



High-performance backup power supply for mains failure. Energizes the elevator for a large number of trips and extended time enabling complete building evacuation.

User guide:

epic
evacuation
equipment

e3

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Epic Power Converters S.L.

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1 Application

e3 (epic evacuation equipment) is a system that completely supplies the energy required by an elevator in case of mains failure. This system could always be applied if the elevator is equipped with a VVVF drive¹.

Standard solution for three phase
drive (VVVF 380 - 400Vac
(optional solution for single-phase drive of
230Vac or three phase 230Vac)

The system is connected to the elevator control. The number of trips can be as high as necessary depending on the selected battery pack. The elevator will continue in operation until e3 communicates low-battery status. Trips can be done in motor or generation mode with the limitation of maximum power imposed by e3.

epic power has an internal tool designed to calculate and provide the optimal configuration of the solution for each specific case. The results generated by this tool offer a detailed analysis of the potential number of trips, considering all the energy consumption associated with the lift. This ensures precise dimensioning not only of the batteries but also of the other system components.

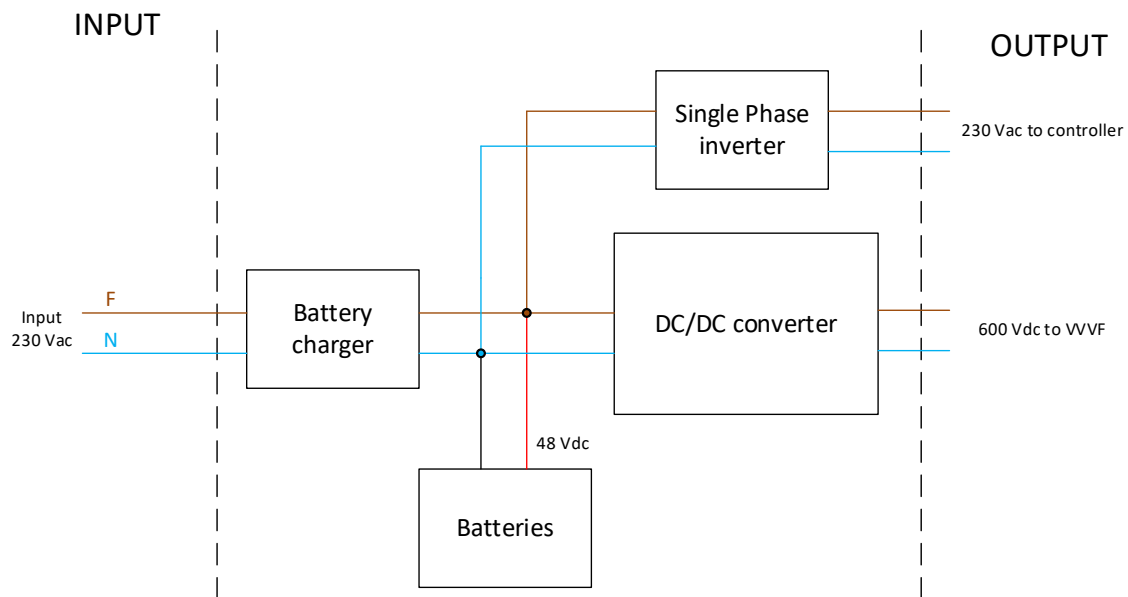
Additionally, this tool takes into account, when required, compliance with regulations such as EN81-72 and BS9999, which have implications for the dimensioning of the e3 solution. These standards are fully considered in the calculations provided by the tool.

For further assistance or to request a calculation tailored to your project, please contact customercare@epicpower.es

¹ This document covers standard 380-400Vac three-phase VFDs, commonly used for industrial motor control and energy efficiency. 230Vac (single- or three-phase) options are available for specific applications but may have different performance characteristics. Consult to epic power for proper selection.

2 System description

The e3 system includes a battery charger that maintains a battery pack of 48Vdc in its optimum state-of-charge. From the batteries, two different supply outputs are fed. One is a single-phase one 230Vac (400W or 700W) to supply the control and the rest of the elements supplied from it such as doors, brakes and cabin lights. In addition to this, the system incorporates a DC/DC converter capable of supplying 600Vdc to feed the VVVF drive directly in the DC link connection. This DC/DC converter transforms 48Vdc energy from the batteries to 600Vdc and vice versa due to its bidirectionality. Therefore, when the motor breaks, batteries can be charged.



The system has some input/output signals to communicate with the controller. The system principally consists of:

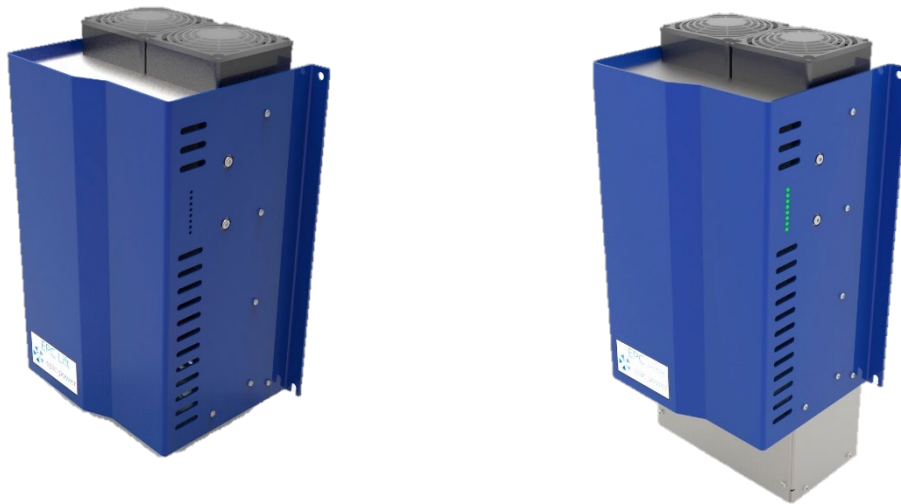
- DC/DC converter
- Battery charger
- Inverter
- Batteries

2.1 DC/DC Converter

The DC/DC converter are able to supply the VVVF directly in the DC link from 48V battery pack.

2.1.1 Technical specs

Feature	EPCL-e3 3k5	EPCL-e3 5k5
Drive DC operating voltage (Vdc)	500÷800 V	
Maximum drive exchanged current	7.5 A	12 A
Nominal power	3,5 kW	5.5 kW
Maximum unidirectional performance	98 %	
Storage temperature	-10÷70 °C	
Weight	6.05 kg	8.95 kg
Dimensions	Size 1	Size 2
IP protection class	IP2X	
Climatic conditions	Type B	
Pollution degree	2	



