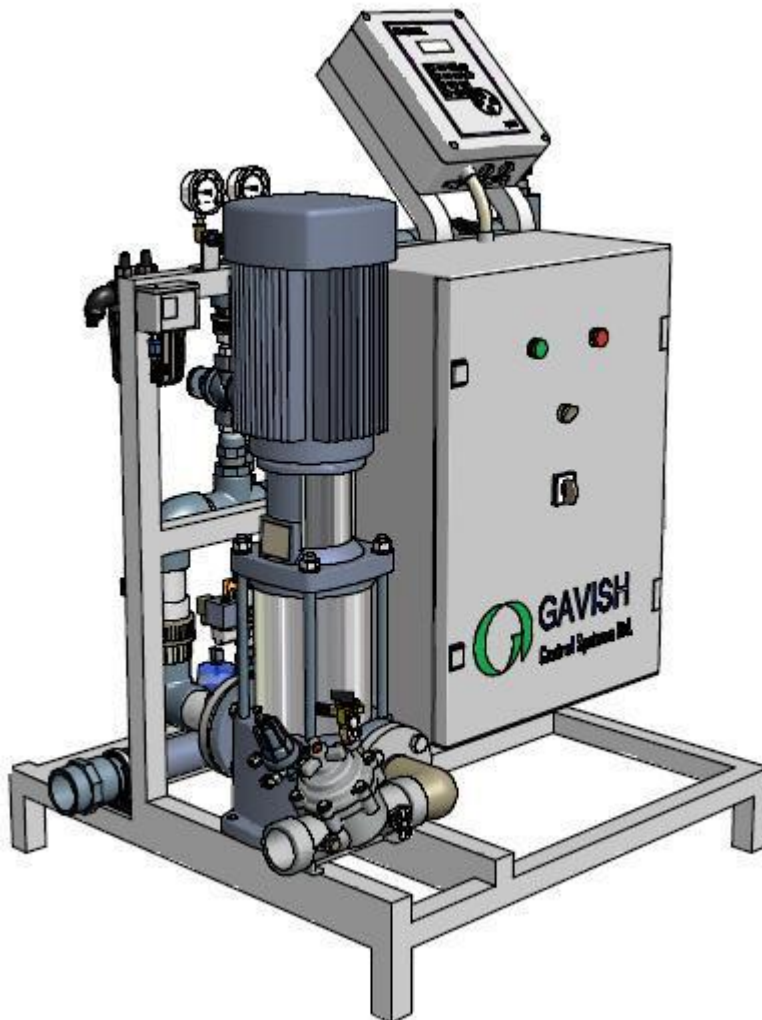


FertiLine

"Gavish" Fertigation machine

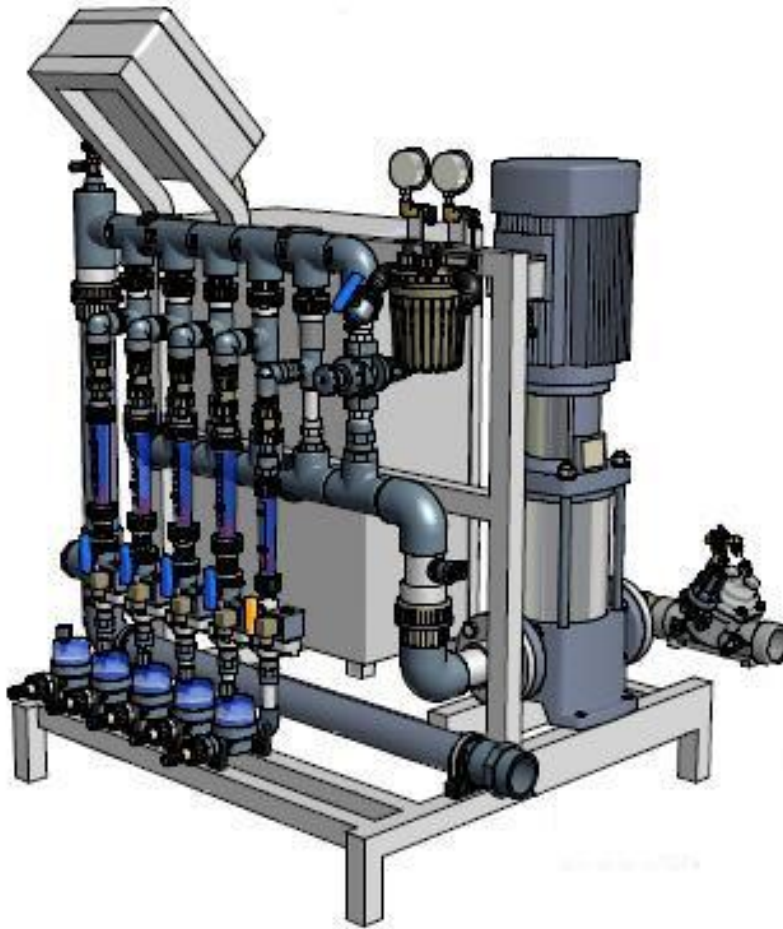
Type 4x1000, 5x1000, Vertical pump



User manual

Givat Brenner, 60948, Israel. Tel: +972-8-9443961 Fax: +972-8-9443357

E-mail: info@gavish.org.il Website: <http://www.gavish.org.il/>



Overview

FertiLine is the fertigation machine produced by "Gavish".

