



## TITAN Lithium 12V 460Ah Data Sheet

Part Number	LFP-460
Nominal Voltage	12.8V
Rated Capacity	460Ah (20Hr)
Capacity	5,888Wh
Achievable Capacity	Up to 506Ah
Dimensions	520mm long x 268mm wide x 240mm high (±0.5mm)
Terminal Type	M8 threaded insert (bolts included)
Case Material	ABS Plastic
Weight	≤40Kg



### Charge & Discharge

Charge Voltage	14.2V - 14.4V
Float Voltage	13.3V - 13.9V
Impedance	<10mΩ
Continuous Charge Current	200A
Continuous Discharge Current	200A

### Temperature Windows

Operating Temperature	Charging	-20°C to 50°C
	Discharging	-20°C to 60°C
Storage Temperature	7 days or less	-20°C to 60°C
	3 months or less	-20°C to 40°C
	4 months or more	-20°C to 25°C

### TITAN Custom BMS Features

BMS Protection			Protection Trigger
Cell charge over voltage protection	Charge over voltage protection		3.65V
	Charge over voltage protection release		3.50V
Pack charge over voltage protection	Charge over voltage protection		14.40V
	Charge over voltage protection release		14.00V
Cell discharge under voltage protection	Discharge under voltage protection		2.50V
	Discharge under voltage protection release		3.00V
Pack discharge under voltage protection	Discharge under voltage protection		10.0V
	Discharge under voltage protection release		12.00V
Charge over current protection	Charge over current protection		200A
	Charge over current protection release	Remove charger	
Discharge over current protection	Primary discharge over current protection		260A
	Secondary discharge over current protection		320A
Short circuit protection	Short circuit current protection		1,500A
	Short circuit protection release	Remove load or charge to release	
Temperature protection	Discharge high temperature protection		60°C - 65°C
	Discharge high temperature protection release		55°C - 60°C
	Discharge low temperature protection		-20°C - -25°C
	Discharge low temperature release		-10°C - -15°C
	Charge high temperature protection		60°C - 65°C
	Charge high temperature protection release		55°C - 60°C
	Charge low temperature protection		0°C - 5°C
	Charge low temperature protection release		5°C - 10°C
Balancing voltage	Balanced start-up voltage		3.400V
	Balanced mode		Active Balance
Power consumption	Running mode		≤6mA
	Normal sleeping		≤150uA
	Deep sleeping		≤50uA
Cell Heater	Heater activation		≤3°C & on charge
	Heater power source		Charger
	Heater switch off		5°C - 10°C
	Heater power consumption		160W (±5%)
	Charger current required for full performance		10A (±5%)
	Accepted protocols for inverters		CAN & RS485
Communications	Batteries in parallel communication		Ethernet

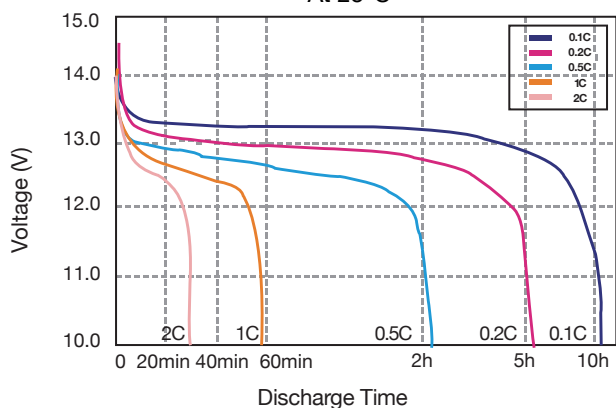


## TITAN Lithium Battery Performance

Note: 1C refers to 1 x current of the rated cell. E.g. a 0.5C rating on a 150Ah battery is charging/discharging at 75A.  
1C on a 150Ah is 150A.

