

Operation and maintenance instructions for NexSys® PURE batteries

ENGLISH

Traction motive power batteries, valve regulated lead acid (VRLA) battery NexSys® PURE series: TPPL (Thin Plate Pure Lead) technology with carbon additive in active material formulation.










Rating Data

- | | |
|-----------------------------|----------------|
| 1. Nominal capacity C_5 : | see type plate |
| 2. Nominal voltage: | see type plate |
| 3. Discharge current: | $C_5/5h$ |
| 4. Rated temperature: | 30°C |

NexSys PURE batteries series are valve-regulated lead-acid batteries. Unlike conventional batteries with liquid electrolyte these batteries have immobilised electrolyte. Instead of a vent plug, a valve is used to regulate the internal gas pressure, preventing the ingress of oxygen from the air and allowing the escape of excess charging gasses should an overcharged condition occur. When operating valve-regulated lead-acid batteries the same safety requirements as for vented batteries apply, to protect against hazards from electric current, from explosion of electrolytic gas and - with some limitations - from the corrosive electrolyte.

Battery valves should never be removed. These batteries do not require topping up with distilled or demineralised water.

SAFETY PRECAUTIONS

	<ul style="list-style-type: none"> Pay attention to the operating instructions and keep them close to the battery. Work on batteries must only be carried out by skilled personnel! 	<p>top of the battery. Remove rings, wristwatches and articles of clothing with metal parts that might come into contact with the battery terminals.</p>	
	<ul style="list-style-type: none"> Use protective glasses and wear safety clothing when working on batteries. Adhere to the current accident prevention rules in the country where the battery is used or EN 62485-3, EN 50110-1. 		<ul style="list-style-type: none"> Electrolyte is highly corrosive. In the normal operation of this battery a contact with acid isn't possible. If the cell containers are damaged, the immobilized electrolyte (absorbed in the separator) is corrosive like the liquid electrolyte.
	<ul style="list-style-type: none"> No smoking! Do not expose batteries to naked flames, glowing embers or sparks, as it may cause the battery to explode. Avoid sparks from cables or electrical apparatus as well as electrostatic discharges. 		<ul style="list-style-type: none"> Batteries are heavy. Ensure secure installation! Use only suitable handling equipment. Lifting hooks must not damage the cells, connectors or cables. Do not place batteries in direct sunlight without protection. Discharged batteries can freeze. For that reason, always store in a frost-free zone.
	<ul style="list-style-type: none"> Acid splashes into the eyes or on the skin must be washed immediately with an abundance of clean water. After abundant flushing consult a doctor immediately! Clothing contaminated by acid should be washed in water. 		<ul style="list-style-type: none"> Dangerous electrical voltage! Avoid short circuits: NexSys PURE batteries are capable of high short circuit currents. Caution – metal parts of the battery are always live: do not place tools or other objects on the battery!
	<ul style="list-style-type: none"> Risk of explosion and fire. Avoid short circuits: do not use non-insulated tools, do not place or drop metal objects on 		<ul style="list-style-type: none"> Pay attention to the hazards that can be caused by batteries.

Ignoring the operating instructions, and repair with non-original parts will render the warranty void. All failures, malfunctions and fault codes of the battery, the charger or any other accessories, must be notified to EnerSys® service immediately.

1. Commissioning

NexSys PURE batteries are supplied in a charged condition. The battery should be inspected to ensure it is in perfect physical condition.

Check:

- The battery cleanliness. Before installing, the battery compartment has to be cleaned.
- The battery end cables have a good contact to terminals and the polarity is correct. Otherwise the battery, vehicle or charger could be damaged.

Use special coding systems for maintenance free batteries for the charging plug- and- socket devices to prevent accidental connection to the wrong type of charger. Never directly connect an electrical appliance (for example: warning beacon) to a part of the battery. This could lead to an imbalance of the cells during the recharge, i.e. a loss of capacity, the risk of insufficient discharge time, damage to the cells and voids the battery warranty. Charge the battery (see 2.2) before commissioning.

2. Operation

EN 62485-3 "Traction batteries for industrial trucks" is the standard which applies. The nominal operating temperature is 30°C. The optimum lifetime of the battery depends on the operating conditions (temperature and depth of discharge). The ambient temperature range of use for the battery is between 0°C and +40°C, any use outside of this range must be approved by the EnerSys Technical department. Optimal battery life is obtained with the battery at a temperature of 25-30°C. Higher temperatures shorten the life of the battery (according to IEC1431 technical report), lower temperatures reduce the available capacity. The upper ambient temperature limit is 40°C and batteries should not be operated above 55°C battery temperature. The capacity of the battery changes with temperature and falls considerably under 0°C.

