Rev.2018-04-01

User manual

Contents

1. Important information

Signs that are used in the manual

Safety-related information is shown in a grey box marked with a red triangle

Important information is shown in a grey box marked with an information symbol

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 Picture 1.

Envirologic AB Fyrisvallsg. 24 SE-752 28 Uppsala Sweden	CE		
Type	EVO Cleaner		
S/N	XXXXXXXX		
Manufact. year	XXXX		
Max IN pressure	210 bar	Ambient temp.	+1°C - +55°C
DC-power	24 V	Weight	270 kg

***Picture 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

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.

Safety instructions

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.

e are other health and safety requirements in the country of use, an appropriate supplement to anual 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.

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 on the side of the operator panel. If the switch is pressed the robot and the water jet will immediately stop.

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.

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 handle 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 pivot 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 and 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 and safety goggles. Other recommended equipment is protective clothing, boots, gloves and a mask.
- 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 capable of remaining in the same position throughout the cleaning process.

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

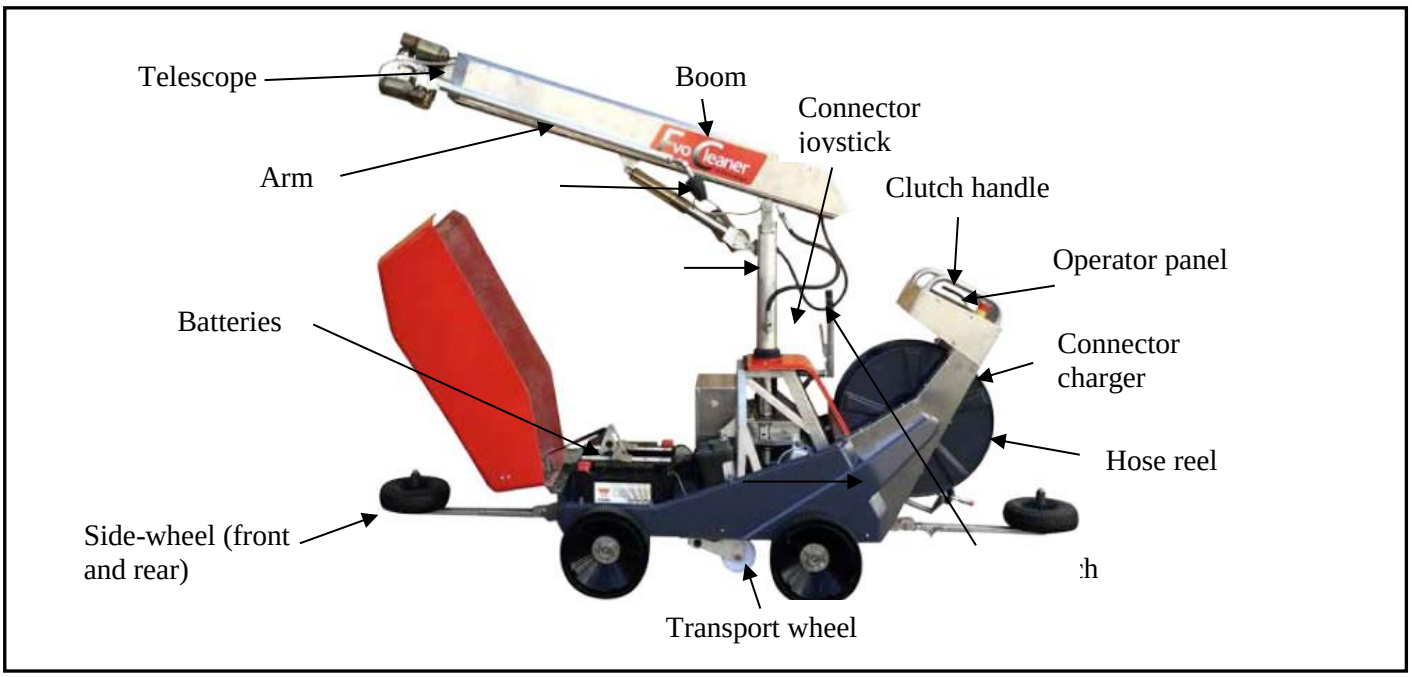
- Do not transport the robot in the parking position if the ground leans more than 20 degrees sideways.
- If the tower is turned 90 degrees from the centre position and the telescope + arm are in their most extended positions, the ground should not lean more than 5 degrees (depending also on whether the water jet is directed up or down).
- During cleaning behind the robot in the marked area in picture 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.

Built-in safety devices

The robot has a built-in safety system with several different alarms. If an 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 separate fuses for charging and for the print-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 current consumption becomes higher than expected.

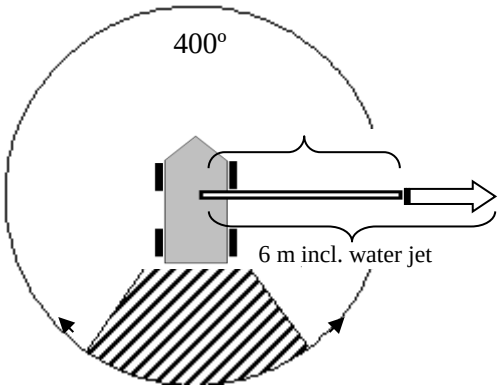
3. Technical specifications



***Picture 2**, parts of the robot*

Technical data, EVO Cleaner

Total width:	680 mm (with special wheels, 600 mm)
Total length:	2100 mm (incl. guidance wheel)
Total height when retracted:	1610 mm
Max reach of arm:	4015 mm
Effective working range:	up to 6000 mm from centre 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 (33.8°F - 131°F)
Storing temp.:	Empty of water, -10°C to +75C (14°F - 167°F)
Control system:	Horner PLC
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 (18-21MPa)
Recommended water flow:	15-18 l/min



***Picture 3**, the reach of the arm*

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.

4. General information

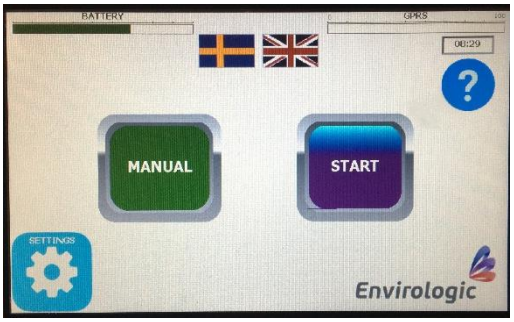
Instructions and documents that are included with the cleaning robot: **User manual.**

The user manual, together with help text 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-volt power from two 12-volt 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 = 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 moves on its own as many times as are necessary to achieve satisfactory cleaning.

5. Starting the robot

The main switch is found on the right side of the operatorspanel.
When charging the batteries, the cleaning robot must be switched off.
The batteries cannot be charged when the robot is on.



Starting the system
When the robot is switched on, the startup process takes about 30 seconds. When the picture to the right is shown the robot is ready to operate.

Every screen have a ?-mark. When pressing and holding that button help text concerning this particular screen will be displayed.

6. Moving the robot

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

Transport wheel
To make it easier moving or turning the robot, the transport wheel can be used, see Picture 2. This is 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!**

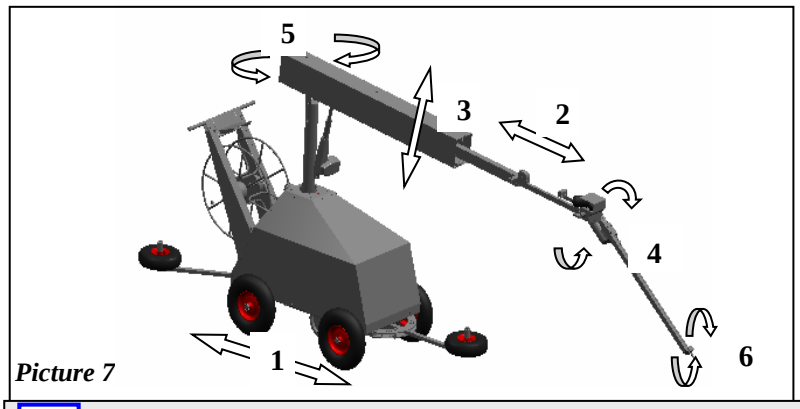
7. Manipulating the robot

The cleaning robot can be controlled from either the operator panel or the joystick.

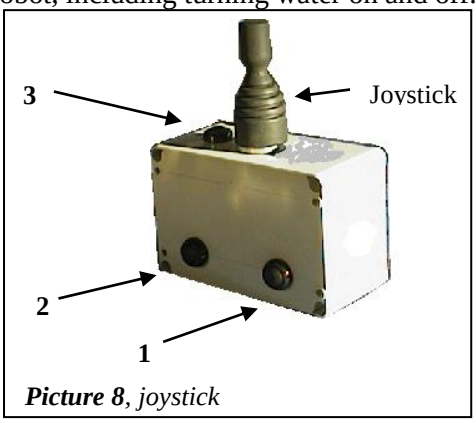
> **i** We recommend that you use the joystick during the teaching process. The joystick is connected to the cleaning robot via a six-metre cable, which facilitates the teaching process and unwanted contamination by manure or collision with the robot's telescopic arm is avoided.

Joystick

The joystick is connected to the black socket, which can be found at the rear of the cleaning robot, see Picture 2. The same socket is used for charging the batteries. 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.



Picture 7



***Picture 8**, joystick*

> **i** The directions above are as seen from behind the robot

Motion selected (*see picture 7*)	**Joystick commands** *(see Picture 8)*
1 Robot forwards/backwards	Press **1** and **2,** move joystick **forwards/backwards**
2 Telescope out/in	Press **1,** move joystick **forwards/backwards**
3 Raise/lower boom	Move joystick **forwards/backwards**
4 Arm in/out	Press **1,** move joystick **left/right**
5 Rotation of tower	Move joystick **left/right**
6 Rotation of nozzle	Press **2,** move joystick **left/right**
Water on/off	Press **3**

8.Teach

The cleaning process requires magnetic position markers, see Picture 9. 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.

***Picture 9**, position marker*

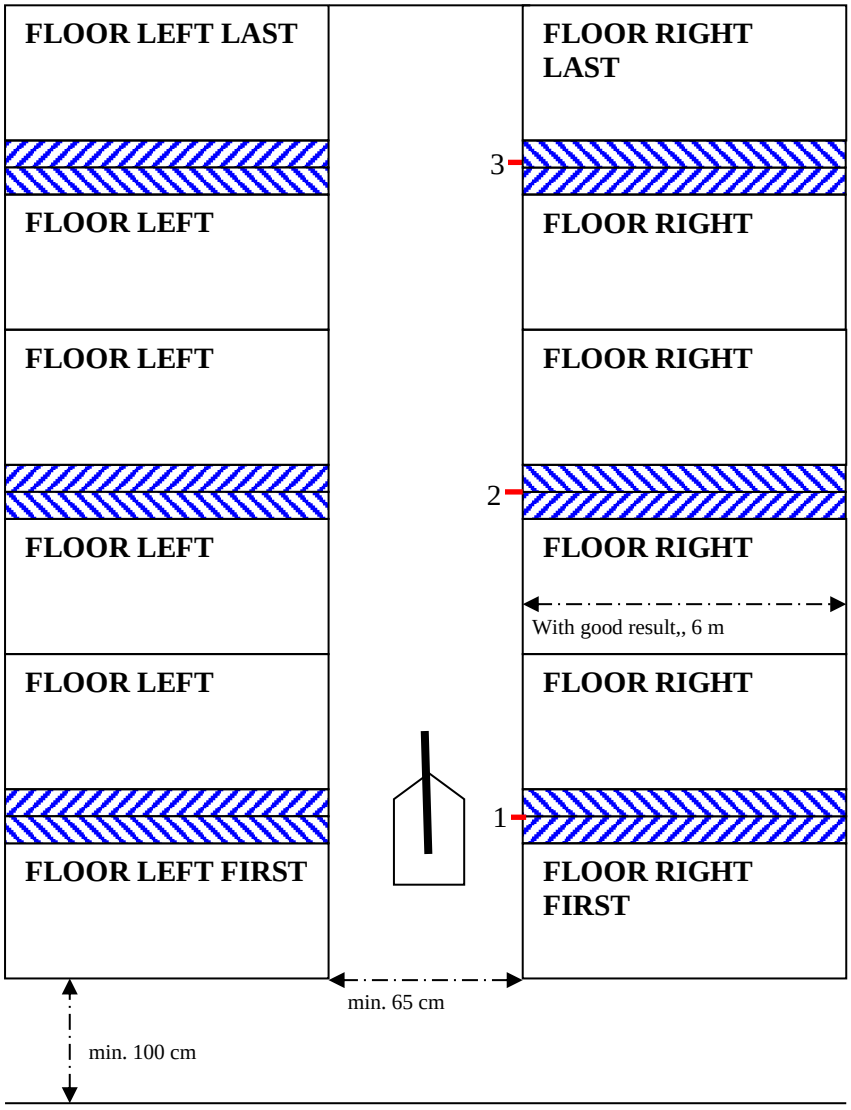
- Before programming, read "Hints for teaching".
- The programming should be done in a dirty pen with working water pressure.
- Any breaks during the programming process will not appear during automatic cleaning. Therefore, the programming can be carried out in a relaxed way, with no requirement for haste.

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

The L**OCATION** is a map of how this particular 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 side-wheels are set and how many markers that have been installed. Make sure the robot is within 1 meter **behind** the first marker when pressing start. The robot is now moving forward, registrating where these markers are. After the last marker it will turn backwards and move all the way back to the position behind the first marker.

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

RECIPE is up to 14 programs that can be used at each marker. You pick the program from a list, place it on the correct place on the screen and when you have placed all programs you wan’t to run by this marker, you go to next. The programs chosen on previus marker stays as default, if you need to make changes you can delete or add programs.



When starting to run a work scheme it should be entered in the START menu. In the work scheme, you enter which recipes will be used and their individual order.

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 is set in the same position it was in during teaching.
4. That the aisle and pens are 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 side-wheels is placed in the correct position, see screen.
10. That you know where to start the cleaning process, check for the first position marker

11. 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 in order 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 particular pen to avoid collisions.

5. Keep some clearance (approx. 15 cm) from house equipment 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 telescopic arm. 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 of the house equipment; keep the nozzle at the right distance.

8. Remember that the robot obtains different parking positions by driving forwards or backwards to the marker. Therefore, try to teach it in the order that it will subsequently be given in the recipe.

9. It is important that no **major** obstacles are located in a position that could interfere with the guidance wheel during movement in the cleaning process. This could cause the robot to skid 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, 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 course cleaning and one fine cleaning!
In the first programming session, the floors of the slaughter 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 sick 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. Take one per cleaning session and add it into the recipe with the add function.

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.

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