



**PNEUMATIC
VACUUM ELEVATORS LLC**

INSTALLATION MANUAL

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IMPORTANT SAFEGUARDS

When using an elevator, basic precautions should always be followed, including the following:
READ ALL INSTRUCTIONS BEFORE USING THIS VACUUM ELEVATOR.

WARNING

- **Never allow children or people unfamiliar with the instructions to operate the elevator.**
- **The elevator is intended for the transportation of people from one landing to another.**
- **Keep all nuts, bolts and screws tight to ensure that the equipment is in safe operating condition.**
- **Never open the door when in operation.**
- **Never remove car ceiling.**
- **Never remove any of the covers that the elevator has.**
- **Do not use elevator when covers have been removed.**
- **ONLY an authorized PVE dealer distributor is to install, work on, and/or service the elevator.**
- **Do not force or kick the doors open.**
- **Do not lay any objects against the cylinder elevator walls.**
- **Never wedge anything between the car and the cylinder.**
- **Do not remove any weather stripping located on the doors.**
- **Do not remove any hardware that is part of the elevator or shipped with the unit.**
- **Do not use elevator if ambient temperature is less than 65°F (18°C).**
- **Do not spill water on any of the electronics.**
- **Do not obstruct the door opening, door clearance, and door locks.**
- **Keep your door key in a secure place.**
- **Do not use elevator if home is under construction and there is dust / particles that are air born.**
- **If voltage exceeds nominal 220VAC it can cause damage to system. Assure a regulated, clean, and dedicated line is supplied to elevator.**
- **Turn OFF motor circuit breaks (power interrupts) before entering hoistway (cylinder)**
- **An approved ANSI or EN 131 “A-Frame” ladder is required to access controls.**
- **Elevator may have a small step into car.**

Requirements of Installation Organization

The following are important items the installation organization needs to comply with.

- The installation organization needs to carry out the work of installation in conformity with the instructions and check list. After the checks are performed the installation organization needs to determine if conformity or additional steps that need to be taken.
- The installation organization needs to verify that the elevator will used for its intended environmental conditions.
- The installation organization needs to ensure that a risk assessment for any working area has been carried out taking into account all information supplied by the owner of elevator.
- The installation organization needs to inform the owner of elevator of any work that needs to be carried out as a consequence of the risk assessment especially for the access and/or the environment related to the installation.
- The installation organization needs to carry out the installation of elevator by competent installation persons and provided them with the necessary tools / equipment.
- The installation organization needs to maintain the competency of the installation persons.
- The installation organization needs to make available for the attendance of a competent installation person(s), given at a reasonable notice, for any inspection carried out by an authorized third party.
- The installation organization needs to take into consideration any additional work that might be required if a fire stop rating is required, in order to meet International Building Code and/or International Residential Code, of the hoistway to meet the code.
- The installation organization needs to take into consideration the location of elevator so that HIGH sunlight exposure is not directed to the elevator.
- The installation organization needs to take into consideration the location of elevator if it will be or not installed in a flood zone. If in a flood zone then the installation organization along with owner of elevator will have to take additional steps.

Requirements of Elevator Owner

The following are important items the owner of elevator needs to comply with.

- It is recommended that the owner of elevator to have the same installation organization in case of multiple installations having the same elevator and installation.
- The owner of elevator needs to inform the installation organization immediately:
 - before any modification related to the installation and/or its environment
- The owner of elevator needs to keep the access to working areas and working rooms safe and free for the installation persons and to inform installation organization about any hazard or change in the workplace and/or the access ways.
- The owner of elevator needs to take into consideration the consequence of the risk assessment.
- The owner of elevator needs to ensure the risk assessment is carried out.
- If a fire stop rating is required, in order to meet International Building Code and/or International Residential Code, of the hoistway then the owner of elevator will have to take additional steps to meet the code.
- If elevator is exposed to HIGH sunlight then the owner of elevator will have to take additional steps to reduce the amount of heat in car.
- If elevator is installed in a flood zone then the owner of elevator will have to take additional steps.

Installation Risk Assessment

It is necessary that a risk assessment be carried out to determine the safety in installation operations of the elevator by adopting safety measures. Safety measure instructions on the building/residence shall be provided to the owner of the elevator. For safe maintenance and to provide relevant instructions, it is necessary, first of all, to identify the maintenance operations. Maintenance operations are:

- a) those operations considered necessary for a correct and safe functioning of the elevator and its components after the completion of the installation
- b) those operations considered necessary during the life of some components, determining as far as possible, the time or condition after which the functioning or integrity of the component is no longer ensured even if correctly maintained.

