

Miondrive 170-100S

User manual

Solar car motor controller | Preliminary Rev A | 15 October 2026

Revision	Issue date	Change summary
A preliminary	15 October 2026	Added Terminal faults and events commands to troubleshooting guidance.

About this manual

This manual describes installation, configuration and operation of the Miondrive 170-100S three-phase motor controller. It is intended for vehicle integrators familiar with high-voltage DC systems and electric drivetrains. Read it together with the applicable Miondrive datasheet and mechanical drawing.

The controller uses VESC-based field-oriented control for PMSM and BLDC motors. Vehicle control uses native VESC CAN. Motor feedback can be sensorless or use compatible Hall sensors.

Document applicability

Item	Identification
Product	Miondrive 170-100S
Hardware revision	4
Firmware and VESC Tool	VESC Tool 7.01
Companion documents	Miondrive 170-100S datasheet Rev A; mechanical drawing revision 1, 10 September 2026

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1 Safety and electrical reference

High voltage and stored energy

The DC link can retain hazardous voltage after the battery is disconnected. No internal discharge resistor is fitted and no automatic discharge time is specified. Elapsed time alone is not evidence that the controller is safe to touch.

Before changing wiring, stop the drivetrain, isolate all energy sources and prevent reconnection. Prevent motor rotation, which can generate voltage. Use a suitably rated instrument to verify the DC-bus voltage and follow the vehicle's approved discharge and verification procedure. Never discharge the DC link by shorting its terminals.

Unexpected motor movement

Motor identification, Hall detection and control commands can produce torque or rotation. Secure the motor and vehicle, provide clearance around rotating parts, and keep people away during commissioning. A stationary motor can still produce torque and draw substantial current.

Electrical domains

Interface	Reference and integration requirement
DC and motor phases	Traction-battery circuit. No reverse-polarity protection is fitted. Verify polarity before energizing.
M8 motor sensors	Pins 5 and 7 connect to battery negative. The sensor interface is not isolated from the traction battery.
M12 CAN and auxiliary	Isolated from the HV domain. Pin 3 is the auxiliary return; do not assume it is interchangeable with M8 sensor ground.
Internal USB-C	Not isolated. Its connection can create a path between the battery-referenced electronics and external equipment.

Do not bridge the isolated auxiliary return to the motor-sensor ground through external equipment. Treat motor-sensor wiring according to its battery reference; its nominal 12 V supply does not make the interface isolated.

Protective functions and system responsibility

Controller current limits, temperature derating and firmware fault responses do not replace system fusing, contactors, isolation or a vehicle emergency-stop strategy. Do not rely on regenerative braking as the sole vehicle braking method.

2 Mounting and cooling

Property	Value
Mass	1,730 g
Enclosure dimensions	190 × 180 × 60 mm, excluding protruding connectors and mating cables
Enclosure	Aluminium; connectors on two sides
Mounting pattern	Ø4.5 mm mounting holes on an 85 × 182 mm pattern
Drawing	Miondrive 170-100s, revision 1, 10 September 2026

Mechanical installation

Choose a rigid mounting location protected from impact, cable strain and contamination. Keep the cooling surface accessible and provide room to mate, release and remove connectors. Support power cables so their weight and vibration do not load the controller terminals.

Use the mechanical drawing to locate the mounting holes. Check fastener clearance and keep mounting loads out of the connector bodies. Establish the enclosure bonding arrangement as part of the vehicle electrical design.

Heat removal

Cooling demand depends on phase current, DC-bus voltage, switching frequency, ambient temperature and duty cycle. The enclosure base can transfer heat to an external heatsink or liquid-cooled cold plate. Validate cooling in the installed vehicle, including stationary operation and high ambient temperature.

For external cooling, provide a clean mating surface and a suitable thermal-interface material. Avoid air gaps and mechanical distortion. Keep coolant and condensation away from electrical connections.

Temperature monitoring

The controller monitors PCB MOSFET temperature sensors and can reduce current at configured thresholds. PCB sensor readings, thermal-camera readings of FET surfaces and enclosure temperature are different measurements; none directly establishes semiconductor junction temperature.

Maximum motor current is 150 A peak. Continuous current capability depends on cooling and operating conditions; thermal derating reduces current when the configured temperature threshold is reached. Validate cooling in the final vehicle installation before sustained high-load operation.

