be hot and can ignite at hot surfaces, flames or sparks.
- The gaseous or liquid electrolyte is harmful by inhalation, in contact with skin and if swallowed. It is also corrosive and can cause burns of eyes, skin and mucous membranes.
- In special cases, e.g. if the battery is exposed to external fire or is misused, it can heat up by the contained energy and cause burns.

Case 3: In case of fluid immersion into the battery (e.g. if the battery is submerged, exposed to flood water etc.), but not in cases or drip water (battery fulfils IP54 according to IEC 60529) or condensation within expected limits:

- The cells remain sealed and do not release their ingredients.
  An electrolysis can produce gas, e.g. hydrogen (extremely flammable), which can accumulate in unventilated areas and which can form explosive mixtures with air.
- If cells already have a breach of their sealing, additional reactions (e.g. electrolysis at electrode materials, reactions with lithium etc.) can occur.

3 Composition / Information on ingredients

The information in table 1, including the weight proportions, refers only to the Li-ion cells in the battery modules and notifies the ingredients or their combustion products that could be harmful. The ingredients are within sealed cells.

Total cell weight: 11.36 kg

Table 1:

Material	CAS-No. / EC No.	Chemical GHS safety label	Weight %
Graphite	CAS# 7782-42-5 EC# 231-955-3	substance with a Community workplace exposure limit	7-25
Cobalt lithium manganese nickel oxide	CAS# 182442-95-1 EC# 695-690-9	Carc. 2, H351; Skin Sens. 1, H317	5-40
Lithium Hexafluorophosphate (1-)	CAS# 21324-40-3 EC# 235-362-0	Acute Tox. 3, H311; Skin Corr. 1B, H314; Acute Tox. 4, H302	0-5
Acetylene Black	CAS# 1333-86-4 EC# 215-609-9	substance with a Community workplace exposure limit	0-2
Diethyl Carbonate	CAS# 105-58-8 EC# 203-311-1	Flam. Liq. 3, H226	0-15
Propylene Carbonate	CAS# 108-32-7 EC# 203-572-1	Eye Irrit. 2, H319	0-15
Ethylene Carbonate	CAS# 96-49-1 EC# 202-510-0	Eye Irrit. 2, H319	0-15
Copper	CAS# 7440-50-8 EC# 231-159-6	substance with a Community workplace exposure limit	10-12
Aluminum	CAS# 7429-90-5 EC# 231-072-3	substance with a Community workplace exposure limit	3-5
Nickel	CAS# 7440-02-0 Ni EC# 231-111-4	substance with a Community workplace exposure limit	0-1

Remainder (w/o cells): Aluminium battery enclosure and inert materials

4 First aid measures

First aid is upon rupture of sealed cells of the battery. The following information is for case where substances are accidentally released. In some cases, the electrical charge of the cell and/or chemical decomposition can cause a hot surface of the battery and/or increase the temperature of vented gas, which include the danger of burns.

After eye contact: Rinse immediately with plenty of water (also under the eyelids), for at least 15 minutes. Seek for medical assistance immediately.

After skin contact: Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. If skin irritation persists, seek for medical assistance.

After inhalation: Move to fresh air. If symptoms persist, seek for medical assistance. Administer oxygen if breathing is difficult and you are trained. If breathing has stopped, contact emergency medical services immediately.

After swallowing: (Not an expected route of exposure) Seek for medical assistance immediately. Clean mouth with water and afterwards drink plenty of water. Do not induce vomiting without medical advice.

Notes to physician and first-aiders: Released Li-ion cell ingredients include corrosive substances or can form them with e.g. water, air moisture, moisture of the mucous membranes etc. For your own protection use personal protective equipment. Avoid contact with skin, eyes and clothing.

5 Firefighting measures

Flammable properties: The battery modules contain flammable electrolytes and other substances (see table 1) and therefore can cause a fire hazard if ruptured. Thermal decomposition of the cell electrode material can lead to release of irritating gases and vapours. In case of fire and/or explosion do not breathe fumes.

Extinguishing media: Suitable are metal fire extinguishing powder, dry sand. Water shall be used only in large amounts. Small amounts of water can have an adverse effect in contact with electrode material or released electrolyte.

External fire: In case of external fire, which can heat up the battery up to critical temperatures, also other extinguishing and cooling media are sufficient: Carbon dioxide (CO_2) or other extinguishing gas, water or extinguishing foam. If the extinguishing medium has a cooling effect, the battery should be cooled simultaneously to the fire extinguishing if possible.

Special hazards: An explosion of the battery module is not likely, because the enclosure has sufficient openings to release gas pressure. But leaked flammable gas can accumulate in an unvented room to critical amounts. Leaked electrolyte (liquid or gaseous) can form small amounts of hydrofluoric acid if it gets in touch with water or moisture.
Charge anode material contains lithium and can form hydrogen at contact with water.

Water protection: Used extinguishing media may be contaminated and shall not get into canalization, surface or groundwater. If necessary thicken or absorb the used media and dispose it properly according to national regulations.

6 Accidental release measures

Personal precautions: Use personal protective equipment. Avoid contact with skin, eyes and clothing.

