INSTALLATION & OPERATION MANUAL

Valve-Regulated Lead-Acid Batteries

This manual covers the safe installation, charging, operation, maintenance, and storage of ATB Power sealed valve-regulated lead-acid (VRLA) batteries in both AGM and GEL constructions. Read it in full before installing or charging any battery.

MAINTENANCE-FREE · SEALED · NON-SPILLABLE

Designed for standby, deep-cycle, solar, motive, and telecom service.

APPLIES TO

AGM: GP (General Purpose), DC (Deep Cycle), FT (Front Terminal), HR (High-Rate), LC (Long-Life Cyclic), 2V Long-Life Cells, Lead-Carbon (LDC), and Start-Stop (SSL) series.
GEL: Gel 12V cycling and Gel 2V standby series.

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1 Important Safety Information

Lead-acid batteries store large amounts of energy and contain corrosive sulfuric acid electrolyte. Servicing must be performed only by trained personnel who have read and understood this manual. Keep this manual with the equipment.

DANGER — READ BEFORE HANDLING

- **Explosive gas.** Batteries can vent flammable hydrogen and oxygen under overcharge or fault. Keep sparks, flames, cigarettes, and other ignition sources away. Do not make or break live connections near a battery.
- **Acid hazard.** Electrolyte is corrosive. If the case is cracked or vented, wear eye protection, a face shield, and acid-resistant gloves and clothing.
- **Short-circuit / arc-flash.** Batteries deliver very high short-circuit current. Remove rings, watches, and metal jewelry. Use insulated tools. Cover terminals during installation.
- **Electric shock.** Series strings can reach hazardous DC voltage. Treat the bank as live at all times.
- **Weight.** Large units are heavy. Use correct lifting technique and approved lifting equipment.

First Aid

- **Eyes:** Flush with clean water for at least 15 minutes and seek medical attention immediately.
- **Skin:** Remove contaminated clothing and wash the affected area with soap and water.
- **Inhalation:** Move to fresh air and seek medical attention if irritation persists.

DO NOT

Do not open, drill, crush, incinerate, or disassemble the battery. Do not attempt to add water — VRLA batteries are sealed and maintenance-free. Do not charge a frozen battery. Do not install or charge in a sealed, unventilated enclosure.

2 Product Overview & Technology

ATB VRLA batteries are sealed, valve-regulated lead-acid batteries. The electrolyte is immobilized, so the battery is non-spillable and can be operated in any orientation except continuously inverted. A one-way pressure-relief valve releases gas only if internal pressure rises abnormally; under normal float and cyclic charging the oxygen-recombination cycle returns gas to water inside the cell, so no water addition is required.

AGM Construction

In an Absorbent Glass Mat (AGM) battery the electrolyte is held in a fine glass-fibre separator between the plates. AGM offers low internal resistance, high discharge rates, fast charge acceptance, and strong performance in standby, high-rate, and cyclic duty.

GEL Construction

In a GEL battery the electrolyte is immobilized as a thixotropic gel by adding fumed silica. GEL excels in deep-cycle and high-temperature service, offers excellent cycle life at deep depth-of-discharge, and tolerates partial-state-of-charge use well. GEL requires a lower charging voltage than AGM (see Section 5).

KEY POINT

AGM and GEL are both VRLA and share most handling, installation, and safety rules. The main practical difference is the **charge voltage setting**. Always select the charger profile (AGM or GEL) that matches the battery installed.

3 Receiving, Inspection & Storage

On Receipt

- Inspect each battery for shipping damage, cracks, leaks, or distorted cases. Report freight damage to the carrier immediately.
- Check the date code. Batteries are shipped charged; rotate stock so the oldest is used first.
- Measure open-circuit voltage (OCV). A 12V battery should read about 12.8–12.9V at rest. If it reads below 12.4V, recharge before placing in service.

Storage

Store batteries indoors in a clean, cool, dry place, upright, away from direct heat and sunlight. VRLA batteries self-discharge slowly — typically 1–3% per month at 25°C (77°F). Lower temperatures slow self-discharge; higher temperatures speed it up.

- Do not store a discharged battery. Sulfation from prolonged low charge permanently reduces capacity.

- Recharge any battery in storage before the open-circuit voltage falls below about 12.4V (12V battery), and in any case at least every **6 months** at 25°C — sooner in warmer storage.
- Give the battery a full refresh charge before commissioning if it has been stored for an extended period.

> **CAUTION**
> Storing VRLA batteries in a deeply discharged state, or for too long without a refresh charge, is a common cause of premature failure and permanent capacity loss.

4 Installation

Correct installation is the first step to getting full life and performance from the battery.

