Aqua-Hort® 12 amp Manual

Electrolytical Micro Element Production and Electro Magnetic Treatment of Plant Production Water.

Production of free ions (Fe, Cu, Zn, Al). Positive side effect on Fungal and Bacterial Diseases in Plant Production. Gives better plant growth.

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Software Development: Lennart Berg, Blogic
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Aqua-Hort is internationally Patented No. 10014176.5-23

3rd. Generation Controls. Version 3.07

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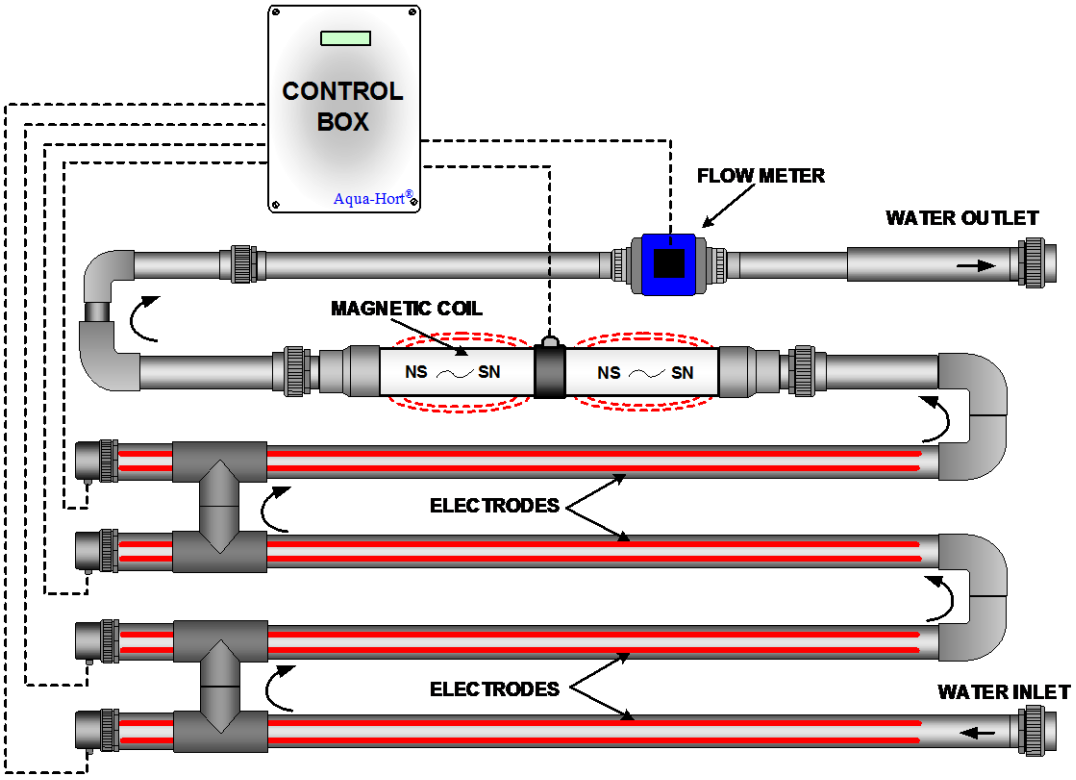
The standard Aqua-Hort 12 amp pipe model is shown in the picture below:

From below: two electrode pipes, then the electro magnet. The top pipe is the flow meter pipe. The control box is in front. Water in in the bottom pipe, and out of the top pipe.

The Aqua-Hort is shown in a function diagramme below:



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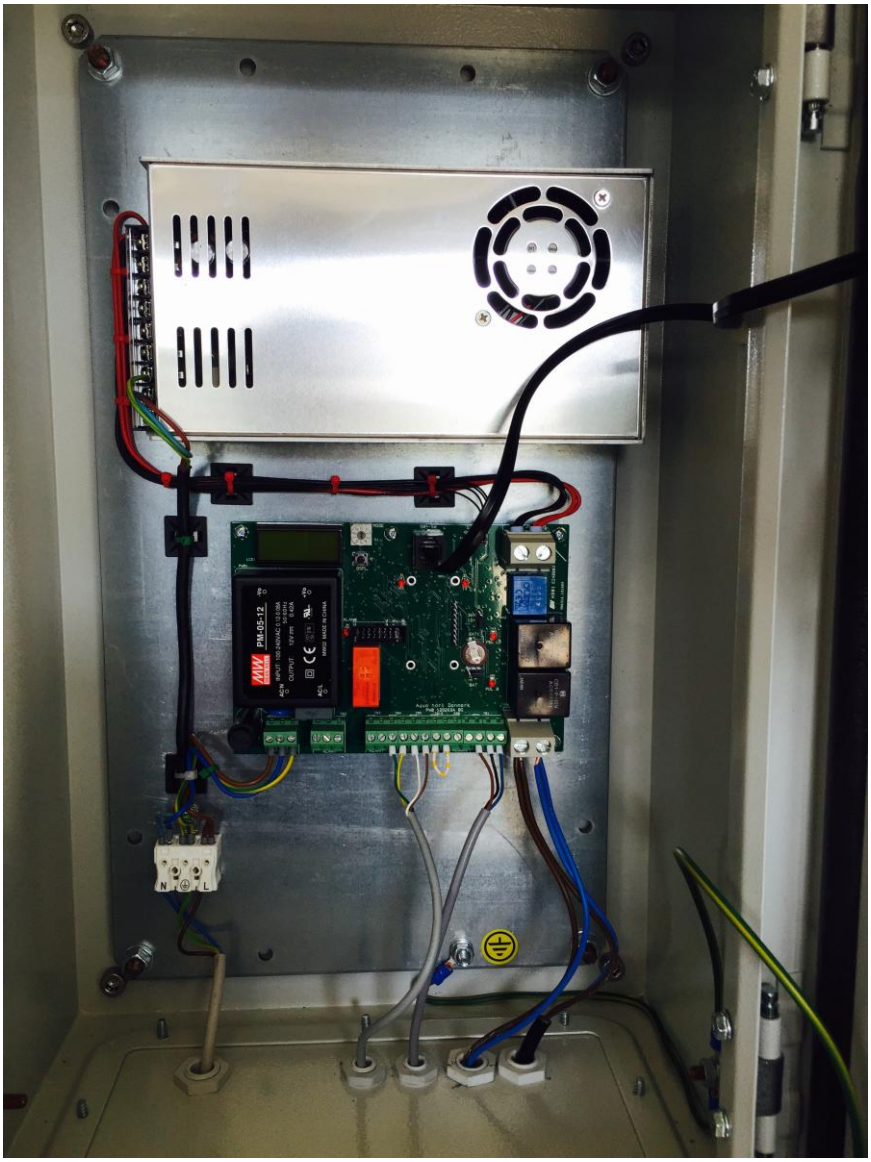
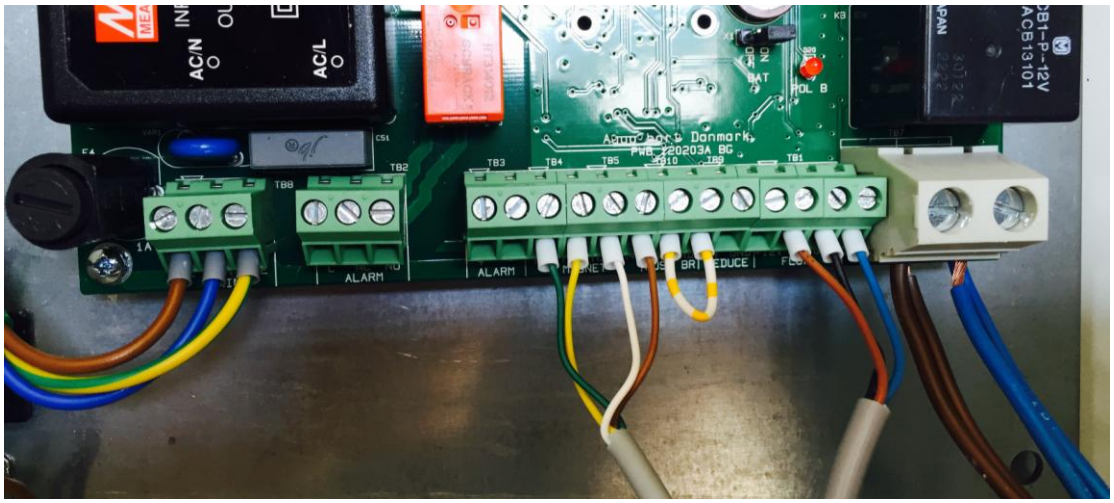
The Aqua-Hort 12 amp Controls



In the control box is the transformer placed above. Maximum output is 12 amp with 24 Volt DC. The maximum effect is therefore 288 Watt.
The main print is placed below. It is a double print with the critical parts on the backside. Ampere sensor and polarity switch is integrated in the board. Top left on the print is mounted a service display showing output ampere and voltage. The input power is 1 x 230 VAC 50/60 Hz.
The lower part is used for the connection pins. Their function is explained on the next page.

