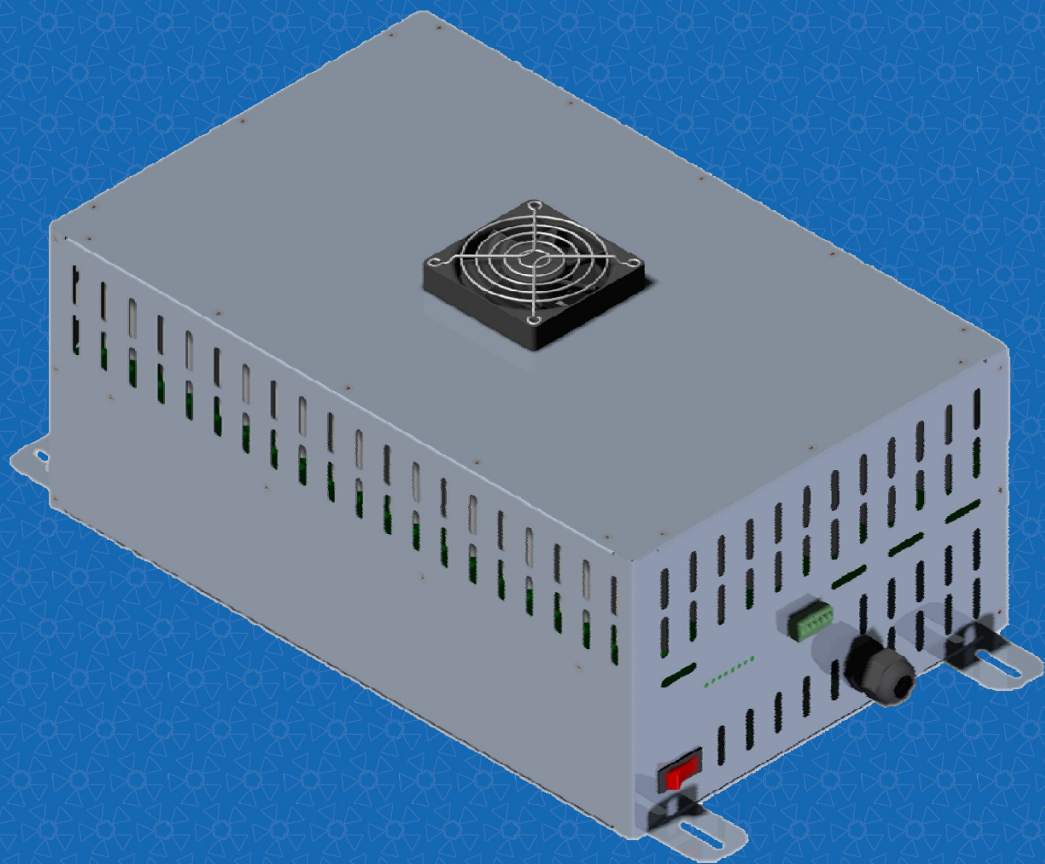


Installation Manual

ERS 2G

Energy Recovery System



ERS 2G powered by
epic power

Version 2.3

March 2016

Epic Power Converters S.L.

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1/OPERATION DESCRIPTION OF ERS 2G

Fig. 1 shows the block diagram of an electrically operated elevator with a variable voltage drive (VVVF).

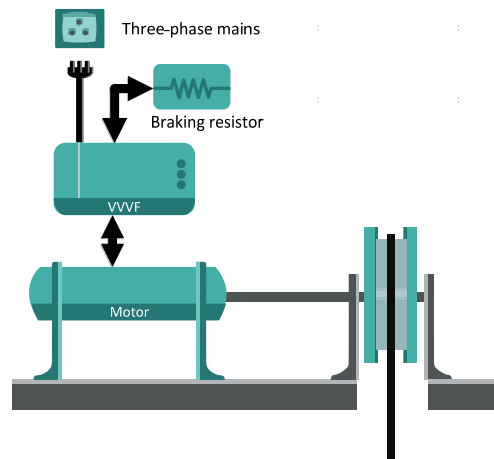


Fig. 1. Block diagram description of the electrical traction system of an elevator

Depending on the control variables, the load and the selected trajectory, the lift may consume energy or recover energy. In the first case, the lift absorbs energy from the mains, as it can be seen in Fig. 2.a, whereas in the second case, the energy that the motor generates while braking is dissipated in a braking resistor as heat, Fig. 2.b.