Its target is to perform irrigation and fertigation of greenhouses, open fields, and other irrigation applications.

The machine locates in parallel to the main water line.

It injects the nutrients and acid into the main line, using Venturi pumps, under control of EC and pH, and divide it al along the irrigation process.

FertiLine with 4x1000 (or 5x1000) L/h fertilizers may serve for water capacity of about 50 to 100 m³/h.

Warning

- Read the User manual carefully before installation.
- Under no circumstances will “Gavish” be liable or responsible for any consequential damage that may arise as a result of installation or use of this equipment.
- Due to the great variety of possible applications for this equipment, the user must assess the suitability of this product for specific applications.
- Make sure to have safety procedures in place to stop any connected equipment in a safe manner if the machine should malfunction or become damaged for any reason.
- Do not replace electrical parts or try to repair this product in any way.
- Only qualified service personnel should open the FertiLine housing or carry out repairs.
- The manufacture is not responsible for problems resulting from improper or irresponsible use of this device.
- Please dispose of this product in accordance with local and national standards and regulations.

Safety Guidelines

- Read the User manual carefully before installation.
- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage.
- Disconnect the power supply before open electric equipment.
- Shut off the power supply before making any maintenance on the buster pump.
- Do not attempt to use the FertiLine with voltage exceeding permissible levels.
- Always exercise proper caution when working with electrical and mechanical equipment.
- Make sure the FertiLine is connected to a valid grounding terminal, of less than 4 Ω .
- Follow all local regulations for storage and handling of chemicals.
- Acid solutions:
The Acid solution concentration in the Acid solution tank should not be concentrated above 12% by volume.
Higher concentration may damage the equipment, and is out of warranty.
- Use rubber gloves, protecting glasses and gas mask before making maintenance to the fert pipes and fert pumps.
- Make sure the valves on the fert tanks are closed before making maintenance on the fert pipes and fert pumps.
- Make sure there is no pressure at the piping – before making maintenance on the water pipes.

FertiLine system contains:

- Four (or five) venturi pump fertilizers, 1000 L/h, for nutrients and acid
Each fertilizer contains solenoid valve, visual flow meter for 1000 L/h, fert counter, ball valve to adjust the fert flow, and flexible fert pipe
- Buster pump for the venturi vacuum. Its capacity is calculated to create the required vacuum level and to push it against the main pipe water pressure.
- Sampling cell with EC and pH electrodes
- EC/pH controller, translating the electrodes readings for the PLC, and enables an easy calibration method.
- FertiLine PLC controller, programmed with the relevant irrigation software.
- Electric panel, includes the pump protection and relays, and terminal blocks for the inputs/outputs wiring.

Plumbing installation instructions:

1. FertiLine machine should be connected in parallel to the main water line.

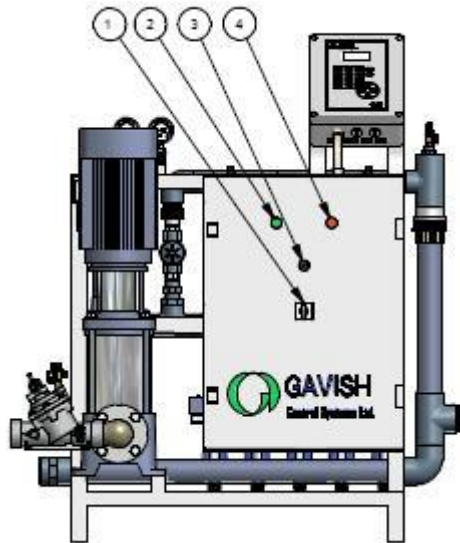
Connect the water from the down-stream into the FertiLine water inlet.

Connect the water from the up-stream into the FertiLine water outlet.

Connecting this way will force part of the water to create more than one cycle, and mixes the fertilizers well in the water.

