



Phocos CIS-N-MPPT-DALI

Industrial MPPT Charge Controller with Dali Lighting Control

[User Manual](#)



Contents

Product Introduction	4
General Safety Information.....	5
Choosing a battery	5
Maintenance and installation notes.....	5
High voltage risks.....	6
Mains and charging current risks.....	6
CE labeling	6
Connecting and Grounding.....	8
Connections and wire color code	8
Example System Application diagram	10
LED indications & warning functions.....	11
LED Driver Description	12
Hardware limits.....	12
Full brightness / base level.....	12
PWM dimming level	13
Nightlight Function (for cases when DALI control does not apply)	14
Adaptive dimming control.....	16
DALI	17
Operations Guide	18
Default factory settings	18

Settings with PhocosLink PC	18
Automatic Test Period	21
Night Light Detection Level	22
Intelligent Low Voltage Disconnect (LVD)	23
SOC Calculation	23
SSR Control and Hybrid Charging	24
LFP Wakeup.....	25
Temperature Compensation (with External Temp Sensor).....	25
Internal Datalogger	25
Firmware Update.....	26
Safety Features.....	27
Technical Data.....	28
MPPT Solar Charge Controller Data	28
LED-Driver Data	29
Other Data.....	29
Product Dimensions.....	30
Liability Exclusion	31

Product Introduction

Dear customer,

Congratulations on buying your Phocos product! Please read the instructions carefully and thoroughly before using the product. It comes with several outstanding features, such as:

- High conversion efficiency (up to 97.5%)
- Three functions in one: MPPT charge controller + nightlight timer + LED driver
- Fully compliant with DALI control gear requirements
- Power output maximization and system costs reduction
- PV oversizing capable to allow operation with cost-effective widely available panels
- IP68 protection
- Robust hardware protections
- Auto-load disconnect functions: by low SOC and/or emergency low voltage
- Datalogger download over RS485
- Compatible with 60 cell PV modules
- Programmed for LFP batteries by default
- Automatic LFP wakeup
- SSR control signal for hybrid charging in parallel with a grid charger
- Programmable over RS485 with **PhocosLink PC software** (<https://www.phocos.com/software-downloads/>)



General Safety Information

This manual contains important installation, set up, and safety operating instructions.

Please read the instructions and warnings in this manual carefully before beginning any installation.

Please do not disassemble or attempt to repair Phocos products. Phocos' charge controllers do not contain user serviceable parts.

Please observe all instructions regarding external fuses/breakers as indicated.

The information contained in this manual must be observed to its full extent. The manual contains information regarding installation, set up, and operation.

Please read this manual carefully before using the product and pay special attention to the safety recommendations in it.

Choosing a battery

The CIS-N-MPPT-DALI is suitable for use with lead acid batteries (Gel, AGM, Flooded) as well as 12V and 24V Lithium batteries that are supplied with a Battery Management System (BMS). Use **PhocosLink PC** (download link available at <https://www.phocos.com/software-downloads/>) in Expert mode to adjust charge settings. If using lithium ion (LFP, Li-NMC), it must be supplied with a BMS. Lithium batteries have maximum allowed charge currents. These maximums typically decrease in cold temperatures. CIS-MPPT-DALI does not limit current for these restrictions. System design of the solar array must account for this. Follow all battery manufacturer safety instructions.

Maintenance and installation notes

When installing or working on the PV system, please disconnect the PV (solar) modules from the charge controller first, to prevent any damage to the charge controller!

Verify all cable/wire connections are done properly and are well insulated and that no water or humidity can ingress to avoid any bad or loose connections that would result in excessive heating or further damage.

Install a fuse or breaker near the battery before installing or adjusting the controller!

When connecting the inductive loads (motors, relay, etc.) a freewheel diode must be connected in parallel to the loads in the reverse biased direction.

High voltage risks

Never touch any electrical conductors to avoid electrical shock.

Never work on live (energized) electrical equipment.

When working around a battery, do not allow tools to bridge the battery terminals, or short circuit any part of the battery.

Use only tools with insulated handles.

Operation of this device may produce a high voltage which could cause severe injuries or death in case of improper installation or operation of the device.

PV modules can generate high DC voltages!

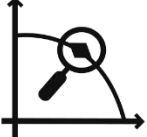
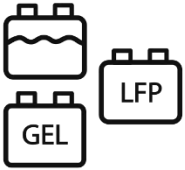
Mains and charging current risks

Make sure the cables are always connected to the correct terminal. An electrical shock can be lethal. In general, any electric shock can be dangerous to your health.

CE labeling

The product is CE compliant.

Key Features

 MPPT	Maximum Power Point Tracking Technology	 High Efficiency	Up to 97.5% power conversion efficiency	 IP68	Type of protection IP68
 DALI Interface	DALI D4i Compatible	 Electronic Fuse	Electronic fuse	 Dimmer	Advanced Dimming Function
 Deep Discharge	Deep Discharge Protection		Fit for flooded, AGM/GEL, and LFP batteries	-40° C ~ +60° C	Ambient temperature: -40°C to +60°C
 NTC	External temperature sensor	12 V 24 V DC	12/24 V, automatic recognition		Common negative

Connecting and Grounding

The controller warms up during operation and should therefore be installed vertically on a non-flammable surface only. Leave at least 5cm clearance above and below the controller for optimal cooling by natural convection.

