SENMATIC
DGT-Volmatic

AMI Quattro User Manual

CONTENTS

Preface

We recommend you to read and follow the installation manual, the technical data and the start-up manual carefully, **before** the product is installed and come into use.

Please check that the product is undamaged. Possible transport damages must be notified 8 days after reception **at the latest**.

Please check that the product has been delivered with the correct voltage and frequency.

The guarantee only covers defects and damages on the product caused by manufacture faults and faults in the material. Faulty installations and wrong use of the product are therefore not covered by the guarantee. We refer to our "Terms and Conditions of Sale and Delivery" for more details.

For installation of the product see the installation guide and diagrams at the back of the manual.

In consideration of the electrical installations the product must not be installed at places exposed to dripping (condensed water) from water installations, gutters etc. The product must not be placed in direct sun light.

In some countries the installation can be carried out by skilled craftsmen only.

Best regards

Senmatic A/S
DGT-Volmatic

Introduction

Congratulation with the new fertilizer mixer AMI Quattro which includes fertilizer mixing, EC-control, pH-control, and control of irrigation of up to 10 valves. AMI Quattro is very easy to use, all settings are made from the AMI Quattro-computer.

All settings are made by the dial, ⌐Clear and ⌐Enter on the AMI Quattro-computer. The program is set up in menus, which gives a good survey of the possibilities of settings in the fertilizer mixer.

If you need to control more than 10 irrigation valves, it is possible to connect one extra irrigation controller together with a device for fertilizer selection to the fertilizer mixer.

This manual contains a short description, that shows how to use the fertilizer mixer, an example of setting the AMI Quattro, a survey of the possibilities, and thereafter a more thorough description on the use of the fertilizer mixer and the functions.
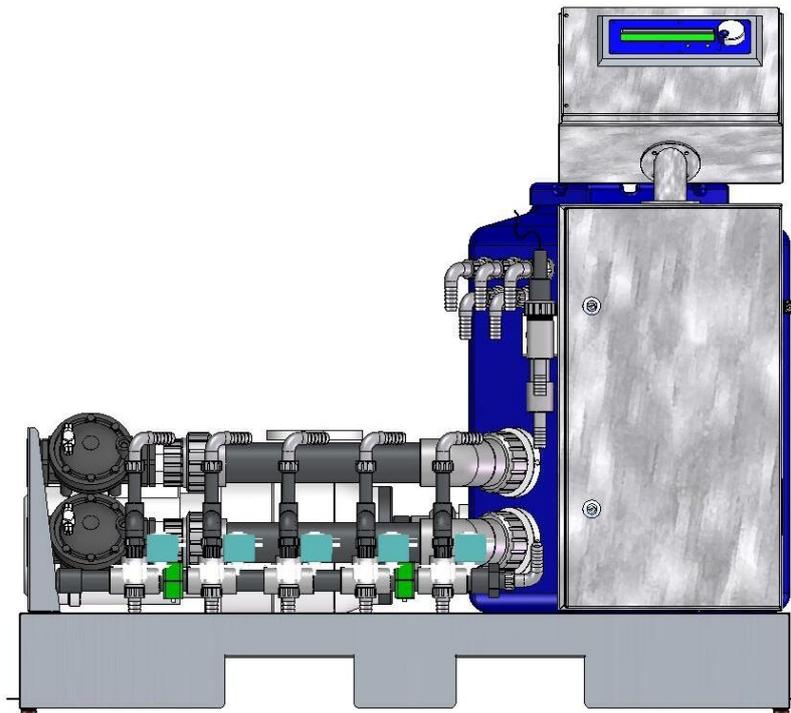
A short description of AMI Quattro fertilizer mixer

The mixer has a pressure pump, a mixing tank, some (2 … 5) dosing venturi and an AMI Quattro computer.
Besides there is an EC sensor, **optional** a pH sensor, and a box with relays and an EC-pH transmitter.

Next to the mixer there should be a number of stock solution tanks and maybe an acid tank.

The principle of the mixer is to mix the stock solutions with water in a wanted proportion (1 to 1) and the total concentration is controlled by a wanted Electrical Conductivity (EC) and pH value or a fixed ration to the water flow.

The wanted EC value can either be absolute or relative to the EC value in the fresh water.

The AMI QUATTRO can, if wanted, mix the fertilizer in a "Fixed ratio". This is a special mixing method typically used in outdoor areas, where a very low concentration is wanted.
Note! This method demands a flow sensor installed.

The stock solutions are normally mixed by the grower/user and have typically the concentration of 10 or max 20 % in the appropriate ratio for a normal consumption in time. In order to make it easy to mix in the right ratio between the stock solutions it is recommended to make all the stock solutions in the same concentration.

If pH control is used the AMI QUATTRO can mix up to 4 fertilizers and 1 acid/base.

The principle of the pH control is dosing acid into the mixing tank in order to keep the right pH value. Normally nitric acid, phosphoric acid or sulphuric acid can be used (or a mixture of these).

The concentration in the acid tank must be between 2% and 10%, depending of the quality of the fresh water and in the appropriate ratio for a normal consumption in time.

The AMI QUATTRO can activate 10 valves distributed in 3 groups. Each group has its own recipe with fertilizer concentration, mixing ratio, pH value etc.

The same valve can appear in several groups and even several times in the same group.

Each group can be started depending on its own start conditions.

Quick guide

```
EC          2.2 mS   pH        5.7
EC-demand   2,2 mS   pH-demand  5,7
Group:          Elaps.:
Active valves:  - - - - - - - - - -
```

⟨ Clear ⟩ , ⟨ Enter ⟩ or turn the dial
☐

```
MAIN MENU           12:30 27/ 11 2007
☐Readings
 Group
 .
```

.
 Special

Turn the dial to find
e.g. "Group" in the main
menu. Press ⟨ Enter ⟩ to select.
Under submenu "Recipe" choose
e.g. "EC-control".

⟨ Enter ⟩   ⟨ Clear ⟩
☐   ☐

```
EC-CONTROL          12:30 27/ 11 2007
☐Mode selector: EC          Off
 EC set point                1.8 mS
 EC dist. at rel. EC-control 1.6 mS
```

Turn the dial to find the correct
set point. Press ⟨ Enter ⟩ . Select
e.g. "Mode selector: EC".

 Light depend. change of EC   0.4 mS
 .
  .

⟨ Enter ⟩   ⟨ Clear ⟩
☐   ☐

```
EC-CONTROL          12:30 27/ 11 2007
☐Mode selector: EC        Absolute
 EC set point                1.8 mS
 EC dist. at rel. EC-control 1.6 mS
```

Turn the dial to change the setting.
Press ⟨ Enter ⟩ to store the new
setting. Press ⟨ Clear ⟩ to avoid the
change.

 .
 .

Example of setting the fertilizer mixer

A grower needs the following fertilizer mix for a culture:
  - EC = 2.0.
  - 2 stock solutions A and B; they are dosed in a ratio of A = 1 and B = 1.
  - pH = 6.0.
  - The valves are to be placed in group 1
  - The group is to be started manually.

The values are adjusted in the following way:
- Select 'Irrigation group' in the main menu with the dial, press ⏎ .
- Select group number e.g. 1.
- Select 'Recipe', press ⏎ .
- Select 'EC-control', press ⏎ .
- Select 'Mode selector: EC', press ⏎ , select 'Absolute', press ⏎ .
- Select 'EC set point', press ⏎ , adjust the value to 2.0 mS, press ⏎ .
- Exit 'EC-control' by pressing ⏎ .
- Select 'Mixing ratio', press ⏎ .
- Select 'Mixing ratio fertilizer A', press ⏎ , adjust the value to 1, press ⏎ .
- Select 'Mixing ratio fertilizer B', press ⏎ , adjust the value to 1, press ⏎ .
- Exit 'Mixing ratio' by pressing ⏎ .
- Select 'pH-control', press ⏎ .
- Select 'Mode selector: pH', press ⏎ , select 'Acid', press ⏎ .
- Select 'pH set point', press ⏎ , adjust the value to 6.0, press ⏎ .
- Exit 'pH-control' by pressing ⏎ .
- Exit 'Recipe' by pressing ⏎ .
- Select 'Irrigation time', press ⏎ .
- Select 'Group 1   0 0 0 0 0 0 0 0 0 0', and select the valves in this Group e.g. 1, 2, 5
-   Select 'G1 cho. - - - - - - - - - -', and set the valves active by changing mark '-' to 'X'
-   Select "Irrigation time valve 1', and set the irrigation time to e.g. 5 minutes.
-   Set the irrigation time for value 2 and 5 to an irrigation time of your choice.
- Exit 'Irrigation time' by pressing ⏎ .
-   Select 'Irrigation conditions', press ⏎ .
-   Select 'Manual start of irr. cycles', correct the value to one, press ⏎ .
- Exit to 'Main menu' by pressing ⏎ 3 times.

This is an example of adjustment of EC, pH, Mixing ratio and start of group 1. Please study the other possibilities for the AMI Quattro-fertilizer mixer in the survey of the set points on the next pages. Remember to erase the above settings if you tried out this example on your mixer.

Note! The fertilizer mixer will only dose fertilizer, when the EC-value and mixing ratio have been set. Respectively, to control dosing of acid the pH-value must have been set, and "Acid" must be chosen instead of "Fertilizer E" in the menu line "2006 Relay type output 6" found in submenu "Special" -> "Service settings" -> "Setup menu".

Short form list of set points in all sub menus

Readings

Status 2:

Flow	--- m3/h	Solar rad.:	--- W/m2
EC 2:	-.- mS	Temp.:	--.- °C
pH 2:	-.- pH	Humid.:	-- RH%

Status:

EC read	-.- mS	pH read	-.- pH
EC-setp.	-.- mS	pH-setp.	-.- pH
Group:	n	Elaps.:	00:00 min
Active valves:	- - - - - - - - - -		

Group 1/2/3:

Performed irr. cycles today	nn
Performed irr. cycles in all	nn
Remaining irr. cycles, sun	nn
Remain.irr.cycles, excl. sun	nn
Start condition	None
External start counter	n
Acc. sun since last irr./m2	Wh
Water %	--%
(Drain % (last Irrigation)	-- %)
(Adjustment of sunint.(drain)	--- Wh)
(Total adjustment of irrig.time	-.-)

Manual group:

Performed irr. cycles today	nn
Performed irr. cycles in all	nn
Manual start No. of irr. cycles	nn

Accumulated sun today /m2   ----- kWh

Totally accumulated sun /m2   ----- kWh

Reading of flow   --.- m3/h

Total Main pump time   ----- hours

Sun radiation, corrected   ----- W/m2

Time

Date

Irrigation groups

Irrigation time:

Group 1: 0 0 0 0 0 0 0 0 0 0
Group 2: 0 0 0 0 0 0 0 0 0 0
Group 3: 0 0 0 0 0 0 0 0 0 0
G1.choi: XX XX XX XX XX XX -- -- -- --
G2.choi: XX XX XX XX XX XX -- -- -- --
G3.choi: XX XX XX XX XX XX -- -- -- --

Irrigation time valve 1	00:00 min.
Irrigation time valve 2	00:00 min.
Irrigation time valve 3	00:00 min.
Irrigation time valve 4	00:00 min.
Irrigation time valve 5	00:00 min.
Irrigation time valve 6	00:00 min.
Irrigation time valve 7	00:00 min.
Irrigation time valve 8	00:00 min.
Irrigation time valve 9	00:00 min.
Irrigation time valve 10	00:00 min.

