



## INSTALLATION MANUAL





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Dear customer,  
for correct installation of the Shaker Set, we invite you to follow the procedure described in this Brochure  
For the programming and use of the “Commander EVO” control system, we advise you to carefully read the  
relevant attached installation and programming manual.

## Shaker Set: technical specifications

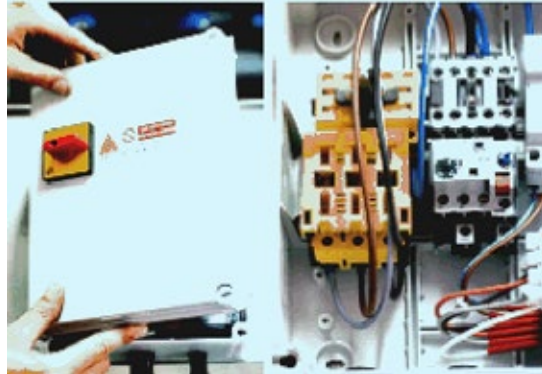
- **Dimensions:** Width: 80 cm  
Height: 120 cm  
Depth: 80 cm  
Weight: 75 kg
- **Power Supply:** 3 x 380 Vac 50Hz  
Other voltages available upon request
- **Capacity 6-18 mc/h** (for 12mc/h model)  
**18-36 mc/h** (for 20mc/h model)  
Operating pressure: 2.5 – 5.5 bar
- **Technical characteristics of components:**
  - **Pump:**  
The Shaker Set uses Electric Pumps made of AISI 304 stainless steel, available in 3 versions with 12mc/h capacity and 3 versions with 20 mc/h capacity.  
Characteristics:  
Self-ventilated asynchronous 2-pole motor  
Three-phase voltage 230/400V +/- 10% 50Hz up to 4 Kw, 400/690V +/- 10% 50Hz for higher powers
- **PH and EC measurement devices**  
To ensure constant monitoring and correction of the PH and electrical conductivity values, the EVO Shaker is equipped with a pH electrode and a conductivity probe.  
PH electrode: polymer electrolyte, max operating pressure 6 bar, BNC connector.  
Conductivity probe: 4 platinum rings, max operating pressure 6 bar, internal NTC temperature sensor.
- **PH and EC Transmitter**  
The Shaker Set system is provided with a pH and EC transmitter designed to accept signals directly (and simultaneously) from the pH electrode and the probe.  
Technical characteristics:
  - Output: insulated 4-20 mA,
  - Scale: from 0 to 14 pH and from 0 to 10 mS/cm
  - Accuracy: (at 20°C) pH: +/- 0.5% F.S.; EC: +/- 2% F.S.
  - Calibration: Manual
  - Power supply: 12-24 Vdc
- **Valves**  
The Shaker Set uses PVC solenoid valves (1/2 " BSP 2/2 ways NC) specially designed for the fertigation use of chemical products (with EPDM membranes). The valve used for the acid is made of Viton.  
All the connectors can be provided with luminous LEDs.

## Shaker Set: Installation Guide

We recommend you locate the Shaker on solid, flat ground, sheltered from frost and direct sunlight to prevent deterioration of the system's electrical and hydraulic components.

### 1. Power supply connection

- **Open the Shaker's switchboard** using a screwdriver.
- **Connect power supply** (three-phase + neutral) to the meter and close the switchboard.



### 2. Connection to the irrigation system

The Shaker must be connected to the plant through an **in line** system(all the water must go through the system) by two branches from the main line by placing an **isolation valve** between the two branches (see installation scheme).

**For flow rates higher than nominal** (18 mc/h for 12mc model; 36 mc/h for 20mc model) a by-pass installation can be done, deviating just one portion of water inside the fertigation system(see installation scheme).

**Note: in the case of by-pass installations, the pH and EC sensors must be installed on the main pipe (or on the probe-holder provided for this purpose).**