Connection Pins



The connection pins for the Aqua-Hort 12 amp Controls are shown above:

From the left the connection pins functions as explained below:
1-3: L: Phase input, N: Nil, input, Yellow/green, ground.
***4-6*: Alarm, potential (non-voltage) free common, NC, NO.**
***7-8*: Alarm, 24 VDC.**
***9-12:* Magnet: 9: Green, 10: Yellow, 11: White, 12: Brown.**
***13-14:* Fuse break alarm**
***15*-16: Dual Flow contact, non-voltage**
***17*-19: Flow Meter: 17: Brown 12 Volt, 18: Black signal and 19: Blue common**
***20-21*: Power outlet: 20: plus, 21 minus.**

As polarity switching takes place every 20 minutes, plus and minus switch in the same order.

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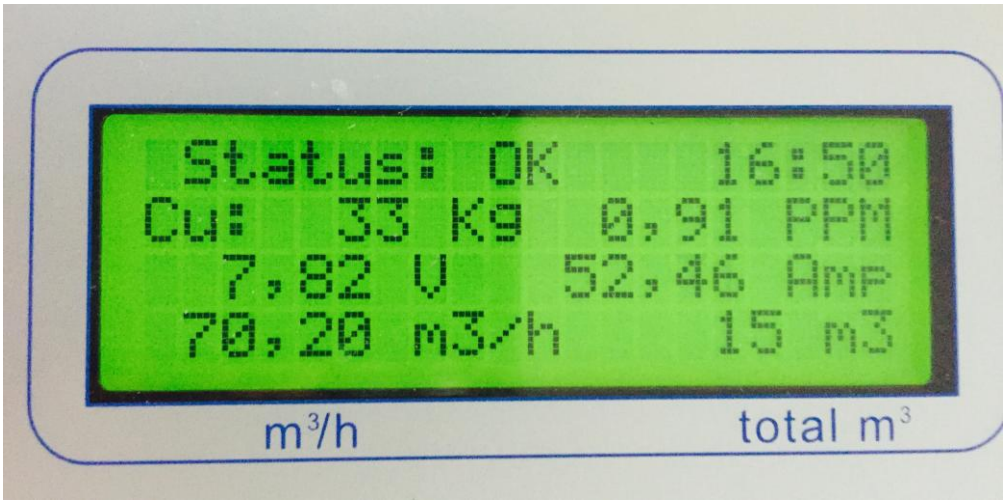
Front Display

The front display is shown in the picture below:



The top line of the display is showing to the left the Status of the system.
To the right the actual time. The time setting is made in menu point no. 8. The battery is charged by the system.

The second line shows to the left the metal bank equal to the amount of electrode metal left in the system. When new electrode metal is inserted the metal bank must be updated. This done in menu point no. 1.
To the right in the second line is the actual PPM of the system. It can be changed by pressing the SET botton, and then with the up and down arrow adjust the value.

In the third line is shown to the left the actual voltage DC of the system. Value shown is between zero and 24 for 24 Volt systems, and between zero and 48 for 48 Volt systems. By low loads are the controls running on-off. The voltage will then be zero at times.
To the right is shown the amperage yielded. The amperes must always be equal to the flow m3/h x ppm x 0,8

In the fourth line is to the left shown the actual flow in cubic meter per hour. Remember to put the k-factor in menu point no. 2 correctly for the specific flow meter used.
To the right is shown the total cubic meter recorded until now. The figure can be reset by pressing Set and Clear Alarm simultaneously for some time.