Location & Environment

- Mount in a clean, dry, ventilated location. Although AGM and GEL batteries normally do not emit gas, ventilation is required to clear any gas produced during abnormal overcharge and to limit heat build-up.
- Keep the battery away from heat sources and direct sunlight. The best service life is achieved at an operating temperature of **20–25°C (68–77°F)**.
- Allow space around each battery for air circulation and for inspection and maintenance.

Orientation & Mounting

- VRLA batteries may be installed upright or on their side. Do not install continuously upside down.
- Secure each battery so it cannot move under vibration or shock. Do not over-compress the case.
- On racks or in cabinets, support the full base of the battery and verify load ratings.

Cabling

- Size cables to carry the maximum expected load current. Under-sized cables overheat, drop voltage, and are a fire hazard.
- In series and parallel banks, keep all interconnect cables the **same length** so every battery sees the same resistance and shares current evenly.
- Route cables to avoid strain on the terminals.

Series & Parallel Connection

- **Series** (connect + of one battery to – of the next) increases system voltage; capacity (Ah) stays the same.
- **Parallel** (connect all + together and all – together) increases capacity; voltage stays the same.
- Connect only batteries of the same brand, type, capacity, age, and state of charge. Do not mix AGM with GEL, or new with old, in the same bank.
- Make the system-positive and system-negative take-off connections at opposite ends/corners of a parallel bank to balance current.

Terminal Connections & Torque

Clean terminals and connect the load and charger with the correct hardware. Make the final positive connection last and the first negative disconnection first. Apply a thin film of anti-corrosion grease (petroleum jelly) to the finished connection. Tighten terminal bolts to the torque specified on the battery label or datasheet for that terminal type; do not over-tighten.

TERMINAL TYPE	TYPICAL TORQUE (N·M)	TYPICAL TORQUE (IN·LB)
Bolt / insert M5	3–4	27–35
Bolt / insert M6	5–6	44–53
Bolt / insert M8	9–11	80–97
Bolt / insert M10	14–20	124–177

Typical guidance values. Always follow the torque marked on the specific battery label or its datasheet, which takes precedence over this table. Re-check torque after the first weeks of service and at every scheduled inspection.

> **CAUTION**
> Loose or corroded connections cause local heating, voltage drop, and reduced capacity, and can lead to thermal runaway. Never connect a charger or load with reversed polarity.

5 Charging

Using the correct charger and settings is the single most important factor in battery life. Use a constant-voltage, current-limited charger (or a smart/microprocessor charger) with the correct **AGM or GEL profile**. If you are unsure whether your charger is suitable, contact ATB Power before connecting it.

Charge Voltage Settings (per 12V battery, at 25°C)

MODE	AGM	GEL	PER CELL
Cyclic / boost (charge)	14.4–14.7 V	14.1–14.4 V	2.40–2.45 / 2.35–2.40 VPC
Float / standby	13.5–13.8 V	13.6–13.8 V	2.25–2.30 VPC
Max. charge current	≤ 0.30 × C	≤ 0.20 × C	C = rated Ah (C20)

For 6V batteries use half these voltages; for a 2V cell use the per-cell figures. C is the rated 20-hour capacity in Ah. Always defer to the specific model datasheet where it gives different values.

Temperature Compensation

Charge voltage must be corrected for temperature when the battery operates away from 25°C. Adjust by approximately **–4 mV per cell per °C** (about –24 mV/°C for a 12V battery; –2 mV/cell per °F). Increase voltage as temperature falls and decrease it as temperature rises. Many smart chargers do this automatically with a temperature sensor.

Commissioning / Initial Charge

- Give a full charge before first use, especially after extended storage.
- Verify the charger profile matches the battery (AGM vs GEL) and the system voltage.
- After charging, allow the battery to rest before measuring open-circuit voltage to confirm full state of charge.

Charging in Service

- In cyclic use, fully recharge as soon as practical after each discharge. Repeatedly leaving a battery partly charged shortens life.
- Opportunity charging is acceptable, but a battery used daily should reach a full charge at least every other day.
- In standby/float use, hold the battery at the float voltage continuously so it stays ready and fully charged.

DO NOT OVERCHARGE

Overcharging drives gassing and dries out the electrolyte, which permanently damages a sealed VRLA battery. Do not exceed the recommended voltages, do not use an uncontrolled or flooded-type charger, and never use an equalization charge on a sealed VRLA battery unless ATB Power specifically directs it.

6 Operation

Depth of Discharge & Cycle Life

Cycle life depends strongly on how deeply the battery is discharged. Shallower cycles give many more cycles than deep ones. For best life in cyclic applications, keep the average discharge at or above 50% state of charge; avoid routinely discharging below 20% state of charge. Recharge promptly after every discharge.