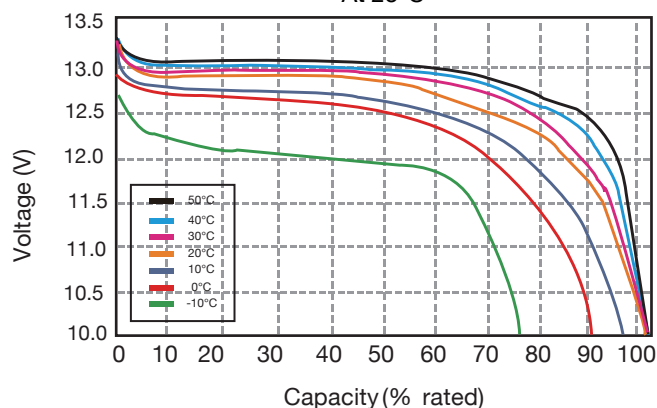
### Discharge Rates

At 25°C



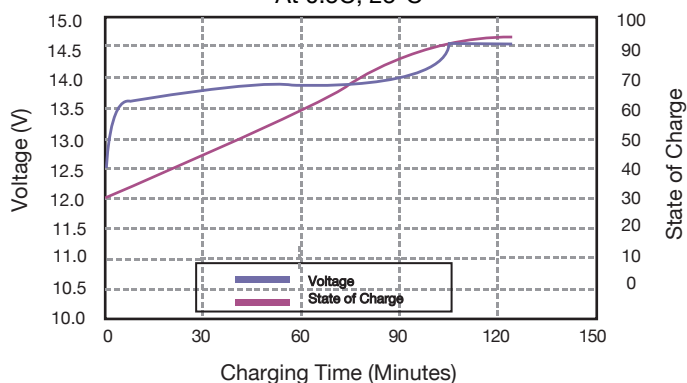
### Temperature effects on discharge rates