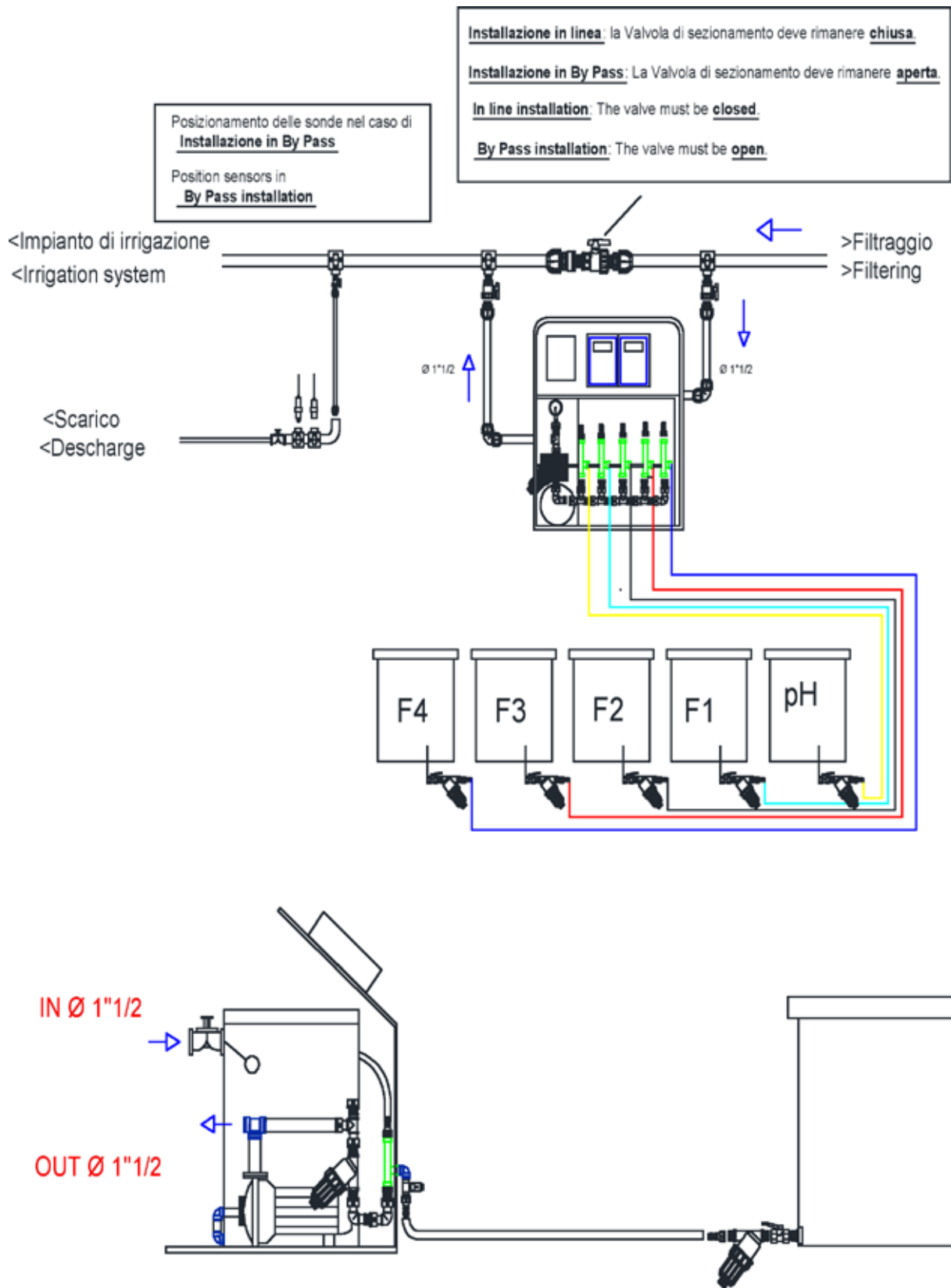
- **Connect the Shaker to the Irrigation network** through the two 1" ½ diam threaded connection sockets. Water enters at the point corresponding to the ball-cock connected to the mixing drum and exits from the threaded Tee placed at the exit point from the booster pump.

- To ensure that the pre-mixing vessel remains constantly full, it is **necessary to install a pressure control**, or autoclave. When the system is not operating, the flow is automatically closed off by the level valve of the vessel, by means of the ball-cock provided for this purpose.

### 3. Connecting the containers of fertilizers

- **Provide the containers with control filters** and connect them to the injection unit through corrosion-proof piping. (see installation scheme)

- **Connect the containers** to the solenoid valves through the appropriate fitting holders, clamp the pipes with hose-clamps and mark the containers with the number of the corresponding valve (1, 2, 3, 4 or ACID). The valve for injecting the acid is marked with the word "acid" while the valves which regulate the injection of the fertilizers are numbered from 1 to 4. (vessel connected to valve 1 = fertilizer 1 etc...).



#### 4. Connecting the main pump control

Commander EVO has a pump control which is activated during irrigation and fertigation cycles supplying 24 Vac power. Equip the switchboard of the plant main pump with a remote control switch with a 24 Vac coil and connect it to the timer as described on the user and maintenance manual of Commander EVO.