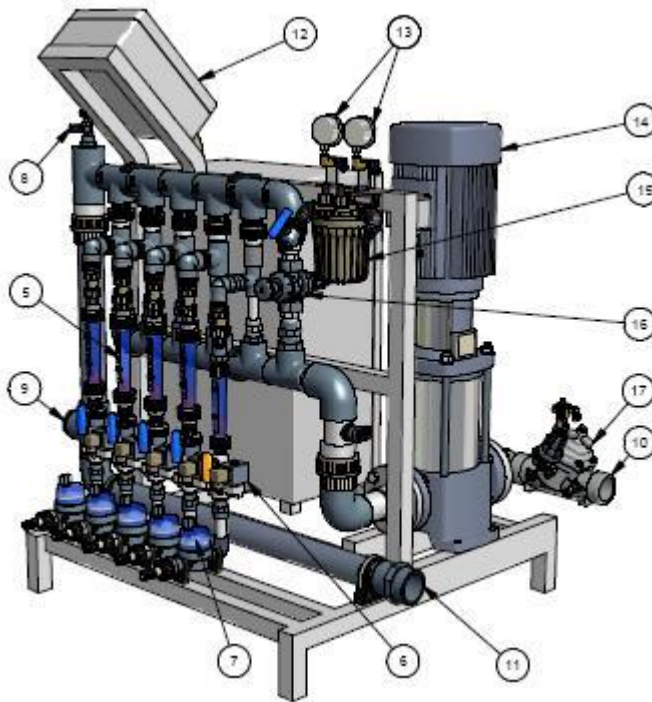
2. Connect the EC/pH feedback pipe to the down-stream main line, about three meters from the FertiLine, better after a filter or another mixing element.

FertiLine components



Legend:

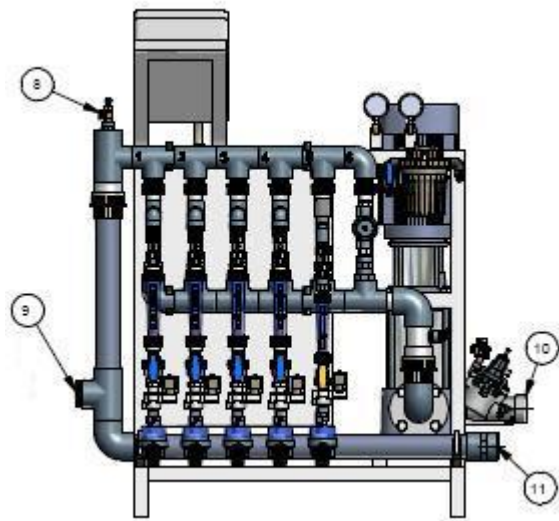
1. Main power switch
2. Buster pump working lamp
3. Buster pump switch: Auto / Manual. Set it to Auto for normal operation.
4. Alarm led – turned ON in case the Buster pump is energized but its protections are OFF.



Legend:

- 5. Visual flow meter (1000 L/h)
- 6. Solenoid valve
- 7. Fert counter
- 8. Air eject ball valve
- 9. Another option for water inlet
- 10. Water outlet
- 11. Water inlet
- 12. Main PLC
- 13. Two pressure displays
- 14. Buster pump
- 15. Sampling cell
- 16. Pressure compensation valve
- 17. Pressure navigator

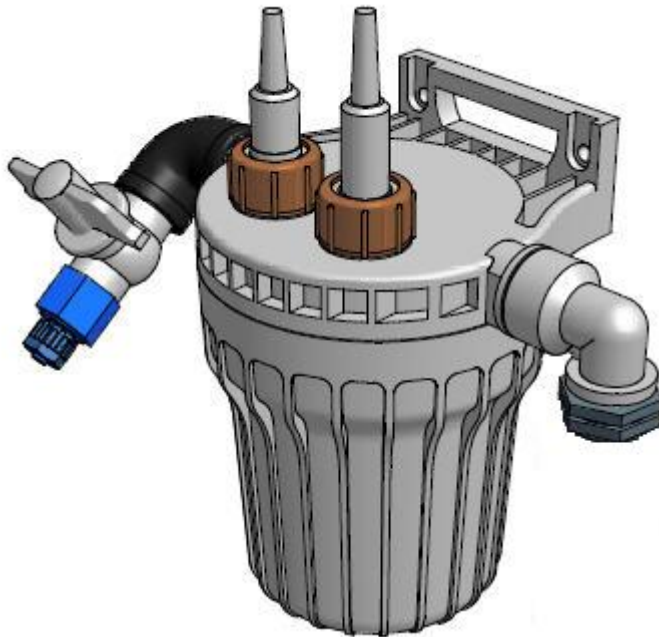
Another back view:



Legend:

- 8. Air eject ball valve
- 9. Another option for water inlet
- 10. Water outlet
- 11. Water inlet

Sampling cell – electrodes holder



The sampling cell uses for collect and analyze the feedback water.