3 Power wiring and precharge

Power connections

Connect the battery to DC+ and DC– through the vehicle's rated protection and switching system. Connect the three motor phases to the phase outputs, identified as M1/M2/M3 on the mechanical drawing and U/V/W in the datasheet. Verify the physical labels before wiring.

Select cable sizes, fuses, disconnects and contactors for the actual DC and phase currents, operating voltage, fault current and thermal environment. Use the specified Amphenol mating connectors and the connector manufacturer's cable preparation and assembly instructions. Do not infer a 150 A continuous DC connector rating from a phase-current peak value.

External precharge

External precharge is mandatory; no internal precharge circuit is fitted. Before closing the main contactor, precharge the DC link close to the battery voltage. Select the permitted voltage difference so that the resulting inrush current remains within the ratings of the contactor and connected components.

Use an external resistor and controlled precharge path in the vehicle circuit. Monitor the voltage difference across the main contactor and inhibit closure if the precharge criterion is not met. A fixed delay alone cannot detect an open resistor, wiring fault or excessive DC-link load.

Nominal DC-link capacitance is approximately 1.7 mF. At 170 V this stores approximately 25 J. For an ideal resistor-capacitor charge from zero, initial current is V_{pack}/R , the time constant is $R \times C$, and resistor pulse energy is approximately $\frac{1}{2} \times C \times V_{\text{pack}}^2$. Include capacitance tolerance, additional bus loads, repeat attempts and resistor pulse ratings in the design.

Regenerative braking

Regeneration returns energy to the DC supply. The battery and BMS must accept the configured charging current at the relevant state of charge and temperature. Reduce or inhibit regeneration when charging is unavailable. An ordinary bench supply may not absorb regenerated energy.

The DC-bus voltage must not exceed 170 VDC, including regenerative braking, switching ripple and supply transients. Select the normal operating voltage and protection settings with sufficient margin below this limit.

Coordinate the vehicle response to BMS charge inhibition and contactor opening. Opening the battery connection during regeneration can remove the energy sink and raise the DC-bus voltage; firmware overvoltage protection is not a replacement for an energy-management strategy.

4 CAN and motor sensor connections

M12 CAN and auxiliary supply

Both five-pin female M12 connectors share the same CAN bus and auxiliary supply. Apply the external 9–36 V DC auxiliary supply between pins 2 and 3. Avoid connecting independent supplies that could backfeed each other.

Pin	Wire colour	Function
1	Brown	Shield; internally not connected to GND
2	White	Auxiliary supply positive, 9–36 V DC
3	Blue	Auxiliary supply return
4	Black	CAN H
5	Grey	CAN L

Use a twisted pair for CAN H and CAN L. Fit 120 Ω termination at each physical end of the CAN network. No internal 120 Ω termination is fitted. Follow the vehicle cable-shielding and bonding plan.

M8 motor sensors

Pin	Wire colour	Function
1	White	12 V nominal sensor supply
2	Brown	Hall 1
3	Green	Hall 2
4	Yellow	Hall 3
5	Grey	Sensor GND, battery negative
6	Pink	Motor-temperature input
7	Blue	Sensor GND, battery negative
8	Red	Not connected; leave unused

Inverter connector: Binder 76 6218 1111 00008-0200. Mating cable example: Binder 77 3405 0000 50008-0200. Match pin numbers to the manufacturer's connector view; do not assume cable colours alone identify the pins.

Use Hall sensors compatible with 12 V power and open-collector or open-drain outputs. Each Hall input has an internal 2.2 k Ω pull-up to 3.3 V. External pull-ups are not required. Do not apply 12 V push-pull signals to the Hall inputs.

5 Configuration and first commissioning

Before connecting VESC Tool

Use VESC Tool 7.01 with the Miondrive-approved firmware and configuration for the installed hardware revision. Do not install an upstream or third-party image solely because it uses VESC.

Record the controller serial number, hardware revision, firmware version and VESC Tool version. Save the existing motor and application configuration before making changes. Use the approved communication connection; the internal USB interface is not isolated.

Commissioning sequence

1. Inspect wiring, polarity, cooling, connector locking, isolation and CAN termination with power isolated. Verify sensor supply compatibility and the complete temperature-sensor circuit.
2. Before powering on, connect a PC running VESC Tool 7.01. Lift the driven wheels off the ground and ensure all rotating parts are unobstructed. Keep people and loose objects clear.
3. Apply auxiliary and DC power using the approved vehicle power sequence and external precharge. Keep drive commands inhibited until the system is ready.
4. Confirm that VESC Tool 7.01 and the installed firmware are compatible; reading and writing configuration will not work with incompatible versions. Click Read Motor Configuration in the bottom-right corner of VESC Tool.