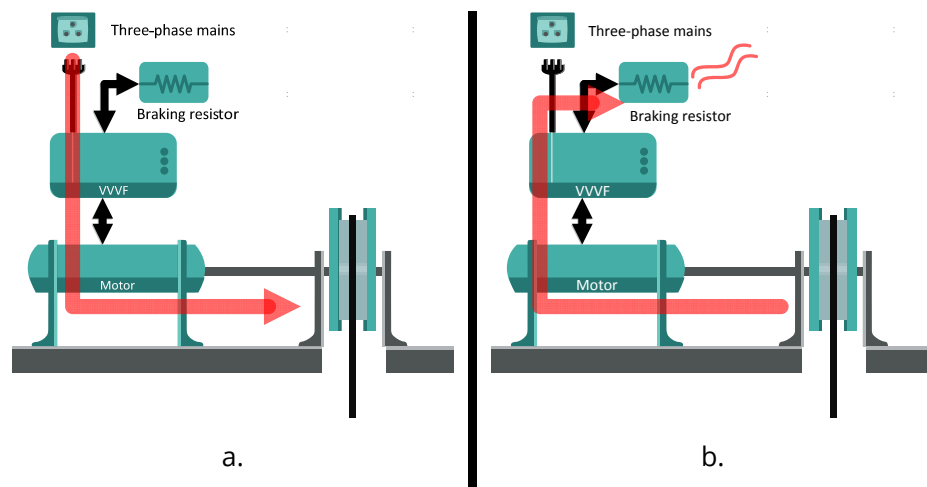


Fig. 2. Energy Exchange in a lift

The energy recovery system ERS 2G by epic-power is simply connected to the VVVF drive as shown in Fig. 3.

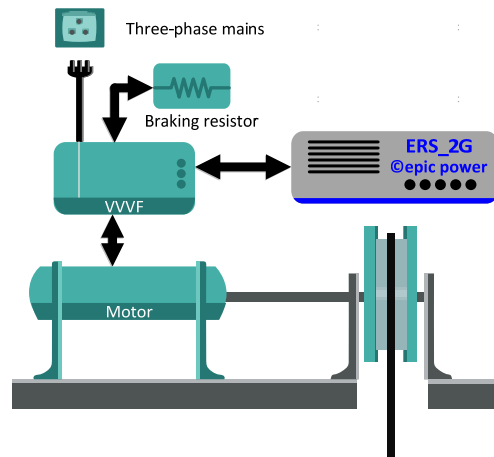


Fig. 3. ERS 2G connection to a lift traction system

ERS 2G fundamental feature is that the connection with the drive is very simple and it's only made through three wires (positive, negative and ground), with no need for any kind of adaptation or preparation.

Figure 4 shows the possible energy flows when the motor is generating and an ERS 2G has been installed. Figure 4.a depicts the case when all the regenerated energy can be fully stored in the ERS 2G. There may be occasions when the ERS 2G cannot store all the regenerated energy, as for example:

- When the energy storage module is full
- When regeneration power is greater than the one ERS 2G is able to absorb.

These cases are not a problem. The excess energy that cannot be stored in our system will be dissipated in the braking resistor. This is the situation shown in figure 4.b. Our ERS 2G does not substitute the braking resistor that has to be installed as usual