Manual group:

Irrigation time

Group : 0 0 0 0 0 0 0 0 0 0
G.choic: XX XX XX XX XX XX -- -- -- --

Irrigation time valve 1	00:00 min.
Irrigation time valve 2	00:00 min.
Irrigation time valve 3	00:00 min.
Irrigation time valve 4	00:00 min.
Irrigation time valve 5	00:00 min.
Irrigation time valve 6	00:00 min.
Irrigation time valve 7	00:00 min.
Irrigation time valve 8	00:00 min.
Irrigation time valve 9	00:00 min.
Irrigation time valve 10	00:00 min.

Manual start of irr. cycles	0
Cancel current irrigation	**No**/Yes
Number of valves in parallel	1
Min time betw. start of irr.	5:00 min
Valve pause:	00:00 min
Group pause:	00:00 min
Choice of recipe:	1
Vessel draining time	00:00 min

Group 1/2/3:

Irrigation time

Valve settings
Group : 0 0 0 0 0 0 0 0 0 0
G.choi: XX XX XX XX XX XX -- -- -- --
Note! V. time common for all groups

Irrigation time valve 1	00:00 min.

Irrigation time valve 2	00:00 min.
Irrigation time valve 3	00:00 min.
Irrigation time valve 4	00:00 min.
Irrigation time valve 5	00:00 min.
Irrigation time valve 6	00:00 min.
Irrigation time valve 7	00:00 min.
Irrigation time valve 8	00:00 min.
Irrigation time valve 9	00:00 min.
Irrigation time valve 10	00:00 min.

Start conditions

Minimum air humidity	**No**/Yes
Start at high temperature	**No**/Yes
Sun integrator	**No**/Yes/Time adj./Drain contr.
External start option	**No**/Yes
Fixed interval	**No**/Yes
Week programme	**No**/Week prog./Fixed time
Frost-protection	**No**/Yes

Recipe 1/2/3:

EC-control

Mode selector: EC	**Off**/Abs./Rel./Ratio
EC set point	1.5 mS
Ratio dosing in ppm	1000 ppm
EC dist. at rel. EC-control	1.0 mS
Radiat. depend. change of EC	0.0 mS
Radiation f start change EC	500 W/m2
P-band for changing EC	200 W/m2
Min. return compensation	-1.0 mS
Max. return compensation	1.0 mS
Choice of basin	**No**/Yes
Distance EC, basin	0.0 mS
EC absolute high alarm limit	3.5 mS
EC relative high alarm limit	1.0 mS
EC relative low alarm limit	-1.0mS

Mixing ratio

Mixing ratio fertilizer A	0
Mixing ratio fertilizer B	0
Mixing ratio fertilizer C	0
Mixing ratio fertilizer D	0
(Mixing ratio fertilizer E	0)

pH-control

Mode selector: pH	**Off**/Acid/Alkaline
pH set point	6.0 pH
Return compensation	No
Min. return compensation	-1.0 pH
Max. return compensation	1.0 pH
pH relative low alarm limit	-1.0 pH
pH relative high alarm limit	1.0 pH
pH absolute low alarm limit	4.0 pH
pH absolute high alarm limit	8.0 pH

Start parameters:

Start time	06:00
Stop time	18:00
Min time betw. start of irr.	5:00 min
Minimum air humidity	50 %RH
High temperature of start	40.0 °C
Start level sun integrator	000 W/m2
Accum sun for start /m2	000 Wh
External starts counter	1
Fixed rhythm	2:00 hour
Temp. of frost-protection	-5.0 °C
Manual start of irr. cycles	0
Cancel current irrigation	**No**/Yes

Adjusted irrigation time: (Only visible when selected)

Basic sun integration	2000 Wh
Max adj. of Irrigation time	100 %
Adjustment P-band (sunint.)	5000 Wh
Manual adj. of Irrig.time	0.00
Total adjustment of Irrig.time	1.00 **Reading**

Drainage control: (If selected in start conditions)

Drain set point time zone 1	20 %
Drain set point time zone 2	20 %
Time for shift time zone 1-2	12:00
Max incr. sun sum f. start	200 Wh
Max decr. sun sum f. start	100 Wh
P-factor by excess drain	10 Wh/%
P-factor by insuffic. drain	5 Wh/%
Sunint. irrigation start lev.	100 Wh

Fixed start time:

Start 1, at:	00:00
Start 2, at:	00:00
Start 3, at:	00:00
Start 4, at:	00:00

Irrigation times:

Group 1: 0 0   0   0   0   0 0 0 0 0
G1.cho.: XX XX XX XX XX XX -- -- -- --
Note! V. time common for all groups

*	Total adjustment of Irrig.time	-.- **Reading**
	Irrigation time valve 1	00:00 min.
	Irrigation time valve 2	00:00 min.
	Irrigation time valve 3	00:00 min.
	Irrigation time valve 4	00:00 min.
	Irrigation time valve 5	00:00 min.
	Irrigation time valve 6	00:00 min.
	Irrigation time valve 7	00:00 min.
	Irrigation time valve 8	00:00 min.
	Irrigation time valve 9	00:00 min.
	Irrigation time valve 10	00:00 min.

No. of valves in parallel	1
Priority level	3.

Avoid prioritized valve stop?	**No**/Yes	
Valve pause:	00:00 min	
Group pause:	00:00 min	
Vessel draining time	00:00 min	
* **Adjustment of Irrigation time?**	No/Yes	**Reading**
* **Drainage control active?**	No/Yes	**Reading**

*)   Depending on start condition.

Manual Standby?	**No**/Yes

Common week program:

Start-irrigat.: day, time	Mon	10:30
Start-irrigat.: day, time	Tue	12:45
Start-irrigat.: day, time	all	18:35
.		
Start-irrigat.: day, time	---	--:--

Common alarm settings:

Deviation EC1-EC2 for alarm	1.0 mS
EC 2 abs. low alarm limit	1.0 mS
EC 2 abs. high alarm limit	3.5 mS
Deviation pH1-pH2 for alarm	1.0 pH
pH 2 abs. low alarm limit	4.0 pH
pH 2 abs. high alarm limit	8.0 pH

Mixer

Active recipe:	-
Mode selector: Mixer	Off/Manual/Auto.
Mode selector: Hose irrigation	**Off**/On
Recipe hose irrigation	**1**/2/3
Transmit act. recipe again?	**No/**Yes
ACTIVE RECIPE	

Alarm list

Alarm, turn off bell	Not seen
Absolute high EC	ALARM
Relative high EC	NO ALARM
Relative low EC	NO ALARM
Relative high pH	ALARM
Relative low pH	
Absolute low pH	
Absolute high pH	
Deviation EC1-EC2	
Deviation pH1-pH2	
Absolute low EC2	
Absolute low pH2	
Absolute high pH2	
Level/motor relay	
Total stop	**No**/Yes
Stop dosing	**No**/Yes
Sensor failure	NO ALARM

Remote control

Name of wanted comp.:	1
Comp. that remote c. 0=Stop:	0

Special

Grower setup:

Time	
Date	
Summer/actual time	
Totally accumulated sun per m2	--- kWh
Total main pump time	-- hours
Group 1/2/3:	
Performed irr. cycles in all	--
Remaining irr. cycles, sun	--
External start counter	--
Manual group:	
Remain.irr. cycles, excl. sun	--
Manual start of irr. cycles	--

pH adjustment:

pH1 _._	pH-sensor 1:	pH 7	0.00 pH
pH1 _._	pH-sensor 1:	pH 4	1.00 pH
pH2 _._	pH-sensor 2:	pH 7	0.00 pH
pH2 _._	pH-sensor 2:	pH 4	1.00 pH

Alarm setup:

Function abs. high EC alarm	**Total stop**/Stop dos./No stop
Function rel. high EC alarm	Stop dos.
Function rel. low EC alarm	No stop
Function rel. high pH alarm	No stop
Function rel. low pH alarm	Stop dos.
Function abs. low pH alarm	Total stop
Function abs. high pH alarm	Total stop
Funct. b EC1 relative EC2	Stop dos.
Funct. b abs. high EC2 alarm	Total stop
Funct. b abs. low EC2 alarm	Total stop
Funct. b pH1 relative pH2	Stop dos.
Funct. b abs. high pH2 alarm	Total stop
Funct. b abs. low pH2 alarm	Total stop
Total stop by sensor fail.?	**Yes**/No
Time for start alarm relay	00:00
Time for stop alarm relay	23.59

Service settings:

Operation

Default in display:
When the fertilizer mixer is not being used, the following display will be shown.

```
EC              2.2 mS    pH                  5.7
EC demand       2.2 mS    pH demand           5.7
Group:          Ready     Elaps:
Active valves: - - - - - - - - - -
```

If no irrigation is started, the text 'Ready' will be shown to the right of 'Group'. When an irrigation starts the text disappears and instead, the number of the active irrigating group is shown. If the mixer is started manually or by an external start signal the recipe used will be shown. If the mixer is set Stand-by it will also be shown here. 'Active valves' indicates the valves currently irrigating. If the mixer is not active the text to the right of 'Active valves' will be 'Inactive'. If the irrigation controller has received a start-signal but is not running you can read the reason here. There are three possibilities 'Awaits mixer', 'Group pause' or 'Valve pause'.

Press one of the 2 buttons or turn the dial, to display the main menu. Use the main menu to set and read the value in the AMI Quattro.

Contrast on the display
The contrast on the display will change according to the air temperature in the compartment; therefore it is possible to adjust the contrast. To adjust the contrast, press ⌐Clear⌐ and at the same time rotate the dial, until you get the right contrast.

Main menu

The main menu shows a survey of all the options in the program. If you want to select the option "Readings", turn the dial, until "Readings" is in the display, and then press ⌐Enter⌐ .
The fertilizer mixer will return to the default displays, when neither the buttons nor the dial has been activated within 5 minutes.

```
MAIN MENU        12:30 27/11 2007
 Reading
 Irrigation groups
 Mixer
```

```
 Alarm list
 Remote control
 Special
```

To return to the main menu from one of the submenus, press ⌐Clear⌐ . The arrow will point to the submenu you came from.

Ordinary set point editing

When you have specified a submenu, where you want to change the settings in the AMI Quattro, the first line in the submenu will be displayed. Turn the dial to go to the rest of the lines in the submenu.

To return to the main menu, press ⌧ . The adjustments of the settings must be completed, or you could delete a correction when you press ⌧ . Move the cursor to the left, and press ⌧ to return to the main menu.

Adjusting set points

Example:

Press ⌧ to adjust a set point. The cursor will move to the value to be adjusted. Adjust the value by turning the dial, till the new value is displayed. When the number has been adjusted, press ⌧ to store the new value. If you do not want to correct the value, press ⌧ , and the old value will be displayed in the box again.