## 5. Connecting solenoid valves

- Open the switch box under the Commander EVO control system and shown in Photo 1 to access the terminal block
- Connect the solenoid valves according to the diagram on the inside cover of the switch box as shown in photo 2

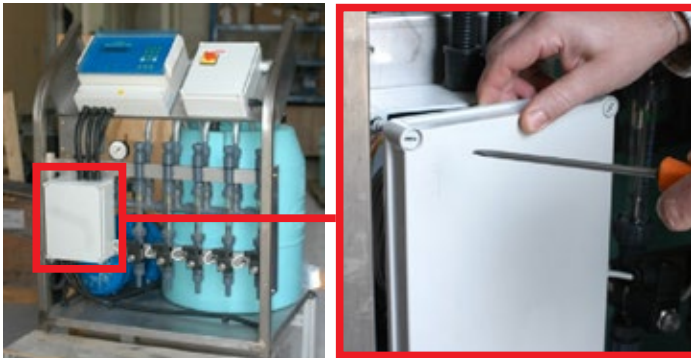


Foto 1



Foto 2

## 6. Connecting rain sensor, pressure switches, automatic filters etc...

For detailed information of the connection of pressure switches, rain sensors, differential pressure switch etc... please read the Commander EVO manual.

## 7. PH electrode installation

For detailed information on installation and calibration, please read the user and maintenance manual of Commander EVO.

## Shaker Set: starting up

Before starting up the "Shaker Set" fertigation machine please read carefully the "Installation and Programming Manual" of the Commander EVO programmer.

### Correct start up procedure:

- 1) **Fill the vessels** of nutrient solutions with the fertilizers and the acid normally used. It is advisable to dilute the fertilizer in the same proportion.
- 2) **Set the parameters on the Commander EVO control system**, for irrigation programming as stated in the Commander EVO programming manual.
- 3) **Set the fertigation recipes** required for plant area as described in the Commander EVO programming manual.
- 4) **Check the operating pressure of the pump (in the standard models it should be between 3 and 4 bar)**. Act on the pump delivery if necessary to bring the pressure to the operating values.
- 5) **Adjust the flow of incoming water** through the appropriate valve, so that the amount of incoming water in the vessel is equivalent to the amount of outgoing water thus ensuring that the premixing vessel remains constantly full.

## Instructions for proper installation

- Using the Shaker Set with a delivery rate above nominal flow rates (depending on the model) prevents the Shaker from operating in its normal configuration (in-line installation). However the Shaker Set can be used on systems with higher delivery rates by By Pass installation.

(for the photo please see KPSS probe-holder kit fertigation price list)

- We recommend using the Shaker Set with fertilizer solutions diluted to 10 %.
- We recommend diluting the acid to the maximum possible dilution (5% - 1% according to the delivery rates). We advise not to use pure acid.

## Routine maintenance

To guarantee the correct operation and long lifetime of the Shaker Set's components, we recommend that due care be taken to ensure their correct use and maintenance.

For this purpose, we suggest inspecting the system at regular intervals to make sure that all the components are working properly.

### Weekly:

- Cleaning the filters on the fertilizer containers, cleaning the filter on the injection system.
- Checking that EC and pH are operating correctly.

### Monthly:

- Cleaning and calibration of the pH electrode and EC probe.

## Probe calibration and maintenance procedure

To ensure more accurate measurement performance, frequent calibration of pH electrode and EC probe is recommended. In particular, calibration of the pH instrument is recommended:

- a) whenever the electrode is changed
- b) after having measured strong chemical aggressive agents
- c) at least once a month

### • PH calibration

- 1) Unscrew the electrode from its place;



- 2) Open the pull-box to access the PH/EC transmitter



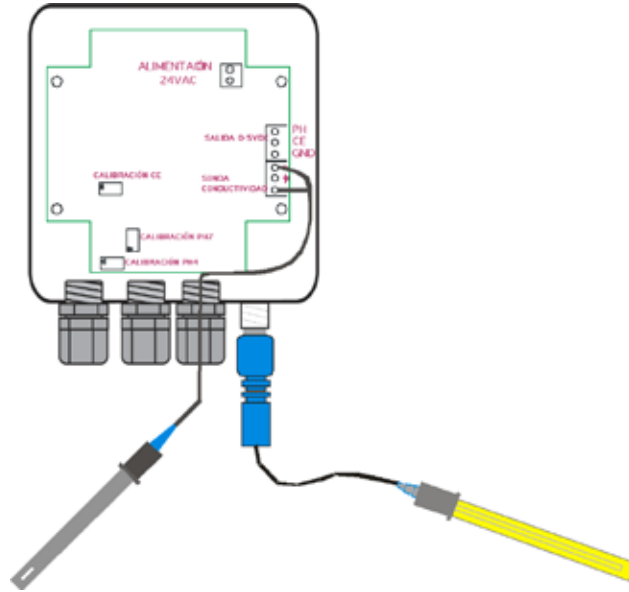
The pH reading displayed on the Commander EVO programmer needs a signal transmitter separate from the main unit.

If you want to connect the probes to the transmitter, you can find the instructions for the wiring and calibration in this manual.



## CONNECTIONS

If you want to connect the probes to the analog signal, please follow the instructions described in the chart.