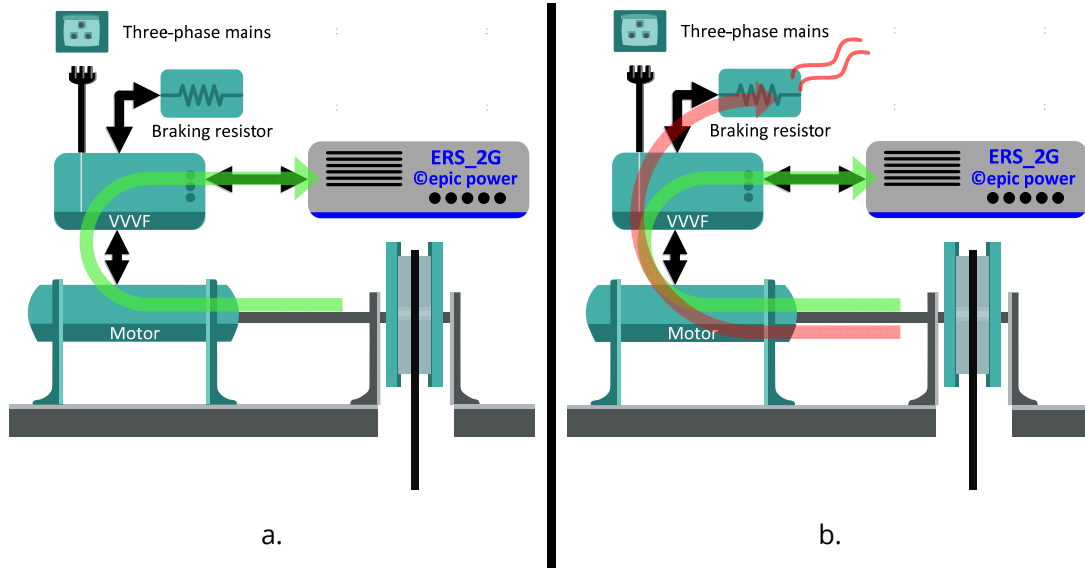


Fig. 4. Regenerative energy flows

The Fig. 5 shows the energy flow when the elevator absorbs energy. The ERS 2G will automatically detect this situation and it will inject the energy elevator requires, as shown in Fig. 5.a. If the ERS 2G is not capable to provide all the required energy (because the energy accumulator is depleted or because it does not reach the required power), the drive will absorb further energy in a conventional way from the three-phase mains.

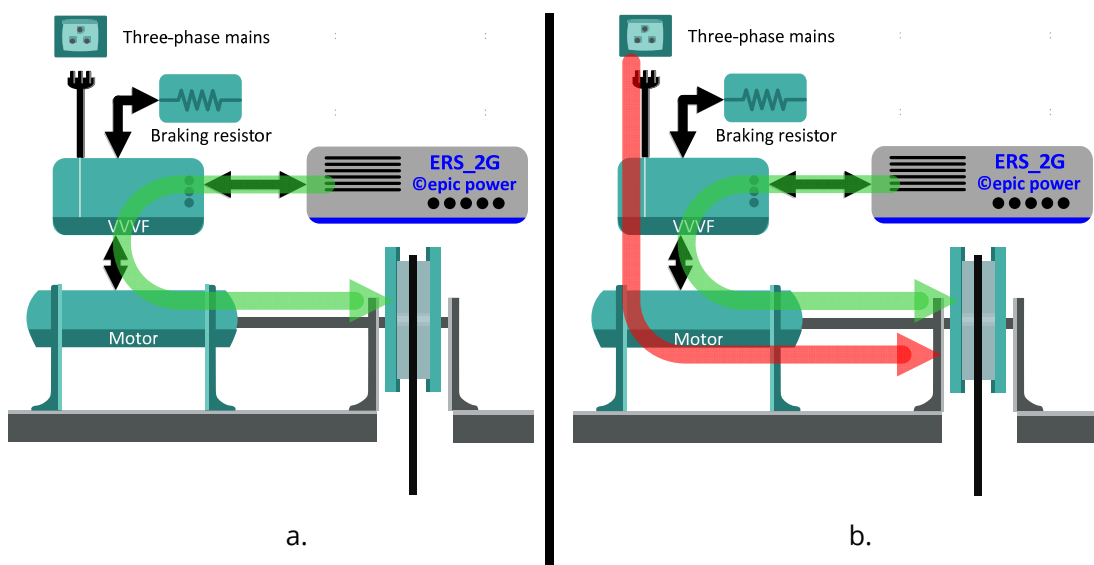
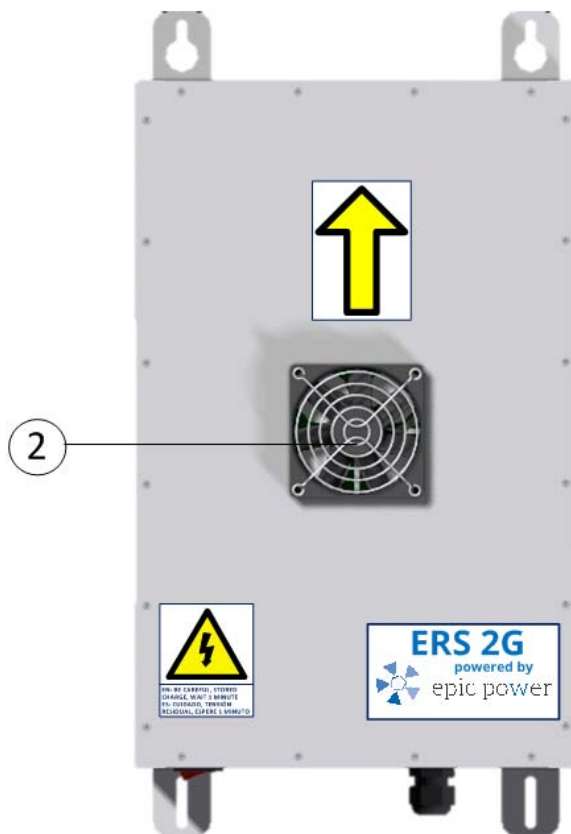
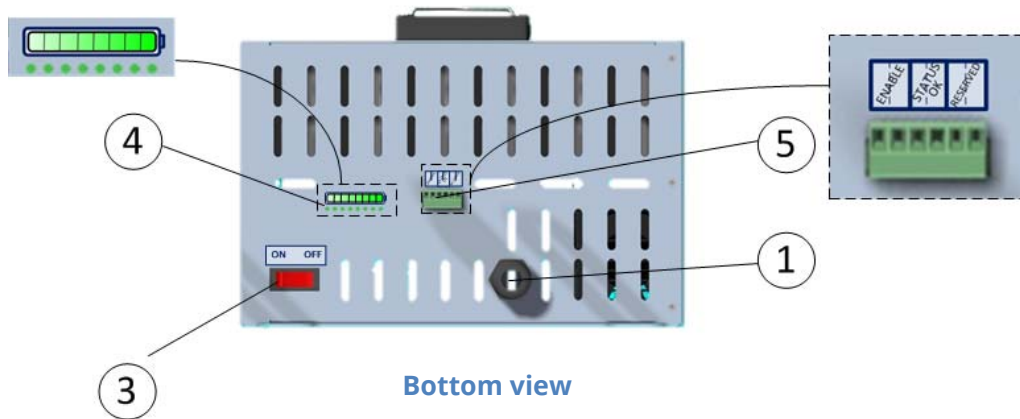


