

# EVO Cleaner

 *made in Sweden by Envirologic*

## User manual



  
**Envirologic**

Original user manual


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# 1. Important information

## Signs that are used in the manual

	Safety-related information is shown in a grey box marked with a red triangle
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	Important information is shown in a grey box marked with an information symbol
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## Intended use

The robot is designed to be safe to use provided it is operated in accordance with the user manual.

EVO Cleaner is an automatic cleaning robot that is intended to replace manual high-pressure cleaning, for example cleaning of pens.

Any other use of the robot is inappropriate. If the instructions in this manual are ignored, this could lead to accidents and harm to people, the environment or animals.

## Robot type

Information in this manual applies to the robot type referred to as EVO Cleaner. A machine plate is attached to the robot showing the CE mark, robot type, serial number, year of manufacture and other important information, as shown in Figure 1.


<b>Envirologic</b>		Envirologic AB (publ) Söderforsgatan 1 752 28 Uppsala Sweden	
Type	EVO Cleaner	<i>Cleaning robot</i>	
S/N	08xxxxxx		
Manufact. year	2021		
Max in pressure	210 bar	Ambient temp.	+1 - +55 °C
Voltage	24 VDC	Weight	270 kg

Figure 1, machine plate

## Restrictions on use

- EVO Cleaner must only be used by trained staff
- EVO Cleaner must only be used in accordance with the instructions in this manual

## 2. Safety

### Safety instructions



It is important that the use of the robot complies with the safety instructions and warnings in this chapter. Read this even if you are already familiar with the use of the robot.



In this manual important information is provided regarding safe use and maintenance of the robot.

The user manual should be regarded as part of the product and should be kept accessible.

The robot is designed in conformity with applicable standards and directives. Up-to-date information on these will be found in the declaration of conformity (CE document). The instructions in this manual must be followed to ensure that the safety and performance of the robot will be maintained.



If there are other health and safety requirements in the country of use, an appropriate supplement to this manual will be created to meet these requirements.



- It is not permissible to remove or modify the design of safety devices on the robot and accessories.



- Only qualified staff are allowed to repair the robot.

### Warnings

The safety devices and warning labels on the robot are designed to prevent accidents. The main responsibility for safe use lies with the persons that are using, maintaining or carrying out repairs on the robot.

To ensure safe use, instructions and warnings should be followed and respected.

### Emergency stop switch

As an additional precaution an emergency stop switch is installed, within easy reach below the operator panel. If the switch is pressed the robot and the water jet will immediately stop.

### Transportation of the robot



During transportation of the robot with a vehicle (for example with a truck or a trailer):

- The robot **must** only be transported in an upright position, turned on, safely fixed so that the robot cannot overturn or suffer any other form of mechanical damage.



- If a malfunction is suspected due to a mishap while undergoing transport the robot **must** be functionally checked before it is put into use.

- If needed, the robot should be lifted in the chassis.

- During transport, secure the robot by the chassis.

### Moving the robot



- The robot must only be moved when it's turned on.

- The robot must only be moved with both hands on the handlebars when the clutch is used.



- Methods for moving the robot must be adapted to the ground and personal capabilities.

- If the ground is steeply inclined (upwards or downwards) the motor must be used, do not use the **clutch or the transport wheel!**

## Recording (programming) and starting a robot program



- Before cleaning, the section must be cleared of humans (except for the person carrying out the recording) and animals; aisles and pens must be clear of obstacles, doors and gates must be closed.



- Warning signs must be placed by the entrance of the section during cleaning.
- The person carrying out the recording must use ear defenders, respiratory mask and safety goggles. Other recommended equipment is protective clothing, boots and gloves.



- During recording the operator must keep a safe distance from the moving parts of the robot and the high-pressure water jet.



- During recording the robot must be manipulated in such a way that the water jet or the moving parts of the robot are not in contact with sensitive electronics or other sensitive equipment.



- When using markers these must be firmly fixed and be able to remain in the same position throughout the cleaning process.



