EKEO

Modular
Battery Solutions

MANUAL BATTERY CONTROLLER

Confidential

Version 20201191

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About the manual

This version of the manual

This version of the manual replaces all previous versions. ELEO has made every effort to ensure this document is complete and accurate. All data in this document is subject to change or correction without prior notice.

Copyright

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Related documents

The following documents are available from ELEO upon request:

- The CAN protocol mapping document
- 3D STEP files
- Module configuration software and GUI.

Units

SI units are used throughout this manual.

Safety warnings and notes

Special attention must be paid to the information presented within the safety and warranty fields throughout the document. Examples of the style and purpose of each are shown below:

	A S1 safety warning indicates a hazard with a high level or risk which could result in death or serious injury

	A S2 safety warning indicates a hazard with low level of risk which could result in a minor or moderate injury

	A NOTE indicates a risk of (irreversible) damage to the product or its surroundings or important information for proper functioning and warranty of the product

Warranty

Please refer to the terms and conditions of sale or contract under which the product was purchased for full details of the applicable warranty.

Product identification

Each product is supplied with a unique product number (PN). When discussing technical issues make sure to have your products PN available. The PN is located at the front and/or top of each battery controller.
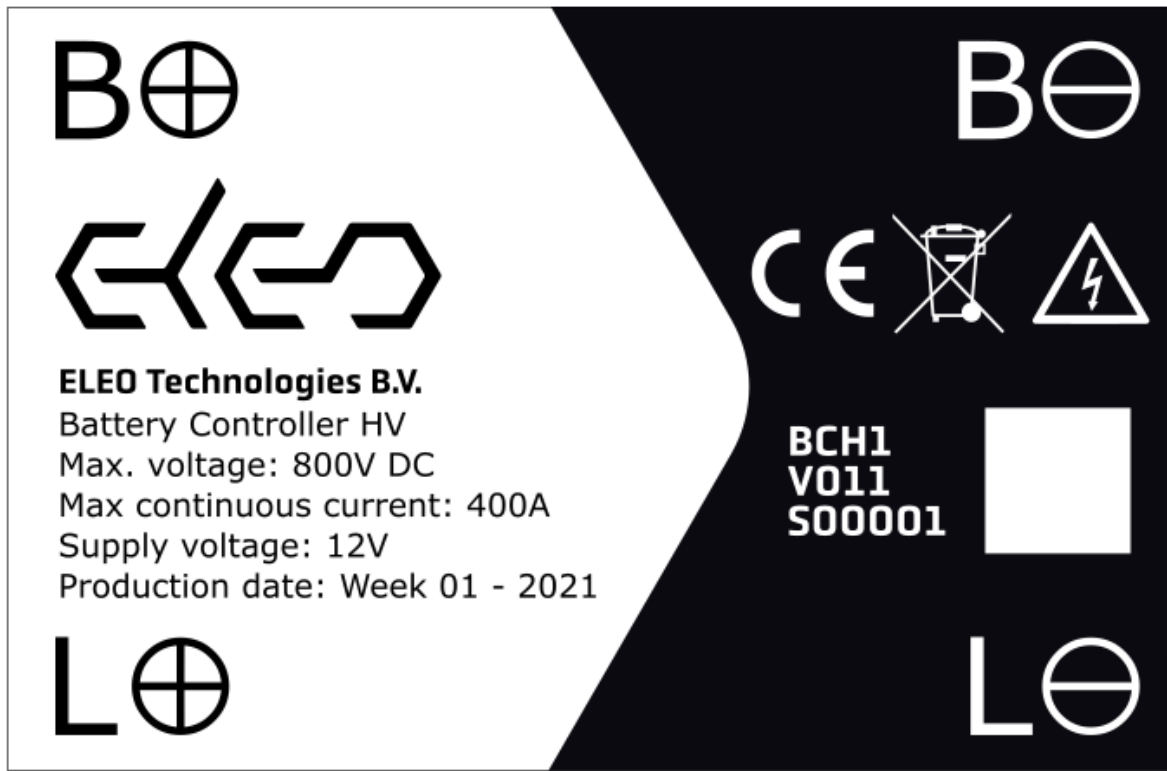

Figure 1: Example of product label. PN is marked with a red rectangle.