Environmental precautions: Spraying water can reduce vapours. Sprayed water or other extinguishing media may be contaminated after use and shall not get into canalization, surface or groundwater. Thicken or absorb released ingredients with powder (rock salt, sand, foam) and dispose.

Methods for Containment: Prevent further leakage or spillage if there is a safe way. The containment shall be labelled properly. For the transport of defective battery modules, the containment must fulfil the requirements of the applicable special provision(s) of dangerous goods regulation (see also 14. Transport information).

Methods for cleaning up: Pick up and transfer to properly labelled containers. In case of rupture:
Take up with sand or other non-combustible absorbent material and place into containers for later disposal. Clean surfaces, floor etc. with water if necessary. Prevent leaked substances and washings from entering canalization, surface or groundwater due to high toxicity to aquatic organisms.

Transport: Li-ion batteries are classified as dangerous goods. Damaged Li-ion batteries require a transport under special provisions, see details under 14. Transport information.

7 Handling and storage of undamaged batteries

The battery modules are electrically charged upon delivery. Voltage cannot be measured directly at the terminals of the Battery flex pack, since the battery module will only be switched on once it has been installed in the Battery flex storage system. Improper charging or discharging may cause gas emissions from the battery module and flammable gas mixtures may escape. By using the batteries with Battery flex base, proper charging and discharging is done automatically. Inspect the battery terminals and pressure equalizing membrane of the battery module for damage. Do not open or disassemble the battery module! Failure to observe these instructions can cause escape of battery contents and decomposition products, leading to reactions which may be harmful to health, property and environment. Do not expose the battery module to great heat or fire. This could cause irreversible damage to the battery. Do not damage the battery module. Do not short-circuit batteries. Do not tamper with the battery module's communication interface.

Storage: The relevant ambient temperature limits for transport, storage and operation of the Battery flex pack must be complied with chapter 14, category *Packaging*. Store battery modules in a way that it is inaccessible to children. Keep battery modules clean and dry. Dirty battery terminals can be cleaned with a clean, dry cloth.
Do not use chemical cleaning products on Battery flex pack.
Only use battery modules for the intended purpose (installation with SOLARWATT Battery flex base).

Storage of large Quantities: In addition to the storage requirements above, follow the further recommendations of the German Insurance Association (GDV e.V) VDS 3103:2016-05:2019-06 (03) - mainly:

- No direct and permanent exposure to high temperatures or heat sources (e.g. direct sunlight).
- Usage of automatic extinguishing systems.
- Maintenance of structural or spatial separation of at least 2.5 m from other combustible materials in areas not protected by automatic extinguishing systems.
- Immediate removal of damaged or defective lithium batteries from storage and production areas and temporary storage at a safe distance or in an area separated from fire protection until disposal.

7.1 Handling and storage of damaged battery modules

In case of damaged batteries with or without ruptures cells: see 5. Accidental release measures

Handling: In case of rupture: Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Do not breathe vapours/dust.

Storage: Keep container tightly closed in a dry and well-ventilated place. Follow 6. Accidental release measures, methods for cleaning up.

Transport: Special provisions of dangerous goods regulations do apply (see 14. Transport information).

8 Exposure controls / Personal protection under normal conditions

Under normal condition (storage, operation according to intended use), proper transport etc., the battery module releases no ingredients. No special protective equipment is required.
The following information is for cases of rupture, unauthorized dismantling etc. where ingredients may leak.

Exposure guidelines: Table 2

Chemical Name CAS-No.	ACGIH TLV	OSHA PEL	NIOSH IDLH
Aluminium CAS# 7429-90-5	TWA: 10 mg/m^3	TWA: 15 mg/m^3 TWA: 5 mg/m^3 (vacated) TWA: 15 mg/m^3 (vacated) TWA: 5 mg/m^3	TWA: 5 mg/m^3
Copper CAS# 7440-50-8	TWA: 0.2 mg/m^3 TWA: 1 mg/m^3	TWA: 0.1 mg/m^3 TWA: 1 mg/m^3 (vacated) TWA: 0.1 mg/m^3	IDLH: 100 mg/m^3 TWA: 1 mg/m^3
Graphite CAS# 7782-42-5	TWA: 2 mg/m^3	(vacated) TWA: 2.5 mg/m^3	IDLH: 1250 mg/m^3 TWA: 2.5 mg/m^3
Lithium cobalt manganese nickel oxide CAS# 182442-95-1	TWA 0.2 mg/m^3 (as dust)	TWA 5 mg/m^3 (as Mn)	
Phosphate(1-), hexafluoro-, lithium CAS# 21324-40-3	TWA 0.2 mg/m^3	TWA: 2.5 mg/m^3 (vacated) TWA: 2.5 mg/m^3	

NIOSH IDLH: Immediately dangerous to life or health

Engineering measures: Showers, eyewash stations, ventilation systems

Personal protective equipment:
- Eye/face protection: wear tightly fitting safety goggles.
- Skin and body protection: wear protective gloves/clothing.
- Respiratory protection: If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn.

Hygiene measures: Act in accordance with good industrial hygiene and safety practice.

9 Physical and chemical properties

Under normal condition (storage, operation according to intended use), proper transport etc. not fully applicable
Water solubility: insoluble in water Physical state: solid