- When using the double nozzle, the automatic wash must be restarted if the water flow is interrupted. This to ensure that the correct valve in the double nozzle is open.

## Cleaning and maintenance



- Rinse the robot thoroughly after use. **Do not use a high-pressure water.**
- The batteries **must** be recharged in a well-ventilated area free of flammable materials.



- During maintenance the robot **must** be switched off.
- Only qualified personnel are allowed to carry out repairs on the robot.

## Risk of overturning



- Do not transport the robot in the parking position if the ground leans more than 20 degrees sideways.



- If the tower is turned 90 degrees from the center position and the telescope and the arm are in their most extended positions, the ground should not lean more than 5 degrees (depending also on whether the water jet is directed up or down).

- During cleaning behind the robot in the marked area in Figure 3, there is a risk of overturning that is dependent on the ground and the position of the boom, telescope and arm. If working in this area the recommendation is to have the telescope in its most retracted position.

- When using the transport wheel, the tower must be centered.

## Battery short circuit



To avoid short circuits when replacing the batteries, always first remove the connector from the minus pole of the battery connected to the robot. Consequently, always reconnect this pole last.

## Built-in safety devices

The robot has a built-in safety system with several different alarms. If a stopping alarm occurs, the robot will immediately stop the operation, shut off the water jet and display an alarm text in the operator panel. The alarm must be acknowledged before the operation can ultimately be restarted.

- **Protection against current faults** is provided by a fuse on the circuit board.
- **Protection against low battery voltage** is controlled by the computer and generates an alarm if this occurs
- **Protection against collision during operation** is detected by each individual motor and generates an alarm if the motor does not move as expected.