Values are not always a number, but also texts you can choose between, for example in the mode selector of the individual functions.

```
EC-CONTROL            12:30 27/11 2007
  Mode selector: EC                    Absolute
  EC set point                         2.2 mS
  EC-dist. at rel. EC-control          1.5 mS
  .
  .
```

Mode selector: Before you set the different options, you must choose how each function should work. By a function we for example mean "EC-control", "Mixing ratio" and so on. All mode selectors are a set point, where you can choose between the different options by means of the dial.

Code word

 To prevent unauthorized persons from correcting the set point settings in the computer it is possible to lock the computer with a code. Under "Service settings/read." -> "Other service settings" -> "2965 Set password" the code is set. The code must be a number different from '0'. If "2965 Set password" indicates '0' there is no code lock on the computer.

When the computer is locked with a code only a very limited menu is displayed:

```
MAIN MENU         12:30 27/ 1 1998
Readings
Remote control
Code word
```

Without the code word it is only possible to read sensors, status, etc. In case the code word is forgotten you must call the dealer who supplied the computer to help unlocking the computer again.

Note! Regardless of a possible code, the computer can always be operated from a PC by means of the DGT*Volmatic SuperLink program.

Readings

```
MAIN MENU        12:30 27/11 2007
  Readings
  Irrigation groups
  Mixer

  Alarm list
  Remote control
  Special
```
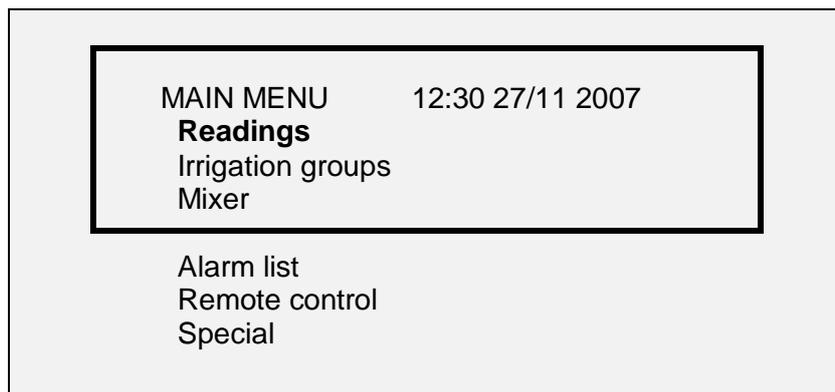
Readings

The following options are available:

STATUS 2
STATUS
GROUP 1
GROUP 2
GROUP 3
MANUEL GROUP
OTHER READINGS

Status 2

Status 2 shows additional information about the current condition on the mixer and concerning a possible set of extra sensors.

```
STATUS 2            12:30 27/11 2007
Flow     6,8 m3/h   Solar rad.:  97 W/m2
EC 2:   2,5 mS      Temp.:       20,3 °C
pH 2:   5,9 pH      Humid.:      78,5 RH%
```

Flow: m3/h	Reading of the current flow.
EC2: mS	Reading of the EC2 sensor. This sensor can be placed either in the drainage water or in the outlet of the mixer for safety alarm.
PH2: pH	Reading of the pH2 sensor. This sensor can be placed either in the drainage water or in the outlet of the mixer for safety alarm.
Solar rad: W/m2	Reading of the current sun radiation corrected for the reduction in the greenhouse.
Temp.: °C	Reading the temperature*
Humid.: RH%	Reading the humidity*

* Since the same analogue inputs are also used for reading Water%, Temperature and Humidity will show faulty values if Water% is used.

Status

Status shows the same readings as shown in the default display. See the chapter "Operation" for further information.

```
EC read      2.2 mS   pH read        5.7 pH
EC setp.     2.2 mS   pH setp.       5.7 pH
Group:       Ready    Elaps:
Active valves:                - - - - - - - - - -
```

EC read: Reading of the current EC value

EC setp.:   Reading of the current EC demand

pH read: Reading of the current pH value

pH setp.:   Reading of the current pH demand

Group: Reading of the activity of the mixer
                Ready: No active irrigation and the mixer is ready to start a new
                                    irrigation.
                Group 1/2/3:   An irrigation cycle is active.
                Manuel R: A manual irrigation is active with shown recipe.
                Stopped: The mixer is in standby mode.
                Mixer R: The mixer is running manually with shown recipe.

Elaps: Reading of the elapsed irrigation time on the active valve.

Active valves: Reading of the irrigation activity.
                Inactive: No valves/group active.
                Await mixer: The irrigation cannot be started. Maybe an alarm is active.
                Active valves: The mixer is active and the active valves are marked with X
                Valve pause: The irrigation is active, but waiting for the next valve.
                Group pause: The irrigation is active, but waiting for the next group.

Group 1/2/3

Each group contains the same readings, so they are described together below:

	Performed irr. cycles today	nn
	Performed irr. cycles in all	nn
	Remaining irr. cycles, sun	nn
	Remain.irr.cycles, excl. sun	nn
	Start condition	None
	External start counter	n
	Acc. sun since last irr./m2	Wh
	Water	%
*	Drain % (last Irrigation)	%
*	Adjustment of sunint.(drain)	Wh
*	Total adjustment of Irrig.time	-.-

  * Depending on the setting of start conditions.

Performed irrigation cycles today
Reading of the number of irrigation cycles the irrigation controller has performed since midnight. The value can be reset under main menu item "Special" -> "Grower Setup".

Performed irrigation cycles in all
Reading of the number of irrigation cycles the irrigation controller has performed since it was reset last time. The value can be reset under main menu item "Special" -> "Grower setup".

Remaining irr. cycles, sun
Reading of the number of irrigation cycles queued up by the solar integrator.

Remain.irr.cycles, excl. sun
Reading of the number of irrigation cycles accumulated, excluded the irrigation cycles that derive from the solar integrator. Manually as well as automatically started irrigation cycles will be placed in the same queue.

Note! All irrigation cycles started from the irrigation queue "Remaining irr. cycles, excl. sun" will be displayed as "Manuel".

Start condition
Reading of the start condition for the current irrigation. This reading is inactive, when there is no active irrigation.

nn   External start counter
Reading of the number of impulses from the external start device. Depending on the external start sensor you will need 1 impulse (e.g. a start tray) or more impulses (e.g. evaporation sensor) to get a start signal.

Wh   Acc. sun since the last irr. /m2
Reading of accumulated solar energy radiation since it was reset last time. Sun radiation will only be accumulated in connection with irrigation, if you have selected to irrigate by sun integrator. The present radiation can be read under measurement values.

%   Drain % (last Irrigation)
Reading of the drainage percentage calculated after last irrigation.

%   Water %
Reading the water % in the growing media (Grodan slaps etc.). Group 1, 2 and 3 is read via analogue input 1, 2 and 7. Scale 0-100% = 0-5V.
Group 1 and 2 share always input with room temp. and humidity while group 3 share input with flow, which is chosen through code 6104.

Wh   Adjustment of sunint.(drain)
Reading of the actual adjustment of the solar integrator set point caused by the drainage controller.

Total adjustment of irrig.time
Reading of the total adjustment of the irrigation time caused by the function 'Adjusted irrigation time'. For further information see the description concerning "Adj. irrigation time" below.

Manual group

Performed irr. cycles today
Performed irr. cycles in all
Manual start No. of irr. cycles

Performed irrigation cycles today
Reading of the number of irrigation cycles the irrigation controller has performed since midnight. The value can be reset under main menu item "Special" -> "Grower setup".

Performed irrigation cycles in all
Reading of the number of irrigation cycles the irrigation controller has performed since it was reset last time. The value can be reset under main menu item "Special" -> "Grower setup".

Manual start No. of irr. cycles
Reading of the number of manual starts in the queue.

Other readings

Acc. sun per 24h per m2
Totally acc. sun per m2
Total Main pump time
Reading of flow
Sun radiation, corrected
Time
Date

Wh   Acc. sun today /m2
Reading of accumulated radiation energy since midnight. The value can be reset under main menu item "Special" -> "Grower setup". The present radiation can be read under measurement values.

kWh   Totally accumulated sun /m2
Reading of accumulated radiation energy since it was reset last time. The value can be reset under main menu item "Special" -> "Grower setup". The present radiation can be read under measurement values.

Total Main pump time
Showing total running time for the main pump. Can be used for checking the maintenance time for the mixer, specially the dosing pump.

m3/h   Reading of flow
Reading of the current flow

W/m2   Sun radiation, corrected
Reading of the actual sun radiation inside the greenhouse. There is corrected for the impact of the shading of the house has and for the screens if they are on.
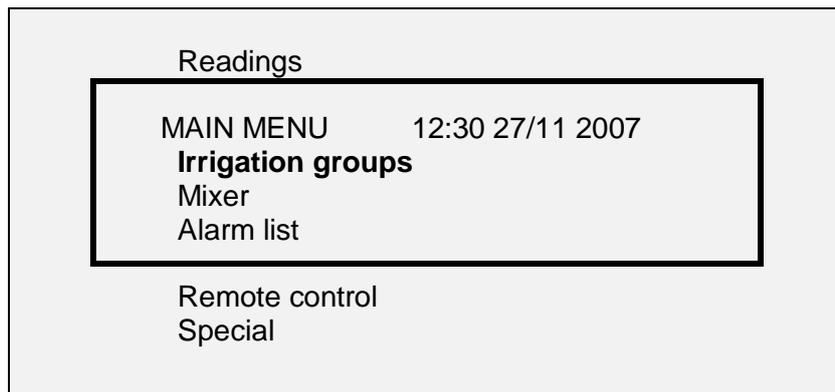
<u>Time</u>
Reading of the time.

<u>Date</u>
Reading of the date.

Note! The clock, the date and the change-over between summer time and actual time can be corrected in the menu item "Grower setup" under main menu item "Special".

Irrigation groups

```
    Readings

    MAIN MENU        12:30 27/11 2007
    Irrigation groups
    Mixer
    Alarm list

    Remote control
    Special
```

Irrigation groups

When the menu point "Irrigation groups" is selected a submenu appears on the display:

When one of the submenu points has been selected the various submenus and functions are reached by turning the dial. The values are corrected by pressing ⌾Enter and then turning the dial until the correct value is shown. Press ⌾Enter again to store the correction.

```
IRRIGATION GROUPS      12:30 27/11 2007
IRRIGATION TIMES
MANUAL GROUP
GROUP 1
```

```
GROUP 2
GROUP 3
MANUAL STANDBY?
COMMON WEEK PROGRAM
COMMON ALARM SETTINGS
```

Irrigation time

In this menu you have the possibility to set the irrigation times and valve distribution in each group for all valves and all automatic started groups. The AMI Quattro contains 10 valves which you can distribute freely in all 3 groups. They are all valves that can be placed in all groups.

Note! The irrigation time for each valve is the same in all groups. You cannot set an irrigation time for e.g. valve 1 in group 1 and then another irrigation time for the same valve in group 2.

Only the manual group has separate irrigation times for each valve.