It is necessary to inform and warn the maintenance persons about residual risks that can arise from the necessary removal of certain guards to carry out specific maintenance operations. The maintenance instructions and warnings shall prescribe the procedures and operating modes intended to overcome these risks and, if it is necessary, to specify personal protective equipment, instruments, tools and provision to be used. Below is a chart that can be used to take into account risks but should not be limited to it.

Elements	Car	Machinery	Area outside lift
Unsuitable access (ladders not secure, no hand-rails, etc.)			
Inadequate lighting (including access areas)			
Slippery floor surface			
Unsuitable dimensions (maintenance places)			
Identification of the car position			
Indirect contact with electricity			
Switches			
Crushing by moving parts (car)			
Manual handling			
More than one maintenance person working			
Absence of a means of communications			
Ventilation and temperature			
Dangerous substances			
Falling objects			
Entrapment			
Means/control for rescue operation			
Fire			
Unexpected water/dirt			

If the risk assessment indicates that additional specific warnings are required for the purpose of maintenance, these shall be affixed directly on the elevator/component or, when this is not possible, in the close vicinity. Markings, signs, pictograms and written warnings shall be readily understandable and unambiguous. Readily understandable signs and pictograms shall be used in preference to written warnings. Information affixed directly on the elevator/installation shall be permanent and legible.

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The intent of this manual is to provide a guide with the instructions necessary to install a pneumatic vacuum elevator. It is advisable, in order to achieve a better understanding of the reading process, to watch the images of the installation video.

Notice: Only elevator technicians that have been fully trained by Pneumatic Vacuum Elevators can install and/or service vacuum elevators.

Installation manual

1. Tasks prior to the installation.

- 1.1 Verify whether the installation is feasible in the customer's residence. Take into account the **Installation Requirements**. Leave a copy of these instructions so that the customer provides the building work with the necessary conditions, in case the person in charge of the installation does not perform the adaptation.
- 1.2 Before setting the installation date, verify that the work is in accordance with all the requisites for the installation. Complete the **Construction Verification** form.
- 1.3 In case some points of the requisites previously mentioned are not fulfilled according to the requests, give the customer notice that the installation will not be done until the work complies with all the established requirements.
- 1.4 Reach an agreement with the customer on the date and time to carry out the installation. Keep in mind to respect the time allowed for loading and unloading the elevator from the truck.

2. Transport and unloading.

- 2.1 Transport the elevator with the tools and items necessary for the installation, which are detailed in the **Tools and Supplies Necessary to Assembly**.
- 2.2 Unload the cylinder components and place them inside the residence.

WARNING: AT ALL TIMES THE CYLINDERS MUST BE HANDLED VERTICALLY, NEVER LAY THE CYLINDER HORIZONTAL. *Laying the cylinders horizontal will damage them and VOID the warranty.*

- 2.3 Unpack the elevator. Start by cutting the packing bands and removing the cardboard box.
- 2.4 Move the cylinders to the installation place in the order in which they will be installed:
1st the Head, 2nd the upper floor cylinder, 3rd the intermediate cylinders and 4th the ground floor cylinder(w/car).
- 2.5 In case the elevator, once installed, is inaccessible, or has difficulty in arriving due to its height, the plastic protectors of polycarbonate must be removed before raising the cylinders and cleaning the polycarbonate with polycarbonate cleaner and a soft cloth (anti-scratch)

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3. Keep in mind that the ground floor cylinder and the LCU inserted.
4. In case the hauling hook has not been installed, as detailed in the file **“Installation Requirements”**, setup the installation tripod.
5. Haul up the head.
 - 5.1 Decide which is the most convenient way to take the head to the upper floor:
 - a) Carrying it up the stairs by hand and or
 - b) Hauling it through the hole in the mid- ceiling .
 - 5.2 Set up the head-spider (hauling bar) on the head by fastening the locks (T shaped) on the head unit.

