

NexSys[®] PURE

GEN 1
THIN PLATE PURE LEAD
(TPPL) TECHNOLOGY



OPERATION AND MAINTENANCE INSTRUCTIONS FOR NEXSYS® PURE BATTERIES

NexSys® PURE batteries are for traction applications. The batteries are Valve Regulated Lead Acid (VRLA) utilizing our Thin Plate Pure Lead (TPPL) technology.

RATING DATA

Nominal capacity C₈ : see table below
 Nominal voltage : see table below
 Rated temperature : 77°F (25°C)

Unlike conventional batteries with liquid electrolyte, NexSys PURE batteries have immobilized electrolyte. Instead of a vent plug, a valve is used to regulate the internal gas pressure, which prevents the ingress of oxygen and allows the escape of excess charging gasses should an overcharged condition occur. When operating VRLA batteries, the same safety requirements apply as for vented batteries. This will help protect against hazards from electric current to explosion of electrolytic gas and corrosive electrolyte.

Battery valves should never be removed. These batteries do not require watering.

Any data, descriptions or specifications set forth herein are subject to change without notice. Before using the product(s), the user is advised and cautioned to make its own determination and assessment of the suitability of the product(s) for the specific use in question and is further advised against relying on the information contained herein as it may relate to any general use or indistinct application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. The product(s) featured herein will be used under conditions beyond the manufacturer's control and therefore all warranties, either express or implied, concerning the fitness or suitability of such product(s) for any particular use or in any specific application, are disclaimed. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself.

SAFETY PRECAUTIONS

DANGER

CONTAINS: Lead, Sulfuric Acid (Electrolyte), Lead Compounds.

Harmful if swallowed, inhaled, or in contact with skin. Acid causes severe skin burns and eye damage. May damage fertility or the unborn child if ingested or inhaled. May cause harm to breastfed children. May cause cancer if ingested or inhaled. Causes skin irritation, serious eye damage. Contact with internal components may cause irritation or severe burns. Causes damage to central nervous system, blood and kidneys through prolonged or repeated exposure if ingested or inhaled. Irritating to eyes, respiratory system, and skin. May form explosive air/gas mixture during charging. Extremely flammable gas (hydrogen). Explosive, fire, blast or projection hazard. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wash thoroughly after handling. Do not eat drink or smoke when using this product. Avoid contact during pregnancy/while nursing. Wear protective gloves/protective clothing, eye protection/face protection.

Use only outdoors or in a well-ventilated area. Avoid contact with internal acid. Do not breathe dust/fume/gas/mist/vapors/spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking IF SWALLOWED OR CONSUMED: rinse mouth. Do NOT induce vomiting. Call a poison center/doctor if you feel unwell. IF ON CLOTHING OR SKIN (or hair): Remove/Take off immediately all contaminated clothing and wash it before reuse. Rinse skin with water/shower. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed/concerned, or if you feel unwell seek medical attention/advice. Store locked up, in a well-ventilated area, in accordance with local and national regulation. Dispose of contents/container in accordance with local and national regulation. Keep out of reach of children.

PROPOSITION 65 WARNING: Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.

WARNING: Risk of fire, explosion or burns. Do not disassemble, heat above 60°C or incinerate. Ventilate spaces where used or charged.

High Voltage: Risk of shock. Do not touch uninsulated terminals or connectors.

WARNING - Do NOT use any type of oil, organic solvent, alcohol, detergent, strong acids, strong alkalis, petroleum-based solvent or ammonia solution to clean the jars or covers. These materials may cause permanent damage to the battery jar and cover and will void the warranty.

Failure to follow these Operation and Maintenance Instructions or using parts that are non-original will void the NexSys PURE battery warranty.

1. Commissioning

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

Check:

- The battery compartment and the battery are in a clean condition.
- The battery cable ends have good contact with the terminals and the polarity is correct.