The first 3 lines in this submenu you set up which valve should be placed in each group. The groups have separate settings for EC (fertilizer concentration), mixing of the stock solutions and pH-control. These functions are described below. To set which valves should use the recipe of e.g. group 1, you turn the dial to get the right number for each position, and step forward to the next position with ⌾Enter . If you have set the valve sequence as 1, 2, 5, 4, 6 and you later want valve 7 to be the first valve to irrigate you will have to make space from the beginning. That is the sequence should be 0, 1, 2, 5, 4, 6.

```
IRRIGATION TIME
Group 1:  0  0  0  0  0  0  0  0  0  0
Group 2:  0  0  0  0  0  0  0  0  0  0
Group 3:  0  0  0  0  0  0  0  0  0  0
```

G1.choi: XX XX XX XX XX XX -- -- -- --
G2.choi: XX XX XX XX XX XX -- -- -- --
G3.choi: XX XX XX XX XX XX -- -- -- --

The next three lines you can set if the valve should be active or not. The mark XX shows that the valve will be activated, when an irrigation is started and -- show that the valve will not irrigate, the valve will be skipped.
This gives an easy way to disable a valve temporary.

Irrigation time valve 1   00:00 min.
.
.
Irrigation time valve 10   00:00 min.

<u>Irrigation time valve 1 ... 10</u>
Adjustment of the irrigation time for each valve. The irrigation time can be set as minutes and seconds (unit min.) or hours and minutes (unit hour). To change unit you will have to go the "Service settings -> "Setup menu".
Note! Do not enter a time shorter than 15 sec.

Manual group

Menu for starting a manual irrigation.
Note! The irrigation time for each valve is different from the irrigation time set for the automatic started groups: Group 1, 2, 3.

The menu contains a submenu and some set points:
IRRIGATION TIMES
   Group : 0   0   0   0   0   0   0   0   0   0
   G.choic: XX XX XX XX XX XX -- -- -- --

Irrigation time valve	1	00:00 min.
Irrigation time valve	2	00:00 min.
Irrigation time valve	3	00:00 min.
Irrigation time valve	4	00:00 min.
Irrigation time valve	5	00:00 min.
Irrigation time valve	6	00:00 min.
Irrigation time valve	7	00:00 min.
Irrigation time valve	8	00:00 min.
Irrigation time valve	9	00:00 min.
Irrigation time valve	10	00:00 min.
Manual start of irr. cycles		0
Cancel current irrigation		**No**/Yes
No. of valves in parallel		1
Min time betw. start of irr.		5:00 min
Valve pause:		00:00 min
Group pause:		00:00 min
Choice of recipe:		1
Vessel draining time		00:00 min

How to set the sequence, active valves and irrigation times is the same as for "Irrigation times" above.

<u>Manual start of number of cycles</u>
Set point for manual start of a number of irrigation cycles. You must set the number of cycles desired. If you for example set the value at 2 the irrigation controller will irrigate 2 cycles in all valves. The pause between several manual irrigations is set in "Min time betw. start of irr.".
Note! Irrigations started by the manual group have priority over automatically started irrigations. Though an irrigation started by an external irrigation automat has priority over both the manual group and group 1, 2, 3.

Cancel current irrigation
Set point for cancelling the current active irrigation cycle. By answering "Yes" the current irrigation is stopped, and the remaining irrigation time is erased.

No. of valves in parallel
Adjustment for the number of valves that you want to irrigate at the same time. You can set from 1 to 10. Remember the number you can have in parallel depends on the water supply from the main pump. When the valves run in parallel e.g. 2 valves irrigating at the same time, and the valves have different length of irrigation time the next two valves will start to irrigate when the valve with the longest irrigation time is expired and the valve pause is elapsed.
Note! The maximum number of valves in parallel is also depending on the 24V power supply. If no extra transformer has been installed the max number is 2 valves.

min. Minimum time between starts of irrigation
Adjustment of the pause between start of 2 cycles of irrigation. The pause also serves as pause between accumulated irrigations queued up waiting to be started.

Valve pause
Adjustment of a pause after each valve. When a pause has been chosen, the irrigation of the next valve will not start until the pause time has expired.

Group pause
Adjustment of a pause after each group. When a pause has been chosen, the irrigation of the first valve in the next group will not start until the pause time has expired.

Choice of recipe:
Selection of which of the 3 possible recipes the irrigation should use. The recipes are set in Group 1, 2 and 3 respectively.
Note! Do not use recipe 0 (the pump will start, but no irrigation).

Vessel draining time
Setting the exact time to empty the vessel.

Group 1/2/3

For each group there are submenus, settings and readings as illustrated below.
Note! All groups are constructed alike, which is why the set points in the 4 submenus have been described once only.

```
 GROUP 1        12:30 27/11 2007
          IRRIGATION TIMES
          START CONDITIONS
          RECIPE 1
```

          START PARAMETERS
          ADJ. IRRIGATION TIME
          DRAINAGE CONTROL
          FIXED START TIME
          IRRIGATION TIMES
          No. of valves in parallel   1

	Priority level:	3.
	Avoid prioritized valve stop?	**No**/Yes
	Valve pause:	00:00 min
	Vessel emptying	00:00 min
	Group pause:	00:00 min
*	Adjustment of Irrigation time?	--- (No/Yes)
*	Drainage control active?	--- (No/Yes)

*)   Depending on the setting of start condition.

For each group you set the conditions that should start an irrigation. If an irrigation is performing and an irrigation is set in queue from each of the groups, the irrigations will be started in group order (group 1, group 2, group 3) also if group 3 set the irrigation in queue first and group 1 last. **Note!** If you have 2 waiting irrigations from each group the irrigations will be performed in the order: Group 1, group 2, group 3, group 1, group 2, group 3.

Start conditions

Start conditions of irrigation are listed one after another. Turn through the options, and press ⌒Enter to choose an option. The box changes between "No" and "Yes", when you turn the switch. To select an option, turn the switch till "Yes" is displayed. To delete an option, turn till the option is displayed, press "Enter", and turn the switch till "No" is displayed.

You have the following possible start conditions:

Minimum air humidity	No/Yes
Start at high temperature	No/Yes
Sun integrator	No/Yes/Time adj./Drain contr
External start option	No/Yes
Fixed interval	No/Yes
Week programme	No/Week prog./Fixed time
Frost-protection	No/Yes

You can choose a combination of the various start options. When you have selected an option, you have to set the appropriate parameters under START PARAMETERS. Depending on your choice of start condition, it will be necessary to set the settings under ADJUSTMENT OF IRRIGATION TIME ('Time adj.'), DRAINAGE CONTROL ('Drain contr') or FIXED START TIME ('Fixed time').
If you select 'Week prog.', you can set 28 fixed irrigation times for the week.

Minimum air humidity

Irrigation or cooling is activated, when the humidity is lower than a set point: "Minimum air humidity".
The function is overrun by the start-stop time in "Start parameters".

Following set points have to be adjusted in the submenu "Start parameters":

The time to start the humidification:	Start time
The time to stop the humidification:	Stop time
The interval between the cycles:	Min time betw. start of irr.
The set point for starting humidification:	Minimum air humidity.

Start at high temperature

Irrigation or cooling is activated, when the temperature is higher than "High temperature of start", set in the submenu "Start parameters".
The function is overrun by the start-stop time in "Start parameters".

Following set points have to be adjusted in the submenu "Start parameters":
The time to start the cooling: Start time
The time to stop the cooling: Stop time
The interval between the cycles: Min time betw. start of irr.
The set point for start cooling: High temperature of start

Sun integrator

Yes:

Irrigation cycles are activated depending on integrated solar radiation. This means the irrigation frequency is proportional to the solar intensity.
The function is overrun by the start-stop time in "Start parameters".

Following set points have to be adjusted in the submenu "Start parameters":
The time to start the irrigation: Start time
The time to stop the irrigation: Stop time
The accumulated solar energy to start an irrigation   Accum. sun for start /m2

Time adj.:

The time adjustment can be used in combination with another start condition: External start, Fixed interval or Week program/Fixed time.
The time adjustment will adjust the irrigation time (longer) depending on integrated solar energy **since last irrigation.** The influence of the sun is adjusted in the sub menu "Adjusted irrigation time"
The function is overrun by the start-stop time in "Start parameters".

Drain contr.:

Drainage control is a special version of the sun integrator function.
When using "Drain control", the sun integrator is adjusted depending on the measured drainage % compared to the wanted drainage %.
If the measured drainage % is lower than the wanted, the sun integrator is adjusted to give a faster irrigation rhythm, but still depending on the solar intensity.
The function is overrun by the start-stop time in "Start parameters".

The adjustment of the drainage control is done in the "Drainage control" sub menu.

External start option

External start will active irrigation cycles via external equipment i.g. start tray.
The function is overrun by the start-stop time in "Start parameters".

Following set points have to be adjusted in the submenu "Start parameters":
The time to start the irrigation: Start time
The time to stop the irrigation: Stop time
Selection number of pulses to active a start   External start counter

Note! Can not be used if "Drain Control" is selected. Same input.

Fixed interval

Fixed interval will active irrigation cycles with a fixed interval between cycles.

Following set points have to be adjusted in the submenu "Start parameters":
The time to start the irrigation: Start time
The time to stop the irrigation: Stop time
Interval between irrigation cycles: Fixed rhythm

Week program

The week program contains 28 start positions, which can be programmed to every day or a specific day of the week.

Note! The week program is common for all 3 groups and gives a start to all groups with start condition "Week program" selected. If you need fixed start times specific for each group, you can choose 'Fixed time' instead of week program, you will then have a possibility of 4 fixed start times for each group

Fixed time:
Fixed time contains 4 start times and they are independent for each group.

Frost protection

Frost protection is primarily focused on open air where a showering can be started to avoid frost damages.

The set point of minimum temperature for frost protection is set in "Start parameters".

Recipe 1/2/3

In each group you can set a recipe containing EC, pH, and fertilizer composition. For each recipe there are 3 submenus.

```
  GROUP 1        12:30 27/11 2007
    EC-control
    Mixing ratio
    pH-control
```

EC-control

To control EC, "EC-control" in the submenu under "Recipe" is selected. Here the wanted EC is adjusted under different conditions together with alarms.

The following options are available:

EC-control	
Mode selector: EC	**Off**/Abs./Rel./Ratio/Return comp.
EC set point	1.5 mS
Ratio dosing in ppm	1000 ppm
EC dist. at rel. EC-control	1.0 mS
Radiat. depend. change of EC	0.0 mS
Radiation f start change EC	500 W/m2
P-band for changing EC	200 W/m2
Min. return compensation	-1.0 mS
Max. return compensation	1.0 mS
Choice of basin	**No**/Yes
Distance EC, basin	0.0 mS
EC absolute high alarm limit	3.5 mS
EC relative high alarm limit	1.0 mS
EC relative low alarm limit	-1.0mS

Mode selector: EC

	Off	No EC-control.
	Absolute	EC is controlled according to a wanted EC-value.
*	Relative	EC is controlled according to a distance to EC in the fresh water. **Note!** Only to be used, when an EC-sensor is is installed and placed in the fresh water supply (EC-sensor 2).
	Ratio	The fertilizer concentration is not controlled as EC, but instead controlled according to a **ratio of fertilizer** added to the fresh water. The ratio is measured in ppm. **Note!** Flow sensor must be installed.
*	Return comp.	EC is compensated for the EC value in return water.
*	**Note!**	The functions can only be used if an EC sensor is placed in the water inlet (EC2)

mS   EC set point
        Adjusting of EC set point, if "Absolute" has been selected in the mode selector.

ppm   Ratio dosing in ppm
        Adjusting the wanted total concentration of fertilizer in ppm, if "Ratio" has been selected in the mode selector.

mS	EC dist. at rel. EC-control

Adjusting of the **distance** between fresh water EC and the outgoing EC, if "Relative" has been selected in the mode selector.