Temperature Effects

- Rated capacity is specified at 25°C. Capacity falls at low temperature and rises slightly at high temperature.
- High temperature accelerates aging. As a guide, sustained operation about 10°C above 25°C roughly halves float service life.
- Keep batteries near 20–25°C for the best balance of capacity and life.

State of Charge vs Open-Circuit Voltage

Let the battery rest (no charge or load) for several hours, then read open-circuit voltage to estimate state of charge:

STATE OF CHARGE	12V BATTERY	6V BATTERY	PER CELL (2V)
100%	~12.8–12.9 V	~6.4 V	~2.14 V
75%	~12.6 V	~6.3 V	~2.10 V
50%	~12.3 V	~6.2 V	~2.06 V
25%	~12.0 V	~6.0 V	~2.00 V
0%	≤ 11.8 V	≤ 5.9 V	≤ 1.97 V

Typical rest-voltage values for VRLA AGM/GEL at 25°C. Voltage under load reads lower; allow the battery to stabilize before judging state of charge.

AVOID DEEP OVER-DISCHARGE

Discharging far below the cut-off voltage, or leaving the battery connected to a parasitic load when not in use, can deeply discharge and damage it. Disconnect the load during long idle periods and keep the battery charged.

7 Maintenance & Inspection

VRLA batteries are maintenance-free in the sense that they need no water addition. They still require periodic inspection to confirm safe, reliable operation.

Periodic Checks

- Keep the battery top clean and dry. Wipe with a cloth dampened with water; do not use solvents or petroleum-based cleaners on the case.
- Inspect for cracks, swelling, leaks, or corrosion. Replace any damaged battery.
- Check that terminal connections are tight and clean; re-torque to specification. Re-grease as needed.
- Verify charger output voltage and, in standby systems, the float voltage of the bank.
- Record float/charge voltage and, where applicable, individual battery voltages to spot a weak unit early.

CAPACITY CHECK

For critical standby systems, perform a periodic capacity (discharge) test per the system standard. A battery that delivers less than 80% of rated capacity is normally considered end-of-life and should be replaced.

8 Troubleshooting

SYMPTOM	LIKELY CAUSE	ACTION
Low capacity / short runtime	Undercharging, sulfation, age, low temperature	Recharge fully; check charger profile/voltage; test capacity; replace if <80%
Will not hold charge	Deep discharge, internal short, end of life	Attempt a full recharge; if voltage falls quickly, replace
Case swelling / heat	Overcharge, high voltage, thermal runaway	Stop charging; correct charger voltage/temp compensation; replace battery
One battery low in a bank	Uneven connections, weak unit	Re-torque, equalize cable lengths, replace the weak battery
Battery dry / vents opening	Chronic overcharge	Reduce charge voltage; verify charger; replace if performance lost

STOP AND DISCONNECT IF

The battery is hot to the touch, swelling, leaking, or venting. Disconnect the charger, ventilate the area, allow it to cool, and remove the battery from service.

9 Transport, End-of-Life & Recycling

Transport

ATB VRLA batteries are classified as non-spillable when they meet the relevant vibration and pressure-differential criteria, and are generally accepted for ground, sea, and air transport when terminals are protected against short circuit. Keep batteries upright, protect terminals, and ship in original packaging where possible. Confirm current carrier and dangerous-goods requirements before shipping.

Recycling & Disposal

- Lead-acid batteries are recyclable. Return spent batteries to an authorized recycler or to the point of purchase.
- Do not dispose of batteries in household waste, in fire, or in water.
- Follow all local, national, and regional regulations for storage, transport, and recycling of lead-acid batteries.

10 Charging Quick Reference

PARAMETER (PER 12V, 25°C)	AGM	GEL
Cyclic / boost charge voltage	14.4–14.7 V	14.1–14.4 V
Float / standby voltage	13.5–13.8 V	13.6–13.8 V
Max charge current	≤ 0.30 C	≤ 0.20 C
Temp. compensation	–4 mV/cell/°C (–24 mV/°C per 12V)	
Recommended operating temp.	20–25°C (68–77°F)	
Self-discharge	~1–3% per month at 25°C	
Recharge in storage	Before OCV < 12.4 V, or every 6 months	
End-of-life capacity	< 80% of rated capacity	
Equalization	Not permitted unless directed by ATB Power	

SUPPORT

Operating the battery outside the conditions in this manual — including incorrect charger settings, overcharge, deep over-discharge, storage in a discharged state, or use of an AGM profile on a GEL battery (or vice versa) — can shorten its service life. For the correct settings for a specific model, or for technical support, contact ATB Power at **info@atbpower.com** or **atbpower.com**.

This manual provides general guidance for ATB VRLA AGM and GEL batteries. Where a specific battery datasheet or label states different values for voltage, current, or torque, those model-specific values take precedence. Specifications are subject to change without notice.