- We recommend connecting wires in the indicated order 1 2 3 4 5 6 7 8 ... to avoid any installation faults
- To avoid working with live wires with exposed ends, first connect wires to the controller, then to the power source (battery or panel)
- Minimum recommended wire size should be equal or greater than the built-in wires
- Make sure the wire length between the battery and the controller is as short as possible
- Be aware that all negative wires of CIS-N-MPPT-DALI are connected and therefore have the same electrical potential. If any grounding is required further to the casing, always do this on the negative wires
- Maximum cable length from charge controller to LEDs: 3m

Connections and wire color code

# on Diagram	Group	Function	Wire Cross section / Size (120W)	Wire Cross section / Size (60W)	Color
1	Loads	LED output positive	0.5mm ² / AWG20	0.5mm ² / AWG20	RED
2		LED output negative	0.5mm ² / AWG20	0.5mm ² / AWG20	BLUE³
3		Ext. Load negative	2.5mm ² / AWG13	1.5mm ² / AWG15	BLACK²
4		Ext. Load positive	2.5mm ² / AWG13	1.5mm ² / AWG15	ORANGE
5, 6	Hybrid Charging ¹	SSR control negative	0.35mm ² / AWG22	0.35mm ² / AWG22	Black
		SSR control positive	0.35mm ² / AWG22	0.35mm ² / AWG22	White
7, 8, 9	DALI ¹	DALI +24V (max 125mA)	0.35mm ² / AWG22	0.35mm ² / AWG22	Black
		DALI+	0.35mm ² / AWG22	0.35mm ² / AWG22	White
		DALI GND	0.35mm ² / AWG22	0.35mm ² / AWG22	Green
10, 11, 12, 13	AUX Communication ¹	AUX GND	0.35mm ² / AWG22	0.35mm ² / AWG22	Black

	M12 male	RS485 A	0.35mm ² / AWG22	0.35mm ² / AWG22	Yellow
		RS485 B	0.35mm ² / AWG22	0.35mm ² / AWG22	White
		AUX+ (battery voltage)	0.35mm ² / AWG22	0.35mm ² / AWG22	Red
14	Power Sources	Battery negative	2.5mm ² / AWG13	1.5mm ² / AWG15	BLACK²
15		Battery positive	2.5mm ² / AWG13	1.5mm ² / AWG15	RED
16		Solar negative	2.5mm ² / AWG13	1.5mm ² / AWG15	BLACK²
17		Solar positive	2.5mm ² / AWG13	1.5mm ² / AWG15	YELLOW

Notes:

¹All signal wires are grouped together as indicated above by function (SSR, DALI, and Aux Communication). Repeating wire colors may not be equipotential.

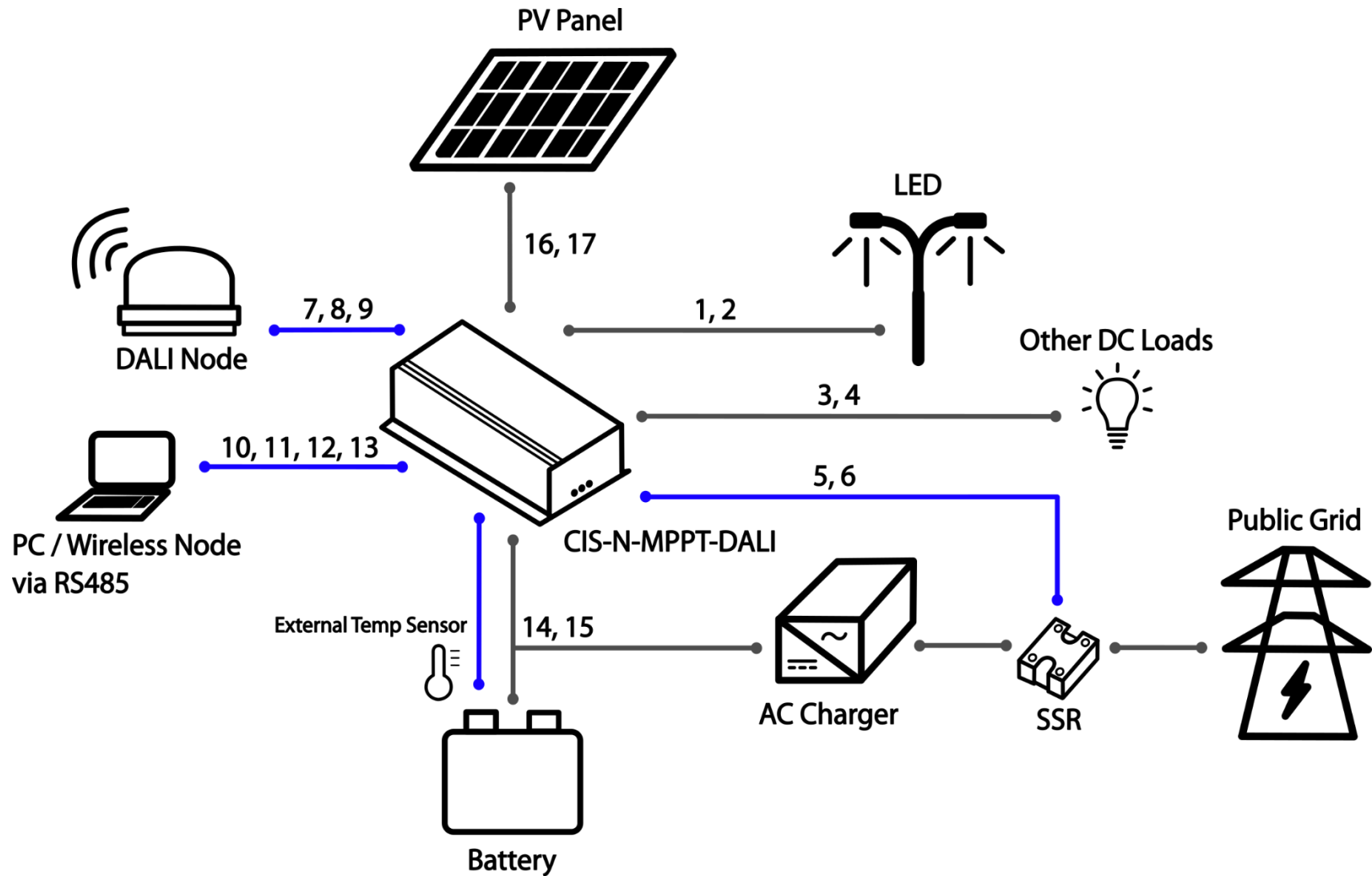
²All 2.5mm² / AWG13 / 1.5mm² / AWG15 Black wires are equivalent, common grounded in the solar charge controller.