Change of EC by high sun radiation

This feature consists of the following 3 set points. To ensure that the plants can get sufficient water for evaporation by high sun radiation it is here possible to lower EC by high radiation. See Fig. 2 below.

mS	Radiat. depend. change of EC

Adjusting of the wanted change in EC depending on high sun radiation.

W/m2	Radiation f start change EC

Adjusting of by which sun radiation the change of EC is to start.

W/m2	P-band for changing EC

Adjusting of over which P-band (increase) higher than the start level in W/m^2 the EC must be lowered with the full change.
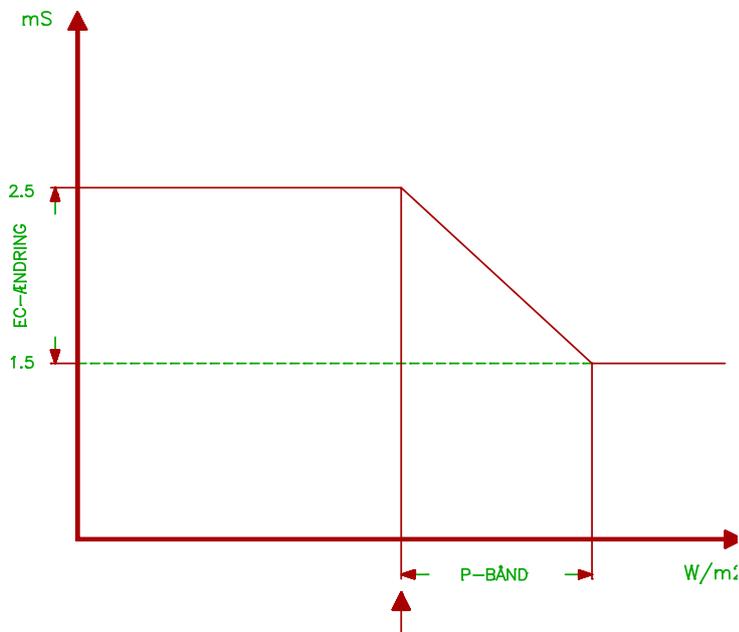
Return compensation

To use return compensation another EC sensor must be installed in the environment which will influence on the final setting of EC, i.e. after the plants on the return pipe. This second sensor will "overrule" the EC sensor on the mixer.

mS	Min. return compensation

Setting the lowest allowed decrease in EC from the wanted value after the irrigation of the plants before start of compensation. **Note!** Negative value.

mS	Max. return compensation

Setting the highest allowed increase in EC from the wanted value after the irrigation of the plants before start of compensation.

No/Yes	Choice of basin

Selection of basin control in this group
When basin is selected "Dist. EC, basin" must be adjusted.

The AMI Quattro will use return water until the basin is empty and then use fresh water.
If the EC value is higher than the wanted "EC set point + Dist. EC, basin", the mixer will dose fresh water plus basin water. The amount of fresh water is depending of how high the EC is above the distance.'
The sensitivity of this is adjusted in service settings.

Note! The AMI Quattro can only control 1 basin.

mS   Dist. EC, basin
Adjusting the acceptable increase of EC when using basin water. The set point is set as a distance to the EC set point , above which the fresh water dosing must start.
If the EC value is higher than the wanted "EC set point + Dist. EC, basin", the mixer will dose fresh water plus basin water. The amount of fresh water is depending of how high the EC is above the distance.
Note! Can be set with negative value. This will make a constant fresh water dosing. The sensitivity of this is adjusted in service settings.
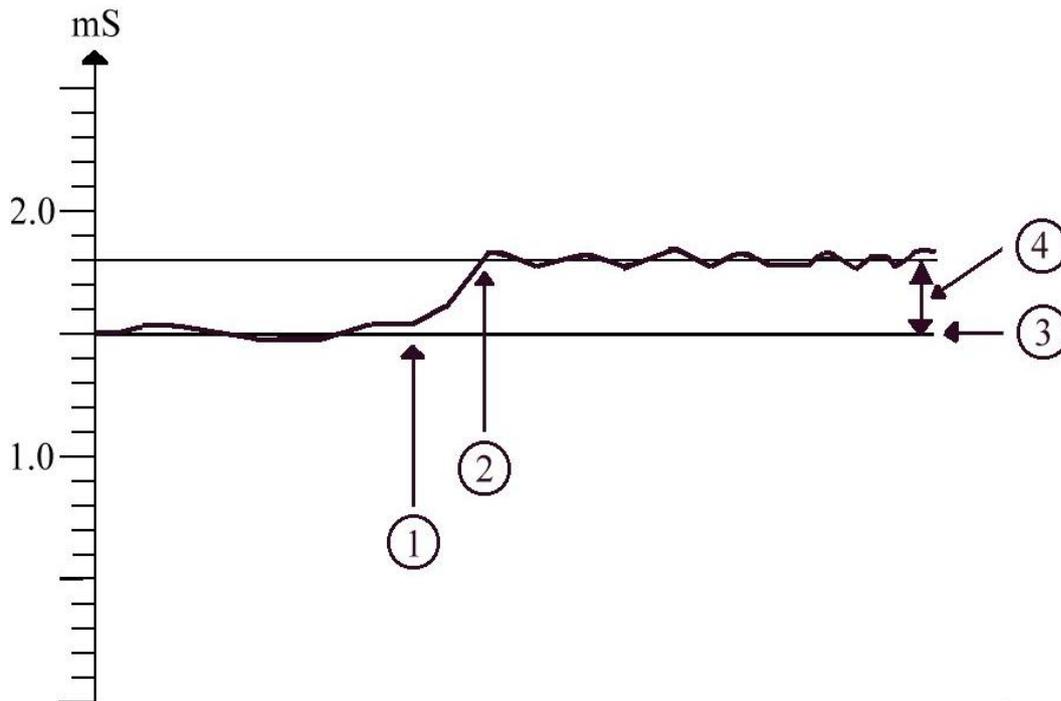
1. Start basin control.
2. Fresh water dosing.
3. EC set point.
4. Distance EC – basin.

Alarms

mS   EC absolute high alarm limit
Adjusting of the absolute upper limit for the EC-value.
When the EC-value exceeds this alarm limit an alarm will arise.

mS   <u>EC relative high alarm limit</u>
Adjusting of the relative upper limit for the EC value.
When the EC-value exceeds the wanted set point value + this alarm limit an alarm will arise. **Note!** Set positive value.

mS   <u>EC relative low alarm limit</u>
Adjusting of the relative lower limit for the EC value.
When the EC-value goes below the wanted set point value + this alarm limit an alarm will arise. **Note!** Set negative value.

Mixing ratio

The following options are available:

Mixing ratio fertilizer A	0
Mixing ratio fertilizer B	0
Mixing ratio fertilizer C	0
Mixing ratio fertilizer D	0
Mixing ratio fertilizer E	0

<u>Mixing ratio</u>
Adjustment of the mixing ratio for each fertilizer.
Note! If there is pH-control on the fertilizer mixer only fertilizer A, B, C, and D can be used for the fertilizer mix. Proportional numbers from 0 to 99 can be entered.

The mixing ratio has from standard been set to 0. When you use less than 5 fertilizers it is an advantage to adjust the mixing ratio to '0' for the fertilizers out of use. The fertilizer will then react faster when regulating the EC.

Example: The fertilizer mix must consist of 1 part from stock solution A, 1 parts from B, and 1 parts from C. The mixing ratio is adjusted:

A:1		A:10
B:1	or	B:10
C:1		C:10

pH-control

To control pH "pH-control" in the submenu under "Recipe" is selected. Here the wanted pH is adjusted together with alarms.

The following options are available:

pH-control	
Mode selector: pH	**Off**/Acid/Base
pH set point	6.0 pH
Return compensation	No
Min. return compensation	-1.0 pH
Max. return compensation	1.0 pH
pH relative low alarm limit	-1.0pH
pH relative high alarm limit	1.0 pH
pH absolute low alarm limit	4.0 pH
pH absolute high alarm limit	8.0 pH

Mode selector: pH
Off   No pH-control.
Acid   pH-control with acid.
Base   pH-control with base.

Note! All 3 groups must choose the same type of pH-control: Either Acid or Base. This is set in "Service settings./read." -> "Setup menu". For each group you can then as pH-control choose either 'Off' or the chosen pH-control possibility.

pH   pH set point
            Adjusting of the wanted pH value.

Return compensation
To use return compensation another pH sensor must be installed in the environment which will influence on the final setting of pH, i.e. after the plants on the return pipe. This second sensor will "overrule" the pH sensor on the mixer.

            Return compensation
            Choosing if return compensation for pH shall be used or not.

pH   Min. return compensation
            Setting the lowest allowed decrease in pH from the wanted value after the irrigation of the plants before start of compensation. **Note!** Negative value.

pH   Max. return compensation
            Setting the highest allowed increase in pH from the wanted value after the irrigation of the plants before start of compensation

Alarms

pH   pH relative low alarm limit
            Adjusting of the relative lower limit for the pH-value.
            When the pH-value goes below the wanted setpoint + this alarm limit an alarm will arise. **Note!** Set negative value.

pH   pH relative high alarm limit
            Adjusting of the relative upper limit for the pH-value.
            When the pH-value exceeds the wanted setpoint + this alarm limit an alarm will arise. **Note!** Set positive value.

pH   pH absolute low alarm limit
            Adjusting of the absolute lower limit for the pH-value.
            When the pH-value goes below the alarm limit an alarm will arise.

pH   pH absolute high alarm limit
            Adjusting of the absolute higher limit for the pH-value.
            When the pH-value exceeds this alarm limit an alarm will arise.

Start parameters

Adjusting of a number of start parameters, which apply with the start conditions. When the dial is turned the different functions are displayed. To correct them, press ⌨Enter , and turn the dial till the correct value is displayed. Press ⌨Enter again, to store the adjustment. Reading of performed irrigations summed up, sun etc under menu item "Readings", and readings are described in the chapter of that menu.

The following options are available:

Start time	06:00
Stop time	18:00
Min time betw. start of irr.	5:00 min
Minimum air humidity	50 %RH
High temperature of start	40.0 °C
Start level sun integrator	000 W/m2
Accum. sun for start /m2	000 Wh
External starts counter	1
Fixed rhythm	2:00 hour
Temp. of frost-protection	-5.0 °C
Manual start of irr. cycles	0
Cancel current irrigation	**No**/Yes

Start time
Adjusting the time of start irrigations. All irrigations started automatically except by the week program will only irrigate within set time space between "Start time" and "Stop time".
Accumulated irrigation cycles i.g. from the sun integrator will be saved until next day.

Stop time
Adjusting the time of stop of automatic started irrigations.

min.   Minimum time between starts of irrigation
Adjusting the pause between 2 cycles of irrigation. The pause also serves as pause between accumulated irrigations queued up waiting to be started.