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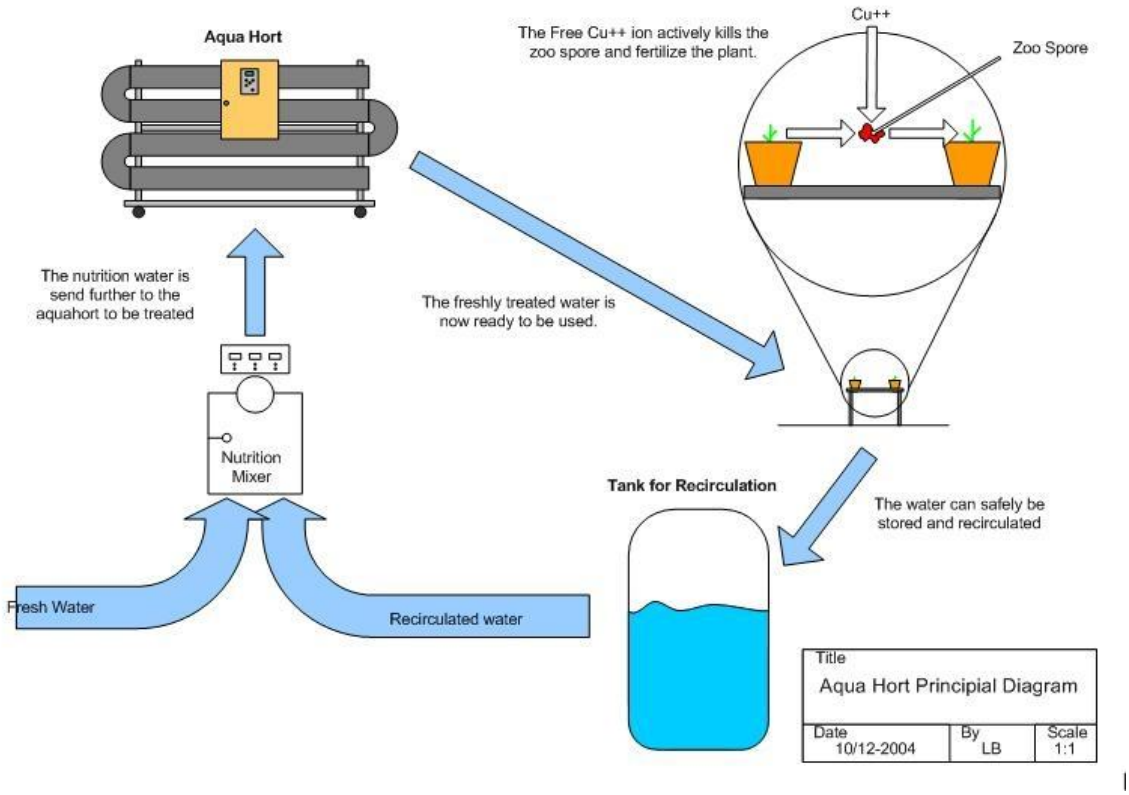
Installation

The Aqua-Hort is normally placed after the fertilizer mixer. The purpose being twofold: One to have the conductivity as high as possible, allowing the controls to work less for the same yield. Secondly to have the high charged Aqua-Hort ions to be as fresh as possible when entering the plant production area. This ensures that the positively charged ions have full force when they "attack" the negatively charged spores in the nutrition water and the root zone.



In cases where a placement after the fertilizer mixer is not possible, the Aqua-Hort is placed in the best suitable position, for example after a day tank with nutrition water, or in a inlet reservoir for the nursery. Nurseries with many fertilizer mixers might also be "forced" to choose this solution.

If the installation is in inlet reservoirs the conductivity will often be low, which requires that the Aqua-Hort is adjusted with bigger electrode surfaces.

In case Aqua-Hort is installed in an outdoor reservoir for simultaneous algae control. The solution is mostly to place an Aqua-Hort boat model in the reservoir.