2.1.2 EPCL – e3: External description

Size 1

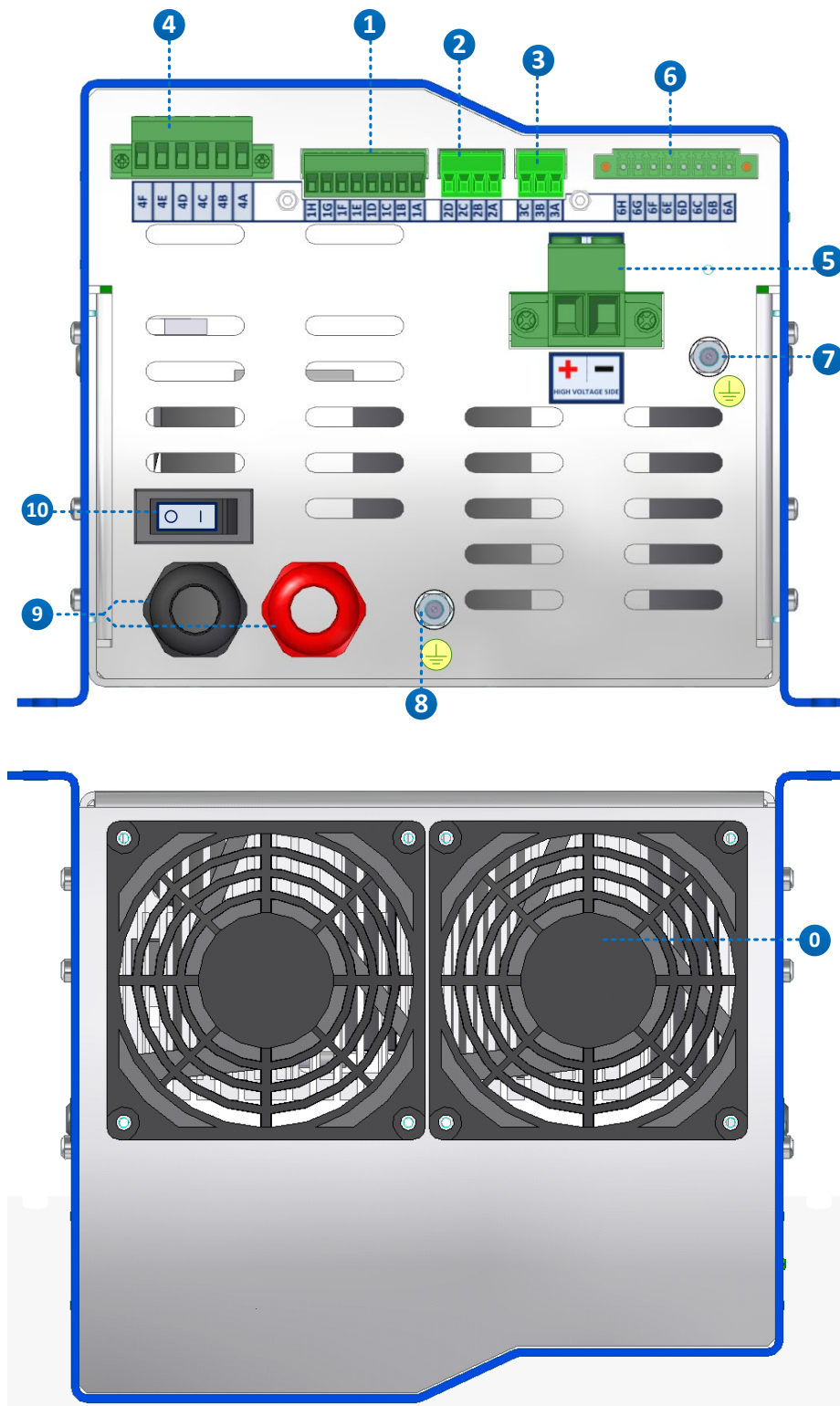


Fig. 1 DC/DC converter **Size 1**

Size 2

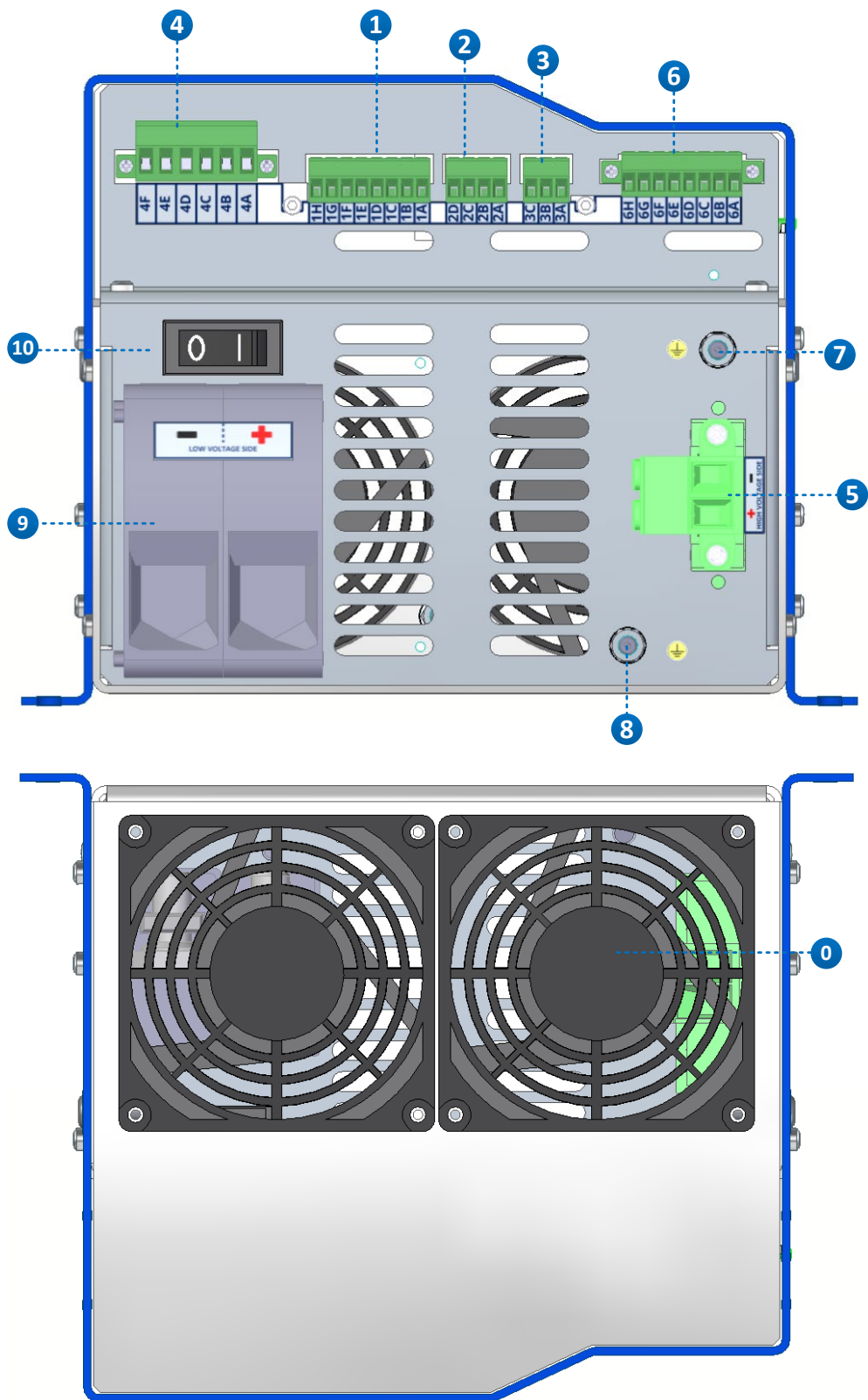
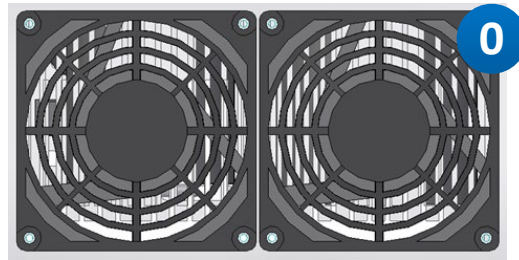