RH%   Minimum air humidity
Adjusting of a minimum limit of air humidity. If the air humidity gets below this limit, the irrigation controller will start spraying cycles. The pause between two sprayings is set above.
The spraying time of each valve is set under irrigation times.
The spaying cycles are over run by the start and stop times of cooling and irrigation, see above.
Note! Only active if "Minimum air humidity" has been selected in "Start condit.".

°C   High temperature of start
Adjusting of a maximum limit of the air temperature. If the air temperature gets above this limit, the irrigation controller will start cooling cycles. The pause between two sprayings is set above.
The cooling time for each valve is set under irrigation times.
The cooling cycles are overrun by the start and stop times of cooling and irrigation, see above.
Note! Only active if "Start at high temperature" has been selected in "Start conditions".

W/m2   Start level sun integrator
Adjusting of the level of sun radiation to start the sun integrator . If the sun radiation gets above this level, sun radiation will be accumulated.
Executing of irrigation cycles by the sun integrator is overrun by the start and stop times of cooling and irrigation, see above.
Outside this time period irrigation cycles will be accumulated e.g. a manually started irrigation will reduce the accumulated cycles.
Setting of start and stop time, see above.
Note! Only active if "Sun integrator" has been selected in "Start conditions".

Wh   Accum. sun for start /m2
Adjusting of the sun integrator "Sensitivity".
An irrigation cycle will start, when the accumulated sun energy has reached the value in this setpoint.
If an irrigation cycles has been started from another start option, the accumulation will be reset.
Note! Only active if "Sun integrator" has been selected in "Start conditions".

External start counter
Adjusting of the wanted number of external signals to start an irrigation cycle.
Enter 1 to start an irrigation at the impulse from for example a start tray
If you for example have connected an evaporation sensor to your irrigation controller, you must set the amount of evaporated water, which will release an irrigation.
Note! Only active if "External start option" has been selected in "Start conditions".
Note! Must not be set to 0.

Fixed rhythm
Adjustment of the interval between irrigation cycles, if you have chosen to irrigate with a fixed interval.
The interval timer will be reset by the other start options.
To set an irrigation at a fixed time independent of the other automatic starts, use the week programme.
Note! Only active if "Fixed interval" has been selected in "Start conditions".

°C   Temperature of frost-protection
Adjusting of a minimum temperature limit for starting the spraying cycles.
This option is for outdoor fruit growing. Please note that the time must also be within the start and stop times of cooling and irrigation, see above.
The spraying cycles are overrun by the start and stop times of cooling and irrigation, see above.
Note! Only active if "Frost-resistance" has been selected in "Start conditions".
Note! A separate outdoor temperature sensor must be installed. The weather station can not be used.

0   Manual start of number of cycles
Set point for starting a number of irrigation cycles manually.
If you for example set the value at 2, the irrigation controller will irrigate 2 cycles in all valves. The pause between several manual irrigations is set in "Min time betw. start of irr.".
Note! The manual start does not have any priority, that is if you start a manual irrigation, and an automatic irrigation is running or there are other irrigations in queue, the manual start will be set in queue with the other waiting irrigations.
Also important to remember: With more irrigations in queue an irrigation started by solar radiation will always be performed before a manual started irrigation.

Remember! Other conditions for the manual group.

No   <u>Cancel current irrigation</u>
Set point for cancelling an active irrigation cycle.
If you answer "Yes" the current irrigation is stopped, and the remaining irrigation time is erased.
**Note!** Accumulated irrigation cycles in queue will not be cancelled.

Adjusted irrigation time

This function will give the opportunity to prolong the irrigation in case of very high solar radiation during the day. The irrigation time can be adjusted according to the integrated solar radiation since last irrigation. The principle is shown in the figure below.
Note! This function is only active when you have chosen "Time adj." for Start condition 'Solar integration'. Since drainage control is also a possible choice for Start condition 'Solar radiation' you cannot have the facilities 'ADJUSTED IRRIGATION TIME' and 'DRAINAGE CONTROL' at the same time.

The principle of 'ADJUSTED IRRIGATION TIME' is shown below:
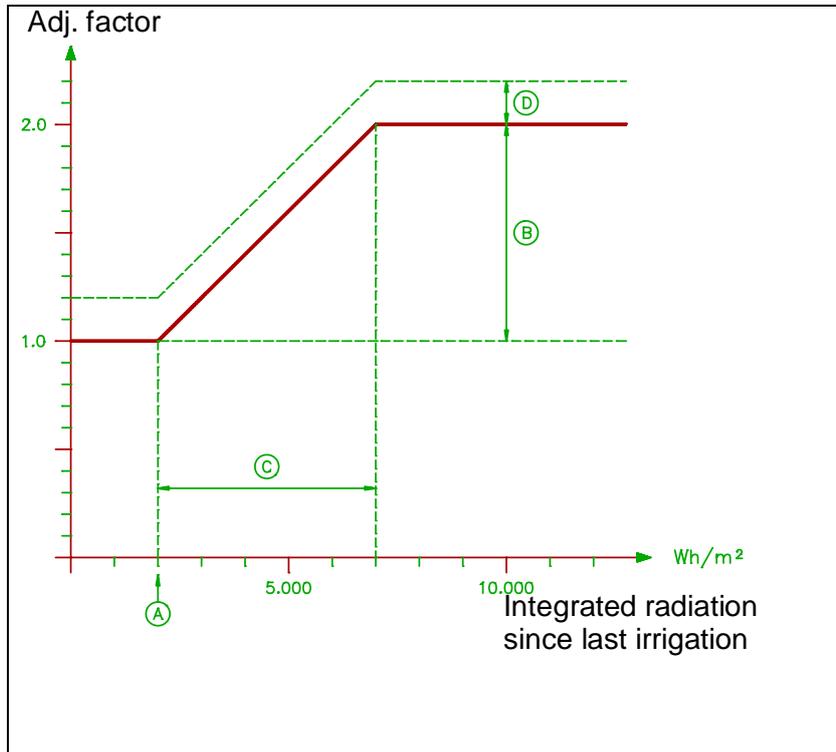
A.   Basic sun integration Wh/m2
B.   Max adjustment of irrigation time %
C.   Adjustment P-band (sun integrator) Wh/m2
D.   Factor for manual adjustment of irrigation time

The following set points are available:

Basic sun integration /m2	2000 Wh	
Max adj. of Irrigation time	100 %	
Adjustment P-band (sunint.)/m2	5000 Wh	
Manual adj. of Irrig.time	0.00	
Total adjustment of Irrig.time	1.00	**Reading**

Wh/m2 Basic sun integration
Adjusting of the integrated solar radiation, since last irrigation, below which no time adjustment will take place. This means that the irrigation time will be as set in the menu 'Irrigation time'. If the integration is higher the irrigation time will be adjusted to a longer time.

% Max adj. of Irrigation time
Adjusting of the maximum possible increases of the irrigation time, depending on sun integration since last irrigation.

Wh/m2 Adjustment P-band (sunint.)
Adjusting of the range of integrated solar radiation, where the increase of the irrigation time is adjusted from normal to the maximum value. At the figure above the 'Basic sun integration' is set to 2000 Wh/m2, and the 'Adjustment P-band' is 5000 Wh/m2. Therefore the adjustment of the irrigation time is calculated between 2000 Wh/m2 until 7000 Wh/m2 (2000 + 5000 Wh/m2).

0.0 Manual adj. of Irrig.time
Adjustment of an optional manual adjustment factor. With this set point it is possible to increase the irrigation time for all the valves in the group without interfering with the normal irrigation times. This is an advantage if you in some months of the year need a higher basic irrigation time but do not want to change the set irrigation time for the valves.

1.0 Total adjustment of Irrig.time
Reading of the factor for total adjustment of the irrigation time including the calculation based on the integrated solar radiation, and manual adjustment.

Drainage control

The purpose of the drainage control is to achieve a controlled quantity of drainage to save water, and at the same time ensures that the plants are irrigated, when they need it.

When using "Drainage Control" the sun integrator is adjusted in accordance to the measured drainage % in relation to the required drainage %. If e.g. the measured drainage % is lower than the required, the sun integrator is adjusted to a faster irrigation frequency, but still depending on the sun intensity. See fig. (Drainage).

When setting be aware that the calculation of the drainage % must be finished before the next irrigation in the group is starting. This can be a problem if you have very short irrigation times or if there is only used one valve in the group. In this case you can correct with the set point: "Start parameters \ minimum time between starts". This set point must be higher than the Irrigation time for the **first** valve in the group plus Drainage Control \test\3446 Delay before % calc.

If the calculated drainage time has not been calculated before the next irrigation in the group, the drainage pulse counter will not be cleared and the collected drainage pulses will be a part of the next irrigation.

The function can be overrun by the start and stop time set in " Start parameters ".

Note! Drainage sensor must be installed, and input for drainage sensors must be chosen in "Special" -> "Service settings" -> "Setup menu" -> "6209 Digital D1-D3 use:".

The principle of the drainage control is shown in the figure below.
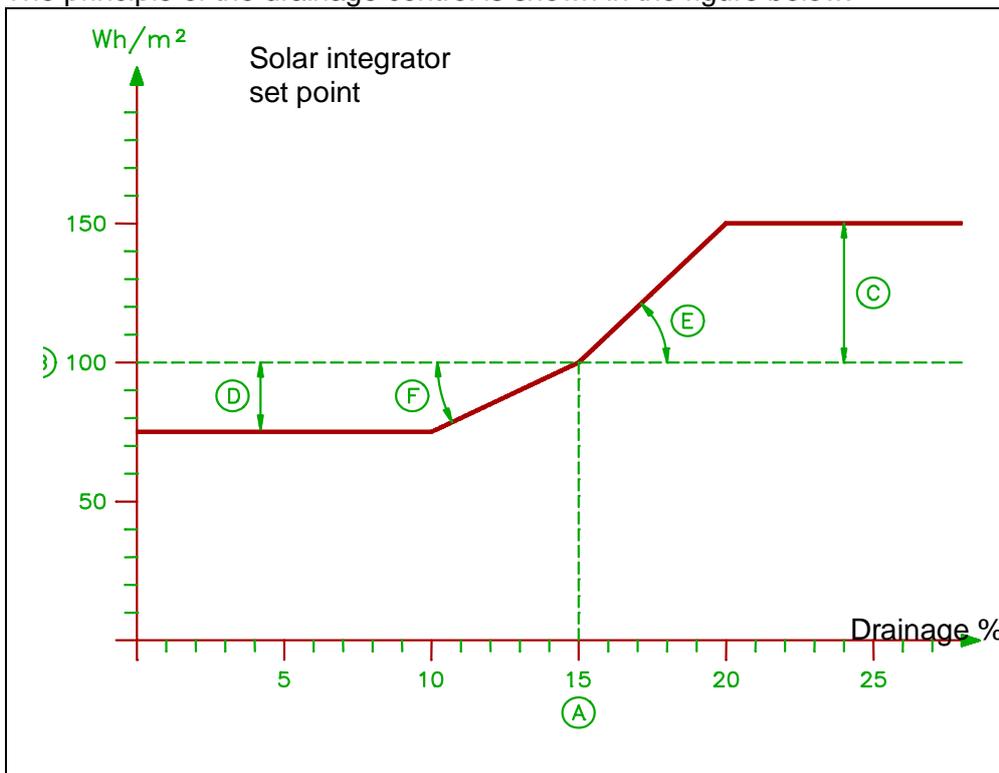
    A. Drainage set point %
    B. Accumulated sun for start (basic) Wh/m2
    C. Max increase sun sum for start Wh/m2
    D. Max decrease sun sum for start Wh/m2
    E. P-factor by excess high draining Wh/%
    F. P-factor by insuffic. draining Wh/%

The following options are available:

Drain set point time zone 1	20 %
Drain set point time zone 2	20 %
Time for shift time zone 1-2	12:00
Max incr. sun sum f. start	200 Wh
Max decr. sun sum f. start	100 Wh
P-factor by excess drain	10 Wh/%
P-factor by insuffic. drain	5 Wh/%
Sunint.Irrigation start lev.	100 Wh

%   Drain set point time zone 1
Adjustment of the requested drainage percentage for time zone 1.