At 25°C



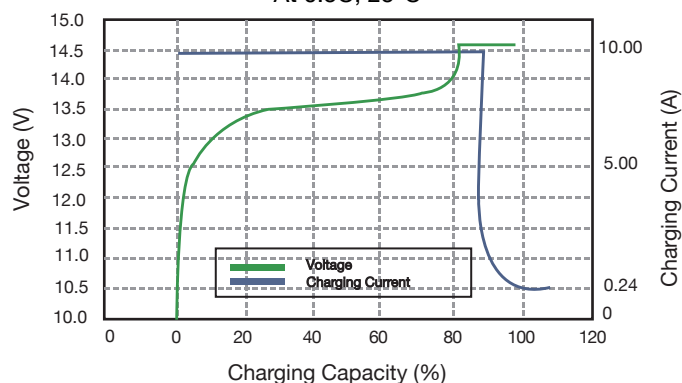
### State of charge over time

At 0.5C, 25°C



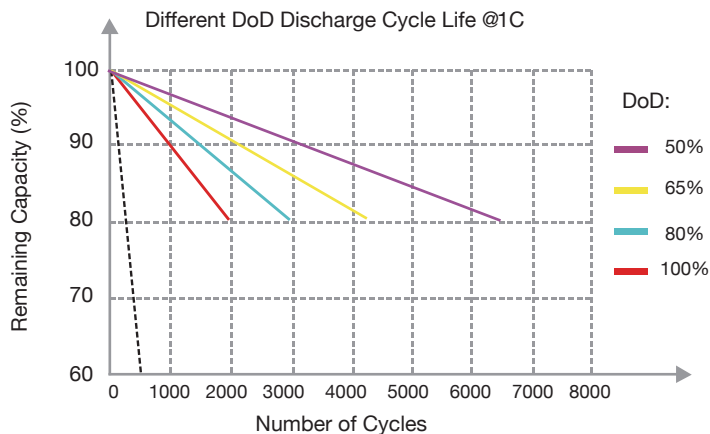
### Charging characteristics

At 0.5C, 25°C



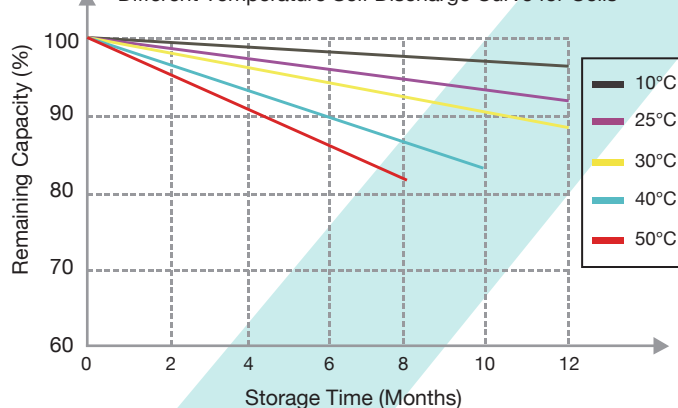
### Cycle Life

At 1C, 25°C



### Self discharge

Different Temperature Self Discharge Curve for Cells



## SECTION 1-COMPANY IDENTIFICATION

### Chemical Product Identification

Product Name: Lithium Ion Phosphate Rechargeable Battery

Common Name: Lithium Iron Phosphate (LiFePO<sub>4</sub>)

Distributed By: Groves Batteries Ltd T/A TITAN Lithium

Address: Lypiatt Street, Cheltenham, GL50 2UB, United Kingdom

Company Registration Number: 05699836

Phone Number: +44 01242 501802

Email: info@titanlithium.co.uk

## SECTION 2 – HAZARDS IDENTIFICATION

Emergency Overview: This product contains a chemical substance. Safety information is given for exposure to the product as sold. Intended use of the product should not result in exposure to the chemical substance. This is a battery. In case of rupture, the below hazards exist.

### CAS# 1333-86-4

#### Classification According to GHS

Self-heating substances and mixtures (1) Carcinogenicity (2)

Specific target organ toxicity, repeated exposure (1) (lung)

#### Label Elements Hazard Images:



Signal Word: Danger Hazard Statements:

H251 Self-heating; may catch fire

H351 Suspected of causing cancer

H372 Causes damage to organs through prolonged or repeated exposure (lung)

Precautionary Statements:

#### Prevention:

P235 Keep cool.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P280 Wear protective gloves, protective clothing, eye protection and face protection.

P260 Do not breathe dust.

P264 Wash skin and clothing thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

#### Response:

P308+P313 If exposed seek medical attention.

P314 Seek medical attention if you feel unwell.

#### Storage:

P407 Maintain air gap between stacks or pallets.

P413 Store at temperatures not exceeding 50°C.

P420 Store separately.

P405 Store locked up.

#### Disposal:

P501 Contents require disposal at approved waste treatment plants.

### CAS# 7440-50-8

#### Classification according to GHS

Sensitisation skin (1, 1A, 1B)

Specific target organ toxicity, single exposure (1) (digestive system) Specific target organ toxicity, single exposure;

Respiratory tract irritation (30)

#### Label Elements Hazard Images:



Signal word: Danger Hazard Statements:

H317 May cause allergic skin reaction.

H370 Causes damage to organs (digestive system).

H335 May cause respiratory irritation.

#### Prevention:

P260 Do not breathe dust, fume.

P272 Contaminated work clothing should not be allowed out of the workplace.

P280 Wear protective gloves, eye protection, face protection.

P264 Wash skin and clothing thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

#### Response:

P302+P352 IF ON SKIN: Wash with plenty of water.

P333+P313 If skin irritation or rash occurs: Seek medical attention.

P321 Specific treatment (See additional emergency instructions).

P362+P364 Take off contaminated clothing and wash it before reuse

P308+P311 IF exposed or concerned: Call a POISON CONTROL CENTRE.

P312 Call a POISON CENTRE if you feel unwell.

#### Storage:

P403 +P233 Store in a well-ventilated place. Keep container tightly closed.

P405 Store locked up.

#### Disposal:

P501 Contents handling to approved waste treatments.