Fig. 2 DC/DC converter Size 2

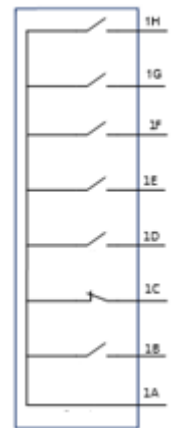
0) FAN



1) OUTPUTS TO CONTROLLER

IMPORTANT: These are potential-free contacts. These outputs should never withstand voltages higher than 24V DC or 250V AC. These outputs should never conduct currents higher than 5A

- **1A) COMMON:** Common connection of terminals 1B, 1C, 1D, 1E y 1F.
- **1B) STATUS OK:** (Normally Open). When this terminal is short-circuited to common it indicates that the DC/DC converter is in operation and therefore, it is supplying the DC link of the drive, so the drive is energized.
- **1C) LOW BATTERY 1** (Normally Closed): When this terminal is open, it indicates SOC < 30%.
- **1D) LOW BATTERY 1** (Normally Open): When this terminal is short-circuited to common it indicates SOC < 30%.
- **1E) LOW BATTERY 2** (Normally Open): When this terminal is short-circuited to common it indicates SOC < 60%.
- **1F) AC CHARGER ON:** (Normally Open): When this terminal is short-circuited to common it indicates to the controller that the battery charger is working properly.
- **1G) EARTH LEAKAGE DETECTION** (Normally Open).
- **1H) No connection.**

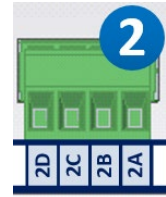


The condition of the contacts depending on the State Of Charge (SOC) of the batteries is:
[closed=0, open=1]

MODO/ MODE	CONDICIÓN/ CONDITION	Estado del contacto 1C/ 1C contact state	Estado del contacto 1D/ 1D contact state	Estado del contacto 1E/ 1E contact state	Estado variador/ VVVF state
1	SoC >= 60%	Cerrado/ close (0)	Abierto/ open(1)	Abierto/ open (1)	ON
2	30% <= SoC < 60%	Cerrado/ close (0)	Abierto/ open (1)	Cerrado/ close (0)	ON
3	SoC < 30% ²	Abierto/ open (1)	Cerrado/ close (0)	Abierto/ open (1)	ON
4	SoC <= 15% ³	Abierto (1)	Cerrado (0)	Cerrado (0)	OFF

2) **OUTPUTS to AUXILIARY ELEMENTS:**

- **2A) y 2B) Batteries EoL (End of Life):** NORMALLY CLOSED. End of life of the batteries. Open circuit shows that the end of life of the battery pack may have been reached.



THE BATTERY PACK MUST BE REPLACED WHEN THIS SIGNAL IS SHOWN

Independently of this signal, it is necessary to carry out a protocol of measurements in the batteries as a preventive operation to find out their state of health. See chapter 2.3.2 Batteries maintenance

- **2C) and 2D) (Remote Control) RC CHARGER + and -:** This terminals must be connected to RC+ and RC- of the battery charger.
 - o The DC/DC converter disables the battery charger to perform routine tests to the battery pack.

3) INPUTS FROM CONTROLLER:

3A) COMMON: Common for the ENABLE inputs 3B and 3C

3B) ENABLE DC/DC: Enable/disable the DC/DC Converter. To enable the DC/DC converter the elevator controller has to short-circuit terminals 3A and 3B.

- The elevator controller has to maintain this signal short-circuited whenever the elevator is switched ON. **EVEN WHEN IT DOES NOT WORK IN EVACUATION MODE**
- This way, the system will constantly apply a battery check protocol, in order to control the SoH (State of Health)

- **3C) ENABLE EVACUATION:** Enable/disable the evacuation mode.

- OPEN CIRCUIT: Enables the evacuation mode. The e3 system will use the battery pack to supply the elevator until the battery discharges.
- SHORT-CIRCUIT: Disables the evacuation mode. The e3 equipment does not use the batteries to power the elevator.

4) POWER CONECTIONS

- 4A) and 4B) BATTERY TO INVERTER + and BATTERY TO INVERTER -: Supplies the inverter from the batteries, through the DC/DC converter.

- 4C) and 4D) AC+ CHARGER and AC- CHARGER: Battery charger to batteries, through DC/DC converter.

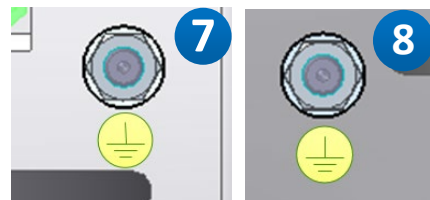
- 4E) and 4F) PV+ CONTROLLER and PV- CONTROLLER: Solar charge controller to batteries through DC/DC converter. (This is only necessary if the solar charge controller has been acquired).



5) **"HIGH VOLTAGE SIDE":** Frequency controller output. P (+) and N (-)

6) **CAN bus (optional):** Connection to optional EPCL CAN interface.

7) and 8) **EARTH CONNECTION:** Earthing connection points to connect necessary components



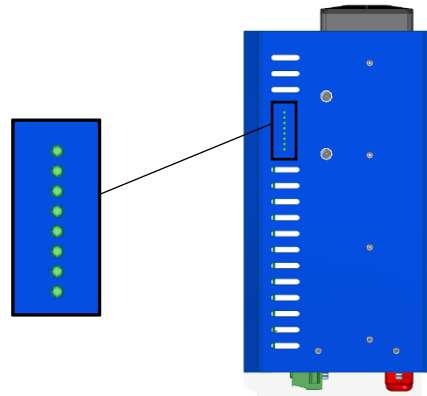
9) **BATTERY CONNECTION:** Through the cable gland shown below, the wires enter to connect the batteries and the DC/DC converter. [Black: negative, Red: positive].

The battery connection varies depending on the type of the DC/DC converter used.



