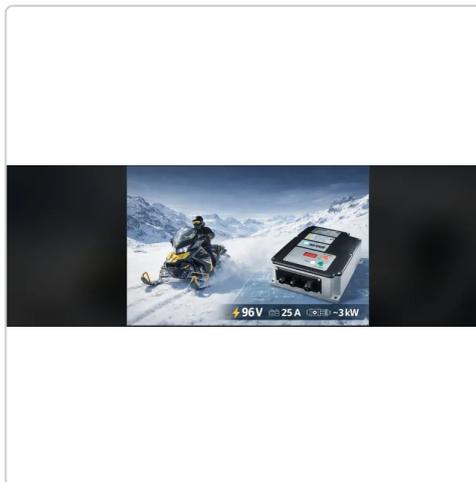# FAQ: Lithium – using CU3 in CCCV on ZIVAN chargers (Q9 standalone vs RE CAN/BMS)

Reference : FAQ-005-CU3-CCCV-LITHIUM

Brand : ZIVAN

Options :

No variants

3D Model : Not available

EAN-13 :

On a lithium traction pack, the **CC/CV (CCCV)** charging strategy is an industrial standard: a **constant-current** phase to recharge quickly, then a **constant-voltage** phase to finish the charge without exceeding the battery's maximum voltage. **ZIVAN** onboard chargers (including the **SG3** range) support two distinct approaches: a **standalone** mode driven by an internal curve (Q9 / **CU3**) and a **CAN-slave** mode (RE) where the charging law is dictated by the **BMS**.

This page clarifies how **CU3** works on ZIVAN chargers, the differences between **Q9 vs RE**, and the key integration checkpoints for a **96 V** architecture (e.g., an onboard **96 V / 25 A** charger – **~3 kW**) in industrial and e-mobility environments.

Context

A lithium **CCCV** charge can be reduced to three elements: (1) a limited **CC current** (by the charger, the battery, or the BMS), (2) a **CV voltage** equal to the pack's maximum admissible voltage, (3) an **end-of-charge** criterion (taper current, timer, or a BMS decision). Unlike lead-acid, prolonged equalization/float phases are generally avoided on lithium because they can be detrimental if applied incorrectly.

In real deployments (retrofit, industrial vehicles, mobile machines), the question is not only "how to charge" but also **how to integrate**: wiring, protections, EMC, thermal design, and consistency with the battery safety chain (contactors, enables, faults).

Q9 and RE modes

On ZIVAN chargers, two philosophies must be distinguished:

- **Standard Q9 mode (standalone)**: the user selects a charging curve (**CU1**, **CU2**, **CU3**) and sets the associated parameters. The charger runs the charge **autonomously**.
- **RE mode (CAN slave)**: the charger becomes a power actuator, controlled by the system over **CAN** (often using CANopen-like logic and configurable frames depending on the integration).

Key point: in **Q9**, the CAN interface may be available for **monitoring** (states/diagnostics) but **is not used to command the charge**. If CAN control frames are sent in this mode, the charger may report **errors** and will not follow those commands. In **RE**, CAN control is part of the intended operating principle.

CU3 in practice

In **Q9**, the **CU3** curve is a **standalone lithium CCCV** curve. The principle is straightforward: you set a **constant current** (limited by the charger, e.g., **25 A** on a 96 V / 25 A unit) and a **constant voltage** corresponding to the **pack's maximum charge voltage**. The charger then manages:

- the **CC** phase until the target voltage is reached,
- the **CV** phase (voltage regulation, current taper),
- the **end of charge** according to its settings (taper current threshold and/or timer depending on configuration).

Before commissioning, lock down battery coherence: max pack voltage (or max cell voltage × number of series cells), admissible charge current, and end-of-charge strategy (current/time cut-off) to avoid unwanted battery-side cut-offs.

CU3 settings

I_{CC} (CC current)	Target current (e.g., **25 A** on SG3 96 V / 25 A)	Defines the CC phase and wiring/thermal stress. Must match battery capability.
V_{CV} (CV voltage)	**Max pack voltage** (end of charge)	Triggers CC → CV and sets the voltage ceiling. Keep below battery protection thresholds.
End of charge	Taper current and/or timer (config-dependent)	Stops the charge at the end of CV. Drives repeatability and battery stress.