### AS# 7429-90-5

#### Classification according to GHS

Substances and mixtures which, in contact with water, emit flammable gases (2, 3)

Specific target organ toxicity, repeated exposure (1) (Lung)

Hazardous to the aquatic environment, long-term hazard (4)



Signal word: Danger Hazard Statements:  
H261 In contact with water releases flammable gas.  
H372 Causes damage to organs through prolonged or repeated. exposure (Lung).  
H413 May cause long lasting harmful effects to aquatic life.

**Prevention:**  
P223 Do not allow contact with water.  
P231+P232 Handle and store contents under inert gas, protect with moisture.  
P280 Wear protective gloves and clothing thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
P273 Avoid release to the environment.

**Response:**  
P302+P335+P334 IF ON SKIN: Brush off loose particles from skin and immerse in cool water.  
P370+P378 In case of fire: use the appropriate media to put out the fire.  
P314 Seek medical attention if you feel unwell.

**Storage:**  
P402+P404 Store in a dry place. Store in a closed container.  
**Disposal:**  
P501 Contents handling to approved waste treatment plants.

**Other Hazards**  
Physical and Chemical hazards: See Section 10  
Human Health Hazards: See Section 11  
Environmental Hazards: See Section 12

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Characterisation: Mixture

Chemical Composition	CAS No.	EC#	Weight (%)
Lithium iron phosphate (LiFePO4)	15365-14-7	604-917-2	20-40%
Lithium hexafluorophosphate	21324-40-3	244-334-7	10-20%
Aluminium	7429-90-5	231-072-3	10-20%
Graphite	7782-42-5	231-955-3	10-20%
Copper	7440-50-8	231-159-6	7-13%
Poly (vinyl chloride)	9002-86-2	618-338-8	1-5%

SECTION 4 – FIRST AID MEASURES

**Description of First Aid Measures**  
**General Information:** No special measures required.  
**After Eye Contact**  
Flush eyes with plenty of water for several minutes while holding eyelids open. Get medical attention if irritation persists.  
**After Skin Contact**  
Remove contaminated clothing and shoes. Immediately wash with water and soap, rinse thoroughly. Wash clothing and shoes before reuse. If irritation occurs, get medical attention.  
**After Inhalation**  
Remove victim to non exposed area. Administer artificial respiration if breathing is difficult. Seek medical attention.  
**After Swallowing**  
Do not induce vomiting. Get medical attention.  
**Personal protective equipment for first-aid responders:** No data available  
**Most important symptoms/effects, acute and delayed:** No data available  
**Indication of immediate medical attention and special treatment needs:** No data available

SECTION 5 – FIRE FIGHTING MEASURES

**Suitable extinguishing media:**  
Use extinguishing agent suitable for local conditions and the surrounding environment, such as ABC extinguisher of the following type: a foam extinguisher, CO2, ABC dry chemical, powdered graphite, copper powder or soda (sodium carbonate) that is common to extinguish other combustible fire types.  
**Unsuitable extinguishing media:** No data available.  
**Specific Hazards Arising from the Chemical:**  
Special hazards arising from the substance or mixture  
Battery may burst and release hazardous decomposition products when exposed to a fire situation. Lithium ion batteries contain flammable electrolytes that may vent, ignite and spark when subjected to high temperature (>150°C (302°F), when damaged or abused (e.g.) mechanical damage or electrical overcharging); may burn rapidly with flare-burning effect; may ignite other batteries in close proximity.  
**Specific protective actions for fire-fighters:**  
Protective equipment: wear self-contained respirator. Wear fully protective impervious suit.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

**Personal Precautions:** Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation.  
**Protective Equipment:** No data available.  
**Emergency Procedures:** Remove ignition sources, evacuate area. Sweep up using a method that does not generate dust. Collect as much of the spilled material as possible, place the spilled material into a suitable container for disposal.



Keep spilled material out of sewers, ditches and bodies of water.

**Environmental Precautions:** Do not allow material to be released into the environment without proper governmental permits.