Fig. 5. Absorption energy flow

In summary:

- The ERS 2G can be connected to **any traction elevator system** which has a three-phase VVVF drive 380~400V , both in **new installations** and **existing ones**.
- **It does not interfere in the conventional operation of the traction system.** If it is not able of absorbing or providing all the required energy, the system operates in a conventional way.
- The ERS 2G **DOES NOT SUBSTITUTE** the **braking resistor**, which continues to be a required item.

2/ EXTERNAL DESCRIPTION OF THE ERS 2G



Part description

- 1 Power connection to the motor drive, P(+), GND, NC, N(-)
- 2 Cooling openings of the ERS 2G's fan. **DO NOT COVER!**
- 3 ON/OFF switch
- 4 LED strip which will indicate by using lights combinations of the 8 LEDs different states:
 - First connection (set up): When you perform first connection a single LED will light and will move from left to right. This process will last 30 seconds approximately. During this period of time the ERS 2G is preparing to work and is not in operation.
 - Normal operation:
 - Ultracapacitors charge: LED strip indicates the amount of energy stored, being the number of ON lights proportional to the energy storage.
 - Stand-by state: While the ERS system is the elevator is not travelling, the ERS system is providing the stand-by energy of the drive. In this situation, the leds showing the current state-of-charge blink.
 - Error indication: The ERS 2G can indicate different types of anomalies through different LED lights combinations:

○ ○ ○ ● ○ ○ ○ ●	ERROR 1
○ ○ ○ ● ○ ○ ● ○	ERROR 2
○ ○ ○ ● ○ ○ ● ●	ERROR 3
○ ○ ○ ● ○ ● ○ ○	ERROR 4
○ ○ ○ ● ○ ● ○ ●	ERROR 5
○ ○ ○ ● ○ ● ● ○	ERROR 6
○ ○ ○ ● ○ ● ● ●	ERROR 7
○ ● ● ● ● ● ● ●	ERROR 8
● ○ ● ○ ○ ● ○ ●	Adjustment mode

In case you see an error code in the led strip, please contact epic power for assistance at support@epicpower.es, indicating the number of error that appears.