BMS and safety

In **CU3 / Q9**, the BMS does not command the charger over CAN, but it remains the battery's **safety authority**: over-voltage/over-temperature monitoring, contactor management, enables, and protective cut-offs. Integration must ensure consistency between:

- the charger's I_{CC} and V_{CV} settings,
- the BMS protection strategy (contactor opening, interlocks),
- system behavior on battery cut-off (contactor opening): clean stop, no erratic restarts.

Proper CU3 settings aim at a stable end-of-charge without triggering battery protection. At nominal power, a full thermal validation (long charge) is a mandatory qualification step on vehicle/machine platforms.

RE CAN mode

In **RE**, the charger is a **CAN slave**: the BMS (or supervisor) sends a **current setpoint**, typically at maximum at the beginning (e.g., 25 A), then reduces it as the battery approaches its limits. "Constant voltage" is not an internal CV

regulation of the charger; it is **achieved by progressively reducing current** as decided by the BMS when a cell (or the pack) reaches the maximum admissible voltage.

Integration checkpoints:

- **Watchdog** and **timeouts**: loss of communication means setpoint to zero and a safe state.
- Clear state machine: enable/disable, faults, zero setpoint, end of charge.
- BMS-side **taper** control: ramp rate, thresholds, and timers to avoid oscillations and overcharge.
- Traceability: log setpoints, events, and faults for field diagnostics.

Choosing a mode

The choice between **CU3 (Q9)** and **RE (CAN)** is primarily driven by **BMS capabilities**, not only by ease of use:

- **If the BMS cannot control a charger** (no CAN, limited CAN, or no configurable frames/CANopen): **CU3 in Q9** provides a standalone lithium CCCV profile with direct I_{CC} and V_{CV} settings.
- **If the BMS can control properly**: it must support robust control (frame format, strict periodicity, timing, loss-of-comms handling, state machine). In that case, **RE** is generally preferable for lithium: more development, but a **quality and safety** guarantee (dynamic limits, controlled stop, deterministic behavior on faults).

Extra benefit in **RE**: **SG3** chargers can act as a field **debug** tool because the display and LEDs can be driven over CAN. This allows showing charger faults and also battery/BMS faults or other bus node diagnostics, provided the charger is **powered/connected to AC** (so the display is active).

96V integration

On a **96 V** architecture, an IP-rated onboard charger (e.g., **IP65**) is an AC/DC conversion block exposed to real constraints: vibration, thermal, harness voltage drop, and EMC robustness. For a **96 V / 25 A** (~**3 kW**) unit, the following points structure a reliable integration.

- **AC input**: wide-range input (typically 95–265 V~) with **active PFC**; provide accessible disconnect, sound earthing, and coordinated upstream protection.
- **DC wiring**: size cable cross-section based on length and acceptable voltage drop; at 25 A, around **6 mm²** is a common baseline in onboard harnesses (adapt to harness and thermal constraints).
- **Protections**: coordinate with the battery chain (BMS, contactors, fuses) and consider behavior on cut-off (contactor opening, polarity issues if applicable to the system).
- **Thermal**: validate long charge at nominal power (charger, cables, connectors) and ensure coherent airflow; IP65 does not remove heat dissipation constraints.
- **EMC / CAN**: separate power and communication, minimize current loops, manage shielding and chassis reference; in RE, CAN robustness (timing, watchdog) becomes a system requirement.

In industrial e-mobility, integration quality is measured by behavior under faults (battery cut-off, CAN loss in RE, over-temperature), and by end-of-charge repeatability (no over-voltage, no oscillation, stable finish).

Logs & diagnosis

Maintenance and traceability are part of the value of an industrial onboard charger. ZIVAN architectures (depending on configuration) can provide **data logging** to correlate charge cycles, events and usage drift. For integrators, logging

CC/CV duration, taper current, temperatures and faults improves field diagnostics, battery aging understanding and integration validation.

Applications

96 V multi-chemistry onboard chargers (lead/lithium) with an IP-rated housing and CAN connectivity are typically used in:

- Industrial electric vehicles and 96 V mobile platforms (material handling, site tractors, internal utility vehicles).
- **Electric retrofit** projects on machines/vehicles with 96 V packs and onboard integration constraints.
- Aerial work platforms, lifts and service equipment operating in harsh environments.
- Industrial cleaning machines with sealing and robustness requirements.
- Marine or exposed stationary applications (sealed housing, diagnostics, usage monitoring).