The optimum lifetime of the battery depends on the operating conditions and lifetime will be optimised with 60% DOD or lower. The maximum permissible discharge is 60% of C_5 of nominal capacity with frequent opportunity charge. The battery obtains its full capacity after about 3 charging and discharging cycles.

2.1 Discharging

The valves on the top of the battery must not be sealed or covered. Electrical connections (e.g. plugs) must only be made or broken in the open circuit condition. Discharges over 60% of the rated capacity are categorised as deep discharges and are not acceptable as they reduce considerably the life expectancy of the battery. Discharged batteries **MUST** be recharged immediately and **MUST** not be left in a discharged condition.

Note: The following statement only applies to partially discharged batteries.

Discharged batteries can freeze. Limit the discharge to a maximum of 60% DOD. The cycle life of the battery will depend on the DOD, the higher the DOD, the shorter the cycle life. The presence of a discharge limiter on the vehicle is imperative.

The following energy cut-off settings must be used:

- 60% DOD 1.96 V

when discharged with currents in the range of I_1 to I_2 .

The battery is fitted with a Low Voltage Alarm (LVA) and the customer must observe the visual and audible warning signals that the battery has reached its maximum discharge level and must be charged immediately. At lower currents please seek advice from EnerSys® Service.

2.2 Charging

NexSys® PURE batteries must be charged using EnerSys NexSys+ Modular or Lifespeed iQ™ Modular chargers. These chargers **MUST** be used on these batteries. Non respecting the matching charges will invalidate any warranty. NexSys PURE batteries are suitable for standard and heavy duty applications. The specific charging profile developed for recharging NexSys PURE batteries allows a fast recharge (0.25 - 0.4 C₅) in 4 hours from 60% DOD and opportunity charging as often as needed without damaging the batteries. Opportunity charge can be performed up to 80% extra energy reintegrated (reintegration rate 40% in 1 hour). Do not put the charger on the battery.

Charging Rate	from 80% DOD -> Full charge	from 60% DOD -> Full charge	from 40% SOC -> 80%	from 40% SOC -> 98% SOC
0.4 C ₅	4.6	4.1	1	2
0.25 C ₅	5.5	4.75	1.6	3.4

NexSys PURE batteries have an extremely low gas emission under normal circumstances. For safety purposes when calculating gas emission levels, use 1.5A / 100Ah C₅. Nevertheless, provision must be made for venting of the charging gases. Doors, battery container lids and the covers of battery compartments must be opened or removed. When the charger switched off, connect the battery to the charger, ensuring that the polarity is correct (positive to positive, negative to negative). Now switch the charger on. NexSys PURE batteries must receive their full charge at least once a week.

2.3 Equalising charge

NexSys+ Modular and Lifespeed iQ Modular chargers will automatically provide an equalising charge, following normal full charge (conditions embedded into the profile).

3. Maintenance

The electrolyte is immobilised. The density of the electrolyte cannot be measured. Never remove the safety valves from the cell. In case of accidental damage to the valve, contact EnerSys service for replacement.

3.1 Daily

- Recharge the battery after every discharge.
- Check the condition of the plugs, cables and that all insulation covers are in place and in good condition.

3.2 Weekly

- Visual inspection for signs of dirt and mechanical damage to all component parts of the battery, pay particular attention to the battery charging plugs and cables.

3.3 Quarterly

At the end of the charge, carry out end of charge voltage, readings, measure and record:

- The voltage of the complete battery
- The voltages of each cell

If significant changes from earlier measurements or differences between the cells are found, please contact EnerSys service. If the discharge time of the battery is not sufficient, check:

- That the required work is compatible with the battery capacity
- The settings of the charger
- The settings of the discharge limiter on the vehicle.

3.4 Annually

Remove internal dust from the battery.

Electrical connections: test all connections (sockets, cables, and contacts). In accordance with EN 1175-1 at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist. The tests on the insulation resistance of the battery must be conducted in accordance with EN 1987-1. The insulation resistance of the battery thus determined must not be below a value of 50 Ω per Volt of nominal voltage, in compliance with EN 62485-3. For batteries up to 20 V nominal voltage the minimum value is 1000Ω.

4. Care of the battery

The battery should always be kept clean and dry to prevent tracking currents. Cleaning must be done in accordance with the ZVEI code of practice "The Cleaning of Vehicle Traction Batteries". Any liquid in the battery tray must be extracted and disposed of in the prescribed manner. Damage to the insulation of the tray should be repaired after cleaning, to ensure that the insulation value complies with EN 62485-3 and to prevent tray corrosion.

Call EnerSys service if it is necessary to remove cells.

Never use (apply) mineral grease on the battery, the sealing material of the terminal is incompatible and it can be permanently damaged. If it's necessary, use (apply) the silicone grease with PTFE.