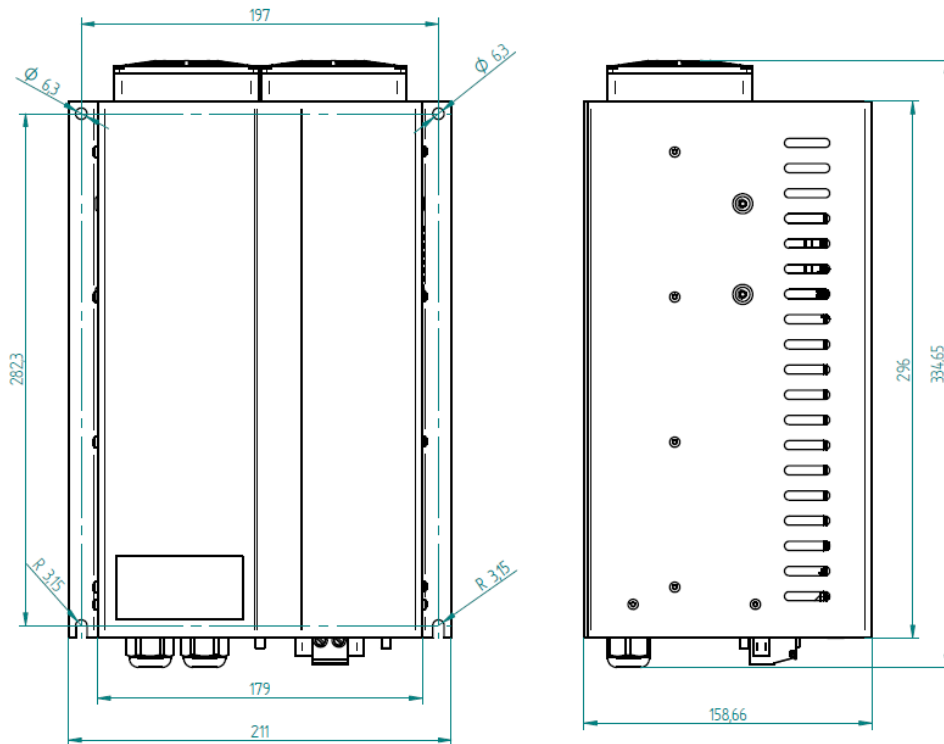
10) **"ON OFF":** Main switch of DC/DC converter.

- 11) **LED STICK:** It is placed in the lateral side of the converter:
- An LED stick placed on the lateral side of the DC/DC converter will show the supplied power and the batteries SOC.
 - The DC/DC converter is waiting to be enabled when the LEDs blink from bottom to top and from top to bottom.
 - When LEDs are illuminated, they are showing the supplied power. (This happens when elevator is moving and the DC/DC converter is supplying power).
 - When LEDs are on pulsating mode, they are showing the batteries' SOC.

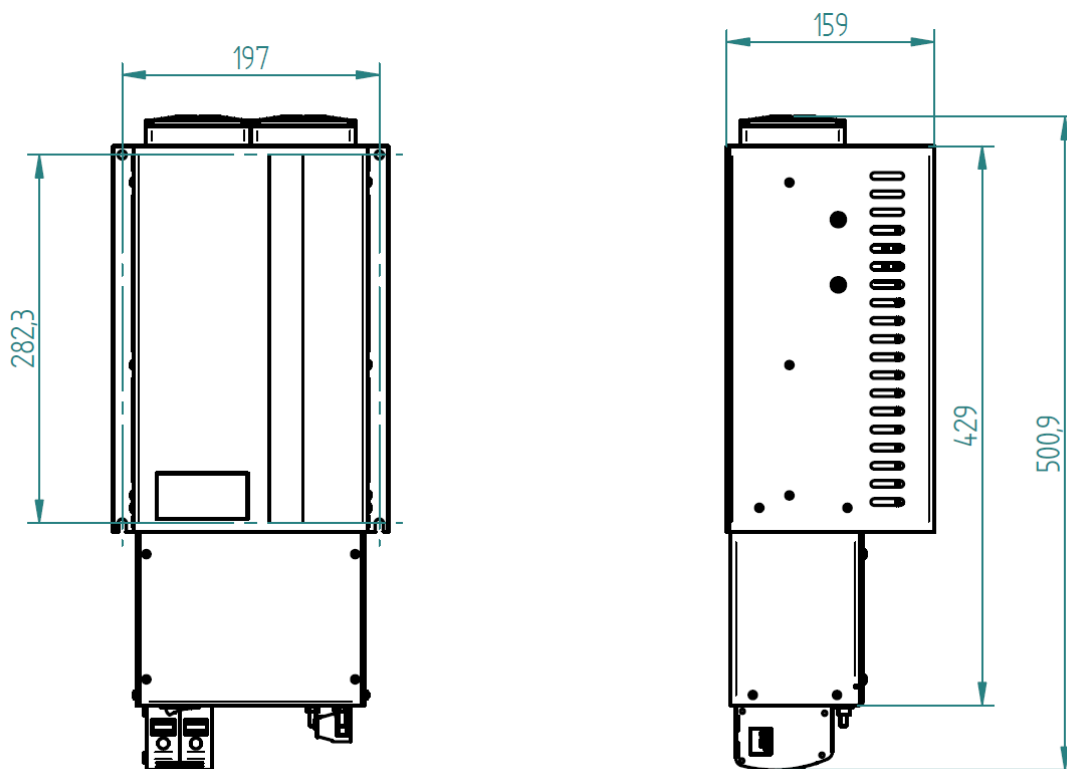


2.1.3 Dimensions

Size 1



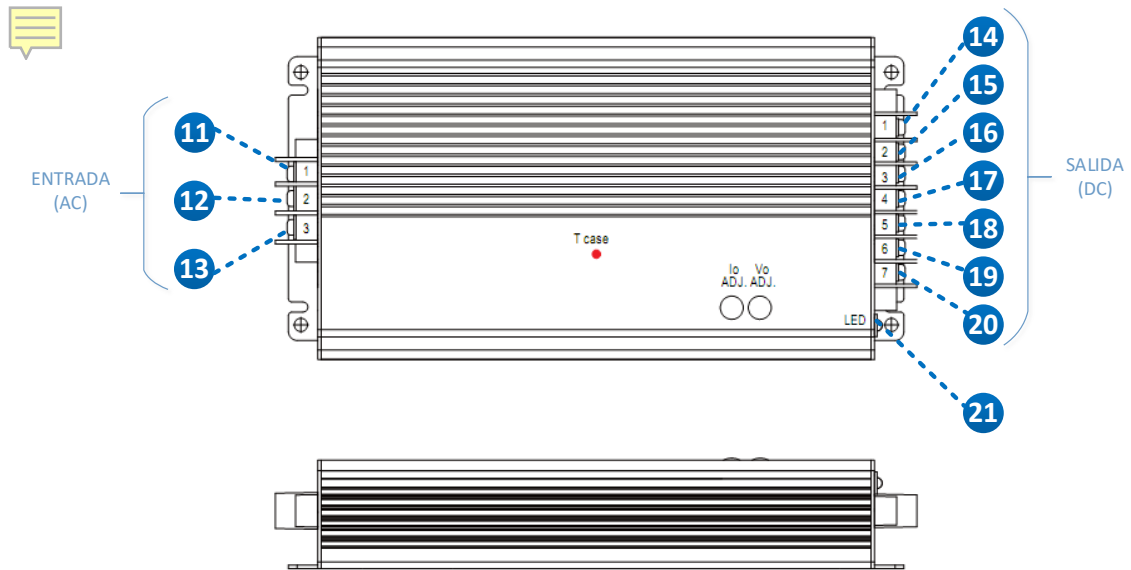
Size 2:



2.2 Battery charger

2.2.1 Technical specs

Feature	Valor/ Value
Reference	HEP-600C-48
Input voltage	90÷305VAC
Output voltage	46.1÷60.5V
Maximum output current	10.5 A
Maximum power	600 W
Storage temperature	-40 ÷85°C
Weight	3.9 kg



- 11) Ground connection-(FG)
- 12) AC connection (Phase) - (AC/L)
- 13) AC connection (Neutral) - (AC/N)
- 14) Connection with RC CHARGER + of the DC/DC converter- (RC+)
- 15) Connection with RC CHARGER - of the DC/DC converter- (RC- & GND)
- 16) Do not connect - (+5V_{SB})
- 17) Battery negative terminal connection - (-V)
 - i) Same electric node as (18)
- 18) Battery negative terminal connection - (-V)
 - i) Same electric node as (17)
- 19) Battery positive terminal connection - (+V)
 - i) Same electric node as (20)
- 20) Battery positive terminal connection - (+V)
 - i) Same electric node as (19)
- 21) LED indicator

2.3 Batteries

There are different types of batteries to meet the needs of each installation. Sometimes you can use two or more battery packs in parallel to meet the requirements.