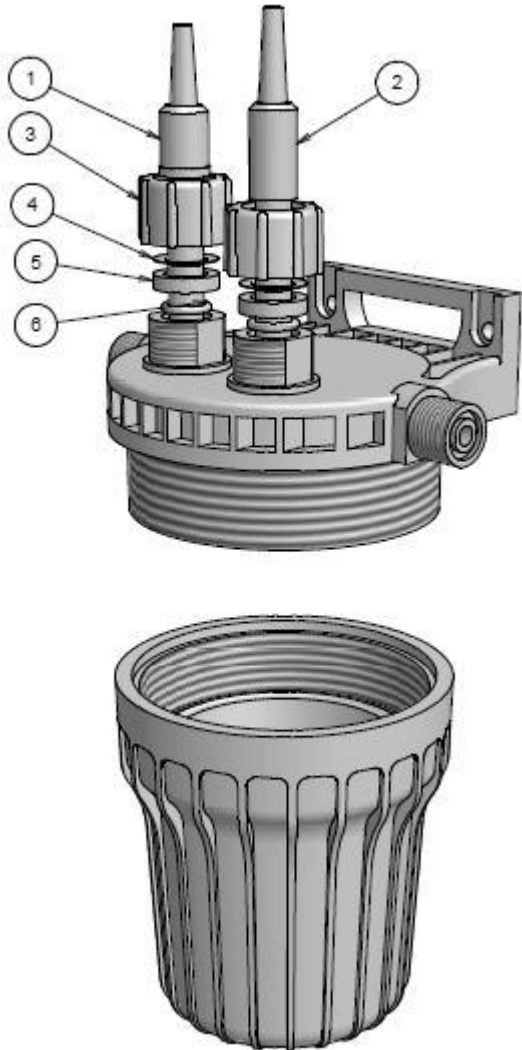
The water flows from the down-stream of the main line, after the FertiLine.

The feedback water enters through the ball valve (at left of the picture), and exit towards the vacuum buster pump or a venturi pump.

The two electrodes (EC and pH) reading the water content, sends it to the EC/pH controller, and from it to the irrigation PLC.

The ball valve should be fully opened during normal working.

It is closed only for disconnect the Sampling cell from the feedback water, for calibration purpose.



Sampling cell components are:

1. EC electrode
2. pH electrode
3. Nut
4. Washer
5. Metal washer
6. "O" ring

Insert the electrodes up to its end, and lock it well using the nut.

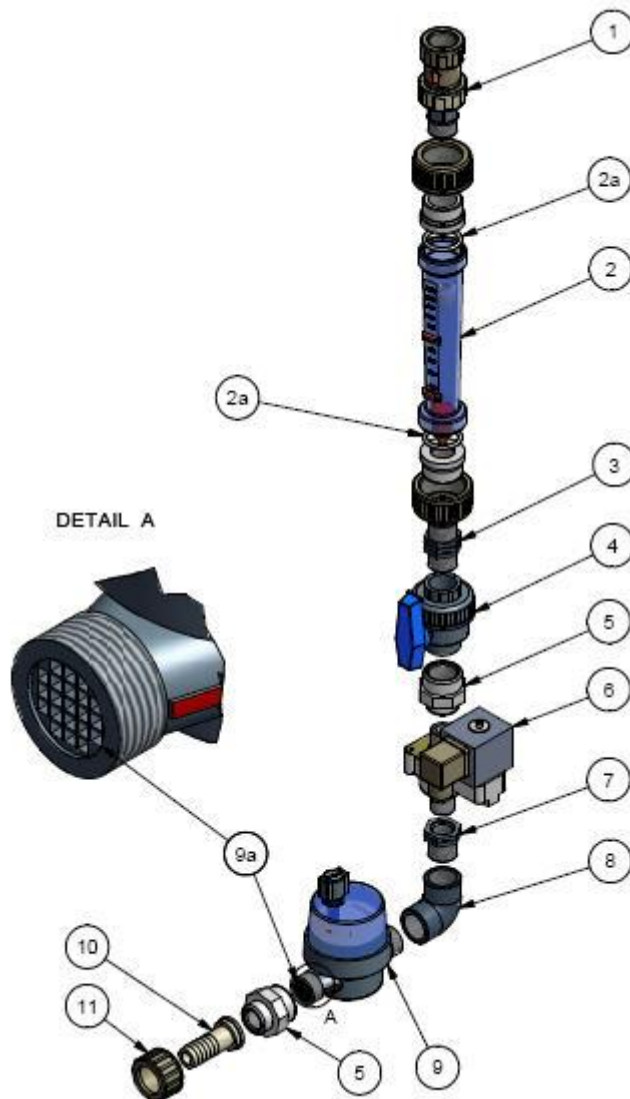
The metal washer enters (a little) into the electrode body, prevents it from jump-out in case of high pressure in the Sampling cell.

Sampling cell - flow nuzzle



Flow nuzzle uses to achieve a constant flow of the feedback water.

Fertilize pump components:



Legend:

1. Non return valve
2. Visual flow meter, transparent, use orange float to displays the flow
- 2.a: "O" rings
3. Nipple
4. Ball valve, uses to adjust the fert flow
5. Records
6. Solenoid valve. Uses to enable/disable the fert flow
7. Fitting
8. Elbow



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9. Fert counter with electric output each 115 CC