**Note: All analog inputs must be connected out of the channel that may contain other electrical cables or anything that interferes with the signal. For the same reason the cables must be grounded.**

3) Clean the electrode with tap water.



4) Probe calibration:

The pH probe has a range going from 3 to 9, common values in applications in agriculture.



The connection is made by a bayonet connector.

This probe is protected with a solution of maintenance before installation. Never dry or you will damage it. Once installed, it must always remain immersed. This condition must be perpetuated forever, even when you do not irrigate. Suitable probe holders are inserted in the insertion point of the probe to ensure hydraulic and mechanical sealing without damaging the sensor.

This coupling (probe / probe holder) allows to facilitate the operations of installation and maintenance thereof.



### PH=7 solution

Remove the probe from the storage container and, after opening the bag containing the solution for the pH7 calibration, mix gently.

Read on the screen of Commander EVO the pH value while adjusting the pH 7 screw (see attached photo) with a suitable screwdriver until the value 7 is displayed on the Commander EVO screen.

Then, clean the probe with water to avoid distortion of the subsequent pH4 calibration.

**PH=4 solution**

After opening the bag containing the solution for the pH4 calibration, mix gently.

Read on the screen of Commander EVO the pH value while adjusting the pH 4 screw (see attached photo) with a suitable screwdriver until the value 4 is displayed on the Commander EVO screen.

Once it has been calibrated , insert the probe in its permanent location.

**Note: the wear of the probe is highlighted by its low reaction rate, a probe in good conditions will normally switch from value 7 to value 4 in 5 seconds on average, a no longer working probe cannot be calibrated.**

**• EC calibration**

- 1) Remove the EC probe from its place



- 2) Open the pull-box to access the PH/EC transmitter

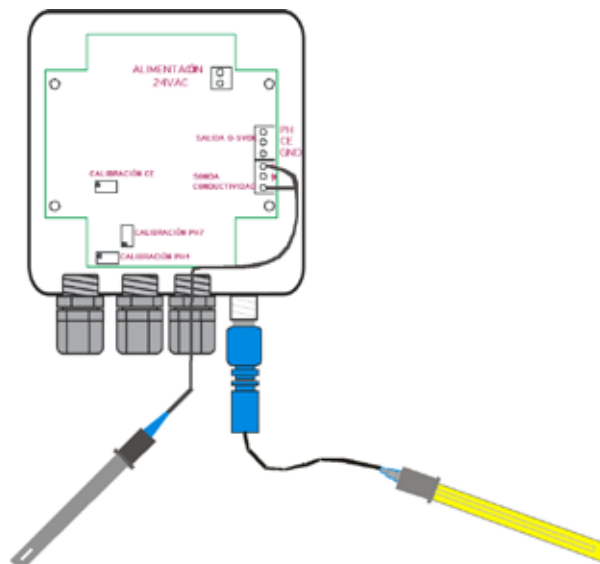


The reading of the EC is displayed in the Commander EVO programmer and needs a signal transmitter separate from the main unit.

If you want to connect the probes to the transmitter, please read the instructions for wiring and calibration provided in this manual.

**CONNECTIONS**

If you want to connect the probes to the analog signal, please follow the instructions described in the chart.



**Note: All analog inputs must be connected out of the channel that may contain other electrical cables or anything that interferes with the signal. For the same reason the cables must be grounded.**

- 3) Rinse the electrode;
  - 4) Probe calibration;
- The EC probe has a range between 0 and 10 miliSiemens (mS).

It has the same form of the pH sensor. It is advisable not to let it dry, this condition implies the precipitation of salts on the electrodes, which would distort the subsequent readings.



The connection is done by placing the cables according to the instructions  
Two cables

- Wire mesh → ELECTRODE**
- White cable → ELECTRODE**

These electrodes have no polarity, they can be exchanged without any problems.

**EC1400 solution**

The calibration of the EC probe is similar to the calibration of the pH probe, after having immersed it in a EC1400 solution, you need to act on the screw until you find the value 1.4 on the screen of Commander EVO. After that, place the dry probe in its normal location.

This should be done periodically to ensure proper regulation of the pH and EC factors. Based on frequency, experience, hours of daily use and water quality, provided that the probes are installed properly. A good option is to verify and record the values of irrigation water before calibration.

**• PH electrode maintenance**

When it is not in use, rinse the electrode with tap-water and put it back in the protective cap with a few drops of pH 7.01 solution.

**NEVER USE DISTILLED OR DEIONIZED WATER FOR pH ELECTRODE STORAGE.**



If the electrode is dry, leave the sensor to soak in pH 7.01 solution for at least an hour to reactivate it. To avoid porosity clogging, we recommend cleaning it at least once a month.

**• EC probe maintenance**

Remove the probe and rinse it with tap-water.





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