Never directly connect an electrical appliance (i.e. warning beacon) to a part of the battery. This could lead to an imbalance of the cells. This will damage all cells in the battery and void the battery warranty. A DC-DC converter must be used to supply any low voltage loads.

NexSys PURE 12V blocs that are assembled into strings must use flexible cable connections with adequate length to ensure there is no stress on the terminal due to battery movement. EnerSys® approved fasteners must be used. The valves on the top of the battery must not be sealed or covered. NexSys PURE batteries may be installed in any direction except inverted. Only batteries with the same state of discharge should be connected together.

Charge the battery (see Section 2.2) before the first discharge. Sufficient controls should be enacted (colored connectors, Wi-iQ® device, etc) to ensure the battery is only charged using an EnerSys approved charger with the appropriate approved NexSys PURE profile.

The specified torque loading for the bolts/screws of the terminals and terminal adaptors for NexSys PURE blocs are detailed in the table below:

NexSys® PURE Battery Type	Standard Terminal	Terminal Torque [in/lbs]	Terminal Adapter	Terminal Torque [in/lbs]
12NXS26 12NXS36 12NXS38 12NXS50 12NXS62 12NXS90 12NXS120	M6 Female	60	SAE	60
12NXS61 12NXS85	M8 Female	80	M6 Male	60
12NXS86	3/8 - 16" Female	60	SAE	60
12NXS137 12NXS157	M6 Female	80	M6 Male	80
12NXS166 12NXS186	M8 Female	80	M6 Male	80

Terminals for NexSys PURE 2V cells are torqued at the factory and do not require any checking or re-torquing in the field.

2.0 Operation

The acceptable ambient operating temperature range for the discharge of NexSys® PURE batteries is between -20°F (-29°C) and 113°F (45°C). The acceptable ambient charging temperature range is between 32°F (0°C) and 113°F (45°C).

The nominal rated capacity is at a battery temperature of 77°F (25°C). Higher temperatures shorten the life of the battery; lower temperatures reduce the available capacity. The capacity of the battery falls considerably under an internal temperature of 41°F (5°C). The lifetime of the battery depends on the operating conditions. Optimal battery life is obtained when the battery is operated, charged and stored in an ambient temperature between 41°F (5°C) and 86°F (30°C); and discharges are equal to or lower than 60% of the nominal C6 capacity. Operation of the battery outside of the optimum temperature range may require the use of a Wi-iQ® device and NexSys+ charger for proper temperature-adjusted charging. Consult an EnerSys® representative for the proper equipment selection for your application.

The battery obtains its full capacity after about three charging and discharging cycles.

2.1 Discharging

Discharges over 80% DOD of the rated capacity are categorized as deep discharges and are not acceptable as they reduce the life of the battery. Discharged batteries MUST be recharged immediately and MUST not be left in a discharged condition. The cycle life of the battery will depend on the DOD; the higher the average DOD, the shorter the cycle life.

Partially discharged and fully discharged batteries can freeze, which irreversibly damages the battery. Limit the discharge to a maximum of 80% DOD in cold climates, and recharge immediately.

The battery may be fitted with a Protection from Over-Discharge™ (POD™) device to provide visual and audible warning signals. An observed warning signal indicates the battery has reached its maximum discharge level and must be charged immediately. The following load cut-off settings must be used:

- 60% DOD at an average loaded voltage of 1.96 volts per cell, or
- 80% DOD at an average loaded voltage of 1.92 volts per cell.

when discharged at average loads with currents in the range of I_a to I_b . At average currents outside of this range, please seek advice from an EnerSys representative for energy cut-off settings.

2.2 Charging

NexSys PURE batteries MUST be charged using an EnerSys approved charger with the appropriate approved NexSys PURE profile. Failure to do so will affect the performance and life of the battery and invalidate any warranty. The specific charging profile developed for recharging NexSys PURE batteries allows opportunity charging as often as needed without damaging the batteries. Charge rate must be maintained between $0.18C_6$ and $0.70C_6$, depending on the battery and charger type. NexSys PURE batteries have an extremely low gas emission. Nevertheless, provisions must be made for venting of the charging gases. Battery container lids and vehicle compartments must always provide adequate ventilation. To allow for some recombination inefficiency, NexSys PURE batteries should be considered to have a gassing rate of 1.5A per 100 Ah.