# 3. Technical specifications

## Parts overview

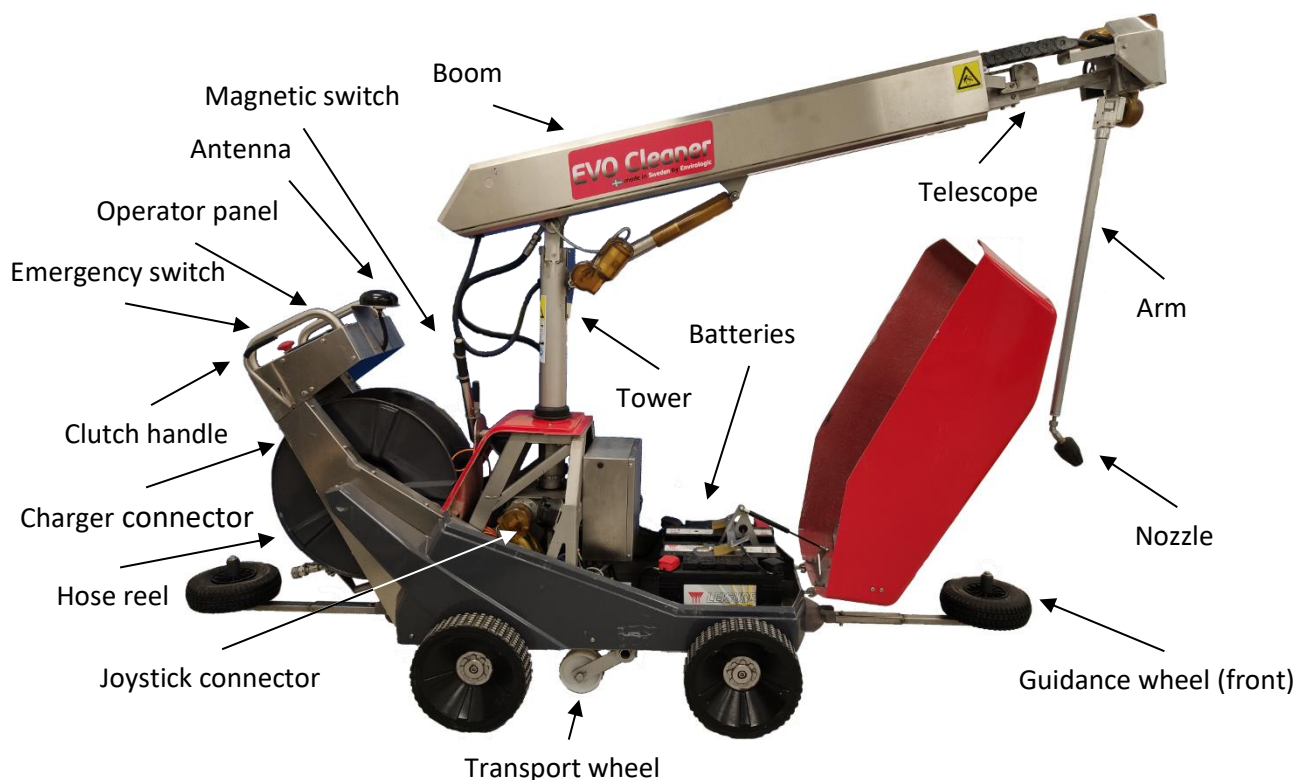


Figure 2, parts of the robot

### Technical data

Total width:	680 mm (610 mm with special wheels)
Total length when retracted:	1930 mm
Total height when retracted:	1610 mm
Max reach of arm:	4015 mm
Effective working range:	up to 6000 mm from center of unit
Weight:	270 kg
Power supply:	24 V DC (2 lead acid batteries at 12 V)
Electric motors:	24 V DC (7 in total)
Ambient temp:	1°C to 55°C (34°F to 131°F)
Storing temp.:	Empty of water, -10°C to 60°C (14°F to 140°F)
Alarm:	Alarm by SMS in the event of operational breakdown
Water supply:	From external high-pressure cleaning unit
Nozzle:	Rotor jet 0.55
Hose reel:	50 m high pressure hose (operated separately from the robot). Connected to a normal cleaning unit.
Recommended water pressure:	180-210 bar (18-21 MPa)
Recommended water flow:	15-18 l/min
Sound power level <sup>1</sup> :	94 dB(A)

### Accessories

Charger:	see separate specifications supplied with the charger
Markers:	design and quantity are dependent on the installation
Nozzle:	alternative nozzles may be available depending on the working area