Safety Precautions

- Do not disassemble the controller
- Do not use outside specified current and voltage limits
- Always add a suitable battery fuse
- Take appropriate measures to prevent electrical shock

Introduction

ELEO's Battery Controllers are designed to offer a plug and play battery solution without compromising on safety and performance. These include both on and off-highway vehicles as well as maritime, railway and stationary applications.

The Battery Controllers can be configured in any series and/or parallel configuration up to 800VDC (900VDC on request) and 400A ensuring any required power and voltage is possible. The Battery Controllers ensures the connected ELEO Battery modules are kept in a safe operating area and provide interface for easy integration with the application and third-party hardware.

The battery controllers have integrated contactors with pre-charging functionality and provide additional safety features such as insulation monitoring and high voltage interlock.

Intended use and safety concept

The ELEO Battery Controller is intended for use in both vehicles and stationary applications. This may be vehicles for road use, but also vehicles for industrial use and home use. The Spike Battery controller may also be used for marine, railway and (stationary) energy storage applications.

The Battery controller is an extension on top the ELEO battery modules and is the interface between the total battery solution/pack and the application. The Battery controller listens to any amount of battery modules and ensures the battery is kept in its safe operating area. The battery controller is capable to disconnect the battery from the application in case of misuse or an error.

> NOTE: An external fuse of the appropriate type and current rating must always be integrated

An external fuse of the appropriate type and current rating must always be integrated in the application outside of the battery modules and battery controller.
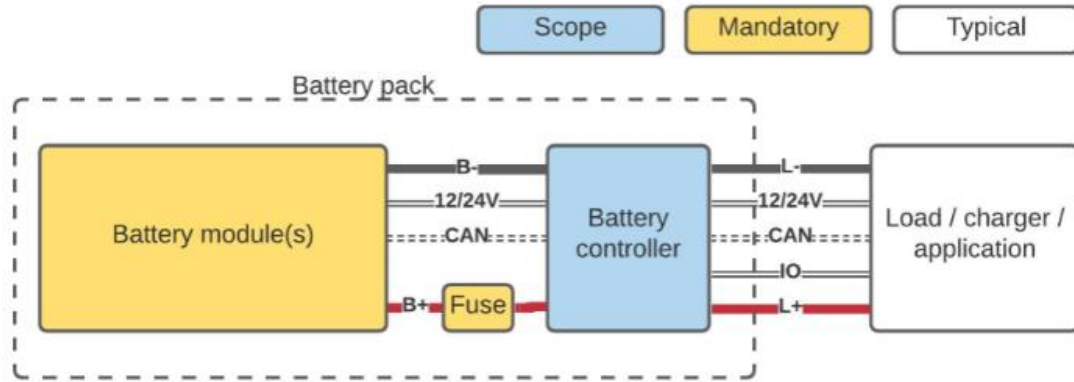
Figure 2: Overview of safety concept of ELEO battery controller

Electrical specifications

Each battery controller communicates over a CAN-bus with configurable baud rate. The battery controller and modules need to be powered externally when turning on the application or initiating charging. The CAN-bus and logics are galvanically isolated from the (HV) battery positive and negative.

ELECTRICAL DATA	Battery controller LV	Battery controller HV
Maximum battery voltage	120VDC	800VDC
Power consumption 12/24VDC	2.8/ 3.3W	4.8/ 5.4W
Supply voltage	9-28V	9-16V or 18-28V
Maximum continues current	400A	400A
Contactor switching	B+	B+ and B-
Insulation monitoring	No	Yes
High voltage interlock	No	Yes

The electrical interfaces are shown below.