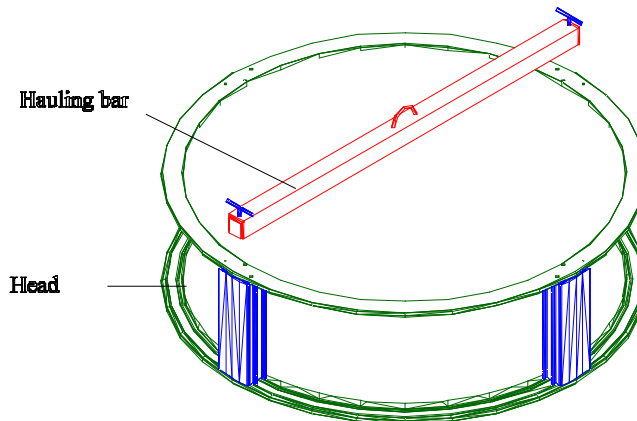


Figure 1

- 5.3 Set the head unit below the floor hole on the upper level. Align the tripod hook and the head-spider hook. Attach the hook/rope/chain from the installation tripod to the hook of the head-spider.
- 5.4 Lift the head unit pulling the rope/chain of the gear softly and, once upstairs, take the hook off the gear and leave the head beside on the upper floor.

Note: Be careful not hit/scratch the cylinder against the walls of the hole.

6. Hauling the upper floor cylinder up.

- 6.1 Set the cylinder of the upper floor below the floor hole.
- 6.2 Install the cylinder-hoist tool inside the cylinder by first remove the fixing bolts and slide one arm into the other.
- 6.3 Place the cylinder-hoist tool inside the cylinder, to do this first open the cylinder door using the door key.
- 6.4 Put the hook of the gear in the hook of the cylinder-hoist tool.
- 6.5 Extend the arm to the columns of the cylinder to which the cylinder-hoist is to be clamped to.
- 6.6 Adjust the fixing bolts of the arm and clamp the brakes.
- 6.7 Haul the cylinder to a height that allows to put below it the intermediate or next cylinder immediately below it (usually the intermediate cylinder).

7. Assembling the upper floor cylinder and the intermediate cylinder.

- 7.1 Clean the support surface of the structural ring of the intermediate cylinder and the lower structural ring of the floor cylinder. Apply silicon to the male and female connectors. Check weather strip on structural rings add silicon if weather strip has been damaged during un-boxing. Or replace weather strip with an auto-adhesive strip of rubber type EPDM thickness 0.08+to 0.12+(2mm to 3mm) on the inside brim of the structural ring.
- 7.2 Move the intermediate cylinder to the position below the hole of the mid-floor. Make sure to align the column which the cables of the intermediate cylinder column where the cables pass through.
- 7.3 Slowly lower the floor cylinder on to the connectors of the intermediate cylinder. Guide the floor cylinder so that the connectors are inserted in their proper places in the columns.
- 7.4 Press the floor cylinder downwards to assure that the rings are appropriately set in contact with each other.
- 7.5 Put the band tightening tool on the band. Remove the bolt and the adjusting screw.
- 7.6 Carefully open the band and place around/on top of mating structural rings of cylinders. Close the band and using a rubber mallet hit around it so that it fits appropriately on the structural rings.
- 7.7 Fix the adjusting screw of the band tightening tool and tighten the screw to close the band. When the band is completely closed and tight, tighten the Allen square head screws $5/16 \times 5/16+$ of the band. Remove the band tightener tool loosening first the nut of the adjustment screw and the tightening butterflies. Turn round levers and remove the tool.
- 7.8 Place the male connector socket allen screws $1/4 \times 7/8+$ on the connectors.
- 7.9 Place in the plastic plugs that cover the holes of the connector screws. They can be set in place by using silicon sealer.

8. Set up the electric connection of the column cables.

- 8.1 Loosen the cable access cover in order to connect hall cabling. Take the 15 pin or 9 pin cable located on the lower section of the cable column of each floor cylinder and pass it through the inside of the cable column of the intermediate by inserting it through the opening of the banded structural rings that join the floor cylinder with the intermediate.
- 8.2 Pass the cable along the cable column and take it out through the lower window (cable access) of the intermediate cylinder. Next make a roll of the cable and fix it temporarily with tape to the column while assembling the next lower cylinder, passing it through the column (this procedure is repeated with each cylinder).
- 8.3 Re-tighten / secure the cable access cover once all connections have been made and verified.

9. Assembling the two intermediate cylinders on top of each other

- 9.1 In case the difference of level between the ground floor and the 1st floor is over 171+ (434cm), it will be necessary to install two intermediate cylinders, since the maximum length of this cylinder is 78+ (198cm) and the length of the standard cylinder of the ground floor is 93+ (236cm). If this is the case, both the standard cylinder of the ground floor and the intermediate cylinder will have to be raised and it will be necessary to put the 2nd intermediate cylinder below.
- 9.2 Repeat the procedure from 7 to 8, joining the intermediate cylinders and the intermediate.