<sup>1</sup> Measured on rotor with rotor jet nozzle and 190 bar water pressure

# Reach

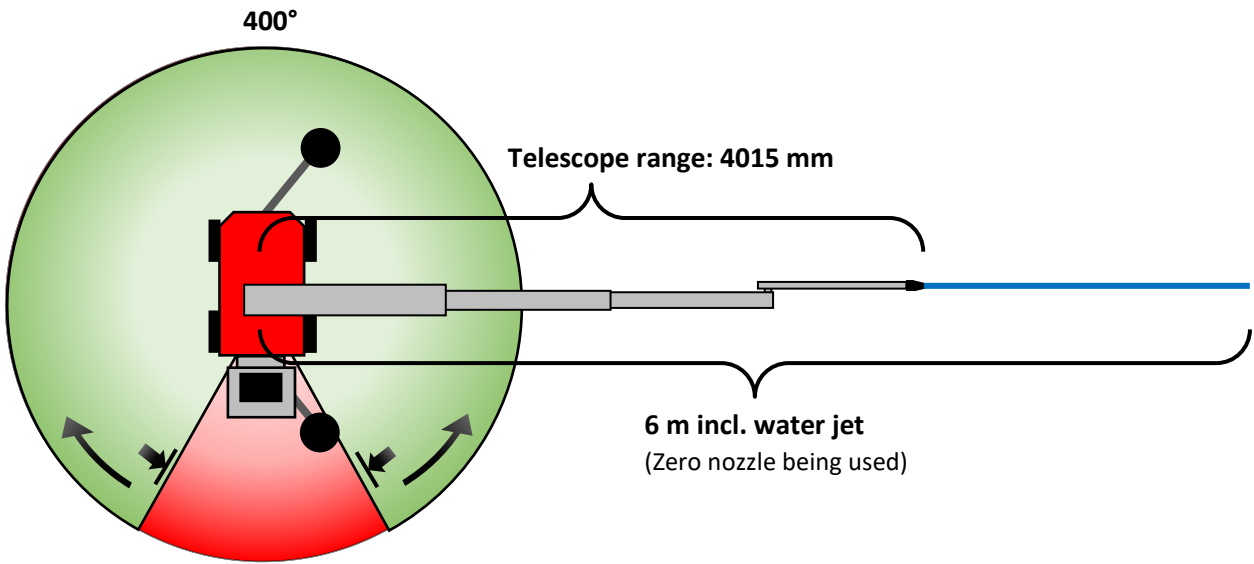


Figure 3, reach of the arm and safe tower working range

## 4. General information

This user manual, together with help texts in the operator panel, includes all the information needed for preparing, making recordings (teaching), managing locations, programs and recipes, performing and ending a cleaning process. It also includes necessary information on how to use the robot in the best and safest way.

### Short functional description

The cleaning robot obtains its 24 V power from two 12 V lead acid batteries. The robot cleans with high-pressure water (warm or cold) with or without additives. The water is supplied from an external high-pressure water supply via a 50 m hose installed on a hose reel that is operated separately by the robot according to how the robot moves. The cleaning is carried out by a telescopic arm, moveable in all directions, with a maximum reach of 4015 mm (effective working range including the water jet is 6000 mm). By using the joystick, you can teach the robot to move and clean in a satisfactory way. After this teaching operation the robot will be able to carry out the movements on its own as many times as are necessary to achieve a satisfactory cleaning result.

### Starting the robot

The main switch is found on the right-hand side of the operator panel. When the robot is switched on, the startup process takes about 30 seconds. When the screen in Figure 4 is shown the robot is ready to operate.

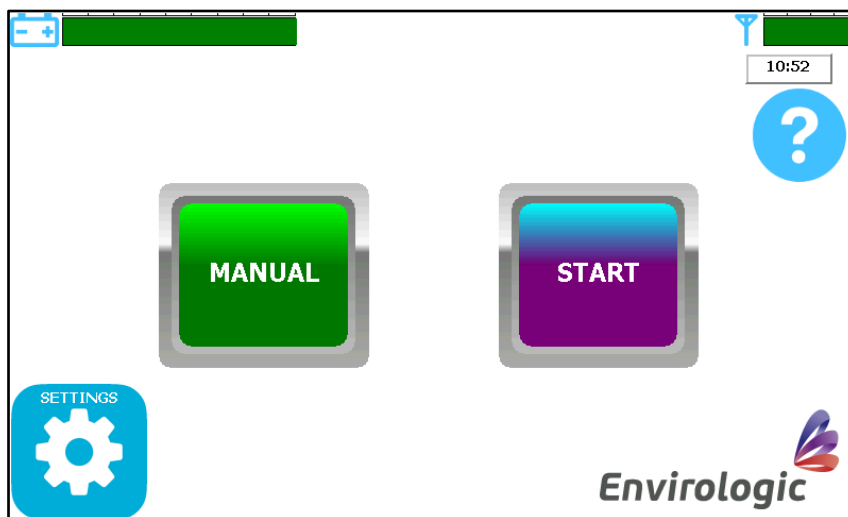


Figure 4, start screen

### Help system

Every screen has a button with a question mark, as seen in Figure 4. When pressing that button, relevant help texts will be displayed on the screen.

### Charging the robot

When charging the batteries, the cleaning robot must be switched off. The batteries cannot be charged when the robot is on.

The charger must be connected to the robot before it is connected to the wall outlet. When the charger is connected to the wall outlet only the orange status light should be turned on. See the charger manual for details.

The cleaning robot shall always be connected to the charger when not used, in order to prolong battery life.



# 5. Manipulation


## Manual mode

Manual mode means using the cleaning robot without a previous teaching process. Manual mode is used for example when the robot is moved from its storage place to the house to be cleaned. Before moving, the robot should be turned on. Manual mode is reached from the start screen. When in manual mode, the cleaning robot can be operated using the buttons on the operator panel or the joystick.