- S (SMALL)
- M (MEDIUM)
- L (LARGE)

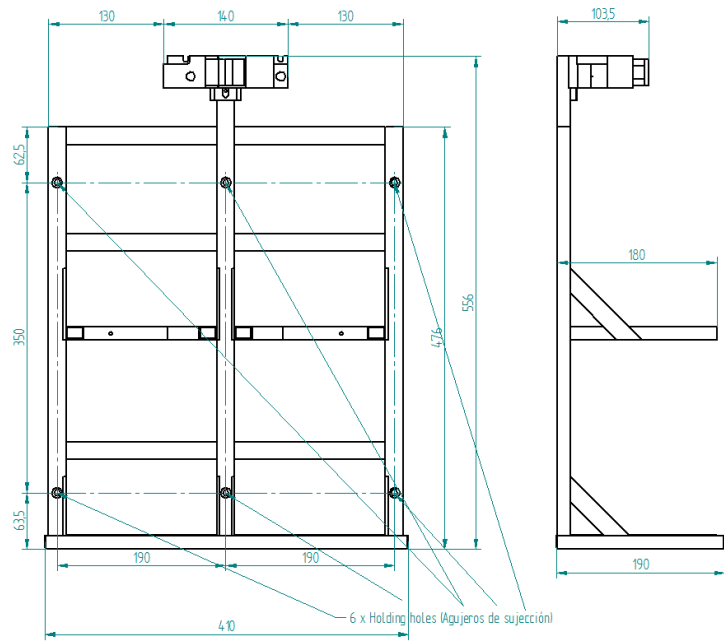
You should contact support@epicpower.es in order to make a correct selection of the battery pack.

2.3.1 Technical specs

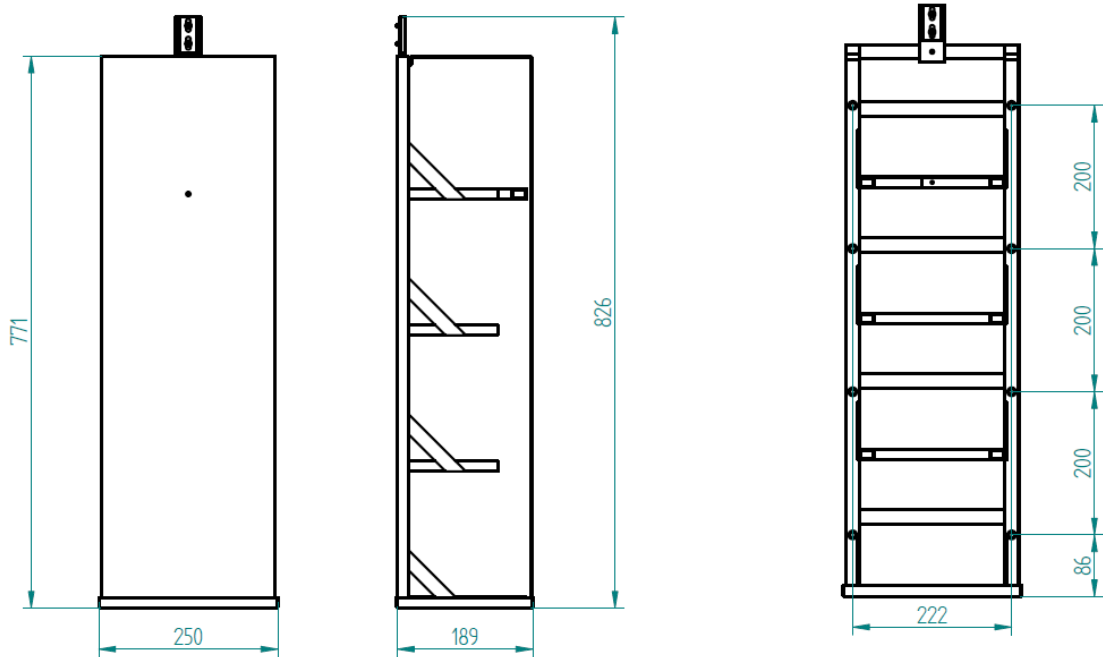
	SMALL – S	MEDIUM – M	LARGE - L
Feature	Valor/ Value	Valor/ Value	Valor/ Value
Number of batteries	4	4	4
Batteries voltage	4 x 12V	4 x 12V	4 x 12V
Storage temperature	-20÷60 °C	-20÷60 °C	-20÷60 °C
Operating temperature	-15÷50 °C (carga/charge)	-15÷50 °C (carga/charge)	-15÷50 °C (carga/charge)
	-20÷60 °C (descarga/disch arge)	-20÷60 °C (descarga/disch arge)	-20÷60 °C (descarga/disch arge)
Weight (4 batteries + battery frame)	60 kg	100 kg	160 kg
Energy (4 batteries)	1700Wh (aprox)	3000Wh	4700Wh