10. Assembling the ground floor cylinder

- 10.1 Haul the assembled cylinders with the tripod to a height that allows to put the ground floor cylinder below them.
- 10.2 Clean the support surface of the structural ring of the intermediate cylinder and the lower structural ring of the floor cylinder. Apply silicon to the male and female connectors. Check weather strip on structural rings add silicon if weather strip has been damaged during un-boxing. Or replace weather strip with an auto-adhesive strip of rubber type EPDM thickness 0.08+ to 0.12+ (2mm to 3mm) on the inside brim of the structural ring. Move the standard cylinder of the ground floor to the position below the hole of the mid-floor. Make sure that the column through with the cable passes in the intermediate cylinder is aligned with the corresponding column of the ground floor cylinder.
- 10.3 Slowly lower the assembled cylinders on to the connectors of the ground floor cylinder. Guide the assembled cylinder so that the connectors are inserted in their proper places in the columns.
- 10.4 Press the assembled cylinder downwards to assure that the rings are appropriately set in contact with each other.

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- 10.5 Put the band tightening tool on the band. Remove the bolt and the adjusting screw.
- 10.6 Carefully open the band and place around/on top of mating structural rings of cylinders. Close the band and using a rubber mallet hit around it so that it fits appropriately on the structural rings.
- 10.7 Fix the adjusting screw of the band tightening tool and tighten the screw to close the band. When the band is completely closed and tight, tighten the Allen square head screws 5/16x5/16+ of the band. Remove the band tighten tool loosening first the nut of the adjustment screw and the tightening butterflies. Turn round levers and remove the tool.
- 10.8 Place the male connector socket allen screws 1/4x7/8+ on the connectors.
- 10.9 Place in the plastic plugs that cover the holes of the connectors screws. They can be set in place by using silicon sealer.

11. Proceed to the electric connection of the command cables.

- 11.1 Repeat step 8

12. Interior cleaning of the cylinders.

- 12.1 Before installing the head unit the remaining silicon adhesive must be removed from the inside of the cylinders, especially at the joint within the rings (if the joint has not been done with weather strip). The leftover silicone will also be found on the joint of connectors. Use a knife and rub with a cloth. Begin with the upper ring of the elevator and go down along the inside of the cylinders using the installation spider for the operator to move inside the cylinder up to the roof of the car.
- 12.2 Pass a cloth or piece of paper with anti-static furniture polish along the inside of the polycarbonate plaques, eliminating any stains in the lower part of the cylinder.
- 12.3 Clean up any dirt that may remain on the roof of the car and in the perimeter where the seal is.

13. Haul up the traveling cable using the cylinder hoist tool (traveling cable is found on top of car.)

14. Remove the cylinder hoist tool, taking out the fixing pins; insert one arm inside the other. Unhook it from the gear and take it out through one of the doors. *WARNING: use extreme caution will performing this step.

15. Installation of the head.

- 15.1 Clean the contact surface of the upper ring of the top floor cylinder and the lower ring of the head unit, place on its surface a thin film of silicon sealer adhesive. Note: this is done only if weather strip is not used between mating structural rings.

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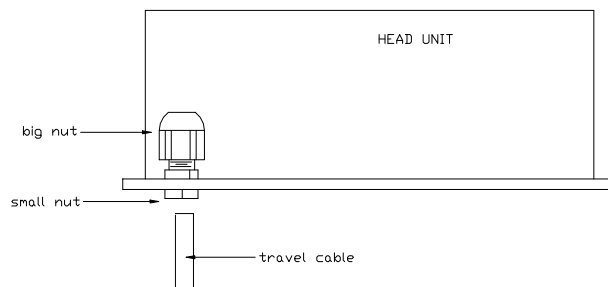
- 15.2 Fix the hook of the gear/rope/chain to the hole of the Head-spider (hauling bar), if height allows this. If it is not possible due the height constrains, the head must be lifted manually. *use caution
- 15.3 Haul the head unit above the top floor cylinder, to caution not to hit or scratch unit.
- 15.4 Lower the head unit and place it on the top floor cylinder. Contrary to the previous assemblies, the head assembly does not require male and female connectors.
- 15.5 Align the cable column of the head with the assembled units. Control box is to be on the same side as top floor cylinder door.
- 15.6 Place the band as described above.

Warning: Be careful when moving the head on the surface of the ring covered with silicone, since this may become slippery with the risk that the head may slide and fall to the floor.