We recommend that you use manual mode to become familiar with the joystick and the different movements.


## Moving the robot

The robot can be manually moved either by manpower or by using the motors for transport. For unpowered transport, the robot is declutched using the clutch handle on the right-hand side of the handlebar. The robot can also be manually operated using the transport motor from the operator panel or the joystick. To make it easier moving or turning the robot, the transport wheel can be used, see Figure 2. This is also controlled on the manual screen.

 If the ground is inclined towards or away from you the motor **must** be used, **do not use the clutch or the transport wheel!**

Also, take care to follow the instructions in the Safety section.

## Joystick

 The joystick is needed during the teaching process. The joystick is connected to the cleaning robot via a six-meter cable, which facilitates the teaching process and unwanted contamination by manure or collision with the robot's telescopic arm is avoided.

The joystick is connected to the black socket, which can be found under the hood on the rear right-hand side of the cleaning robot, see Figure 2. The plug must be turned 90 degrees for secure tightening when connected. The joystick is used to control all motions of the cleaning robot, including turning water on and off. See Figure 5 for an overview of the joystick.

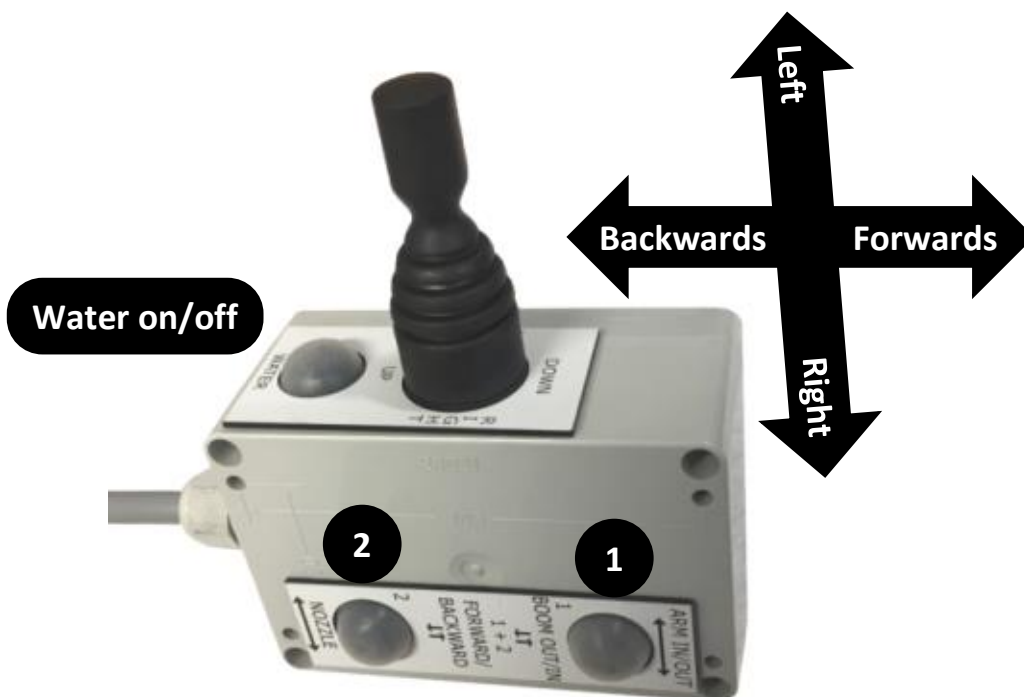



Figure 5, joystick

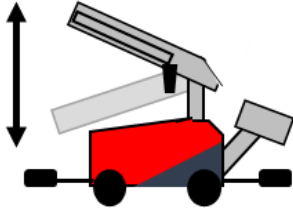
An overview of the different motions is given in Figure 6.

 The directions of motion in this manual are described as seen from behind the robot

### Boom up/down

The boom moves about 100° from bottom (position 0) to top (position 1250). Parked position should be horizontal (about position 700).