Electrical connections (i.e. DC connectors) must only be made or broken in the open circuit condition. Stop the charger before disconnecting the battery.

3. Maintenance

The electrolyte is immobilized. The density of the electrolyte cannot be measured. Never remove the safety valves from the battery. In case of accidental damage to the valve, contact your EnerSys representative for replacement.

3.1 Daily

- Plug the battery into the proper charger at every opportunity.
- Check the condition of the plugs, cables and make sure that all insulation covers are in place and are in good condition.

3.2 Weekly

- Allow up to six hours for a full charge at least once per week.
- Visually inspect for signs of dirt and mechanical damage to all component parts of the battery, paying particular attention to the battery charging plugs and cables.

3.3 Quarterly

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

- The voltage of the complete battery.
- The voltages of each cell or bloc.

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

- That the required work is compatible with the battery capacity.
- Battery has been plugged into the charger at every opportunity.
- The settings of the charger.

3.4 Annually

Remove internal dust from the charger. Inspect and test all electrical connections (sockets, cables and contacts). Check the torque loading of the bolts/screws on bloc type products. Test the insulation resistance of the battery. Insulation resistance of the battery thus determined must not be below a value of 50 Ω per volt of nominal voltage. For batteries up to 20V nominal voltage the minimum value is 1000 Ω .

4. Care of the Battery

The battery should always be kept clean and dry. 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 prevent corrosion.

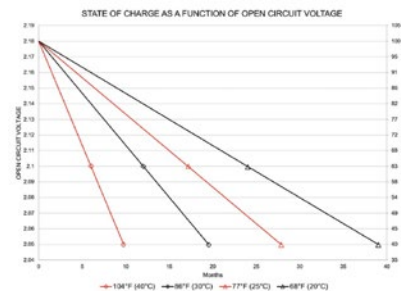
5. Storage

Batteries are shipped from the manufacturer fully charged. The state of charge will decrease with storage. All batteries lose their stored energy when allowed to be in 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. High temperatures greatly reduce storage life. It is recommended that the fully charged battery should be stored in a cool dry place, ideally below 68°F (20°C), but no lower than 41°F (5°C).

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 one month or longer, all electronic devices (such as Wi-iQ device, POD device) must be professionally disconnected by an EnerSys service representative.

The 2V assembled product has a maximum inspection-free storage time of six months, if stored at or below 68°F (20°C) (provided the battery is fully charged when put into storage and that all electronic devices or other equipment that could cause the battery to discharge are disconnected), after which a refresh charge should be administered. However, it is advisable to conduct an inspection and Open Circuit Voltage (OCV) check after three months and recharge if the OCV is less than 2.10 volts per cell.

The 12V product has a maximum inspection-free storage time of two years, if stored at or below 68°F (20°C) with no electronic devices connected. After this time a refresh charge should be administered. However, it is advisable to conduct an inspection and open circuit voltage check after 12 months and recharge if the OCV is less than 2.10 Volts per cell. When stored in temperatures in excess of 86°F (30°C), the battery should be OCV checked every six months. The graph below shows the relationship between temperature, storage time and OCV.



A new battery may be stored for up to five years without degradation of performance provided that an OCV check is conducted every 12 months and refresh charges are administered as needed.

6. Malfunctions

If malfunctions are found on the battery or the charger, please contact an EnerSys representative. The measurements taken in Section 3.3 will identify problems and help establish a base to correct them.

7. Disposal

NexSys PURE batteries must be recycled. End-of-life batteries must be packaged and transported in accordance with prevailing transportation rules and regulations. End-of-life batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.

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