- Disabled: In case ERS 2G is disabled by an external control signal LEDs will turn ON one by one. Enabling and disabling of ERS 2G is explained next.

5 6-way connector:

- Terminals 1 and 2: External ENABLE signal. Isolated input.
 - i) Closed. A shortcut is created between terminals 1 and 2 by an external source: ERS is ENABLED.
It is necessary that the elevator control is the one that generates this enabling signal.
 - ii) Open: Drive supply is disabled. VVVF drive is not being energized by our system. ERS is DISABLED but ready to be enabled. Leds will move from left to right and vice-versa in a quick mode to showcase that the ERS is disabled but not turned-off.
- Terminals 3 and 4: STATUS OK. Isolated output. Indication of the system state
 - o Short-circuit between terminals 3 and 4 (closed): The system (ERS 2G) is working correctly.
 - o Open: The system (ERS 2G) is not working.
- Terminals 5 and 6: RESERVED for other uses. .

3/ ERS 2G INSTALLATION PROCEDURE

3/1 Installation requirements

To be able to install an ERS 2G, the elevator must comply with the following terms:

- It must have a frequency drive (VVVF).
- Frequency drive must have two accessible power terminals + and -, which are connected to the internal DC bus of the drive. These connectors are often found in most of the commercial drives (for example Frenic-Lift from Fuji or Control Techniques). They are usually in the power connector of the drive and can have different appellations, as for example P(+), N(-). Most of the producers, have already predicted the option of a regenerative system or a rescue DC supply through these connectors. Please check the drive manual for the precise location and naming of these terminals. [IMPORTANT NOTE: The ERS is NOT placed in parallel to the braking resistor]
- *IT IS ESSENTIAL TO CONNECT THE ERS 2G TO THESE TERMINALS, OTHERWISE THE ERS 2G OR THE DRIVE COULD BE DAMAGED. IN CASE OF DOUBT, PLEASE CONTACT EPIC POWER'S SUPPORT@EPICPOWER.ES.*

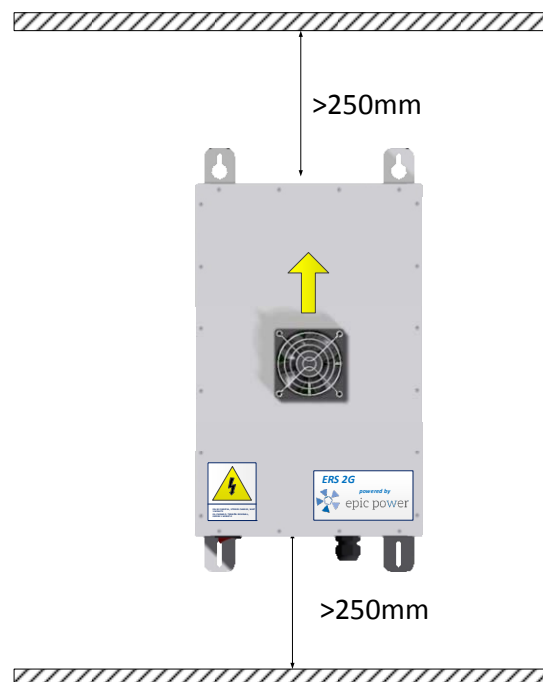
3/2 Product description

The ERS 2G is a single module that has inside both the power converter and the energy storage. This module has a height of 414 mm, a depth of 166mm and a width of 266mm (check section 6 for further details about mechanical dimensions). Thanks to these dimensions, it can be easily located in any machine room less (MRL) or with machine room lift installation.