**Methods and Materials for Containment and Cleaning Up:**

All waste must refer to the United Nations, the national and local regulations for disposal.

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

## SECTION 7 – HANDLING AND STORAGE

**Precautions for Safe Handling:**

Consumption of food and beverage should be avoided in work areas. Wash hands with soap and water before eating or drinking. Ground containers when transferring liquid to prevent static accumulation and discharge.

Batteries may explode or cause burns, if disassembled, crushed or exposed to fire or high temperatures. Do not short or install with incorrect polarity.

**Conditions for safe storage, including any incompatibilities:**

**Requirements to be met by storerooms and receptacles**

Store in a cool, dry, well-ventilated place.

**Information about storage in one common storage facility**

Keep away from heat, avoiding long exposure to sunlight.

**Further information about storage conditions**

Keep container tightly sealed

**Specific and use:** No data available

## SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

**Appropriate engineering controls:** The usual precautionary measures for handling chemicals should be followed. Remove all soiled and contaminated clothing immediately. Wash hands before breaks and at the end of work.

**Personal Protective Equipment**

Respiratory protection: Wear suitable protective mask in order to reduce the respiratory system. In case of leakage, wear chemical protective clothing, including self-contained breathing apparatus.

**Hand protection:** Wear appropriate protective gloves to reduce skin contact.

**Eyes protection:** Wear safety goggles or eye protection combined with respiratory protection.

**Skin and body protection:** Working environment required, wear suitable protective clothing to minimise contact with skin. The type of protective equipment must be according to the concentration and content of certain hazardous substances in the workplace.

## SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

**Information on basic physical and chemical properties**

**Colour:** Black

**Physical State:** Prismatic

**Odour:** Not available

**Odour Threshold:** Not available

**pH:** Not available

**Melting point/freezing point:** Not available

**Initial boiling point and boiling range:** Not available

**Flash Point:** Not available

**Evaporation Rate:** Not available

**Flammability (solid, gas):** Not available

**Explosion Limits (vol% in air):** Not available

**Vapour Pressure, kPa at 20°C:** Not available

**Vapour Density:** Not available

**Density/Relative Density (water=1):** Not available

**Solubility(ies):** Not available

**Partition Coefficient: n-octanal/water:** Not available

**Auto-ignition Temperature:** Not available

**Decomposition Temperature:** Not available

**Viscosity:** Not available

**Other Information:** Not available

## SECTION 10 – STABILITY AND REACTIVITY

**Reactivity:** No data available

**Chemical Stability:** Stable

**Possibility of Hazardous Reactions:** No data available

**Conditions to Avoid:** Flames, sparks and other sources of ignition, incompatible materials

**Incompatibilities Materials:** Oxidising agents, acid, base

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide, lithium-oxide fumes

## SECTION 11– TOXICOLOGICAL INFORMATION

**Acute Toxicity:**

CAS No.	LC50/LD50
15365-14-7	No data available
21324-40-3	No data available
7429-90-5	No data available
7782-42-5	No data available
7440-50-8	No data available
9002-86-2	No data available

**Skin Corrosion/Irritation:** No data available

**Serious Eye Damage/Irritation:** No data available

**Respiratory or Skin Sensitisation:** No data available

**Germ Cell Mutagenicity:** No data available

**Carcinogenicity:** No data available

**Reproductive Toxicity:** No data available

**Specific Target Organ Toxicity-Single Exposure:** No data available

**Specific Target Organ Toxicity-Repeated Exposure:** No data available

**Aspiration Hazard:** No data available

**Information on the Likely Routes of Exposure:** No data available

**Eye:** No data available

**Skin:** No data available  
**Ingestion:** No data available  
**Inhalation:** No data available

SECTION 12 – ECOLOGICAL INFORMATION


**Ecological Toxicity:** No data available  
**Persistence and Degradability:** No data available  
**Bioaccumulative Potential:** No data available  
**Mobility in Soil:** No data available  
**Other Adverse Effects:** No data available

SECTION 13 – DISPOSAL CONSIDERATIONS

**Disposal Methods**  
**Recommendation:** Consult state, local or national regulations to ensure proper disposal.  
**Uncleaned Packaging**  
**Recommendation:** Disposal must be made according to official regulations.