%   Drain set point time zone 2
Adjustment of the requested drainage percentage for time zone 2.

hh:mm   Time for shift time zone 1-2
Adjustment of the time of day for changing between the two time zones to achieve two different drainage percentage.

Wh   Max increase sun sum f. start
Adjustment of the maximum increase of the solar integrator set point for prolonging the pause between two irrigations.
When the drainage percentage is higher than the set point, the solar integrator will be adjusted to make the pause between the irrigations longer. The basic set point for start irrigation based on integrated solar radiation is set under 'Start parameters' in set point 'Accum. sun for start /m2'.

Wh   Max decrease sun sum for start
Adjustment of the maximum decrease of the solar integrator set point reducing the pause between two irrigations. When the drainage percentage is lower than the set point, the solar integrator will be adjusted to make the pause between the irrigations shorter.

Wh/%   P-factor by excess drainage
Adjustment of how quick the increase of the solar integrator setpoint should be in case of excess drainage.

Wh/%   P-factor by insufficient drainage
Adjustment of how quick the decrease of the solar integrator set point should be in case of insufficient drainage.

%   Sunint.Irrigation start lev.
Adjustment of the sun integrator set point in the morning until the first drainage is registered. Then the drainage program will change back to the calculated rhythm from yesterday. No adjustment is made on the solar integrator until drainage is registered.

Fixed start time

This function will give you fixed start times specific for each group.
Choose 'Fixed time' for the start condition 'Week programme'. You will then have a possibility of up to 4 fixed start times per day for each group. To set the start times go to the menu 'FIXED START TIME'. The menu show 4 lines, where you can set a start time.

Start 1, at:	00:00
Start 2, at:	00:00
Start 3, at:	00:00
Start 4, at:	00:00

Irrigation times

How to set the sequence, active valves and irrigation times for one group is the same as for "Irrigation times" for all groups above.

Looking at the irrigation times for each group separately you will have a reading which is not shown in the Irrigation Menu for all 3 groups at one time.

> Total adjustment of irrigation time
> Reading of the current adjustment factor for the irrigation time which will change the next irrigation time per valve. The adjustment is related to the settings of adjusting the irrigation time. See description of the menu "Adjusted irrigation time" above.

Readings and settings for "Group 1/2/3"

	No. of valves in parallel	1
	Priority level:	3.
	Avoid prioritized valve stop?	**No**/Yes
	Valve pause:	00:00 min
	Group pause:	00:00 min
*	**Adjustment of Irrigation time?**	--- (No/Yes)
*	**Drainage control active?**	--- (No/Yes)

*) Depending on the setting of start condition.

1   No. of valves in parallel
         Adjusting the number of valves you want to irrigate at the same time. You can set from 1 to 10. Remember the number you can have in parallel depends on the water supply from the main pump. When the valves run in parallel e.g. 2 valves irrigating at the same time, and the valves have different length of irrigation time the next two valves will start to irrigate when the valve with the longest irrigation time is expired and the valve pause is elapsed.

3.   Priority level
         Adjusting the priority between the 3 groups for water distribution between 1, 2 or 3. '1' is highest priority. When two groups have the same priority, they will queue up.

No   Avoid prioritized valve stop
Set point for choosing if a prioritized group can stop a current irrigation.
If you use ebb-flood benches a stop of an irrigation, while it is running and then continue later makes no sense. . If you answer 'Yes' in this set point this group will not stop until the active valve has finished its irrigation time.

min.   Valve pause
Adjusting of a pause after each valve. When a pause has been coded, the irrigation of the next valve will not start until the pause time has expired.

min.   Group pause
Adjusting of a pause after each group. When a pause has been coded, the irrigation of the first valve in the next group will not start until the pause time has expired.

00:00 min   Vessel draining time.
Adjustment of the time needed for emptying the mixing tank before the irrigation time of the last valve in the group has finished.

Note! The draining time is not variable. If the tank is empty before the irrigation has finished the mixer will continue with the selected recipe**.**

Note! Tank draining can only be performed, if the mixer is supplied a special "tank draining relay".

No   Adjustment of Irrigation time?
Showing if the start condition 'Time adj.' is chosen.

No   Drainage control active ?
Showing if the start condition 'drain contr' is chosen.

Setting in menu "Irrigation groups":

Manual Stand-by

Set point for a temporary stop of operation.
Answering 'Yes' in this set point an ongoing irrigation is stopped, and the remaining irrigation time is stored. To start the irrigation again answer 'No'. Both the valve control and the fertilizer mixing is set Stand-by.

Common week program

For each week it is possible to enter 28 fixed start times. You can distribute the 28 fixed times within a week as you like. It is possible to program one or all 28 start times as a daily start. Turn the dial through the 28 start settings and enter day of the week (or 'all') and time against each start setting. You can enter the times in arbitrary order; the irrigation controller will arrange them in such a way that the first value always will be the next irrigation.

```
┌─────────────────────────────────────────────────────┐
│  WEEK PROGRAMME          12:30 27/11 2007             │
│  Start-irrigat.: day, time              Mon  10:30    │
│  Start-irrigat.: day, time              Tue  12:45    │
│  Start-irrigat.: day, time              all   18:35   │
└─────────────────────────────────────────────────────┘
   .
   .
  Start-irrigat.: day, time                Sun   17:30
```

Instead of choosing a week day you can choose "all" with a start every day.
Note! If you jump out of the sub menu, Week programme when an irrigation shall start, this irrigation is skipped.
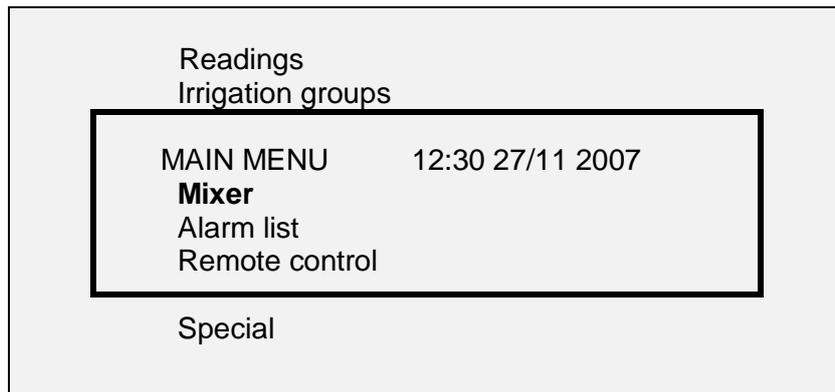

Common alarm settings

Survey of the common alarm settings for the possible extra EC- and pH-sensors.

Deviation EC1-EC2 for alarm	1.0 mS
EC 2 abs. low alarm limit	1.0 mS
EC 2 abs. high alarm limit	3.5 mS
Deviation pH1-pH2 for alarm	1.0 pH
pH 2 abs. low alarm limit	4.0 pH
pH 2 abs. high alarm limit	8.0 pH

mS   <u>Deviation EC1-EC2 for alarm</u>
Adjustment of the allowed deviation between the reading on EC-sensor 1 and EC-sensor 2
The reading on EC-sensor 2 is compared with reading on EC-sensor 1. . If the deviation exceeds this limit an alarm will arise.
Note! The alarm does not show which of the sensors that should be adjusted or is broken, only that there is a difference between the measured values.

mS   <u>EC 2 abs. low alarm limit</u>
Adjustment of the lower limit for the EC2-value.
When the EC2-value goes below this alarm limit an alarm will arise.

mS   <u>EC 2 abs. high alarm limit</u>
Adjustment of the upper limit for the EC2-value.
When the EC2-value exceeds this alarm limit an alarm will arise.

pH   <u>Deviation pH1-pH2 for alarm</u>
Adjustment of the allowed deviation between the reading pH-sensor 1 and pH-sensor 2.
The reading on pH-sensor 2 is compared with reading on pH-sensor 1.
If the deviation exceeds this limit an alarm will arise. Note! The alarm does not show which of the sensors that should be adjusted or is broken, only that there is a difference between the measured values.

pH   <u>pH 2 abs. low alarm limit</u>
Adjustment of the lower limit for the pH2-value.
When the pH2-value goes below this alarm limit an alarm will arise.

pH   <u>pH 2 abs. high alarm limit</u>

Adjustment of the upper limit for the pH2-value.
When the pH2-value exceeds this alarm limit an alarm will arise.

Mixer

```
        Readings
        Irrigation groups

        MAIN MENU        12:30 27/11 2007
        Mixer
        Alarm list
        Remote control

        Special
```

Mixer

In this menu the mixer can be switched on and off. Moreover you can choose hose irrigation, when the mode selector for the mixer is set to "Aut. start". From standard the mixer is set on "Aut. start" and the hose irrigation is switched off.

Active recipe:	-
Mode selector: Mixer	Off/Manual/Auto.
Mode selector: Hose irrigation	**Off**/On
Recipe hose irrigation	**1**/2/3
Transmit act. recipe again?	**No/**Yes
ACTIVE RECIPE	

Active recipe:
Reading the recipe number of the current irrigation.

Mode selector: Mixer
Off	The mixer is switched off.
Man.start	The mixer is mixing until the mode selector is set on 'Off' or 'Aut. start'.
	Note! No valve will be activated.
Aut.start	The mixer is started automatically, either by the internal irrigation controller, or by an external irrigation controller.

Mode selector: Hose irrigation.
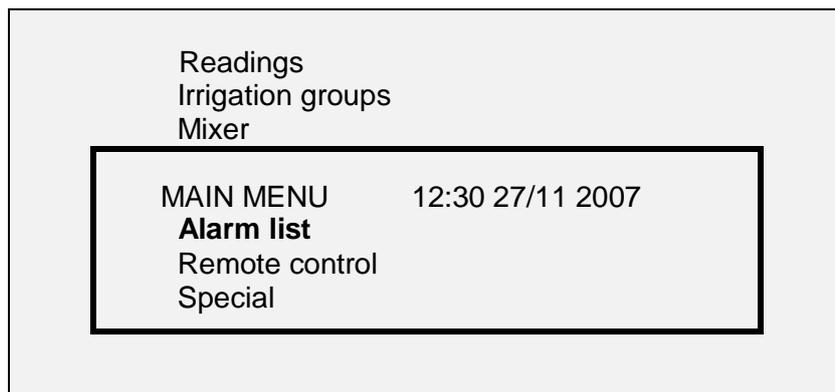|	
Off	Hose irrigation is not possible.
On	Hose irrigation is possible. Mode selector for the mixer must be set to "Aut. start".
	Note! Another automatic start not possible until hose irr. is again "Off"

Recipe hose irrigation
Setting of the recipe that should be used by a hose irrigation.
Note! Recipe 0 can not be used.