Note: Bear in mind that the Split model has a split plate that is placed on top cylinder instead of head unit.

16. Proceeding to the electric connection of the head.

- 16.1 Remove the polycarbonate cover from the quad point of where the control box is located.
- 16.2 Open control box by removing screws. Note: a micro switch is located on control box not allowing the unit to run if cover is removed.
- 16.3 Connect the cylinder column cables; refer to electrical prints (control box layout) for indication of location.
- 16.4 Put on the cable access cover+ once all connections have been made and verified.
- 16.5 Feed the traveling cable through the hole in the base of the head unit, inserting your hand through the left opening in the head roof. Pull cable to ensure no slack is left on cable. Using strain relief/cord grip affix the traveling cable to head unit. **Note: the strain relief/cord grip need to be placed so that it is in the head unit and not in cylinder causing obstruction.**-see below



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Note: Make sure that the traveling cable is not twisted or coiled that can effect the slide movement in the seal of the car.

16.6 Insert the cable through the left side of the control box.

16.7 Connect the individual wires of the traveling cable as shown on the electrical prints (control box layout print).

--SEE ELECTRICAL DRAWINGS--

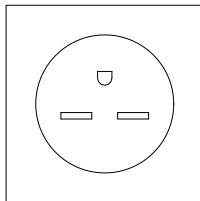
16.8 Plug the provided 2ft (60cm) power cord and plug found on top of elevator or head/split system to the 220VAC, 1phase outlet (installed by home owner/electrician).

The provided plug is manufactured by Pass & Seymour or comparable substitute:

Catalog Number	Page (PDF)	Rating A	Rating V	Description	Cord Diameter	NEMA Config. No.
3869	G11	30/50	250	Angled Plug, Black	.56 - 1.1 in.	6-30P/6-50P

Home owner / electrician to provide 220VAC, 1phase, [model 37:30amp; model 30:25amp; model 52:35amp] electrical outlet as shown below (Pass & Seymour or comparable substitute):

220VAC, 1phase
POWER OUTLET



Straight Blade Devices Power Outlet Receptacles & Plugs 20, 30, 50, & 60A

Pass & Seymour
legrand

Catalog Number	Rating A.	Rating V.	Usage	Receptacle/Plug Config and NEMA No.	Description	AL/CU
3801	30	250		6-30	Flush Receptacle	•

17. Installation of the cylinder doors . if they have been removed.

17.1 Put up the hinges of the doors fixing them with Allen screws 1/2"x1+

17.2 Put up the doors and screw on the axes of the hinges with Allen screws 3/8"x1 1/4+ with auto braking nuts and flat washers.

17.3 Regulate the height of the doors adding or removing the flat washers in the lower hinge.

17.4 Put up the arm of the hydraulic door closers inserting firstly the hexagon of the body of the door closer and then in the fixing screw to the cylinder. Put on and adjust the corresponding nut and screw.

17.5 Regulate the closing speed of the door, fixing with a screwdriver the screw situated on the right side of the body of the hydraulic door closer.

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18. Remove the protection film of any polycarbonate sheet that still has it and follow previously described steps.

19. Place and attach the two half circles of the aluminum floor-finish-rings to the floor of the upper floors.

20. Place and attach the four quad wood ceiling-finishing-rings to the ceiling of each floor penetrated by elevator. Fix each quarter of termination with 2 pegs and contact cement.

Starting the elevator

1. Turn on the end user provided circuit breaker which provides energy to the elevator.
2. In the control box, turn on the double-pole circuit protector. Next turn on the rest of the circuits.
3. Verify that the PVE Board is powered up.
4. Verify that the **EMERGENCY STOP** button in the car is in **OFF** mode (opposite direction of the arrow).
5. Verify that when the door is opened on the lower floor, the light and ventilation of car turned on. Also, when the door has been closed for 10 seconds, that it shuts off. Note: fan and light are shipped unplugged.
6. Verify that when the **ALARM** button is hit, a warning signal is sent out.
7. PVE Board information.