3/3 Installation procedure

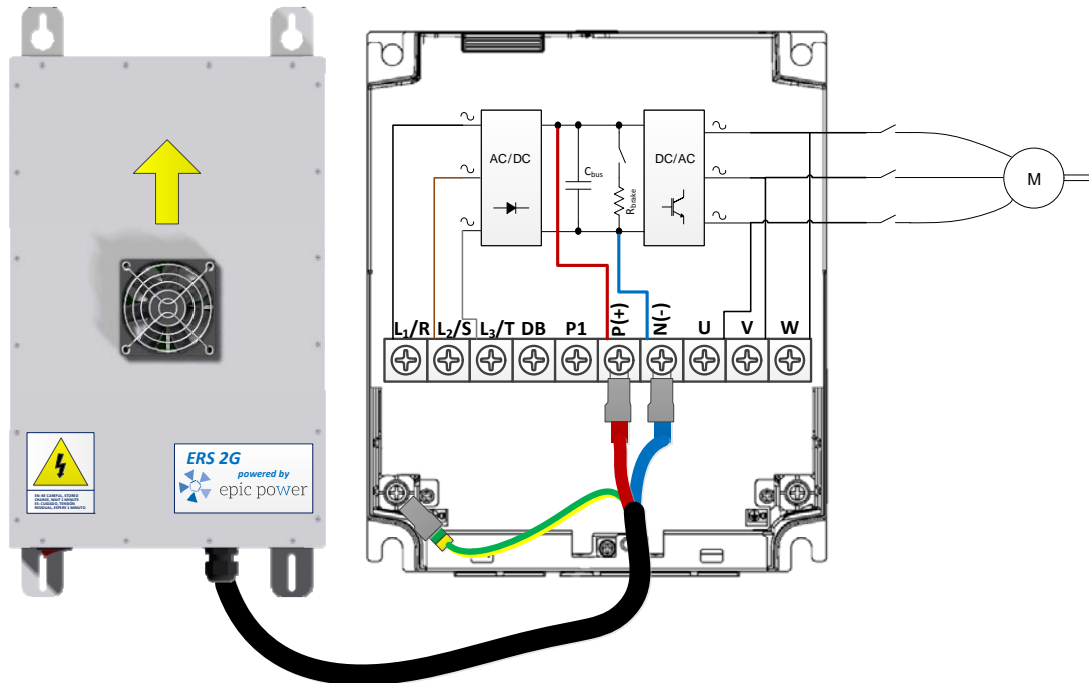
Follow these steps:

- 1) Choose a location not affected by accidental liquid splashes or dusty air flows. If possible, the ERS must be close to the VWF inverter.
- 2) The ERS must be installed in a vertical surface.
- 3) One of the ERS sides has an arrow signaling the direction the ERS must be positioned on the wall. Screw the ERS to a vertical surface as shown in the next figure, with the arrow pointing up. If positioned differently, the ERS will not be adequately cooled and it could be damaged.



In the same way, a minimum air gap of 250mm must be guaranteed in the upper and lower sides of the ERS, as shown in previous figure. Otherwise, the ERS will not be adequately cooled and it could be damaged.

- 4) At this point the electrical connection of the ERS to the frequency inverter has to be completed. First of all, **SWITCH OFF THE FREQUENCY INVERTER**. Make sure that an accidental reconnection is not possible.
- 5) Follow the instructions of the frequency inverter installation manual and wait the required lap of time until the DC bus voltage falls down to safe levels.
- 6) Follow the instructions of the frequency inverter installation manual and gain access to the DC bus connectors P(+) and N(-).
- 7) Using a multimeter measure the residual voltage at connectors P(+), N(-).
- 8) If the remaining voltage is at safe levels (<50V) you can continue with the installation process. If not, wait.
- 9) Check the switch of the ERS 2G (element n° 7 from description in section 2) is OFF.
- 10) Image below shows how this connection should be made. The naming of the terminals in the drive may be different depending on the drive model. Please check the manual. **VERY IMPORTANT NOTE.** The ERS is not connected in parallel to the braking resistor. It is connected to the internal DC bus of the drive.






IT IS STRONGLY RECOMMENDED THAT THE ENABLE SIGNAL EXPLAINED IN SECTION 2, PART DESCRIPTION, NUMBER 5, TERMINALS 1 AND 2 IS GOVERNED BY THE LIFT CONTROL. OTHERWISE, THE ERS ALWAYS HAS TO BE MANUALLY TURNED OFF BEFORE ANY LIFT MAINTENANCE ACTION IS PERFORMED.