*Move joystick shaft backwards/forwards*



### Tower right/left

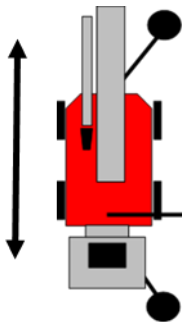
The tower can go about 200° in both directions (positions ±1000) from its parked forward position (about position 0).

*Move joystick shaft right/left*



### Robot forward/backward

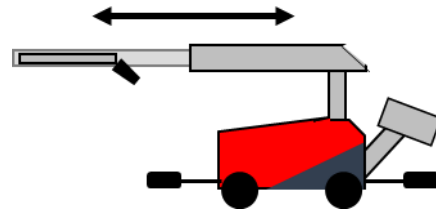
*Move joystick shaft forwards/backwards, while pressing buttons 1 and 2 simultaneously*



### Telescope out/in

The telescope can run out of its parked position 0 to position 425.

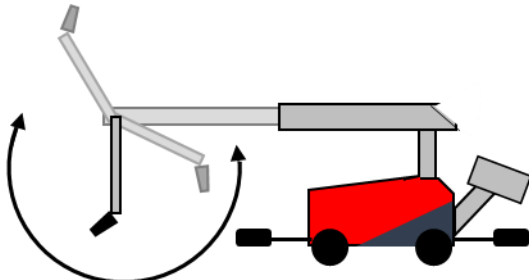
*Move joystick shaft forwards/backwards, while pressing button 1*



### Arm out/in

The arm starts from its parked position parallel to the boom (position about -55). The arm can go out about 315° (to position 1100), so it points towards the ceiling.

*Move joystick shaft right/left, while pressing button 1*



### Nozzle right/left

The nozzle can spin 360° in both directions. The nozzle is parked when the arm is parked and nozzle points downwards.

*Move joystick shaft right/left, while pressing button 2*

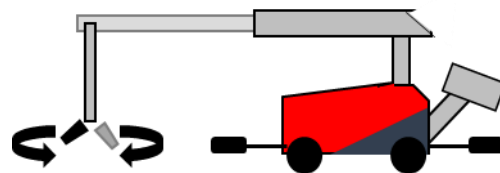


Figure 6, motions

## 6. Teach

### Markers

The cleaning process requires magnetic position markers, see Figure 7. The position markers which can be S or U shaped are placed in a bracket, mounted on the house equipment before the cleaning process takes place. The cleaning robot reaches the markers during the cleaning process and position information is transferred to the computer.



Figure 7, position marker

i

- Before programming, read the section “Teaching hints”.
- The programming should be done in a dirty pen with working water pressure.
- Any pauses during the programming process will not appear during automatic cleaning. Therefore, the programming can be carried out in a relaxed way, with no requirement for haste.

### Recordings

To be able to run the robot automatically three things must be instructed to the robot: **LOCATION**, **PROGRAM** and **RECIPE**.

The **LOCATION** is a map of how the path, which the robot shall travel, looks like. The process starts by giving the location a name, e.g. “FINISHING 2-5”, instruct on which side the guidance wheels are set and how many markers that have been installed. Make sure the robot is within 1 meter **before** the first marker when pressing start. The robot is now moving forward, recording where these markers are. Follow the robot and make sure all markers are registered correctly and that the wheels do not spin. After the last marker the robot will turn backwards and move all the way back to the initial position behind the first marker.

The **PROGRAM** is the cleaning procedure, where the joystick is used to manipulate the robot. These programs will be stored under the chosen location.

The **RECIPE** is up to 14 programs that can be used at each marker at the location. You pick the program from a list, place it on the correct place on the screen and when you have placed all programs you want to run by this marker, you go to next. The programs chosen on previous marker stays as default, if you need to make changes you can delete or add programs.

See Figure 8 for an example of a location layout.

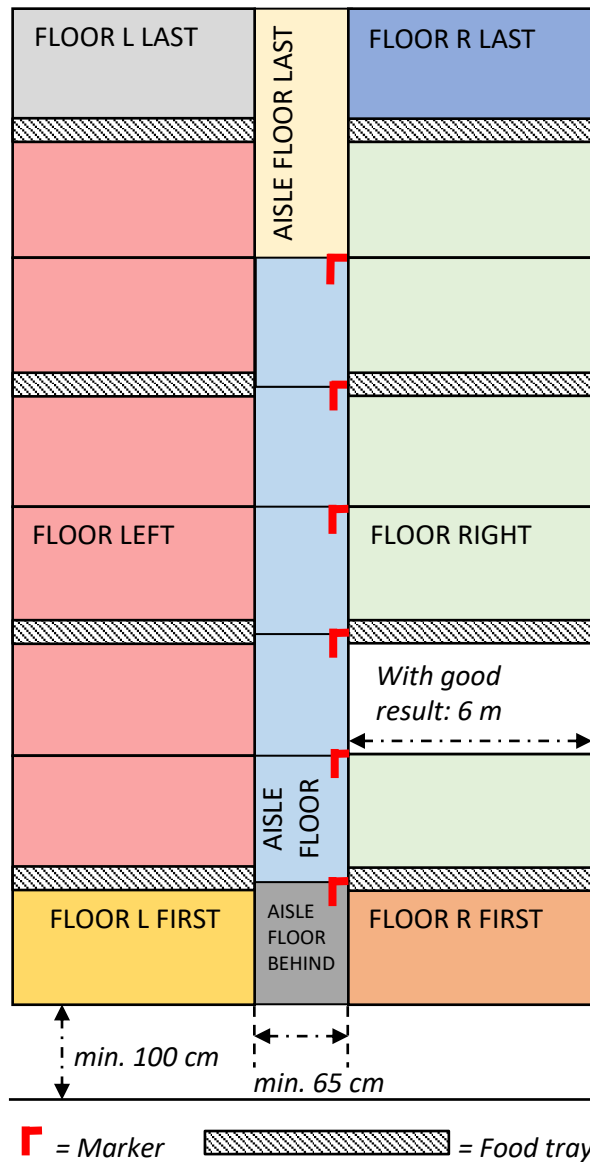


Figure 8, example of pig pen layout

## Automatic wash



### Before cleaning, check the following:

1. That no magnetic position marker brackets have been moved or are missing
2. That each magnetic position marker is fixed in the correct bracket
3. That the magnetic switch arm is set 5 cm from the middle of the magnetic markers.
4. That the area to be cleaned is clear of obstacles, which can interrupt the cleaning process
5. That the high-pressure cleaning unit is powered up
6. That water is connected to the high-pressure cleaner
7. That the high-pressure hose is free to move and secured centrally behind the hose reel
8. That the charger is disconnected
9. That the guidance wheels are placed in the correct position, see screen.
10. That you know where to start the cleaning process, check for the first position marker
11. That the area to be cleaned is cleared of humans and animals

To start running a working scheme (automatic wash) select START on the start screen. First select which location to run. Then select which recipes to use in the order they should be run. Before starting the wash, make sure to put the robot within 1 meter before the first position marker. Make sure the guidance wheels are in contact with the wall on the side of the aisle where the markers are located. After the first marker has been found the robot will automatically execute the listed recipes and programs. Between each recipe the robot will move back to the first marker.

## **Aborting**

An automatic wash can be aborted before it is finished in two ways:

- When pressing stop the robot will finish the current program before stopping
- When pressing pause or the Emergency stop switch, the program will be immediately stopped if the stop button is pressed.

If the emergency stop switch has been pressed the wash will immediately continue if the stop switch is restored and the alarm is cleared on the screen.