Confirm that the green message “Motor config updated” appears before continuing. Check that DC-bus voltage and temperature readings are plausible, and resolve faults before running motor detection.

5. Configure the motor-current limits, battery discharge and regenerative braking current limits, voltage limits, and motor and MOSFET temperature limits within the controller and motor ratings. Write the motor configuration to the controller, then click Read Motor Configuration again. Confirm the green “Motor config updated” message and check that the displayed settings match the intended values.

6. Open the FOC tab. Enter the motor-detection settings: current $I = 50$ A, $D = 0.20$ and $\alpha = 2000.0$ ERPM/s. Run motor detection. Measure R & L first. This measures motor resistance (R) and inductance (L). The motor normally makes noise but does not rotate. Measure λ next review the detected motor parameters. Check the detected flux linkage λ before applying the results. If λ displays 100.000 mWb, do not accept the result solely because VESC Tool reports successful detection. The display may have reached its upper limit. Investigate and verify the measurement before saving the motor configuration. If values are fine click on Apply the accepted results then click write motor config.

7. If Hall sensors are fitted, run Hall detection after successful motor detection. Review and save the detected Hall table. Skip this step for sensorless operation.

8. Read back the complete configuration and recheck all limits before testing normal motor operation. Confirm that the detection procedure has not changed the intended operating limits.

9. Check low-speed direction, Hall operation and current readings at low load. Stop and investigate unexpected motion, rough running or excessive current.

10. Save the final configuration to the controller, then click Read Motor Configuration. Confirm the green “Motor config updated” message and verify the settings. Check correct motor direction and smooth operation at low load before increasing load.

Current and speed settings

Motor current and battery DC current are separate limits. Input current is drawn from the battery to drive the motor; regenerative braking current is returned to the battery. The datasheet lists 150 A peak DC limits for each direction; these are not continuous DC ratings. Do not apply the sinusoidal peak-to-RMS conversion to battery DC current.

Rated continuous motor current is 56 Arms without external cooling, subject to thermal limits. Maximum motor current is 150 Apeak, approximately 106 Arms for sinusoidal current. Available current and peak duration depend on cooling, ambient temperature and operating conditions. Current is reduced at the configured thermal derating threshold; 150 Apeak remains the maximum regardless of cooling. Verify the current convention of the selected VESC settings.

The specified PWM switching frequency is the actual switching frequency, with a maximum of 30 kHz. VESC Tool uses the zero-vector frequency, which is twice the actual switching frequency. For 20 kHz actual switching frequency, enter 40 kHz in VESC Tool. The 30 kHz actual maximum corresponds to 60 kHz zero-vector frequency; it is a limit, not a recommended default.

Electrical speed equals mechanical rpm multiplied by the motor pole-pair count. Use the motor’s speed limit and the validated controller operating range. Leave field weakening disabled until speed, voltage, current and thermal limits have been established.

6 Vehicle CAN integration

Select native VESC CAN, assign a unique controller ID, and use the same bitrate on every node. The protocol uses 29-bit extended identifiers. Commands include current, brake current, duty cycle, electrical speed and position; telemetry includes currents, voltage, duty, speed, temperatures and energy counters.

Send control commands periodically. Configure a nonzero timeout and its braking current: zero timeout braking current releases the motor, while a nonzero setting requests braking. Select the response to suit the vehicle and test it with the drivetrain secured. Do not assume a factory timeout value.

Choose status-message groups and transmission rates in VESC Tool. Check bus loading and timestamp received data. Detect stale telemetry in the vehicle controller. Use the official protocol reference for message IDs, scaling and packet definitions; verify compatibility with the installed firmware.

Vehicle control checks

Check	Acceptance criterion
Addressing	Commands reach only the intended inverter; duplicate IDs are eliminated.
Power-up	Drive stays inhibited until the vehicle explicitly permits operation.
Command loss	The configured timeout response occurs without unintended restart.
Telemetry loss	The vehicle detects stale data and applies its defined response.
Regeneration	Requested charging remains within battery and BMS acceptance.
Fault recovery	Restart requires a deliberate vehicle decision after the fault is resolved.

Some faults can clear automatically. The vehicle must not assume that a cleared fault provides a latched inhibit. Prevent old or continuously transmitted torque commands from causing an unexpected restart.