| Name	PN	PN mating part	Description
Battery positive	SLPRBTPSO	SLPPB35BSO (35mm2) SLPPB50BSO (50mm2)	To battery positive B+ via fuse
Battery negative	SLPRBTPSB	SLPPB35BSB (35mm2) SLPPB50BSB (50mm2)	To battery negative B-
Load positive	SLPRBTPSO	SLPPB35BSO (35mm2) SLPPB50BSO (50mm2)	To load positive L+
Load negative	SLPRBTPSB	SLPPB35BSB (35mm2) SLPPB50BSB (50mm2)	To load negative L-
Module interface	DT15-4P	DT06-4S	CAN and power supply to battery modules
Application interface	1-776230-1	776164-1	Application side communication and IO's
Internal interface	DT15-12PA	DT06-12SA	Additional internal pack functionality
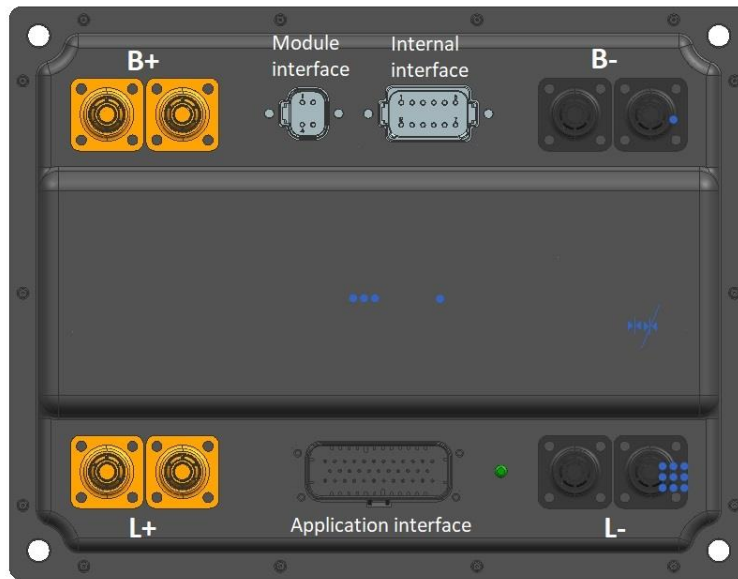
Figure 3: Electrical interfaces battery controller

Pinout Application interface (1-776230-1)

Pin	Name	Type	Rating	Description
1	HVIL in external	Analog input		HV variant only: Input HVIL loop monitored by battery controller. Connect to pin 2 when not used. *(Required for system functioning, HV only)*
2	HVIL out external	Analog output		HV variant only: Output HVIL loop monitored by battery controller. Connector to pin 1 when not used. *(Required for system functioning, HV only)*
3	GND	Reference		
4	Contactor feedback	Digital output	@V_{dd}	High when contactors are closed (conducting). Low when contactors are open.
5	GND	Reference		
6	Charge control	Digital output	@V_{dd}	High when charging is allowed. Low when charging is not allowed/should be stopped.
7	GND	Reference		
8	Error line	Digital output	@V_{dd}	Low when there is an error. High when there is no error.
9	GND	Reference		
10	Warning line	Digital output	@V_{dd}	Low when there is a warning. High when there is no warning.
11	GND	Reference		
12	Charging Status line	Digital output	@V_{dd}	Low when not in charging. Blinking low/high at 0.5Hz when charging.

				High when charging done.
13	CAN high 2	Comms		Communication to application
14	CAN low 2	Comms		Communication to application
15	CAN GND 2	Comms Reference		Communication to application
16	Reserved			
17	Reserved			
18	Reserved			
19	Reserved			
20	Reserved			
21	Reserved			
22	Reserved			
23	CAN GND 2	Comms Reference		Communication to application
24	CAN high 2	Comms		Communication to application
25	CAN low 2	Comms		Communication to application
26	General power supply 1	Power output	10A max* @V_{dd}	Can be used to supply battery enable switch
27	General power supply 2	Power output	10A max* @V_{dd}	Can be used to supply charge enable switch
28	Enable	Digital input	see pin 35	Switch to V_{dd} to close contactors *(Required for system functioning)*
29	Charge enable	Digital input	see pin 35	Switch to V_{dd} to engage charging protocol
30	GND	Reference		
31	Auxiliary power supply.	Power input	see pin 35	
32	GND	Reference		
33	Power supply 2 (V_{dd})	Power input	see pin 35	Power supply input to battery system logics 2
34	GND	Reference		*(Required for system functioning)*
35	Power supply 1 (V_{dd})	Power input	See electrical data table	Power supply input to battery system logics 1 *(Required for system functioning)*

Sum of the power output currents may not exceed 8A when one battery power supply input is used and may not exceed 18A when both battery power supply inputs are used.