Aqua-Hort menu

The menu mode is arrived at by pressing the Arrow up and down simultaneously for some time.
The Aqua-Hort Menu has the following items:

1. ***Set Copper amount:*** **Here is the amount of metal installed, mostly copper, recorded. The controls will keep control of the balance. In this way it can be observed when metal change is needed.**
2. ***Set water Flow Data:*** **Here is the k-Factor (puls per liter) of the Flow meter recorded.**
3. ***Set Virtual Flow Data:*** **Here is the setting of the virtual flow facility. Either On or Off. By On the simulated Pulse per Liter must also be set. Remember to swith the Virtual Flow Meter off by use of a regular flow meter. When using the virtual flow meter must a connection be laid between the two right pins of the flow input.**
4. ***Measurement Unit*****: Here is the unit chosen in which the data should be shown. Metric or US Imperial Gallons.**
5. ***External PPM Adjustment*****: (Dual level) or Flow Watch. This is a facility to adjust the dosing in a particular watering situation. Either higher or lower. An alternative use is to make it act as an flow watch within a minimum and maximum flow setting. A potential free contact must be laid to make it operate. Normally from the irrigation computer.**
6. ***Set Hardware Type:*** **To tell the controls about the Max. Capacity in amps. Standard 200 amp.**
7. ***Auto Start/Stop*****: By this facility a programmed start and stop can be employed. When the Auto Start is On the Aqua-Hort will only operate within the hours programmed.**
8. ***Set Time*****: This is a feature to set the time.**

Flow Meter (burkert):

The connecting slots are used according to the following plan: (See also the wiring diagram)

1: + to 1 on Hall generator flow sensor. Brown colour
2: in to 2 on Hall generator flow sensor. Black colour
3: GND to 3 on Hall generator flow sensor. Blue Colour
Earthing on Hall generator is not used.

DN 15:	20	mm pipe,	min flow	0,5 m3/h	Max flow	6 m3/h	k-Factor	107,6
DN 20:	25	mm pipe,	min flow	0,8 m3/h	Max flow	10 m3/h	k-Factor	75,3
DN 25:	32	mm pipe,	min flow	1,3 m3/h	Max flow	18 m3/h	k-Factor	52,9
DN 32:	40	mm pipe,	min flow	1,9 m3/h	Max flow	25 m3/h	k-Factor	28,5
DN 40:	50	mm pipe,	min flow	3,0 m3/h	Max flow	40 m3/h	k-Factor	17,3
DN 50:	63	mm pipe,	min flow	5,0 m3/h	Max flow	70 m3/h	k-Factor	10,2
DN 65:	75	mm pipe,	min flow	7,0 m3/h	Max flow	100 m3/h	k-Factor	11,2
DN 80:	90	mm pipe,	min flow	11 m3/h	Max flow	150 m3/h	k-Factor	7,4
DN 100:	110	mm pipe,	min flow	18 m3/h	Max flow	210 m3/h	k-Factor	4,8
DN 125:	140	mm pipe,	min flow	30 m3/h	Max flow	400 m3/h	k-Factor	3,45
DN 150:	160	mm pipe,	min flow	48 m3/h	Max flow	600 m3/h	k-Factor	2,55

When pressing the up and down arrows simultaneously on the front panel, the menu for setting the k-Factor appears. In rare cases where no flow meter is used, the flow simulator is activated. Maximum pulse per second Hz 100.

Magnet:

Cable pairs with low resistance forms a pair.

1: pair 1 coil 1 green to 1 on magnet
2: pair 1 coil 1 yellow to 2 on magnet
3: pair 2 coil 2 white to 3 on magnet
4: pair 2 coil 2 brown to 4 on magnet

To prevent condensation on the electronic parts it is recommended that the power remains on always.
By overload the thermo shut-off switches will be activated. Deactivate by cutting the power supply for a short period.

Maintenance

Checking the Aqua-Hort Controls.

1) Disconnect the electrode cables from the polarity switch.
2) Put water on so the unit shows flow.
3) Set the ppm to zero. Measure the DC Voltage on the electrode outlets. It must be zero VDC.
4) Set the ppm to one. Measure the DC Voltage on the electrode outlets. It must be 24 VDC.

When the controls has been checked, and problems still occur it must the electrodes or the connections to them which are faulthy. By **measuring the resistance on each electrode** pair, the weak point can be found. It might be broken cables or the electrodes worn out or short circuited.

Inspect the electrodes

The electrodes should be inspected every six months. If layers has accumulated on the electrodes, they must be cleaned. When worn out, replacement must take place.

Errors displayed:

1) **Current too low:** This means the demands are higher than what the unit can yield. Either too high volume or ppm setting, or the conductivity is too low for the circumstances. Solution: bigger unit eventually increase the EC.
2) **Current too high:** This means a short circuit in the electrodes. Must be repaired.
3) **Komm. Error to Dos**: The signal to the display print is not transmitted. Try to take the cable out a couple of times.