Protocol reference

VESC CAN documentation: https://github.com/vedderb/bldc/blob/master/documentation/comm_can.md

CAN implementation: https://github.com/vedderb/bldc/blob/master/comm/comm_can.c

These links describe the VESC CAN protocol. Supported commands and behaviour depend on the firmware installed on the controller.

7 Operation and shutdown

Starting the vehicle

Use the vehicle's approved startup sequence. Keep torque inhibited while auxiliary power, communications and DC-link precharge are established. Confirm the precharge criterion before closing the main contactor. Enable drive only after readings are plausible, no blocking fault is present and the vehicle is ready.

During operation

Monitor bus voltage, motor and battery currents, MOSFET and motor temperatures, fault state and communication freshness. Keep operation inside the validated limits for the actual motor, battery and cooling installation. Low-inductance motors can increase current ripple and losses; the reported 10 μ H demonstration is not an efficiency or continuous-current rating.

If thermal derating occurs, reduce the load and investigate cooling. Do not raise temperature limits to conceal inadequate cooling. If abnormal noise, unexpected acceleration, intermittent sensors or repeated faults occur, stop the test and investigate before continuing.

Normal shutdown

1. Bring the drivetrain to a controlled stop and command zero torque. Keep an energy-absorption path available while the motor can regenerate.
2. Inhibit further drive commands. Open the power switching devices according to the vehicle shutdown design after current has decayed.
3. Isolate auxiliary and traction supplies as required by the approved service procedure and prevent reconnection.
4. Before touching wiring, prevent motor rotation and verify the DC link has discharged using the approved measurement procedure.

Emergency shutdown may require a different sequence and suitably rated DC interruption. Define and validate it at vehicle level; a CAN stop command alone is not an independent emergency isolation method.

Stored configuration and firmware

Keep a versioned backup of motor and application settings. After firmware or configuration changes, verify current limits, sensor settings, CAN configuration and fault responses before returning to service. Do not assume an update preserves every setting.

8 Troubleshooting and maintenance

Capture the fault message, operating conditions and configuration before changing settings. Investigate the cause of a fault instead of repeatedly resetting the controller or increasing a protection threshold.

To review what happened, connect VESC Tool and open the Terminal tab. Enter faults and press Enter to display the recorded faults since controller startup. Enter events and press Enter to display recent motor events and commands. These records can help explain a failed motor-detection attempt or unexpected behaviour; they are not a complete history of all activity.

If it is safe to keep the controller powered, copy the terminal output before restarting or switching off, because these records are not retained across a controller restart. Recent events can also be overwritten as new events occur. Include the output when contacting Miontronics for support. If a command is unavailable, enter help to check the commands supported by the installed firmware.

Symptom	Checks before retrying
No communication	Check auxiliary voltage and polarity, CAN bitrate and ID, termination, wiring and tool compatibility.
Precharge fails	Keep the main contactor open. Check the external precharge path, resistor, voltage sensing and unintended DC-link loads.
Motor does not turn	Check faults, vehicle inhibit, command timeout, current limits, phase connections and feedback configuration.
Rough running or high current	Stop the test. Check phase/Hall configuration, motor identification results and motor compatibility.
Overvoltage during braking	Reduce or inhibit regeneration. Check pack charge acceptance, BMS state, battery connection and voltage limits.
Temperature rise or derating	Reduce load. Check cooling contact, airflow, ambient temperature, current and switching settings.
Implausible motor temperature	Check sensor type and parameters, wiring and the verified return connection. Do not bypass protection to continue testing.
Unexpected restart after a fault	Check transmitted commands and vehicle inhibit logic. Validate deliberate restart handling.

Inspection and service

With all supplies isolated and the DC bus verified discharged, inspect connector locking, cable support, insulation, signs of overheating, enclosure damage and the cooling interface. Establish inspection intervals appropriate to vibration, moisture and operating hours.

Support information

When contacting Miontronics, provide product serial number, hardware and firmware revisions, VESC Tool version, saved configuration, motor details, battery voltage, cooling arrangement, fault logs and the conditions that reproduce the issue.

Product support and enquiries: <https://miontronics.com/>

Supporting documents

Miondrive 170-100S datasheet: Rev A is the companion datasheet for this manual draft; confirm applicability to the installed hardware before commissioning. Mechanical drawing: Miondrive 170-100s, revision 1, 10

September 2026. Connector assembly and rating information: use the manufacturer documents for the exact fitted part numbers.

Software information

Miondrive uses VESC-based firmware. Use only firmware approved by Miontronics.