Note! A flow switch and pressostate must be installed in order to use hose irrigation, in order to detect, when the water for the hose is turned on. If you want to irrigate without fertilizer and acid the "Function selector: EC" and "Function selector pH": is set 'Off'. The two selectors are listed in the menus for respectively EC control and pH control.

No	Transmit act. recipe again?
	Reply with a 'Yes' if a changed recipe should be transmitted to a performing irrigation. The mixer will use the old recipe until you answer 'Yes' in this set point, and the rest of the irrigation will be performed with the new recipe. The changed recipe will always be used for the next irrigation having the same recipe number.

Alarm list

```
        Readings
        Irrigation groups
        Mixer

    MAIN MENU        12:30 27/11 2007
    Alarm list
    Remote control
    Special
```
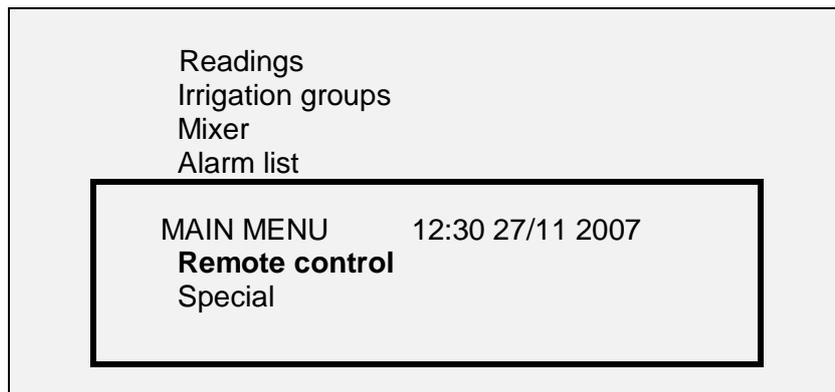
Alarm list

When the fertilizer mixer gives an alarm, the alarm list will be shown automatically if the default-pictures are on the display. The text "Alarm, turn off bell   Not seen" is shown. Choose "Seen" to turn off bell.

When you select this menu item, a list of alarm possibilities is shown. The fertilizer mixer will give the alarm, when one of the alarm limits has been exceeded, and the text in the display will change from "NO ALARM" to "ALARM".

```
ALARM LIST:
   Alarm, turn off bell              Not seen
   Absolute high EC                  ALARM
   Relative high EC                  NO ALARM
```

Relative low EC	NO ALARM
Relative high pH	ALARM
Relative low pH	
Absolute low pH	
Absolute high pH	
Deviation EC1-EC2	
Deviation pH1-pH2	
Absolute low EC2	
Absolute low pH2	
Absolute high pH2	
Level/motor relay	
Total stop	**No**/Yes
Stop dosing	**No**/Yes
Sensor failure	NO ALARM

Remote control

```
        Readings
        Irrigation groups
        Mixer
        Alarm list

    MAIN MENU        12:30 27/11 2007
    Remote control
    Special
```

Remote control

If you have a LCC900 or LCC90 climate computer in connection with an AMI Quattro fertilizer mixer, you can choose to set the climate computers from the fertilizer mixer. Select menu item "Remote control" in the main menu. The number of the climate computer can only be set in "Setup menu" under "Service settings".

```
REMOTE CONTROL        12:30 27/11 2007


Name of wanted comp.:              1
Comp. that remote c. 0=Stop:       0
```

If you want to work in one of the other compartments, press ⌁Enter against the line "Name of wanted comp.:" and choose compartment number.

An example of how you can change to another compartment.

```
REMOTE CONTROL        12:30 27/11 2007


Name of wanted comp.:              1
Comp. that remote c. 0=Stop:       2
```
                                   3

.
                                   249

Note! Only control remote one compartment at a time. I.e. do not control remote a LCC900/LCC90, which is already remote controlled or remote controlling.

To select another compartment, turn the dial till it is displayed and then press ⌁Enter . When you are working in another compartment, clock and date have disappeared from the top line, and instead if you have selected compartment 1 it reads, : "Node: 1". Set the values in the other compartment in the same way as you set the values in the compartment you are inside now. When working in another compartment, the display of the climate computer, you are correcting will show the same displays, you have on the display.

Note! It is still possible to correct the settings direct in the climate computer, while correcting it from somewhere else.

Example of what is displayed when you are looking at a LCC900/LCC90 climate computer:

```
PRIMARY HEAT          12:30        Node:   1
 Mode selector: Temperature        Sun up/d.
 Air temperature, day              18.0 °C
 Air temperature, night            16.0 °C
```

```
 Time for dawn              06:00
 .
```

Turn,'Enter'-select,'Clear' - main menu

When the corrections have been made in the settings of the other compartment, choose "Remote control" and change "Comp. that remote controls:" to '0' to interrupt the connection with the compartment.

Special

Readings
Irrigation groups
Mixer
Alarm list
Remote control

MAIN MENU   12:30 27/11 2007
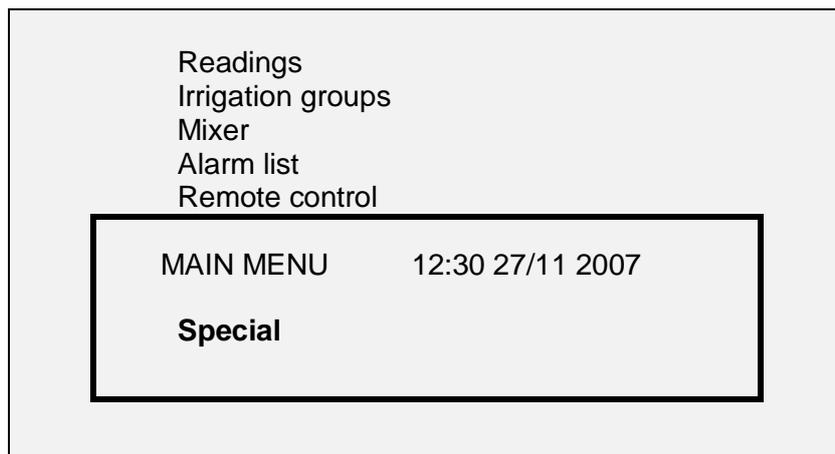
Special

Special

At the bottom of the main menu is the menu item "Special". Select that menu item to see a submenu.

```
SPECIAL            12:30 27/11 2007
 Grower setup
 Adjustment of pH
 Alarm setup
```

 Service settings

Grower setup

This menu contains the set points which are seldom used. Here you can set time and date and reset the counters. Each group has its own submenu with counters

Grower setup:
       Time
       Date
       Summer/actual time
       Totally accumulated sun per m2   --- kWh
       Total main pump time   -- hours
       GROUP 1/2/3
       MANUAL GROUP

       Summer/actual time
       Adjustment of whether the computer operates according to summer time ("Summer") or actual time ("Winter"). Change-over from summer time to actual time must always be set here and not by setting the time.

       Totally accumulated sun per m2
       Here you set the value for 'Totally accumulated sun per m2' back to zero.

       Total main pump time
       Here you set the value for 'Total main pump time' back to zero.

Group 1/2/3:
       Performed irr. cycles in all   --
       Remaining irr. cycles, sun   --
       External start counter   --

For each group you reset the counters by changing the number to '0'. You cannot set any other number in the set points than '0'.

Manual group:
       Remain.irr. cycles, excl. sun   --
       Manual start of irr. cycles   --

For the manual group you reset the counters by changing the number to '0'. You cannot set any other number in the set points than '0'.

Adjustment of pH

pH1 _._	pH-sensor 1:	pH 7	0.00 pH
pH1 _._	pH-sensor 1:	pH 4	1.00 pH
pH2 _._	pH-sensor 2:	pH 7	0.00 pH
pH2 _._	pH-sensor 2:	pH 4	1.00 pH

It is necessary to check the pH-sensor **every 2 weeks**. It can be done directly at the display of AMI Quattro. Adjustment is carried out in the following way:

Rinse the pH-sensor with demineralised water and place the sensor in pH = 7.0 buffer solution.
Select "pH-sensor 1: pH 7" respectively "pH-sensor 2: pH 7" dependent on if it is pH-sensor 1 or 2 that is to be adjusted. pH-sensor 1 is always the sensor placed on the mixer.
Adjust the set point until the reading shows 7.0.
Rinse the sensor with demineralised water and place the sensor in pH = 4.0 buffer solution.
Adjust pH to 4.0 in the set point "pH-sensor 1: pH 4" ("pH-sensor 2: pH 4").
Finally pH = 7.0 is adjusted again in the same way as described above.

Note! When the pH7 adjustment reach and/or exceeds -1.00 it is time for the replacement of the sensor.

Alarm setup

In this submenu there are a number of alarm options, choice of functions by sensor error, start- and stop time for activation of the alarm relay.

Function abs. high EC alarm	**Total stop**/Stop dos./No stop
Function rel. high EC alarm	Stop dos.
Function rel. low EC alarm	No stop
Function rel. high pH alarm	No stop
Function rel. low pH alarm	Stop dos.
Function abs. low pH alarm	Total stop
Function abs. high pH alarm	Total stop
Funct. b EC1 relative EC2	Stop dos.
Funct. b abs. high EC2 alarm	Total stop
Funct. b abs. low EC2 alarm	Total stop
Funct. b pH1 relative pH2	Stop dos.
Funct. b abs. high pH2 alarm	Total stop
Funct. b abs. low pH2 alarm	Total stop
Total stop by sensor fail.?	**Yes**/No
Time for start alarm relay	00:00
Time for stop alarm relay	23.59

For each alarm it is possible to choose how the fertilizer mixer is to react. The following alarm possibilities are available where each possibility gives a choice between the three options described below.

The three options for each set point:

No stop   It is possible to choose to let the fertilizer mixer continue to irrigate as before the alarm arose.

Stop dos.   It is possible to choose to stop the dosing of fertilizer, and acid or base when an EC-alarm or pH-alarm arise. The irrigation is then performed with fresh water after the alarm has appeared.

Total stop   It is possible to choose to stop the fertilizer completely.

Sensor failure

Total stop by sensor fail.?
Choose 'Yes' or 'No'. The dosing always stops; if you answer 'Yes' also the pressure pump will stop. Example: 'No' has been entered and a pH-sensor error has appeared: The acid dosing stops while the fertilizer dosing continues. I.e. the plants get water with the correct EC-value, but the water has not been pH-adjusted.

Time for start and stop alarm relay
To avoid wake up calls during the night it is possible to choose a period without activating the alarm bell. There is still an alarm registered in AMI Quattro but the alarm relay is not activated.

Time for start alarm relay
Adjustment of start of time period during which the alarm relay can be activated.

Time for stop alarm relay
Adjustment of stop of time period during which the alarm relay can be activated.