5. Storage

Batteries are dispatched from the manufacturer in a fully charged condition. The state of charge will decrease with storage. All batteries lose their stored energy when allowed to stand open circuit, due to parasitic chemical reactions.

The rate of self-discharge is non-linear and decreases with decreasing state of charge. It is also strongly influenced by temperature.

If the truck/vehicle is going to be unused for periods in excess of 48 hours, the ignition key must be removed and any auxiliary equipment (such as lights, beacons, on-board computer etc) must be switched off. If the truck or battery is going to be decommissioned for a period of 1 month or longer, all electronic devices (such as Wi-iQ®, LVA) must be professionally disconnected by EnerSys service – please contact us for assistance.

High temperatures greatly reduce storage life.

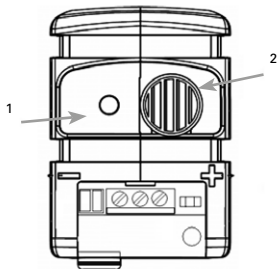
Standard storage time for a battery not installed into a truck is 1 month without need to recharge. Maximum storage time is 6 months at 20°C provided the battery is fully charged when put into storage and provided that all electronic devices (LVA, Wi-iQ) or other equipment that could cause the battery to discharge are disconnected. However, it is advisable to conduct an inspection and open circuit voltage check after 3 months and implement a refresh charge if necessary.

6. Malfunctions

If malfunctions are found on the battery or the charger, EnerSys service should be called in without delay. The measurements taken in point 3.3 will facilitate fault finding and their elimination. A service contract with us will make it easier to detect and correct faults in good time.

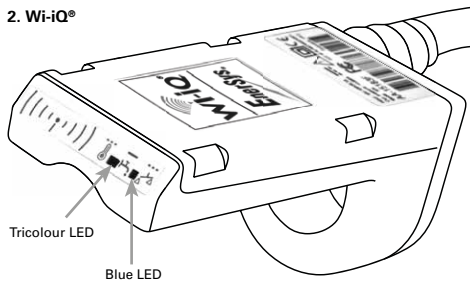
The two electronic devices will also provide indications according to the table below.

1. Low Voltage Alarm



		Description	Comment	Stop Condition
1	LED	Slow flashing green	Normal operation	
1	LED	Flashing red	SOC < 40%, the battery needs to be recharge soon	Battery on charge V>2.08V/c
1	LED	Flashing green (0.2s ON - 5s OFF)	Normal operation, battery on discharge	
1	LED	Fast flashing green	Normal operation, battery on charge	
2	Buzzer	Beeping 3 times every 5 minutes	SOC < 40%, the battery needs to be recharge soon	Battery on charge V>2.08V/c
2	Buzzer	Beeping 1 time every 5 seconds	SOC < 20%, the battery needs to be recharged immediately	Battery on charge V>2.08V/c

2. Wi-iQ®



	Description	Comment
Tricolour LED	Green blinking	hardware OK
	Blue rapid blinking	wireless identification
	Red blinking	temperature warning > 55°C
Blue LED	Rapid blinking	wireless identification
	Slow blinking	voltage balance warning

7. Disposal

NexSys® PURE batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing transportation rules and regulations. Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.

8. Certificate



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CERTIFICATE

We, the undersigned, certify that our NEXSYS range batteries have a gas recombination level higher or equal to 95% when working. Despite of this gas recombination, there is hydrogen and oxygen emission during recharge. Though this gas emission is very low, a ventilation during recharge is absolutely necessary. (please refer to legislation, EN 50272-3 and IEC 62485-3 standards).

ARRAS, March 3rd, 2016

Xavier MUNERET
Technical & Quality Manager



Société à Responsabilité Limitée au Capital de 40 948 270 Euros
R.C.S. Arras 441 320 636

Declaration of Conformity

ENERSYS SARL Rue Alexander Fleming ZI Est -CS 40962 F-62033 Arras Cedex- France declares under our sole responsibility that the product:

Product Name: Wi-iQ

Part Number: AA-xxxxxx

to which this declaration relates, is in conformity with the following normative European and International standards:

Health & Safety (Directive 2014/53/EU)

- IEC/EN 61010-1:2010

EMC (Directive 2014/53/EU)

- ETSI EN 301 489-1, V2.1.1 : 2016; ETSI EN 301 489-17, V3.1.1: 2016; EN 62479 : 2010; EN 61000-6-2 : 2005

Radio Spectrum (Directive 2014/53/EU)

- EN 300 328 V2.1.1 (2016-11)

Date : 06.02.2018, Arras

Name : Bruno Konevetz

Title : Charger Quality Manager EMEA

Signature :



Back to the manufacturer!

Batteries with this sign must be recycled.

Batteries that are not returned for the recycling process must be disposed of as hazardous waste!