- 11) Once all the connections are made, connect and activate the frequency inverter
- 12) After 30 seconds, turn switch ON .
- 13) At this point the **ERS 2G** is operating y and ready to work.



ATTENTION

IT IS MANDATORY to connect the ground wire (minimum section of 1.5 mm²). Apart from improving the overall safety, it provides EMC/EMI protection. If it is not connected, malfunction of the ERS can occur and the

	<p>device can be damaged.</p> <p>In case of loss of the ground connection the ERS will keep working, but its mechanical enclosure will not be grounded and will not share the same voltage of the ground of the installation.</p>
 ATTENTION	<p>BE SURE to SWITCH OFF and DISCONNECT the frequency inverter from the three-phase mains before any manipulation is made. Otherwise there is a high risk of damages and injuries that can lead the operator to death.</p>
 ATTENTION	<p>The effort of holding the wires mustn't rely on the terminals. It is recommended the use of fixing ties.</p>
 ATTENTION	<p>The equipment has been designed for Type B weather conditions and Grade 2 contamination: In case other conditions concur, consult the producer (epic power).</p>

4/ MAINTENANCE

The ERS does not need any specific maintenance procedure. It must be regularly verified that the cooling openings are free of dust or other material that can block the required air-flow.

Anyway, sometimes OTHER MAINTENANCE OPERATIONS require switching off the FREQUENCY INVERTER. In this case, it is important to switch off the ERS following the next steps:

- a. Switch off the ERS (3)
- b. Switch off and/or disconnect the frequency inverter
- c. Following the instructions given by the frequency inverter manual, wait the required time until the DC bus voltage is at safe low levels
- d. It is not necessary to disconnect the wires connecting the ERS, but MAKE SURE, that the ERS IS SWITCHED OFF. Otherwise, the drive could be energized and personal damage can occur.
- e. At this point you can proceed with the programmed tasks
- f. Switch on the frequency inverter
- g. After 30 seconds (required for DC bus pre-charge of the drive) you can switch on the ERS switch (3).
- h. At this point the ERS 2G is ready to operate.



ATTENTION

Although the three phase line has been disconnected and the frequency inverter is switched off, the **ERS MAY STILL BE ENERGIZING THE FREQUENCY INVERTER.**

So before **MANIPULATING** the **FREQUENCY INVERTER** DO MAKE sure that the **ERS** is **SWITCHED-OFF**



ATTENTION

With the material that is provided with ERS, the required safety isolation is guaranteed. In case of replacing a wire, use an equivalent one.



ATTENTION

In case of replacement of the hose terminals at the drive side, these must have a terminal ending, to prevent loose threads. This is how the hose provided with the system is terminated.

5/ PRECAUTIONS



ATTENTION

The **ERS 2G DOES NOT REPLACE** any system or device that is required for the conventional operation of the lift. This is particularly valid for the braking resistor, which must **NEVER** be **REMOVED**.



ATTENTION

The **ERS 2G** is **NOT CONNECTED** in parallel to the braking resistor.



ATTENTION

Make sure to follow exactly the installation and maintenance procedures. Otherwise overvoltage and/or overcurrent can happen, which can damage the equipment and/or can lead to injuries to humans.



ATTENTION

The connection between the frequency inverter and the ERS can reach high voltage levels up to 800VDC, which can cause the death of human beings.