Dimensions

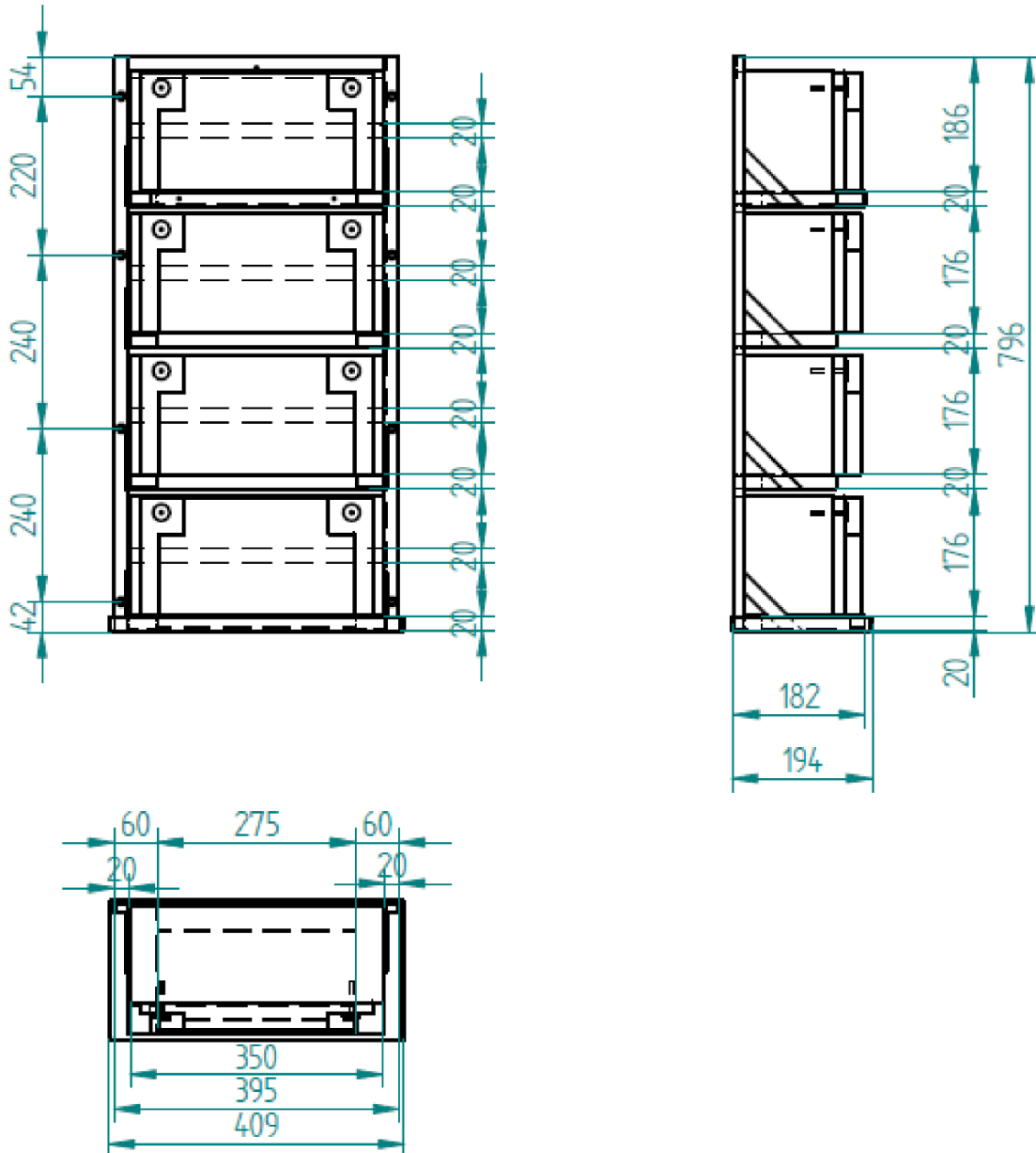
2.3.1.1 Battery array - SMALL (option 1)



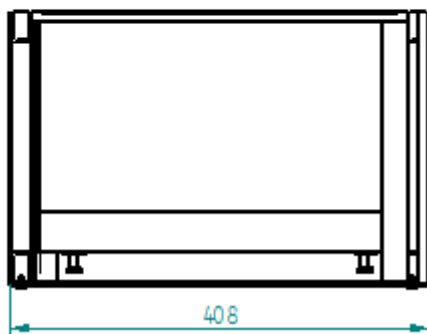
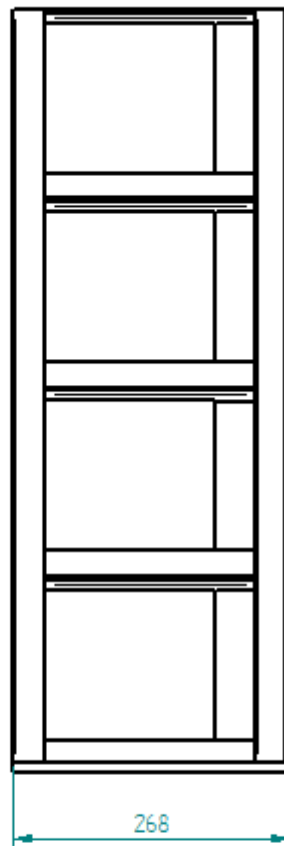
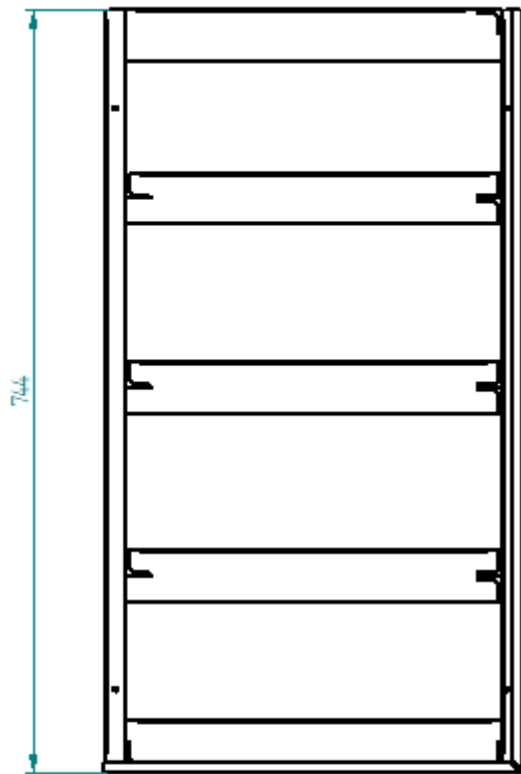
2.3.1.2 Battery array - SMALL (option 2)



2.3.1.3 Battery array - MEDIUM



2.3.1.4 Battery array - LARGE



2.3.2 Maintenance

Batteries must be checked during maintenance services. Please perform the following steps:

- Visual inspection (dust or damage)
- Check battery connections
- Disconnect lift from mains
- Disconnect battery charger from mains.
- Activate evacuation mode
- Check battery voltage
- Perform one trip with empty cabin going up and down and check the minimum battery voltage. It should be over 45 V.
- Now, perform 10 trips of one floor (up and down). The minimum battery voltage should be higher than voltage measured in previous step minus 1.5 V.
- Additionally, the End of Life signal has to be checked. Please see EPCL – e3: External description the connectors 2A-2B

To

2.4 Single phase inverter

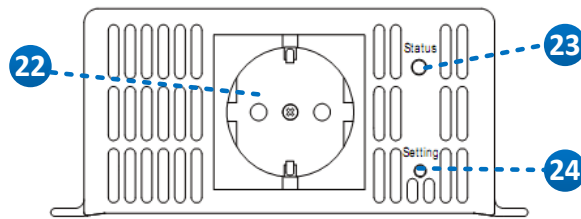
There are two different inverters available depending on requirements.

2.4.1 Technical specs

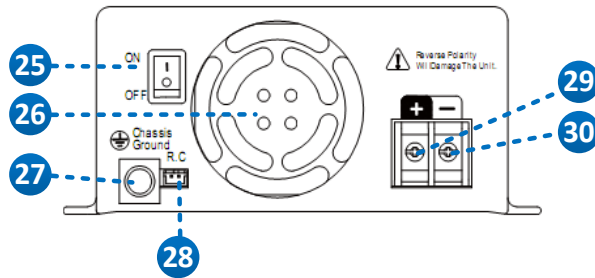
	400W	700W
Features	Kg	Value
Reference	TS-400-248B	TS-400-248B
Input voltage range	42÷60 VDC	42÷60 VDC
Output voltage range	200÷240VAC	200÷240VAC
Output frequency	50 (60) Hz	50 (60) Hz
Rated power	400 W	700 W
Maximum output power	460W for 3 minutes	800 W for 3 minutes
	600W for 10 seconds	
	800W for 30 AC cycles	surge power 1400W
Storage temperature	-30 ÷70°C	-30 ÷70°C
Weight	1,84 Kg	3 Kg

The single-phase inverter generates an isolated output, making the connection of one of the output lines to ground a must. Doing so, the output will be connected to ground and the differential protections of the system will perform correctly.

Cara delantera



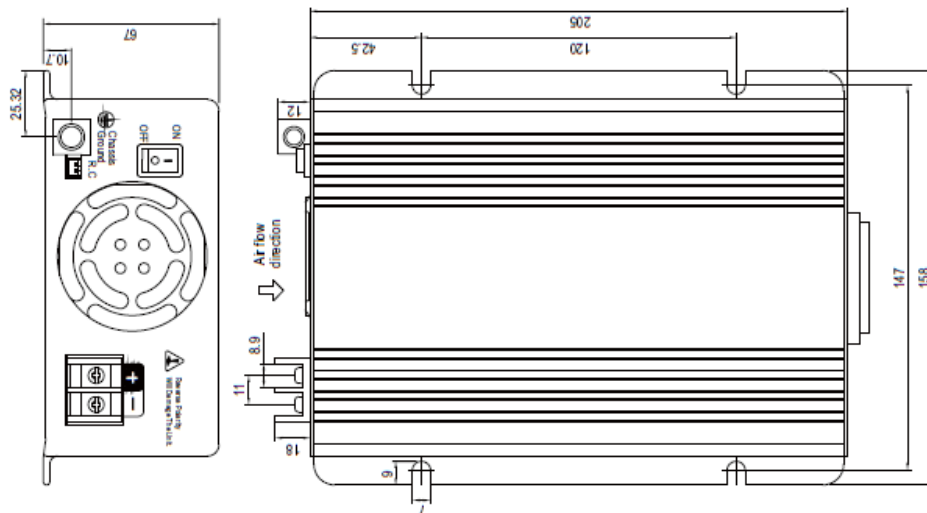
Cara trasera



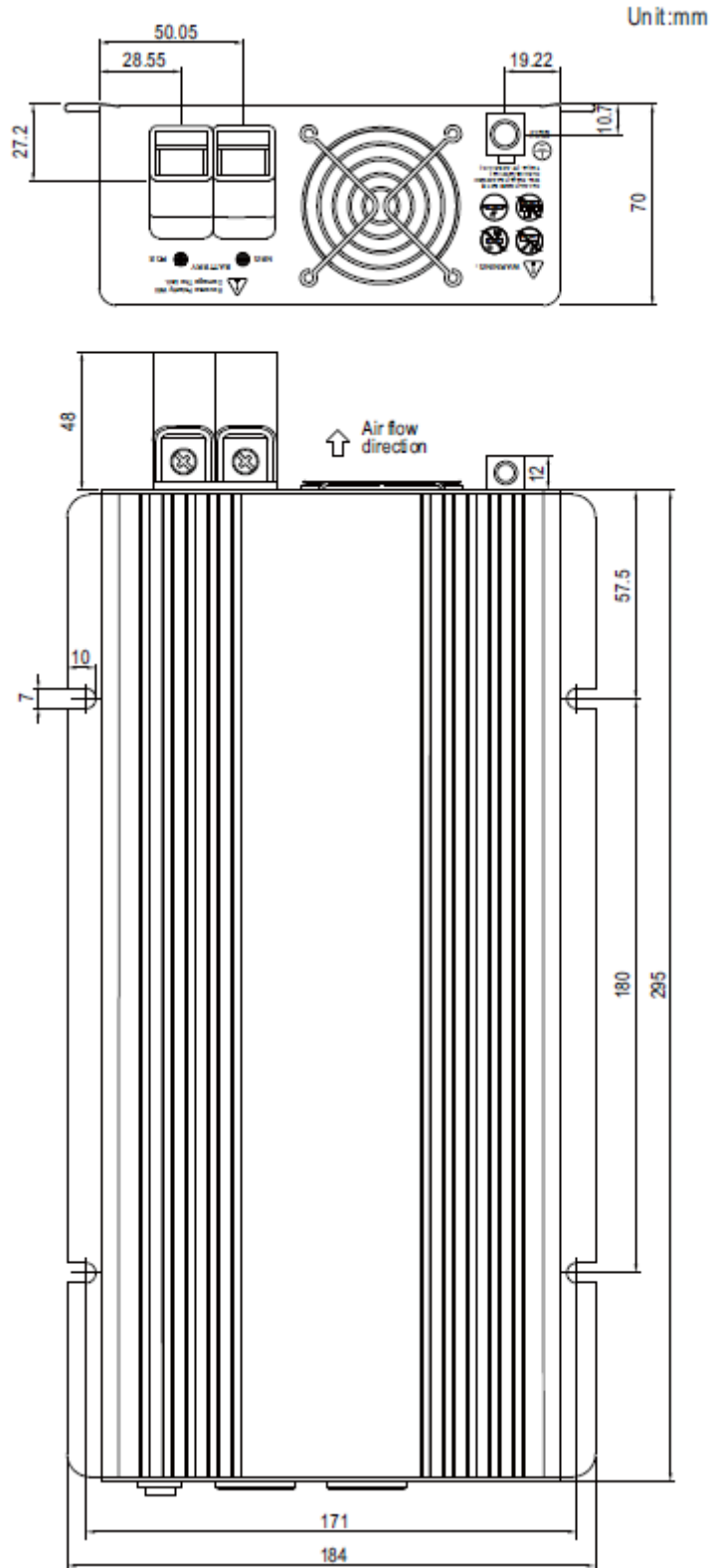
- 22) 230 Vac output: Supplies all single-phase elements of the elevator.
- 23) LED diode Status: Green
- 24) Setting button: Allows switching of output voltage between 220Vac and 240Vac, and switching of frequency between 50Hz y 60Hz (default output set at 230Vac and 50Hz).
- 25) On/Off Switch
- 26) Fan
- 27) Ground connection.
- 28) RC: Connected to terminals "RC inverter +" and "RC inverter -" of the converter (terminals 2A and 2B). Not used
- 29) Battery positive DC input.
- 30) Battery negative DC input.

2.4.2 Dimensions

2.4.2.1 400W inverter



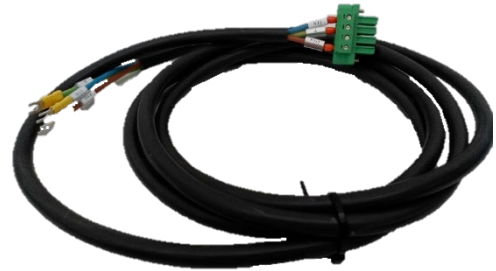
2.4.2.2 700W inverter



2.5 Provided cables

2.5.1 DC/DC to VVVF Cable

VVVF Supply (frequency controller). Three 2.5 mm² cored, three-meter-long cable. Ferrule ports on one side, and aerial connector for 5 on the other side with free earth and fork terminal.



2.5.2 Battery charger and inverter power connection cable to the DCDC

Connection between battery charger, AC inverter and the DCDC converter. Twisted four-wire cable of 2.5mm² and 1m in length. Aerial terminal on one side and U connectors on the other side.

Two of the wires connect the terminals “Battery to inverter +” 4A and “Battery to inverter -” 4B from the DC/DC converter to terminals 29 and 30 of the AC inverter.

The other two wires connect the terminals “AC+ charger” 4C and “AC- charger” 4D of the DC/DC converter to the terminals 19 and 18 of the battery charger.



2.5.3 Cables between batteries

3 different cables that connect pairs of batteries. Different sections and lengths according to batteries and battery array. The terminals will be M5, M6 or M8 according to the battery used.



2.5.4 Fuse holder, fuse and fuse holder to battery cable

Different components according to the converter used:

e3 3k5: Two pole Fuse holder (Q331122), 100 A 22x58 fuse (FR22GG50V100) and a cable of different section and length according to batteries and battery array.

e3 5k5: 2 x One pole Fuse holder (Holder NHC-00 160A), 160 A fuse (NH-00) and a cable of 50 mm² to connect the fuse holder with the batteries.

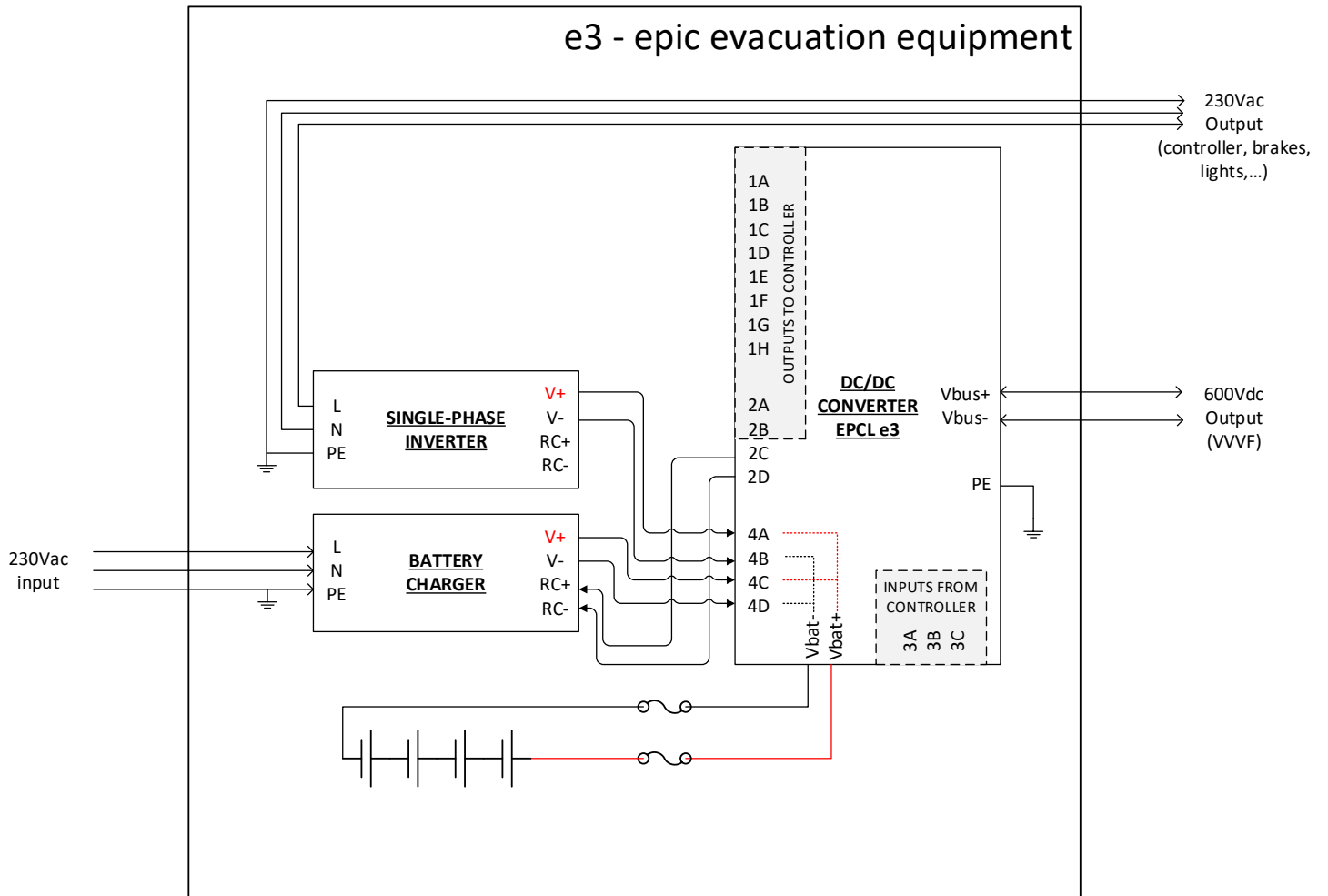
2.5.5 Battery charger and inverter signal connection cable to the DCDC

Two wire cable terminating in an aerial connector on one side and 2xU terminals in the other side. 1m in length. Connects terminals

RC CHARGER + (2C) y RC CHARGER - (2D) to the battery charger to the connector 28 of the DC/DC converter



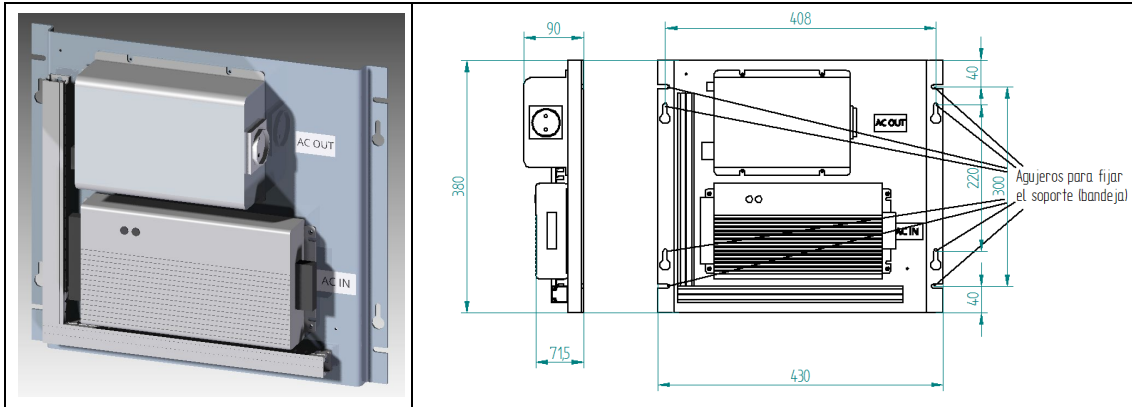
3 General overview block diagram



4 Optionals

4.1 Holder tray

A metallic plate can be purchased optionally for greater ease when installing and wiring the multiple components. In this case, the battery charger and the inverter are already installed and pre-wired.



4.2 Prewired electrical cabinet

A metallic cabinet can be purchased optionally for greater ease when installing and wiring the multiple components. In this case all the necessary elements are already installed and pre-wired, except for the batteries.

Other schematics will be available for this specific option. Epic power recommends the use of this solution to reduce the installation time. There are two available options.