Test for free Copper

The Aqua-Hort system will release exactly the amount of free charged copper which the ppm setting and the flow prescribes (m^3/h x ppm x 0,8 = amp).
Still interference might change the amount arriving at the plant site. Therefore it is recommended to test from time to time that the right levels are achieved.
With the system is delivered a set of the Aquaquant test system from the Hanna company, 0,1 – 5,0 ppm.

Under "normal" circumstances with a good water source giving clean water with a balanced mineral mixture and some bicarbonate there are seldom problems. The setting on the Aqua-Hort will be the same as what can be measured at the plant site.
Interference can often be found under the following circumstances:

a) Use of "aggressive" water like reverse osmosis water or water from rock mountains very low conductivity.
b) Water from riwer sources with many organic particles.
c) Use of "cheap" iron chelates combined with aggressive water.
d) Use of water with high pH. Above 72.

If the interference is less than 1 ppm is the cure often compensatory dosing. If higher some measure must be undertaken. Addition of bicarbonate (50 ppm) is normally a good cure. It also adds pH buffer to the water.
Another measure is to change the iron chelate to a more stable type like EDDHA chelates. If the iron dosing is very high, it might help to lower that.
If rainwater is the source it is a good measure to add 10-20% well water to the rain water. A practice which is normally followed in Denmark – with or without Aqua-Hort.

Nutrition water with high pH should normally be acid treated to bring the pH down.

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Practical Hints:

Check the ampere output

The ampere reading in the upper right corner of the display must always correspond to the formula: Flow x ppm x 0,8 = ampere. The flow in cubic meter per hour.

Flow Meter

In the flow meter house there is a small wheel rotating. It is situated in the side of the wall.
If the unit shows no flow during watering it is most likely because the small wheel is blocked by some dirt particle. Unscrew the flow meter housing, and clean away the dirt.

Daily Use

The display has in the working mode four informations: **Upper Left corner**: The ppm copper setting. **Upper right corner**: The ampere reading. **Lower left corner**: The flow rate m^3/h. **Lower right corner**: The total flow achieved m^3.

The following check points are used for running the Aqua-Hort:

1) **Set the desired Cu level by pressing the Set button. Then choose the level by means of the arrows ⇑ or ⇓ and confirm with the OK button.**

2) **Check the ampere output by the formula: (m^3/h) * ppm Cu * 0,8 = ampere. Example: 10 m^3/h * 1,2 ppm Cu * 0,8 = 9,6 ampere**

3) **Set The copper consumption is the total water flow multiplied by the average ppm setting. Example: 12000 m^3 * 1,2 ppm = 14,4 kg copper. The copper reservoir in a Aqua-Hort standard unit is 33 kg copper. Order new copper rods from the Aqua-Hort agent for replacement.**

4) **There are three error displays which might occur. 1: EL. X CURR. TOO LOW. This appears if the demands are higher than the capacity. The voltage will reach the max. of 24 volt. The common cause is too low EC in the water. A fault in the electronics might also be the cause. 2: EL. X CURR. TOO HIGH. A fault in the electronics is likely. 3: KOMM. ERROR TO DOS. Communication between the main board and the display fails. Try to disconnect the connection cable for a short while.**

Dosing:

The dosing applied depends on the conditions at the installation site. The dosing level is set by the user, who is responsible for maintaining the right levels. Recommended starting levels are: 1,0 to 2,0 ppm for fungus diseases. 1,0 to 3,0 for bacterial problems, and 2,0 to 4,0 for algae problems. The copper test set is used to check that the plants receive the dosing desired.
When recirculation is employed, care must be taken to adjust the dosing downward to avoid accumulation in the media. This especially applies to use in inactive media like Grodan and Perlite. This because the inactive media does not have the complex binding capacity which the organic media like peat has. For vegetable production on inactive media with frequent watering the dosing might be something like 0,2-0,3 ppm.

Guarantees:

The guarantee period for the Aqua-Hort machine is 2 years. The guarantees applies for the technical performance of the machine as such.
Undesired consequences for production and other installations are not covered by the guarantee. The Aqua-Hort machine is made available for the user, who takes the responsibility for the application in the nursery.