9.a: Build-in net, uses as a filter, preventing solids enter the counter

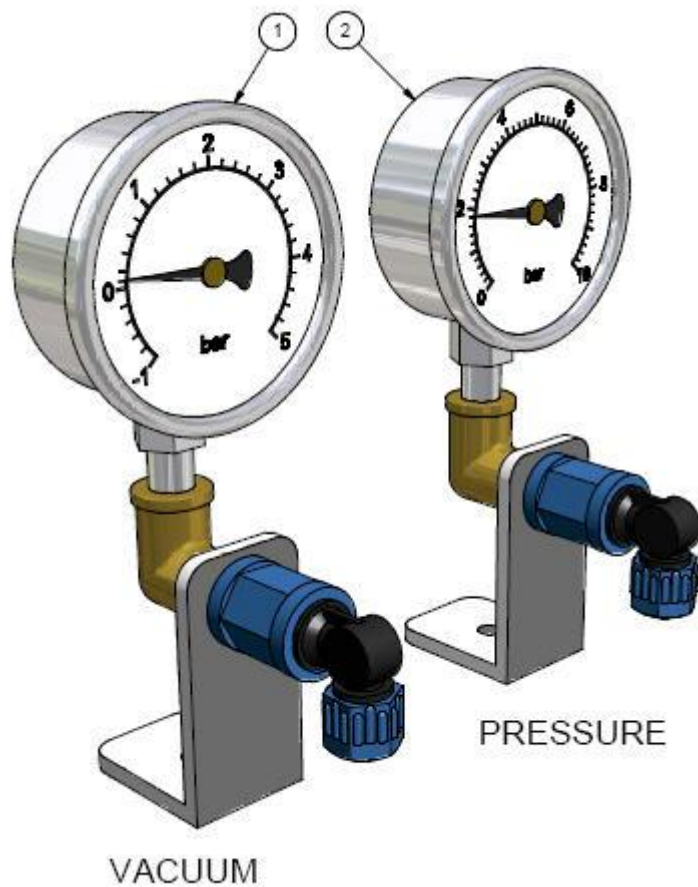
10. Teeth connector. Uses to connect the flexible fert pipe.

11. Teeth nut. Uses for tighten the flexible pipe to the teeth connector.

Note: The fert counter contains numeric counter on its cover.

Because the pulsed-flow – this numeric counting is not accurate and has to be ignored!

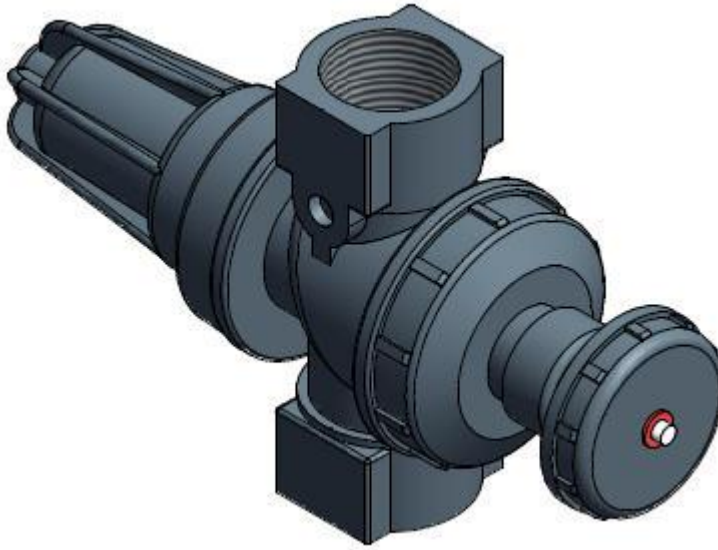
Pressure display



The pressure displays uses to inform us about the pressures of the process.

- The Vacuum display shows the pressure level at the buster pump entrance.
This pressure should be maintained between -0.5 to +0.5 bar.
This pressure may be adjusted using two elements:
 1. The " Pressure compensation valve" (item 16) (see picture below)
 2. The "Pressure navigator" (item 17)
- The Pressure display shows the pressure of the main water line.
it should be according to the irrigation system specifications

Pressure compensation valve

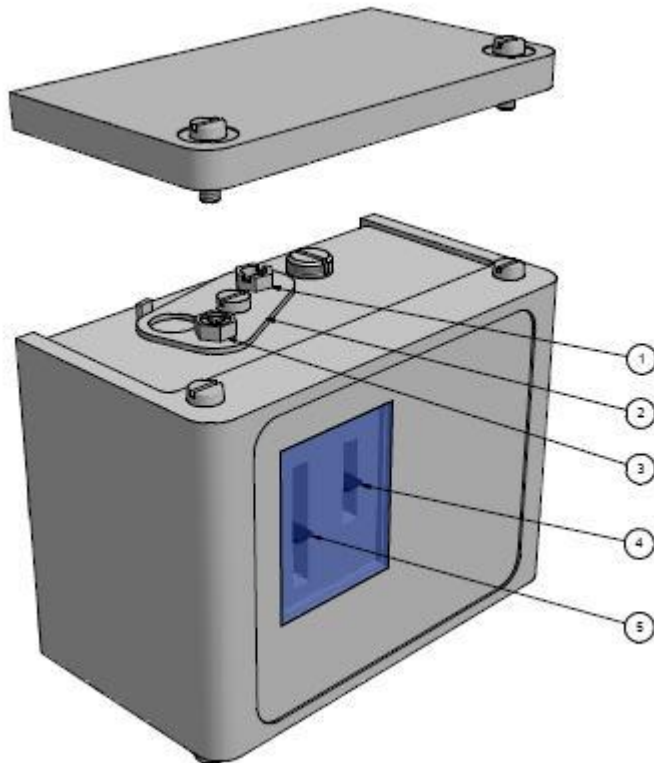


The "Pressure compensation valve" uses to compensate on the lack of solution flow into the buster pump.