## 7. Teaching hints

1. The teaching process should take place using working pressure, because the arm is affected by the power from the flowing water.
2. Avoid retraction of the telescope when the boom is in its maximum elevated position, since this causes a high level of stress on the telescoping motor.
3. The teaching of programs should be done in dirty pens to be able to observe the track of the water jet.
4. Ensure that there are no local obstacles in one pen such as gas extraction equipment, posts, etc. If so, the teaching process should take place in this pen to avoid collisions.
5. Keep some clearance (approx. 15 cm) from house equipment and fixtures during the teaching process. This is important when changing the position of the boom, to avoid collision if the cleaning robot has a slightly different position during the cleaning process. There can also be a discrepancy in the house equipment when going from one pen to another.
6. If it is not possible to take point 5 into account, because of a lack of space or similar problems, you should consider moving away from the area that could cause a collision before you change the height of the boom, for example, or retract the telescope. In this way you can be sure that there will not be a production stoppage due to collisions, even if some parts of the arm touch the equipment.
7. Take care and avoid damaging the house equipment; keep the nozzle at the right distance.
8. Keep the nozzle at a distance where you have the water pressure and width of the spray to manage the task you've planned for the program. Being closer to the surfaces gives more pressure but also results in more movements due to the narrower spray.
9. It is important that no major obstacles are in a position that could interfere with the guidance wheel during movement in the cleaning process. This could cause the robot to skid or spin and lose its exact positioning. (To avoid this, extra position markers can be used.)
10. If you are using a double nozzle, be very careful in turning the water on, so the correct nozzle is chosen. When you change nozzle, turn the water off, move the arm out into a horizontal position, turn the nozzle, run the tower, boom, telescope or the machine in, for at least, 5 seconds and only then turn the water on.
11. Try to perform the teaching process for new pens efficiently. Time measurement for each pen is a good working tool. It is very important to divide the pen into smaller parts. It is very easy to maintain concentration for a few minutes but after a while you lose focus and start to make mistakes.

### **Always do one program for coarse cleaning and one for fine cleaning!**

In the first programming session, the floors of the finishing pen will be washed and saved as a program. Limit yourself to the standard pens i.e. whatever type you have many pens of. It is an obvious error to carry out teaching in a special pen or a half pen for the first time when you are in a new section.

12. Next time you clean a section which looks like the one you installed the robot in, you should redo the worst program. This means that it is useful for you to make some notes about how it worked out after you cleaned last time, so you will remember what you want to do. Maybe you were not satisfied with the floor in the right-hand pen, so you re-teach that program. If you do it this way you will take 15 to 30 minutes on teaching during each cleaning session for some time to come. The result will be that you will constantly reduce the cleaning time, improve the result and you will also learn how to use the robot in the most effective way.

When you are completely satisfied with the standard pens it is time to carry out teaching on the rest.

13. Pauses during the teaching process are not recorded so there is a lot of time to plan the next move.
14. During automatic cleaning the subsequent movement will start a bit before the previous movement is done, which means the robot will round off corners. During automatic washing, this could lead to a bit shorter nozzle movements compared to those movements you taught the robot. The conclusion would be to always make your nozzle movements a bit longer than necessary.

## 8. Maintenance

After use the robot shall be cleaned thoroughly with a water hose. The batteries shall be charged fully after the cleaning robot has been washing. As a rule of thumb, charge the batteries for as long as the robot has been washing. Store the robot in a well ventilated, frost-free area.



- Do not use **high pressure** for cleaning the robot
- When the robot is not in use it must be kept in an area that is frost-free.

## 9. EUROPEAN DECLARATION OF CONFORMITY

We,

Envirologic AB, org.nr. 556572-1775  
Söderforsgatan 1  
752 28 Uppsala  
SWEDEN  
Telephone No. +46 18 39 82 30,

declare under our sole responsibility that the product:

EVO Cleaner, nr of items 08xxxxxxx

to which this declaration relates is in conformity with the following standards or other normative documents:

Council Directive 2006/42/EC (May 17, 2006) on Machinery,

Council Directive 2014/30/EU (February 26, 2014) on Electromagnetic Compatibility

The Technical Construction File required by this Directive is maintained at corporate headquarters of Envirologic AB, Söderforsgatan 1 752 28 Uppsala Sweden.

Uppsala ..... 1 January 2020  
Envirologic AB



.....  
Johan Wennerberg, CEO



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