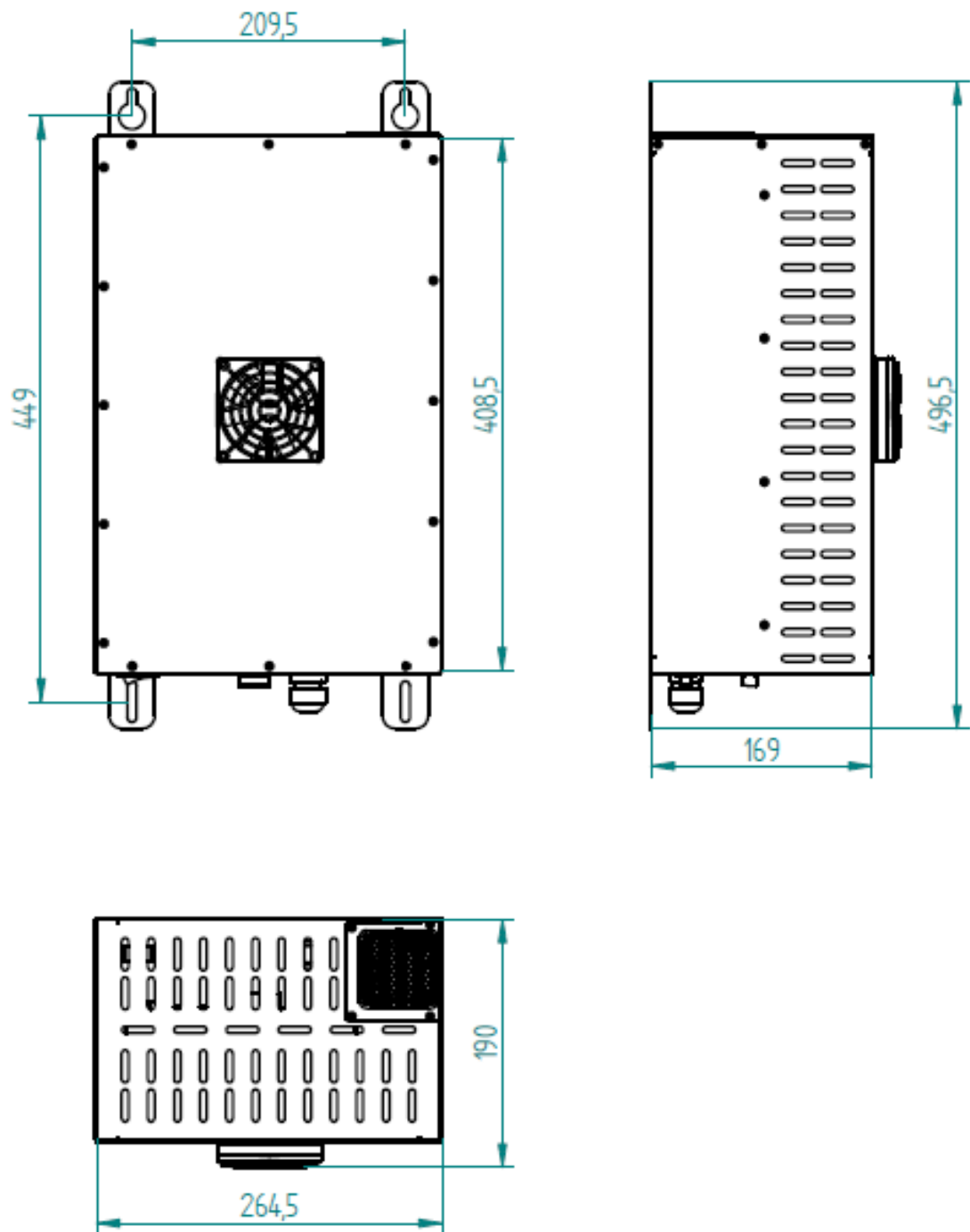
ATTENTION

In the case of failure or any further question related to the operation of the ERS please contact EPIC-Power at support@epicpower.es. **DO NOT REMOVE THE COVER OF THE ERS**, it is a complex power electronics device that must be handled only by qualified personnel. Inadequate ERS manipulation could damage the ERS or could cause a serious accident.

6/ TECHNICAL DATA

Characteristics	Value
Voltage range of the DC connection to the frequency inverter	500÷800V
Maximum current through the DC connection to the frequency inverter	12.4A
Maximum power	6.3kW
Unidirectional efficiency	≤98%
Storage temperature	-10÷70°C
Operation temperature	5÷40°C
Weight of ERS 2G	10 kg
IP protection degree	IP2X

Dimensions of the ERS 2G:



7/ APPLICABLE REGULATIONS

The ERS 2G has been designed and manufactured according to its applicable regulations:

- **Directive 2006/95/CE** from European Parliament and from council of December 12, 2006 which establishes a Low Voltage Directive for electronic systems.
 - UNE-EN 50178:1998

- **Directive 2004/108/CE** from European Parliament and from council of December 15, 2004 which regulates equipment electromagnetic compatibility and tries to guarantee the operation of the domestic market demanding the equipments to satisfy an adequate level of electromagnetic compatibility.
 - UNE-EN 12015:2005
 - UNE-EN 12016:2014