It is connected in parallel to the other fert pumps.

This "lack" is caused by the changes of the total volume of the water and fertilizers during the fertigation process.

Low pressure switch



The pressure switch uses to protect the buster pump against working without water.

It measures the mail line water pressure, and disconnects the pump in case of low pressure.

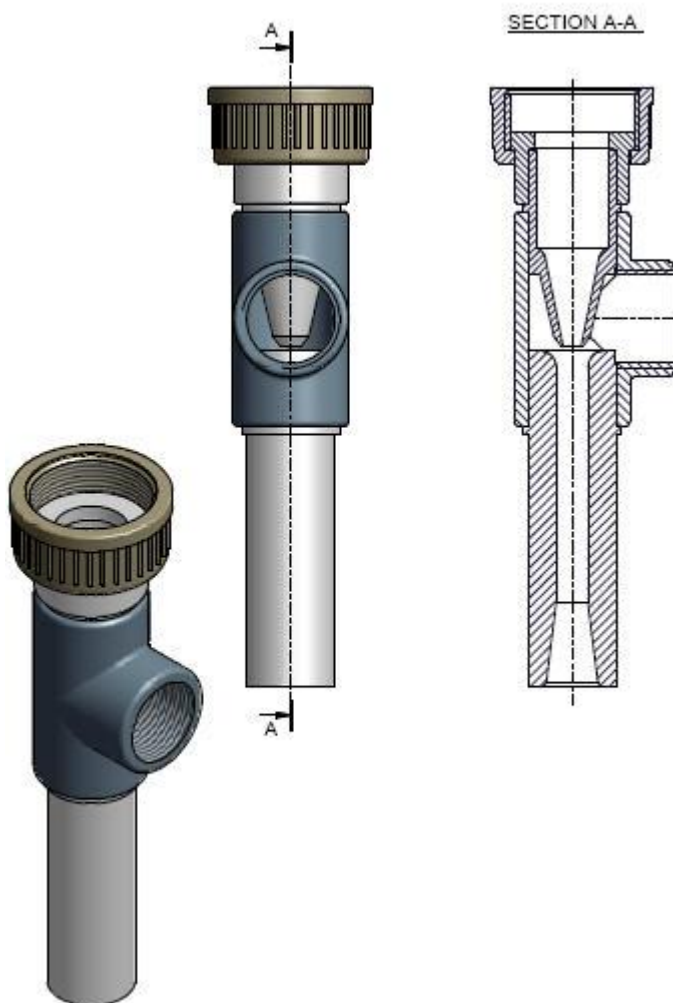
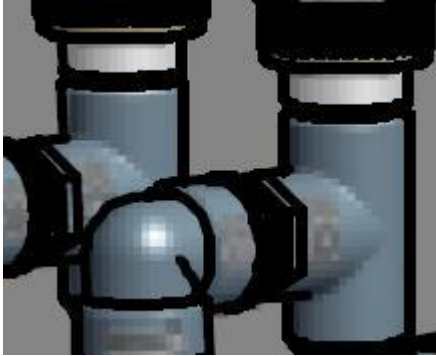
Legend:

1. Differential setting screw
2. Protecting plate
3. Pressure setting screw
4. Differential setting display
5. Pressure setting display

Pressure switch setting:

1. Remove the pressure switch cover and the protecting plate.
2. Set the pressure setting screw to 2 bars
3. Set the differential screw to 0.3 bar
4. Secure the protecting plate and the pressure switch cover.

Venturi pump



The picture displays the Venturi pump.

Water at the line pressure (high) flows from the upper inlet towards the vacuum pressure at the lower outlet.

The water stream becomes narrow and faster at the nozzle, and expands at the cone inlet. This phenomena creates vacuum at the cross axle.



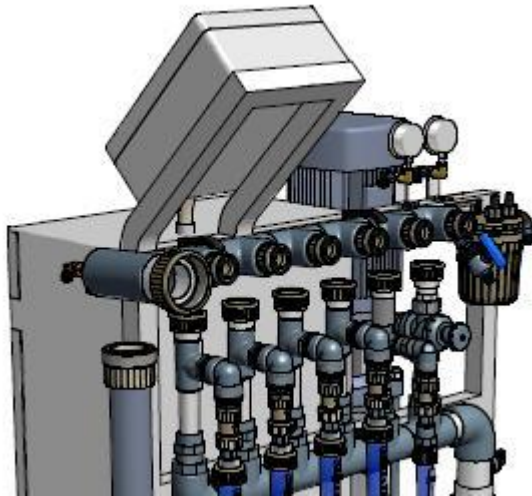
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It is the Venturi effect.

This vacuum uses for sucking the fertilizer.