From the PVE Board there is a menu that gives you several option into which you can view input/outputs. One screen allows you to view all inputs at once called %MON ALL INS+ and there is another screen that allows you to view individual inputs called %MON ONE INS+. Same is true for outputs: %MON ALL OUTS+ and %MON ONE OUTS+

The following is a list of individual nomenclature as indicated on electrical prints
DC# = door closed, DL# = door locked, DU# = door unlocked, C# = call button
M# = lower magnetic sensor, MU# = upper magnetic sensor, ESI = emergency stop (the # changes depending on what level; 1 = ground floor, 2 = mid floor, 3 = top floor)
T1 = 1st group of turbines, T2 = 2nd group of turbines, CLO = car locking pins
FAN = fan, LMP = light , EVO = vacuum valve

MON ALL INS

1=C 2=DC 3=DU 4=DL 5=M 6=MU

[UB model will display; **G**: ground floor **M**: mid floor **T**: top floor]

[CB model will display; **1**: ground floor **2**: 2nd floor **3**: 3rd floor **4**: 4th floor]

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- 7.1 Try all of the buttons and functions on every floor and car. Verify that all signal are recognized by PVE board.
8. Run car top different floors. Note: more than likely doors will have to be aligned.
 9. Stop the car in the middle floor in between the ground floor and upper floor in order to place strings on bottom of car. With the car on the upper floor manually put the turbines into action (**See USER MANUAL**). The car will start to slowly descend. Then open the door of the ground floor cylinder, allow the car to start descending down and push up against it using both arms the car will stop. After the car has anchor itself with its emergency brakes. Place the springs on the base of the car. Now close the door and manually press the motor contactor for a few seconds in order to unlock the car-releasing the emergency brake system (**See USER MANUAL**). The car will descend to the ground floor.

10. TEST THE FUNCTION OF THE ELEVATOR

10.1 Car Guides.

10.1.1 Press the **CALL** button and verify that the correct movement of the car over the cylinder guides is taking place. As the car passes through the different unions of cylinders, there should be no noise. In this case, it is probably that the regulated guides of the car, which are located in the inferior and superior extremes, need better adjustment. Note: air leaks will cause a buff sound and need to be fix.

10.1.2. Verify that the doors close, the seal and orifice where the traveling cable pass through is working properly. If you are experiencing a loss of air, it will be noticeable due to noise you will hear in the car as you ride in it.

10.1.3. Verify that the traveling cable at the head unit location is properly sealed. The cable should not role on to the top of the car. It should slide inside the same way that it is moving. If for some reason it tends to role over the car, enlarge the passway of the orifice and also fill and seal the cable with liquid silicone.

10.2. Adjustment of location for sensors and functions.

10.2.1 With the car in ascending movement and with the maximum weight permitted, verify that at the end of the ride, the car does not crash the roof of the cylinder. If this occurs, it means that the upper magnetic sensor (MU) is located extremely high. Lower it $\frac{1}{2}+$ (12.7mm) and repeat step.

10.2.2 With the car anchored on the highest floor, with the maximum weight permitted, press the **CALL** button and verify the car goes up enough so that the car can unlock the trapped system in the car. In the case where the car anchors itself on the same floor, the upper magnetic sensor (MU) is extremely low. Raise it $\frac{1}{2}+$ (12.7mm) and repeat step.

10.3. Power shortage

With the car in ascending mode, place the double-pole circuit breaker in the off position. This action is similar to a power shortage. The car should hold itself up and then slowly descend onto the ground floor. Once the car reaches the ground floor, the door should be unlocked.

10.4. Emergency stop

While the car is descending, hit the **EMERGENCY STOP** button. The car should hold itself up and then slowly descend onto the ground floor just like it was described in the power shortage section.

10.5. Brakes

10.5.1. In order to test the brake system we should first see to it that while the car is descending a large amount of air is entering the cylinder, simulating the rotation of a polycarbonate iron, the rotation of a door, etc. For this, with the car descending without having past the door, we will need to manually open the door of the upper floor, maintaining a small opening between the door and the frame so that we can quickly close the door in case the brake system fails. This is done in order to avoid the free fall of the car. As you close the door, avoid letting air into the exterior cylinder and the car will stop quickly so that it can keep descending onto the ground floor.

10.5.2. PROCEDURE: With the car is locked on the upper floor manually hit the switch for the group of turbines that unlock the car and open the superior door (**See USER MANUAL**). The car will descend slowly until it finds the vane of the door on the upper floor; from this moment the car will automatically activate the emergency brakes allowing only about a 2+(5cm) fall.

10.5.3. If for some reason the brakes do not go into effect or they take a long period of time to work, adjust the car roof springs.

10.5.5. Close the door and press the motor contactor to release the brakes.

10.5.6. Verify that the teeth on the brakes blocks did not leave any marks on the surface of the aluminum guides, which makes the sliding very difficult. In which case, you must sand down the surface of the columns until you reach a more uniform surface.