SECTION 14 – TRANSPORT INFORMATION

**Acute Toxicity:**

UN Number	
IATA IMDG ADR Model Regulation	UN3480
UN Proper shipping name	
IATA IMDG ADR Model Regulation	Lithium ion battery
Transport Hazard Class (es)	
IATA IMDG ADR Model Regulation	9
Packing group	
IATA IMDG ADR Model Regulation	N/A
Packing Sign	
IATA IMDG ADR Model Regulation	
Environmental Hazards Marine Pollutant:	No
Special precautions for user	N/A

**Transport Information:**  
TITAN LiFePO4 Batteries have passed compliance tests:  
**UN38.3**  
**CE**  
**RoHS**  
**UKCA**  
**EMC**

Watt-hour exceeds the standard, so it belongs to dangerous goods. The goods are packaged according to the packaging Instruction 965 Section IA of IATA DGR for transportation, Cargo aircraft only.

Watt-hour exceeds the standard, so it belongs to dangerous goods. The goods are packaged according to the special provision 230, 348 of IMDG (37-14).

Watt-hour exceeds the standard, so it belongs to dangerous goods. The goods are packaged according to the <<Recommendations On The Transport of Dangerous Goods- Model Regulations>>(19th).

Separate batteries to prevent short-circuiting and they should be packed in a strong package during transport. Lithium cell or battery should incorporate a safety venting device or be designed to prevent a violent rupture under normal transport conditions. Keep away from high temperature and open flames. Lithium ion cells and batteries must be offered for transport at a state of charge (SoC) not exceeding 30% of their rated design capacity.

**Transport Fashion:** By air, by sea, by railway, by road.

SECTION 15 – REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

CAS No.	TSCA	IESC	DSL/NDSL	EINECS/ ELINCS/ NLP
15365-14-7	Listed	Listed	Listed DSL	Listed
21324-40-3	Listed	Listed	Listed DSL	Listed
7429-90-5	Listed	Listed	Listed DSL	Listed
7782-42-5	Listed	Listed	Listed DSL	Listed
7440-50-8	Listed	Listed	Listed DSL	Listed
9002-86-2	Listed	Listed	Listed DSL	Listed



Issue Department: Technical Department Modification Record: Notice to Reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above names supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although, certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Other Information:

CAS: (Chemical Abstracts Service)

EC: (European Commission)

ACGIH: (American Conference of Governmental Industrial Hygienists) NIOSH: (US National Institute for Occupational Safety and Health) OSHA: (US Occupational Safety and Health)

TLV: (Threshold Limit Value)

TWA: (Time Weighted Average)

STEL: (Short Term Exposure Limit)

PEL: (Permissible Exposure Average)

REL: (Recommended Exposure Limit)

PC-STEL: (Permissible concentration-time weighted average PC-TWA: (Permissible concentration-short time exposure limit) LC50: (Lethal concentration, 50 percent kill)

LD50: Lethal dose, 50 percent kill)

IARC: (International Agency for Research on Cancer)

EC50: (Median effective concentration)

BCF: (Bio concentration Factor)

BOD: Biochemical Oxygen Demand)

NOEC: (No observed effect concentration)

NTP: (US National Toxicology Program)

RTECS: (Registry of Toxic Effects of Chemical Substances) IATA: (International Air Transport Association)

IMDG: (International Maritime Dangerous Goods)

TDG: (Recommendations on the TRANSPORT OF DANGEROUS GOODS Model Regulations)

TOC: (Total Organic Carbon)

TSCA: (Toxic Substances Control Act of USA)

DSL: 9The Domestic Substances List of Canada)

NDSL: (The Non-Domestic Substances List of Canada)