Opening the Venturi manifold for cleaning



In case the fert flow seems to be too low:

One of the possibilities is that there some dirt (like plastic flakes, Teflon strips, etc.) stuck in the Venturi pump inlet.

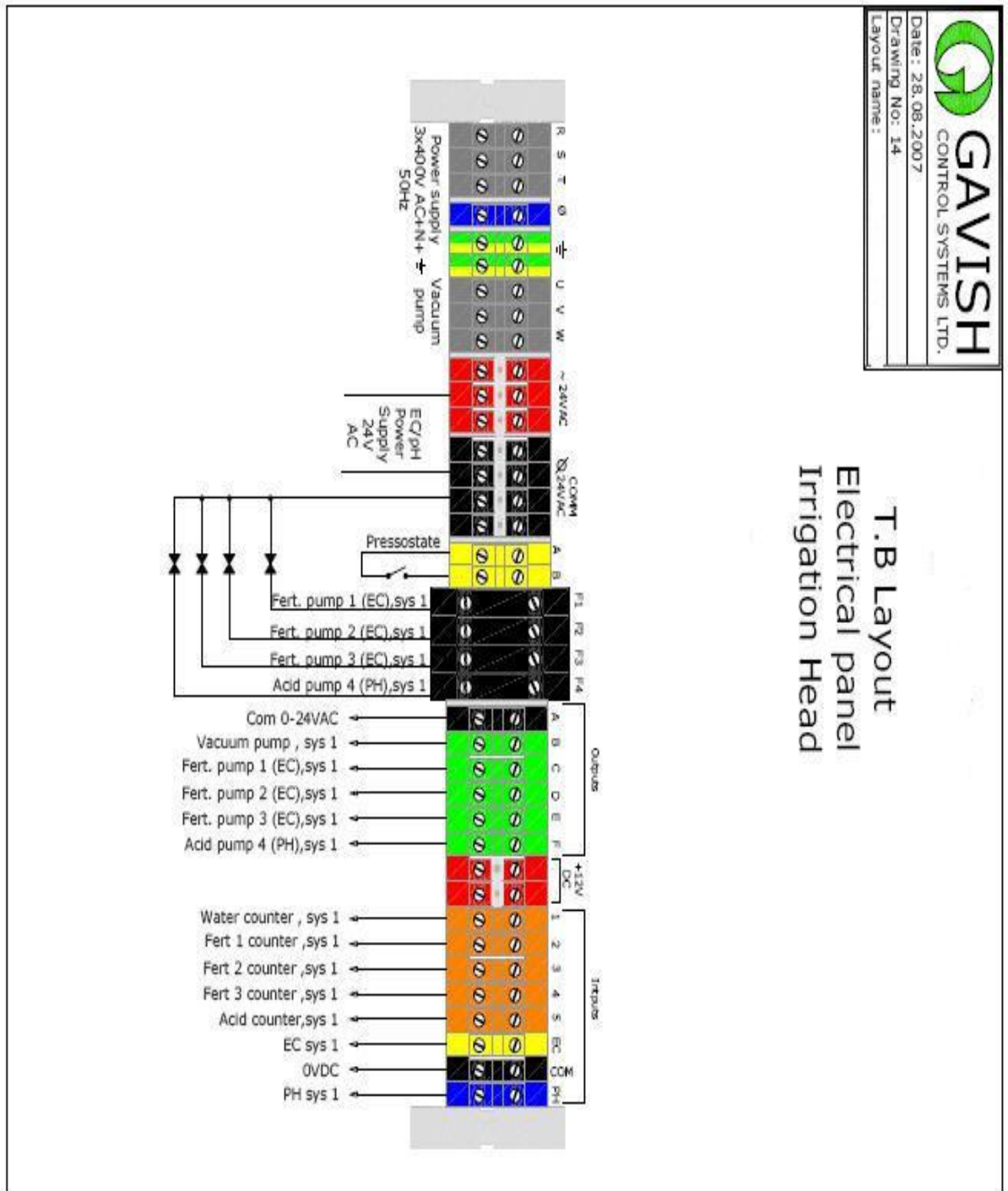
In order to check and clean it:

Disassemble the manifold records, as displayed in the above pictures, and turn the upper manifold by 90°.

Now you may watch and clean the Venturi inlet.