³The LED- (Blue 0.5mm² / AWG20) is equipotential with the solar charge controller and battery common ground.

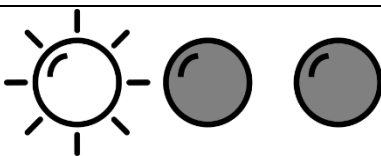
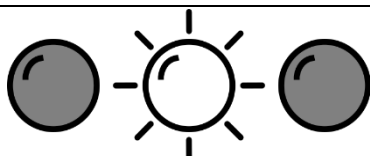
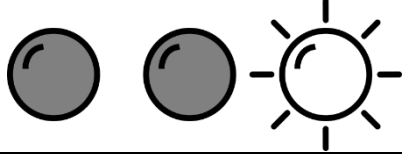
Wiring Guide Quick reference

1, 2	LED +/-	Red(+) and Blue(-) Pair
3, 4	Load +/-	Large Orange(+) and Large Black(-) unpaired
5, 6	SSR +/-	Small White(+) and Black(-) group of 2 with heat shrink
7-9	DALI +24V, DALI+, GND	Small Black(+24V), White(DALI+), and Green(GND) group of 3 with heat shrink
10-13	AUX RS485A, RS485B, AUX+, GND	M12 male connector; A: 1 yellow, B: 2 white, GND: 3 black, AUX+: 4 red
-	External Temp sensor	Small Black with temp probe termination
14, 15	Battery +/-	Large Red(+) and Large Black (-) unpaired
16, 17	PV +/-	Large Yellow(+) and Large Black(-) unpaired

Example System Application diagram



LED indications & warning functions

LED	Color	Status	Function
	Green	On	Controller connected to battery, night detected - Or - Controller connected to panel only, battery not detected
		Flash	Controller connected to battery, day detected
		Off	Battery or Panel not sufficient/present to power controller
	Red	On	Charging failure (overvoltage / overcurrent)
		Off	Charging OK
	Red	On	Load low/high voltage disconnect (LVD/HVD)
		Flash	Load overcurrent
		Off	Load OK
All LEDs	-	Green->Red->Green->	Programming

LED Driver Description

Hardware limits:

- LED voltage up to 55V
- LED current between 350-3500mA / 250-2500mA – adjustable by ~35mA / 25mA increments (120W / 60W version)
- True color dimming of the LED possible between 5-100% using invisible to the eye PWM
- Full DALI compliance as Control Gear (LED driver) including fade timers and level control

Full brightness / base level

Via DALI or RS485 (PhocosLink PC), the base dimming level is set to the maximum continuous current desired for the LED engine to achieve full brightness. This is the percentage of 3500mA supplied to LED when no PWM dimming takes place.

Example:

The image displays three screenshots of the LED driver control interface:

- Night Light:** Features a 'Y' icon. The 'Mode' is set to 'Dusk to Dawn (D2D)'. 'Evening Hours' and 'Morning Hours' are both set to 0.0 h.
- Dimmer Settings (Clock Icon):** Features a clock icon. The 'Mode' is set to 'Off'. 'Evening Dimming' and 'Morning Dimming' are both set to 2.0 h.
- Dimmer Settings (Percentage Icon):** Features a percentage icon. The 'Dimming Level' is set to 100 %. The 'Base Dimming Level' is set to 70 %.

In the above example the LED will be supplied with ~2.5A through the night, with no dimming. The LED will turn on as soon as night is detected and off as soon as day is detected. (All examples are for 120W version)

PWM dimming level

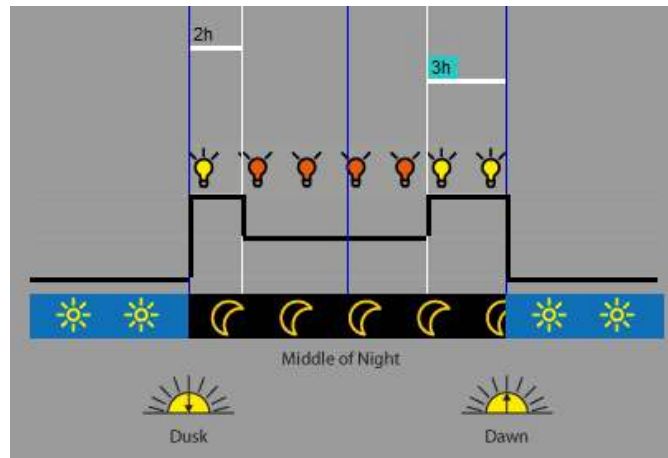
While using the internal Nightlight control, the dimming level is the level of dimming applied to the LED output for true color retention. It takes effect while dimming is active.

Example:

Night Light	Dimmer Settings	Dimmer Settings
		
Mode: Dusk to Dawn (D2D) ▼	Mode: Dusk and Dawn (DD) ▼	
Evening Hours: <input type="range"/> 0.0 h	Evening Dimming: <input type="range"/> 2.0 h	Dimming Level: <input type="range"/> 50 %
Morning Hours: <input type="range"/> 0.0 h	Morning Dimming: <input type="range"/> 3.0 h	Base Dimming Level: <input type="range"/> 70 %

In the above example the LED will be supplied with ~2.5A starting at dusk, then modulated to an average of ~1.2A 2h after dusk, returning to ~2.5A 3h before dawn.

Note: When the LED driver is directly controlled by DALI, the lamp brightness is adjusted with PWM dimming to retain the LED color across dimming levels.



Visual Representation of D2D dimming timers

Nightlight Function (for cases when DALI control does not apply)

The controller includes a sophisticated 2-timer nightlight which uses real data to find the relative length of night and day, with dusk, dawn, and middle of the night learned over several days of operation.

The **Nightlight Timer** sets when to turn the lamp on at all. While no Dimming is active, the LED is powered at the “Base Dimming level” (Full Brightness).

D2D: Turns ON the lamp all night – Use this mode when the lamp should be ON at some level from Dusk to Dawn.

Middle of Night: Turns OFF the lamp during the middle of the night relative to around midnight, by specifying the time in hours before midnight to turn OFF and hours after midnight to turn ON.

Dusk/Dawn: Turns OFF the lamp during the middle of the night relative to dawn and dusk, by specifying the time in hours after Dusk to turn OFF and hours before Dawn to turn ON.

The **Dimmer Setting** is used to optionally dim the lamp in the middle of the night to save energy while there is little need for full brightness. It can only dim the lamp while it is ON (i.e., overlapping Dimming time with lamp OFF time will still result in the lamp being OFF). Set it to OFF if the lamp should always remain at full brightness.

Middle of Night: Dims the lamp during the middle of the night relative to around midnight, by specifying hours before midnight to Dim the lamp and hours after midnight to return to full brightness.

Dusk/Dawn: Dims the lamp during the middle of the night relative to dawn and dusk, by specifying hours after Dusk to Dim the lamp and hours before Dawn to return to full brightness.

Note: “Midnight” is defined here as exactly halfway between Dusk and Dawn, which are based on the PV night level voltage setting, and therefore may not correspond exactly to 00:00 (Local timekeeping midnight). This is influenced by many factors including geography, local time zone, panel angle, and artificial light sources.

This allows for an incredible range of flexibility in the options for setting nightlight control when there is no DALI node controlling the LED, or when the DALI node is unable to communicate for some reason.

Adaptive dimming control

If the battery SOC is less than 90% at dusk, the LED brightness will be reduced proportional to the battery SOC to help prevent an early LVD during the night.

Example:

The image displays three screenshots of a lighting control interface:

- Night Light:** Features a street light icon. The 'Mode' is set to 'Dusk to Dawn (D2D)'. 'Evening Hours' and 'Morning Hours' are both set to 0.0 h.
- Dimmer Settings (Clock Icon):** Features a clock icon. The 'Mode' is set to 'Dusk and Dawn (DD)'. 'Evening Dimming' and 'Morning Dimming' are both set to 2.0 h.
- Dimmer Settings (Percentage Icon):** Features a percentage icon. The 'Dimming Level' is set to 50 % and the 'Base Dimming Level' is set to 70 %.

In the above example, assume the battery SOC is calculated as 80% at dusk. For the first two hours of night, the LED will have $3.5A * 70\% * 80\% = 2A$. From 2h after dusk to 2h before dawn, it will have $3.5A * 70\% * 50\% * 80\% = 1A$.

This adaptive lighting control helps prevent system downtime and LVDs when DALI is not used or not available for any reason.

DALI

The primary control method of this device is intended to be over a DALI bus with other devices, switches, controllers, and nodes, which determine the proper state of the LED and communicate it to the CIS-N-MPPT-DALI. Using the DALI interface, the LED output can be fully remotely or locally controlled as a control gear on a DALI bus.

Please visit <https://www.dali-alliance.org> for more details on the DALI standard and how the CIS-N-MPPT-DALI may be integrated in your new or existing DALI network of devices.

For installations without DALI or when the DALI bus fails to communicate an LED state, the LED driver will revert to a preprogrammed DALI fallback level or if ALC is enabled, an internal, sophisticated, and adaptive lighting algorithm takes over and can be utilized.

Via DALI, most parameters and settings related to the solar charge controller and LED driver can be configured, queried, and customized. Contact Phocos for more details or integration recommendations.

Operations Guide

Default factory settings

	Factory setting
LED nightlight mode	Dusk to Dawn (D2D)
Low voltage disconnect	11.0V
Battery type	LFP
Nightlight level	8.0V
Full brightness evening hours	0h
Full brightness morning hours	0h
Full brightness value	29%
Dimmed evening hours	2h
Dimmed morning hours	1h
Dimming value	30%
Boost Voltage	14.1V
Float Voltage	14.0V
Boost Activation	12.0V
Daily Boost time	30min
Boost time	60min

Settings with PhocosLink PC

See the PhocosLink PC download link on www.phocos.com. Connect with an RS485 to USB adapter. Ensure that the adapter is able to supply its own idle bus levels as the controller's node is high impedance.

Custom Battery Profile Settings

Attention: The default battery chemistry profiles for Flooded (liquid), AGM/GEL, and LFP use industry standard set points to properly charge and discharge a wide range of commercially available batteries. Only adjust these settings if confident in the ability to set them properly. Phocos cannot be liable for damages to device or property as a result of changes to these settings.

Battery  Type: ☐ Liquid ☐ AGM/Gel ☐ LiFePO4 ☒ CUSTOM Capacity: <input type="range"/> 50 Ah - ...	LVD  Level: <input type="range"/> 22.0 V Mode: ☒ Voltage ☐ Current adjusted/SOC Grid Charger DC Current: <input type="range"/> 2.0 A	Load Disconnect  Mode: ☐ Off ☒ Automatic	Various  Factory Settings: Reset DALI Power Supply Settings: Disable ALC Dimming: Enable	ADJUST AT YOUR OWN RISK Type: ☐ Liquid ☒ AGM/Gel ☐ LiFePO4 Available Settings: Min Battery Temperature: <input type="range"/> 0 °C Max Battery Temperature: <input type="range"/> 40 °C Temperature Compensation: <input type="range"/> 25 mV/K Equalization Days: <input type="range"/> 0 Days Daily Boost Time: <input type="range"/> 5 Minutes Boost Time: <input type="range"/> 5 Minutes Equalization Time: <input type="range"/> 0 Minutes Max Neg Temp Compensation: <input type="range"/> -2.00 V Max Pos Temp Compensation: <input type="range"/> 2.00 V Float Voltage: <input type="range"/> 27.0 V Boost Voltage: <input type="range"/> 29.4 V Boost Activation Voltage: <input type="range"/> 28.0 V Equalization Voltage: <input type="range"/> 29.4 V Equalization Activation Voltage: <input type="range"/> 20.0 V Over Voltage: <input type="range"/> 30.0 V Over Voltage Reconnect: <input type="range"/> 29.0 V Under Voltage: <input type="range"/> 21.6 V LVD Reconnect Voltage: <input type="range"/> 24.4 V
Night Settings  Detection Level: <input type="range"/> 16.0 V	Night Light  Mode: Dusk to Dawn (D2D) Evening Hours: <input type="range"/> 0.0 h Morning Hours: <input type="range"/> 0.0 h	Dimmer Settings  Mode: Dusk and Dawn (DD) Evening Dimming: <input type="range"/> 2.0 h Morning Dimming: <input type="range"/> 2.0 h	Dimmer Settings  Dimming Level: <input type="range"/> 30 % Base Dimming Level: <input type="range"/> 25 %	

Type: This setting is critical for proper SOC calculation, based on battery chemistry. If the battery chemistry is not shown, please select LFP. This choice will use Coulomb-counting to find the SOC. This setting does not affect Equalization settings.

Min/Max Battery Temp: Lower and upper temperature bounds for safe battery operation. Outside this range, the battery will not be charged.

Temperature Compensation: Set to 0 to disable negative temperature compensation (recommended for Lithium). Reduces the charging voltage at temperatures above 25°C and increases the charge voltage at low temperatures.

EQ days: How often to perform an EQ stage with no trigger.

Daily boost time: How long to hold the Boost voltage each day during the main/daily charge.

Boost time: How long to hold the Boost voltage if the Boost activation voltage was reached.

Equalization time: How long to hold the EQ voltage when triggered. Set to 0 min to disable.

Max neg/pos temperature compensation: Upper/lower limits on the compensated charge voltage, to set absolute maximum/minimum charge voltages.

Float Voltage: The charge voltage target after the end of the boost stage.

Boost Voltage: The charge voltage target held for a Boost or Daily charge stage.

Boost Activation Voltage: Intended to trigger another Boost charge stage if the battery is deeply discharged. Typically, the Boost time will be set longer than the daily boost time.

Equalization Voltage: The charge voltage target held for an EQ charge. Set equal to the Boost Voltage to avoid overcharging LFP or AGM/GEL.

Equalization Activation Voltage: Intended to trigger another EQ charge stage if the battery is deeply discharged. Set this to 0V if not desired.

Over Voltage: The maximum battery voltage allowed without triggering a fault. If the battery voltage is above this, the controller will not charge or discharge the battery.

Over Voltage reconnect: When to return to normal operation after an over voltage is detected.

Under Voltage: Emergency low voltage to immediately disconnect all loads, regardless of the calculated SOC.

LVD Reconnect Voltage: The battery voltage at which to reconnect the loads after a normal LVD event.

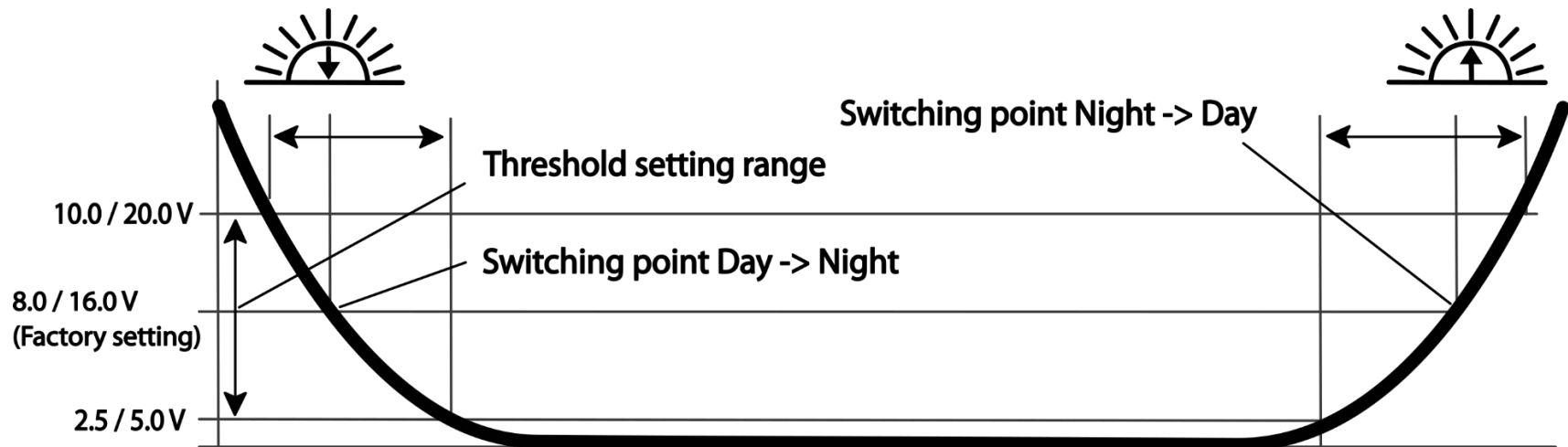
Automatic Test Period

At every boot of the controller, the LED output will be set to full brightness and the SSR output activated for 1 min, regardless of the nightlight settings and PV detection. This is for testing the LED engine, battery, and hybrid charger installation.

Night Light Detection Level

The controller recognizes “day” and “night” based on the solar PV array open circuit voltage. The daylight threshold can be modified according to the requirements of the local conditions and the solar PV array used.

To find the exact values, we recommend measuring the PV solar array “open circuit voltage” at twilight and when the controller is expected to switch the loads “on” or “off”. This value (the closest setting available) can be set according to the description presented in the programming section.



Intelligent Low Voltage Disconnect (LVD)

The total allowed Load on the battery through the controller may include the LED at full brightness, plus 5A on the external load wire, and an additional 1A (fused) for the AUX+ supply, and the DALI +24V supply (converted from the battery voltage) at full capacity according to the DALI standard.

As the Battery supplies these various Loads (LED, Load+ wire, AUX supply, DALI+ supply), an internal protection is implemented in the form of an LVD setting to prevent deep discharge. There are two methods of LVD setting for lead acid battery types:

Voltage Based: If the battery voltage is less than the voltage based LVD the load will disconnect within 1 minute. This occurs regardless of the load.

Current Adjusted/SOC Based: The user sets a no-load LVD voltage. LVD will trigger if that voltage is met while no load current flows. However, while a load current flows, the LVD setpoint is adjusted downwards to compensate for the drop in battery voltage under load. This helps especially to prevent early LVDs in systems with small batteries. For the best results, the programmed battery capacity should be accurate.

SOC Calculation

The battery SOC is calculated assuming the LVD no-load voltage is 0% SOC. So, the SOC calculation available from the controller accurately estimates the remaining usable capacity in the battery. For LFP batteries, SOC is calculated by Ah counting in combination with high and low SOC setpoints.

SSR Control and Hybrid Charging

The SSR control signal may be used to activate an external SSR which powers an AC/DC charger to provide extra grid-sourced charge current for hybrid systems. This SSR output is activated when the remaining time left in the day is needed for the grid charger to supplement the battery to reach 100% SOC before nighttime.

To use this system properly, the grid charger current should be sized so that the battery can be fully charged in several hours or less while it is activated – and the **Grid Charger Current** setting must be programmed accurately (with PhocosLink PC) for proper activation and SOC calculation, especially for LFP batteries.

The grid charger voltage should be set near the battery's boost voltage, to ensure a full charge. The SSR will deactivate after the boost voltage is reached for an appropriate length of time so there is no risk of overcharging. The SSR signal (SSR+/-) provides up to ~15mA at up to the battery voltage. Many typical commercially available SSRs with DC input range 3-32Vdc will accept this input, but our recommendations for SSR and AC/DC charger are as follows:

SSR Recommendation:

Carlo Gavazzi RM1A23D25

AC Charger Recommendation:

12V battery – Meanwell HLG-80H-15A, HLG-150H-15A

24V battery – Meanwell HLG-80H-30A, HLG-150H-30A

This hybrid charging function does not conflict with any DALI controls of the LED output.

Test the Hybrid Charger setup by making all connections and probing the AC/DC charger DC output current during the first minute of controller operation after boot – the SSR signal wires will be active, the SSR should conduct, and the AC/DC should begin charging the battery. Check that the SSR is deactivated after the first minute if the battery is near full. The grid charger will be controlled automatically and ensure a full battery at the end of each day.

LFP Wakeup

If the controller is powered on from Solar only, it will assume it has a dead LFP battery connected, whose BMS has disconnected the internal cells from the terminals. To wake up the connected BMS, the charge controller will apply a short duration pulse up ~14V/28V. If several attempts are made without success, the controller will wait 30minutes before attempting again. If the battery is restarted manually or replaced, the controller will enter normal operation.

Temperature Compensation (with External Temp Sensor)

An external battery temperature sensor is included to compensate for temperature variation while charging lead acid batteries. For all batteries, including LFP, this sensor is used to determine if the battery temperature is within the allowed range for safe charging – so, it is recommended to always be thermally attached to the battery terminal.

Internal Datalogger

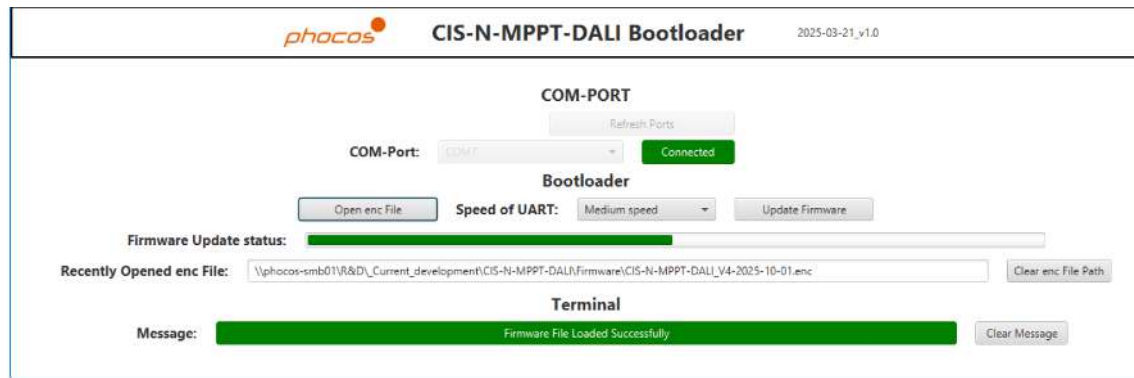
The controller retains data every day for 1 month and then aggregates that data into a monthly average for up to 2years. This data can be read and saved using Phocoslink PC to help with future system sizing, PV production predictions, and analysis of load trends and battery health.

Firmware Update

The CIS-N-MPPT-DALI's program firmware may be updated over RS485. Phocos may release bug fixes, feature updates, or performance improvements over the lifetime of the product to ensure optimal performance and customer satisfaction.

To update the firmware on the CIS-N-MPPT-DALI:

1. Install and run the "Bootloader_CIS-N-MPPT-DALI_Installer", available on phocos.com under the product landing page.
2. Run "Bootloader_CIS-N-MPPT-DALI".
3. Connect a USB to RS485 adapter between the PC and CIS-N-MPPT-DALI RS485 wires (group of **4** wires: white [A], black [B], green [GND]). It is not necessary to disconnect loads/PV panel before the update. The controller must be powered on from a battery source within the normal operating voltage.
4. Click "**Refresh**". Choose the serial port to which the USB adapter is connected.
5. Click "**Connect**". If the COM port is opened successfully, the button will change to indicate "Connected".
6. Click "**Open enc File**". Select the desired firmware file. Release versions are available from phocos.com under the product landing page or from Phocos directly.



7. Click "**Update Firmware**" to initiate the update. Monitor the progress bar.
8. The "Message" field will indicate the outcome of the update attempt.
9. If unsuccessful, check the RS485/USB connection and retry. Check that the controller is powered on from battery by checking the LED indicators.

Safety Features

	PV terminal	Battery terminal	Load	LED output
Reverse polarity	Protected (1)	Not protected (2)	---	---
Short circuit	Protected	Protected (4)	Not protected (3)	Limited (7)
Overcurrent	Limited	---	Limited (3)	---
Reverse current	Protected (5)	---	---	---
Overvoltage	Max. 85 V (6)	Max. 50 V	Switches off above battery overvoltage setting	
Undervoltage	---	---	Switches off	
Over temperature	Reduces the charging current if over temperature occurs and switches off the load if the temperature reaches a high level.			

- (1) Panels are short circuited by diodes. The controller can therefore only be subjected to these conditions for a limited time. A battery connected to the panel terminals in reverse polarity will instantly cause damage to the controller.
- (2) A battery fuse is necessary to protect the CIS-N-MPPT-DALI from getting damaged by reverse polarity connection on the battery terminals. Even with a properly sized fuse, damage may easily occur.
- (3) Load output (via Load-wire) is protected in high current events <65A.
- (4) Battery must be protected by a fuse, or it might be permanently damaged in case of short circuit.
- (5) MPPT switches off when detecting reverse current and prevents battery discharge to panel at night.
- (6) At voltages above 85V the MPPT will stop charging.
- (7) Start-up while shorted is protected but the LED driver output cannot be shorted after powered on. Some limited protection is provided in case of LED engine failure causing high current into the LED fixture.

WARNING: The combination of different error conditions may cause damage to the controller. Always remove the fault condition before you continue connecting the controller!

Technical Data

MPPT Solar Charge Controller Data

Type	CIS-N-MPPT-DALI (120W)	CIS-N-MPPT-DALI-60W
System Voltage	12 / 24V auto recognition	12 / 24V auto recognition
Max. Charge Current	15A	10A
Max. External Load Current	5A	5A
Float Charge	Pb: 14.4 / 28.8 V (25 °C); LFP: 14.0 / 28.0 V	Pb: 14.4 / 28.8 V (25 °C); LFP: 14.0 / 28.0 V
Main Charge	Pb: 14.4 / 28.8 V (25 °C); LFP: 14.1 / 28.2 V 0.5 h daily	14.4 / 28.8V (25°C); LFP: 14.1 / 28.2 V 0.5 h daily
Boost Charge	Pb: 14.4 / 28.8 V (25 °C), 2 h activation: battery voltage <12.3 / 24.6 V LFP: 14.1 / 28.2 V (25 °C), 1 h activation: battery voltage <12.0 / 24.0 V	Pb: 14.4 / 28.8 V (25 °C), 2 h activation: battery voltage <12.3 / 24.6 V LFP: 14.1 / 28.2 V (25 °C), 1 h activation: battery voltage <12.0 / 24.0 V
Equalization Charge	Pb liquid: 14.8 / 29.6 V (25 °C), 2 h activation: battery voltage <12.1 / 24.2 V (at least every 30 days)	Pb liquid: 14.8 / 29.6 V (25 °C), 2 h activation: battery voltage <12.1 / 24.2 V (at least every 30 days)
Deep-Discharge Protection	11.5-12.0 / 23.0-24.0V (by SOC) 11.0-12.0 / 22.0-24.0V (by voltage)	11.5-12.0 / 23.0-24.0V (by SOC) 11.0-12.0 / 22.0-24.0V (by voltage)
Reconnect Level	Pb: 12.8 / 25.6 V; LFP: 12.2 / 24.4 V	Pb: 12.8 / 25.6 V; LFP: 12.2 / 24.4 V
Overvoltage Protection	Pb: 15.5 / 31.0 V; LFP: 14.8 / 29.6 V	Pb: 15.5 / 31.0 V; LFP: 14.8 / 29.6 V
Undervoltage Protection	10.5 / 21.0V	10.5 / 21.0V
Max. PV Panel Voltage	85V	55V
MPP Voltage Range	(Battery Voltage + 1 V) to 70 V	(Battery Voltage + 1V) to 45 V
Max. Usable PV Power	225W / 450W	150 W / 300 W
Max. PV Array Power	500Wp / 1000Wp	300 W / 600 W
Temperature Comp.	-25 mV/K (12V) / -50 mV/K (24V) (Lead Acid only)	-25 mV/K (12V) / -50 mV/K (24V) (Lead Acid only)
Idle Self-Consumption	<30 mA	<30 mA
Grounding	Common Negative	Common Negative
Ambient Temperature	-40 to 60°C	-40 to 60°C

Battery Type	Lead acid (Gel, AGM, Flooded), LFP, Custom	Lead acid (Gel, AGM, Flooded), LFP, Custom
Datalogger	2 years	2 years
Wire Cross Section	2.5 mm ² (AWG13)	1.5mm ² (AWG 15)
Dimensions (WxHxD)	160 x 96.1 x 48.25 mm / 6.3 x 3.78 x 1.9 in	160 x 96.6 x 27.0
Weight	1080 g / 2.4 lbs	670 g / 1.5 lms
Ingress Protection	IP68 (1.5 m, 72h)	IP68 (1.5 m, 72h)
Certificates	CE compliant, RoHS compliant, D4i Part 101, 102, 207, 250, 251, 252, 253, 150	CE compliant, RoHS compliant, D4i Part 101, 102, 207, 250, 251, 252, 253, 150
Warranty	5 years	5 years

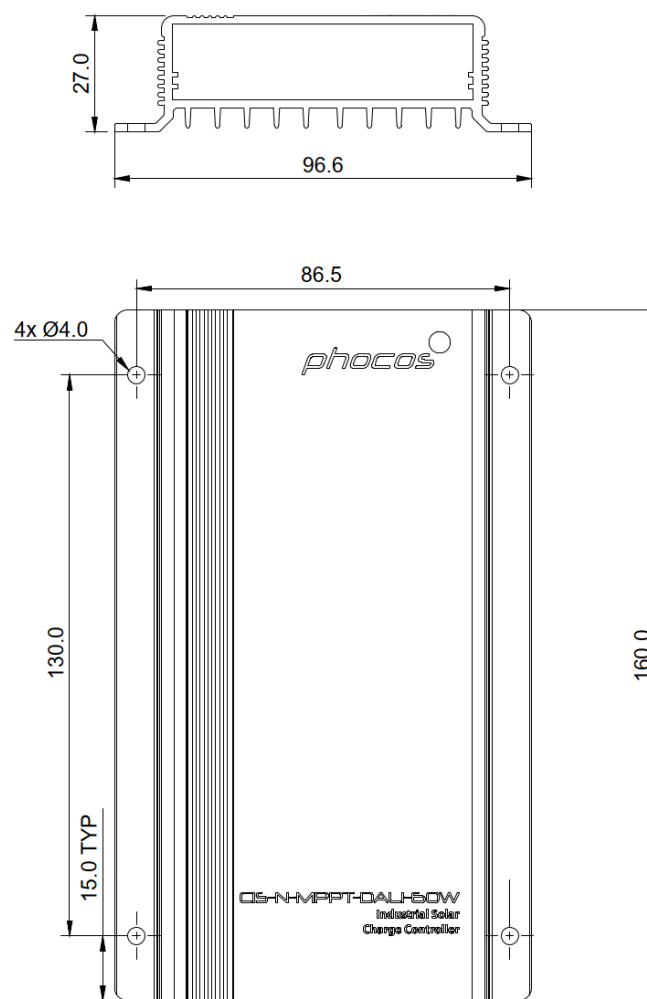
LED-Driver Data

Type	CIS-N-MPPT-DALI (120W)	CIS-N-MPPT-DALI-60W
Output Voltage	15 – 55 V (12V) / 30 – 55 V (24V)	15 – 55 V (12V) / 30 – 55 V (24V)
Continuous Output Current	350 – 3500 mA (selectable in 1% steps of 35mA)	250 - 2500mA (selectable in 1% steps of 25mA)
Max. Load Power	120W ($\geq 12.0V$) / 190W (24V)	60W (12.0 V) / 120W (24.0 V)
Dimming Level	5% - 100%, PWM-diming	5% - 100%, PWM-diming

Other Data

Type	General
SSR signal Voltage Range	Equal to the Battery Voltage
SSR signal max Current Supply	~15mA
DALI AUX +24V Max/Peak Current Supply	125 / 250mA
DALI+ Bus Nominal Voltage	16V
DALI+ Bus Current Supply Range	50mA, max 60mA
AUX+ Voltage range	Equal to battery Voltage
AUX+ max cont. Current Supply, AUX+ peak Current Supply	1A, 5A (1s)
Ext. Load Voltage range	Equal to battery Voltage

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Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable for if there has been service or repair conducted by any unauthorized person, unusual installation, wrong installation, or flawed system design.

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