**If pin 33 is used, it needs to be powered from the same voltage source as pin 35

Pinout Module interface (DT15-4P)

Pin	Name	Type	Rating	Description
1	Module power supply	Power output	10A max* @V_{dd}	Power supply output to modules.
2	CAN high 2	Comms		Communication to application
3	GND	Reference		
4	CAN low 2	Comms		Communication to application

Pinout Internal interface (DT15-12PA)

Pin	Name	Type	Rating	Description
1	Module power supply	Power output	10A max* @V_{dd}	Power supply output to modules.
2	Reserved			
3	Reserved			
4	GND	Reference		
5	Temperature sensor 1	Analog input		10kΩ thermistor (+)
6	Temperature sensor 2	Analog input		10kΩ thermistor (+)
7	GND	Reference		
8	GND	Reference		
9	HVIL in internal	Analog input		HV variant only: Input HVIL loop monitored by battery controller. Connect to pin 10 when not used. *(Required for system functioning, HV only)*
10	HVIL out internal	Analog output		HV variant only: Output HVIL loop monitored by battery controller. Connector to pin 9 when not used. *(Required for system functioning, HV only)*
11	Auxillary battery power supply.	Power input	LV: 9 – 28V HV: 9 – 16V	
12	GND	Reference		

LED

Color	Description
Red	Contactor(s) open (not conducting)
Green	Contactor(s) closed (conducting)
Blue	Configuration mode

Mechanical specifications

The battery controller is equipped with 4 M8 clearance holes. These can be used to fixate the controller. The controller can be fixated in any possible orientation.

MECHANICAL DATA	Battery controller LV	Battery controller HV
Protection class[1]	IP65	IP65
Weight	1.8 kg	1.9 kg
Width	303 mm	303 mm
Height	85 mm	85 mm
Length	235 mm	235 mm

[1] Designed not certified;
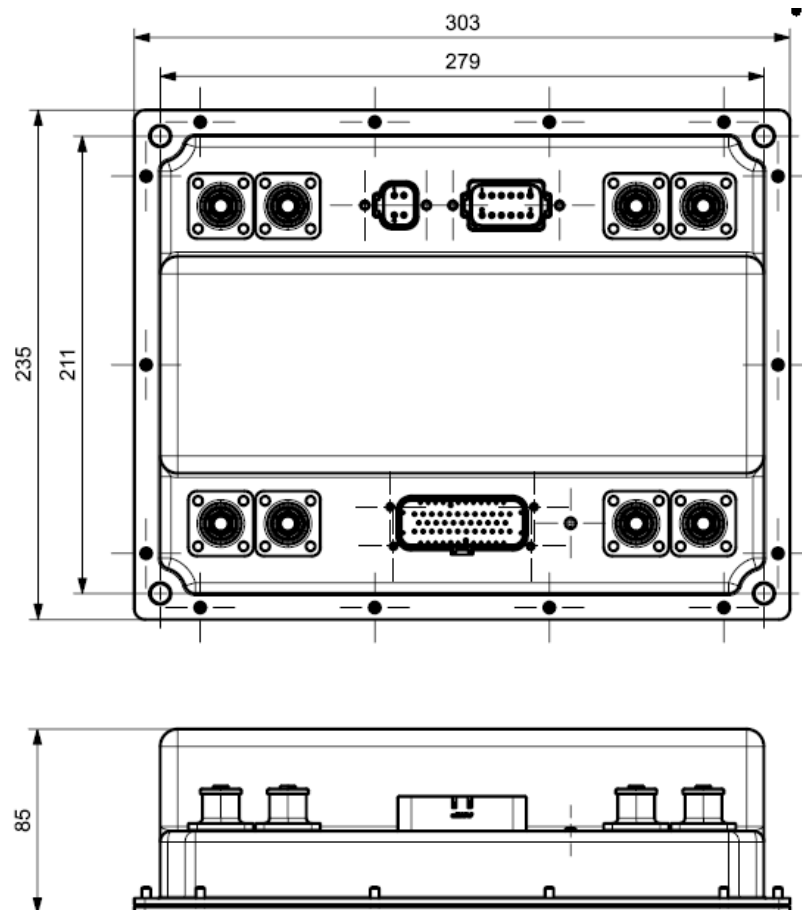
Figure 4: Dimensions of the battery controller

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