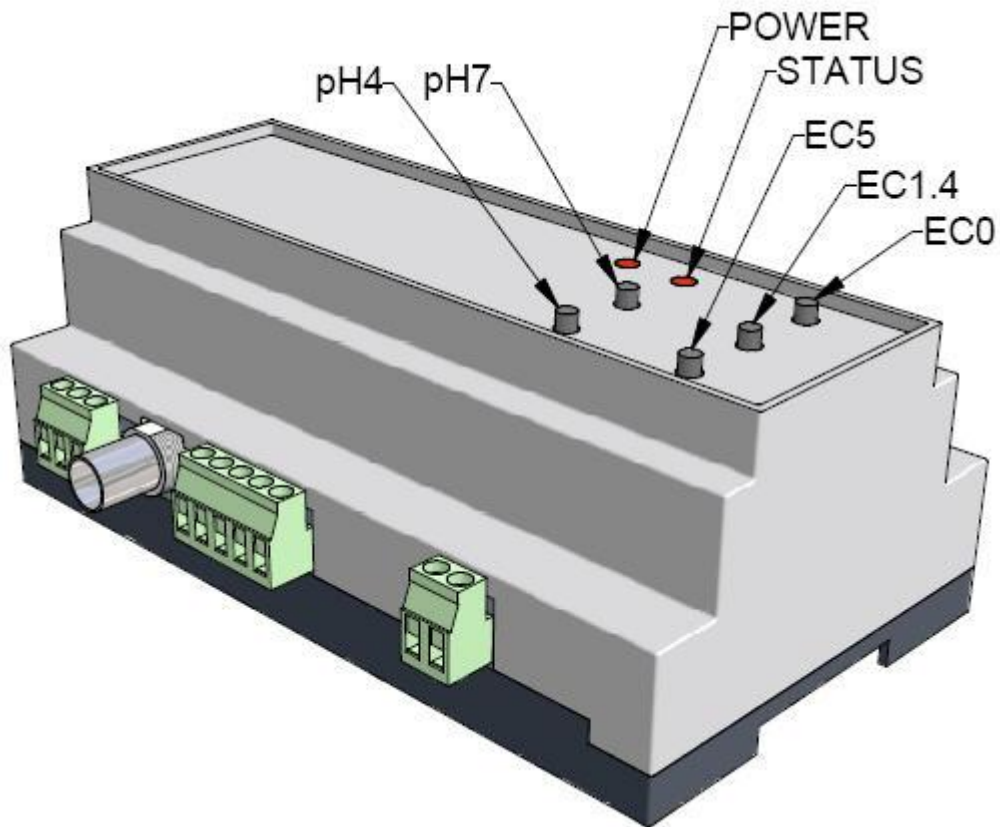


Terminal blocks at electric panel

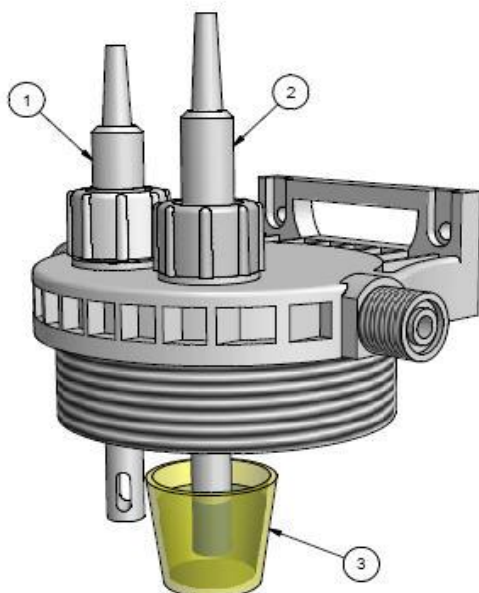


EC/pH calibration

The EC/pH controller:



EC and pH electrode has to be calibrated each 3 months.
Please follow the EC-pH controller calibration procedure:



- a. Make sure the Power led is ON.
- b. Open the lower cup of the Sampling cell. Locate a small cup (3) under the calibrated electrode, as displayed in the above scheme.

1. EC zero calibration:

- a. Put the electrode in the air, press and hold the EC 0 button.
- b. After few seconds - the Status led turns to constant ON.
- c. Release the button.
- d. Wait until the Status led turns to OFF (few seconds). Now it is calibrated.
- e. In case of failure - the Status led start blinks for 20 seconds.

2. EC 1.4 calibration

Put the electrode in 1.413 buffer, press and hold the EC 1.4 button.

All other steps are the same as steps b-e above.

3. Setting the EC/ph controller for calibration at 1.4 and 5:

Press and hold the buttons of EC1.4 and EC5 simultaneously for 20 seconds.

Now you may calibrate it with buffers of 1.4 and 5.

In order to resume to calibration at 0 and 1.4:

Press and hold the buttons of EC 0 and EC1.4 simultaneously for 20 seconds.

Now you may calibrate it with buffer of 1.4 and in the air (0).

4. pH 7 calibration

Put the electrode in 7.0 buffer, press and hold the pH 7 button.

All other steps are the same as steps b-e above.

5. pH 4 calibration

Put the electrode in 4.0 buffer, press and hold the pH 4 button.

All other steps are the same as steps b-e above.

6. EC electrode maintenance

Once at 3 months put the end of the EC electrode into 5% HCL solution for 5 minutes.

Do not touch the electrode surface with metal or sharp tools. Just wipe it with wet duster.

7. pH electrode maintenance

The pH electrode end is made out of glass – do not break or scratch it.

Once at 3 months put the end of the pH electrode into 5% HCL solution for 5 minutes.

The predicted life of pH electrode is 1.5 to 2 years.

Typical irrigation room:

