1	General help ECONOMIC
2	Control General
3	Control Climate
4	Control Water
5	Energy management
6	Service manual
7	
8	
9	
10	

HOOGENDOORN AUTOMATION

Postal address:
PO Box 108
NL - 3130 AC Vlaardingen
Tel: +31 (0)10 460 80 80
Fax: +31 (0)10 460 80 00
E-mail: info@hoogendoorn.nl
Website: www.hoogendoorn.nl

Address for visitors:
Westlandseweg 190
3131 HX Vlaardingen

Manual : Help screens HOOGENDOORN ECONOMIC
Manual number : P1365 version 1
Program version : 7.6.4

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EXTRA SECURITY Critical processes must be additionally monitored by the attention of the user himself and/or secured with devices outside the computer. There are many critical processes in a horticultural business, such as watering, smoothing peaks in gas and electricity consumption, CO2 supply, lighting, and so on. Monitoring outside the computer means for example the use of equipment that is not connected to or dependent on the control computer, but also the regular execution of personal (visual) inspections. In addition safety devices outside the computer must also be fitted to prevent damage to installations in case of incorrect or unexpected computer control.

1. General help ECONOMIC

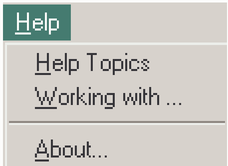
Help with help

1. What does it do...

You do not know how to do something or want to discover new options? Use help!

2. Types of help

You can select **Help** from the menu.
The following screen appears:



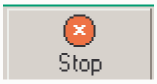
By selecting the option "Help Topics" a new dialog appears that shows you help about the *ECONOMIC* NT. At the moment the help system contains the following types of information:

- **General Help *ECONOMIC* NT**
  By selecting **General Help *ECONOMIC* NT** you get help on the basic knowledge of *ECONOMIC* NT and the *ECONOMIC* NT operating programs.
- **Controls**
  This is the help on settings.
  This help is context-sensitive (gives help on the setting(s) you are currently working with).

By selecting the option "Working with..." help appears about the program you are currently working with. The last option "About..." shows the version number of the *ECONOMIC* NT software.

Tip Except for the above-mentioned help resources you can find help in the ***ECONOMIC* NT manual**.

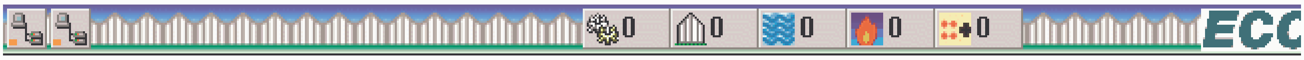
3. Using the help program

	Back:	Move to the previous help page.
	Stop:	Stop downloading information.
	Refresh:	Refresh the current page on the screen.
	Home:	Go to the help screen "Basic knowledge *ECONOMIC* NT".
	Print:	Print the current page.
	Hoogendoorn website:	Go to the Hoogendoorn website (only possible if you have an Internet subscription with an Internet provider).

Help with Ecobar

1. What does it do...

The Ecobar is used to access the *ECONOMIC* NT operating system and the alarm reports quickly and easily.



The Ecobar is always on the screen when the program is being operated.
The buttons for all holdings connected to the system are on the left of the Ecobar.
The buttons with the alarms for the different program modules are in the centre of the Ecobar.

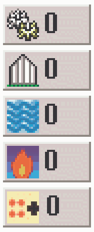
2. Operation for several holdings

When you click *ECONOMIC* NT, a menu appears from which you can select **Operate**.

The light on the *ECONOMIC* NT button glows green in the idle state. A blinking orange light means it is receiving or sending communications. A steady red light means there is a fault.

3. Looking at alarms

The status of an alarm button shows how many active alarms there are for that module. Click a button to open the corresponding alarm report.



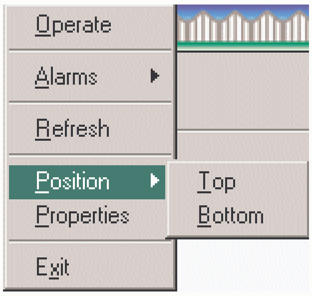
Retrieve general alarm report
Retrieve climate alarm report
Retrieve water alarm report
Retrieve energy alarm report
Retrieve total alarm report

The status of the button for an alarm report may also show a question mark. This indicates that the number of active alarms is unknown. A possible cause is that there is no communication.

4. Moving the Ecobar

The Ecobar always appears on the screen when Operate is opened.
You can choose whether the Ecobar appears at the top or bottom of the screen.

- Click the Ecobar with the right mouse and move the mouse pointer to **Position**
- The next window appears:

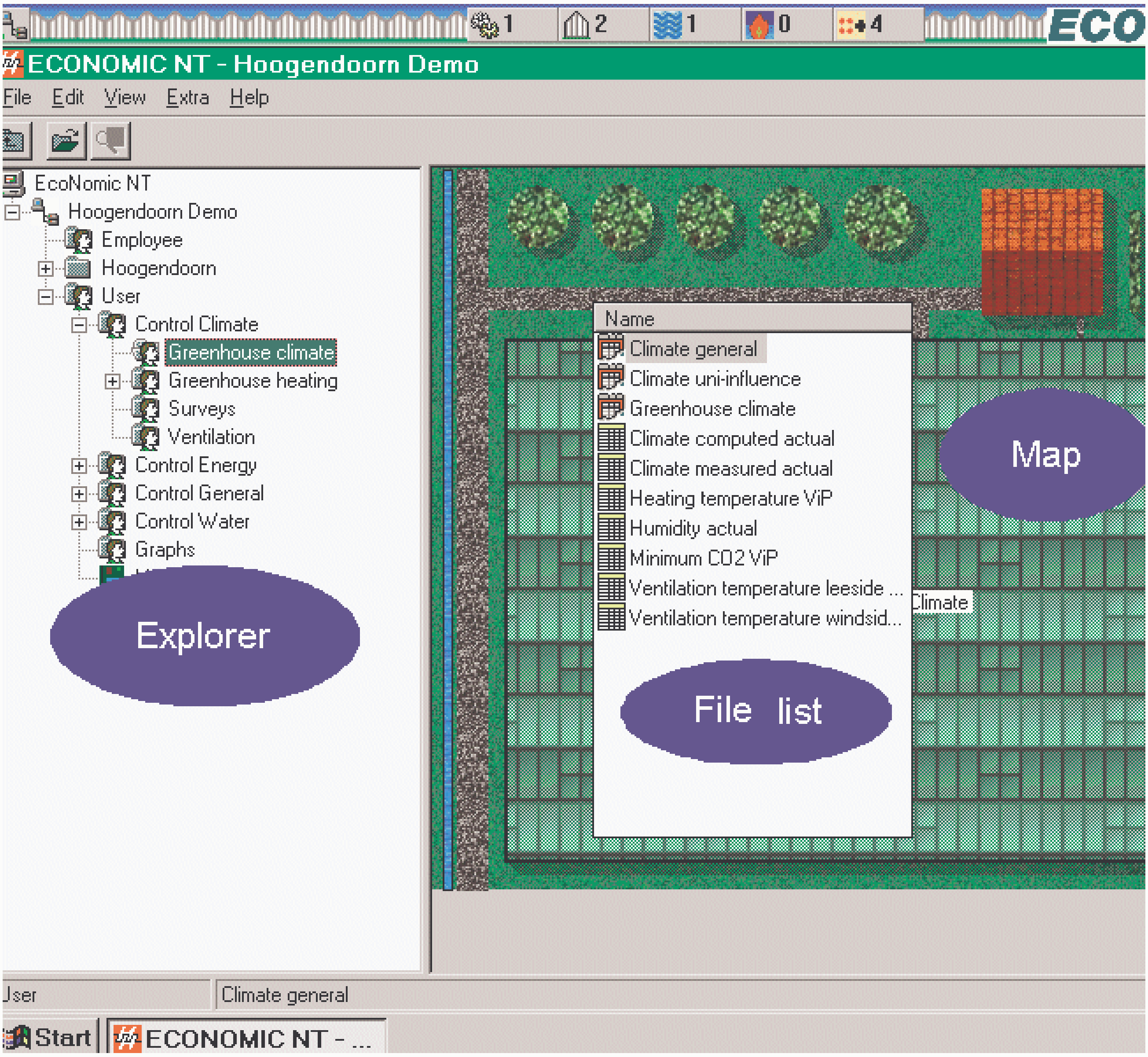


- Select **top** or **bottom**

Explorer Help

1. What does it do...

On the left of the *ECONOMIC* NT window is **Explorer**.
On the right of the window is the **map**.
The small window in the middle is the **file list**.



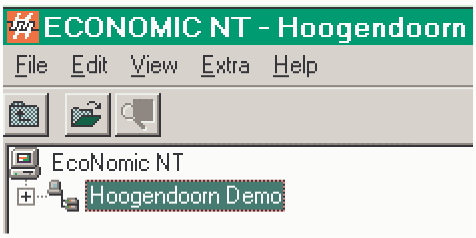
Explorer enables you to browse in folders.
These folders are arranged in a tree structure.

In Explorer you can:

- click the left mouse button on ⊞. The menu selected will then be opened.
- click the left mouse button on ⊟. The menu selected will then be closed.
- click the left mouse button on . The folder selected will then be opened.

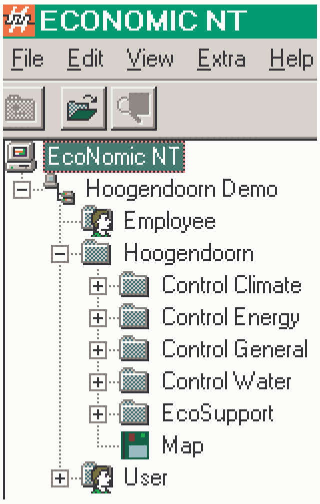
2. Browsing with Explorer

When all the folders are closed, Explorer looks like this:



The name of your business will appear in place of "Hoogendoorn Demo".

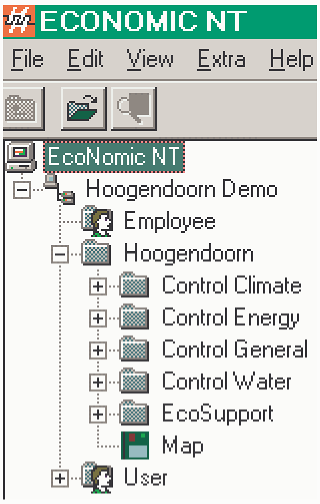
Click on the ⊞ and the following window will appear:



The "Hoogendoorn" folder contains **all** the folders. **Nothing** can be changed in the Hoogendoorn folder. In this way a service engineer always knows where to find the settings and reports. This is useful if the service engineer comes out to you to rectify a fault or if assistance is being provided remotely via the helpdesk.

On delivery of the *ECONOMIC* NT the "User" folder also contains **all** the folders as standard. You can modify these folders as you see fit.

2.1. Open folder



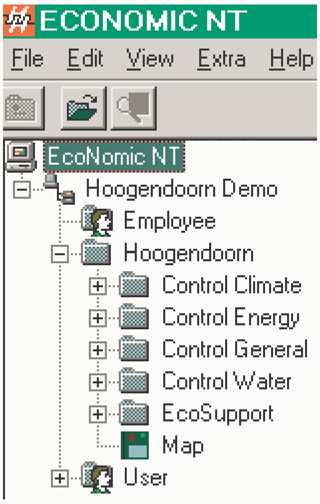
Folders are arranged in a tree structure.

You can open a folder in different ways:

1. Click on the ⊞ for the "Hoogendoorn" folder

2. Click on the "Hoogendoorn" folder and then on the  button
3. Double click on the "Hoogendoorn" folder

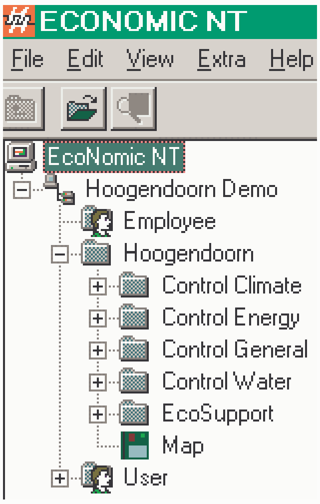
Then the window below will appear:



2.2. Previous folder

Folders are arranged in a tree structure.

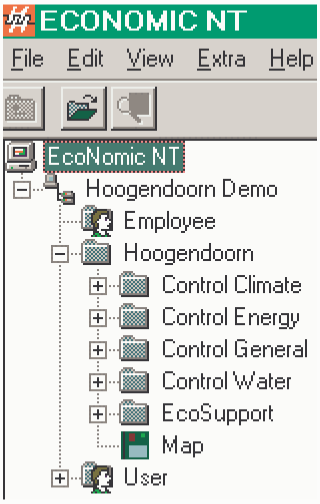
Click on the  button
In this way you can go back to a previous folder one step at a time.



3. Working from the map

The map has been made to scale and shows the distribution of the groups or valves across the nursery for each control.
When changing settings it is especially useful to work via the map.

3.1. Searching for settings list



We are going to search for the Greenhouse Climate settings. Follow the steps below:

- Click on the ⊞ for the "Control Climate" folder
- Click on **Greenhouse Climate**
- A **file list** will appear containing settings and reports

This is a symbol for a settings list
This is a symbol for a report

- Double click on the **Greenhouse Climate** folder in the **file list**
- The file list will then disappear and one or more groups can be selected

- The groups can be selected in different ways:

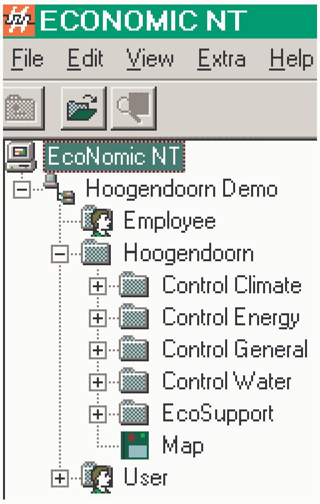
  - Click **in a group** with the left mouse button. The group will change colour. You can add another group by holding down the [Ctrl] key while clicking on a different group with the left mouse button.
    You can also remove a group from the selection by holding down the [Ctrl] key while clicking on the group that you want to remove from the selection.
  - Click **in the group** with the left mouse button and hold the left mouse button down as you drag the mouse pointer over other groups. As you drag the pointer the selected groups will change colour.
  - Click **outside the greenhouse** with the left mouse button and hold the left mouse button down as you drag the mouse pointer over the groups. You will then see a dotted box appear on the screen that indicates the selection. As soon as you release the left mouse button the selected groups will change colour.

- Click on
- The settings for the selected group(s) will appear

You can select **all** the groups **quickly** by selecting **no** groups and immediately clicking on

The **order** in which you select groups is important. Once you have selected groups, the settings that appear on the screen are those of the **first group selected**

3.2. Renaming group or valve

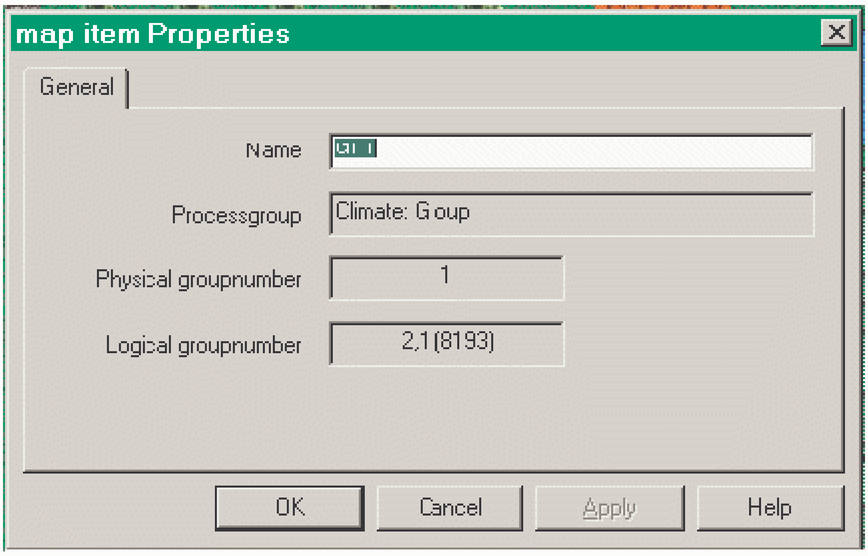


We are going to search for the Greenhouse Climate map. Follow the steps below:

- Click on the ⊞ for the "Control Climate" folder
- Click on **Greenhouse Climate**
- Double click on the folder **Greenhouse Climate** in the **file list**
- The file list will then disappear

Now each group can be renamed.
- Click in group 1 with the left mouse button
- Press the **right mouse button**
- The menu below will appear:

- Move the mouse pointer and click on "Properties"
- The box below will appear:



- You can now type in a new name

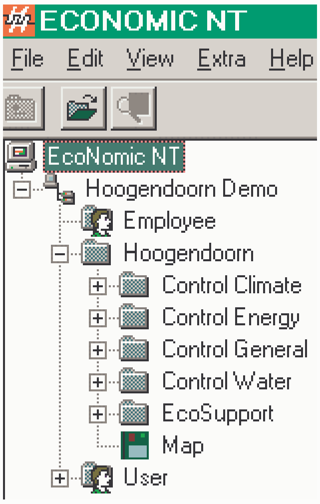
4. Modifying the "User" user folder for the first time

The quickest and easiest way to modify the "User" user folder is to:
- delete folders of controls that are not available
- filter out settings that you do not use

Help on "Filtering out settings" can be found under Setup program help

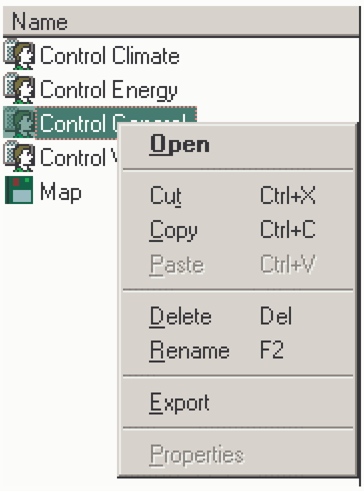
4.1. Deleting a folder

We shall now delete a folder step by step:



- Click on the "User" folder

Let's say that you do not have any watering in the *ECONOMIC* NT.
- Click on the "Control Water" folder in the **file list**
- Press the **right mouse button**
- The menu below will appear:



- Move the mouse pointer to "Delete"
- Then click on the Ja key
- The "Control Water" folder will be deleted.

- Delete all the folders of controls that are not available as above.

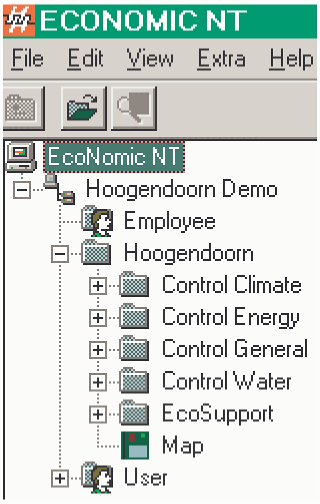
5. Creating your own new user folder

The quickest and easiest way to create a new user folder is to:
- create a new empty folder
- add folders with existing settings lists
- delete folders of controls not available
- filter out settings that you do not use

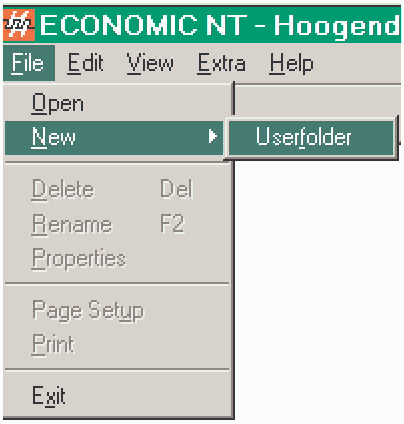
Help on "Filtering out settings" can be found under Setup program help

5.1. Creating folders

We shall now create a folder step by step:



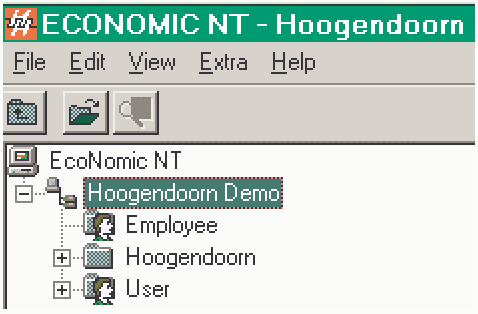
- In the menu select **File, New, User Folder**



- The following will appear in the **file list**:

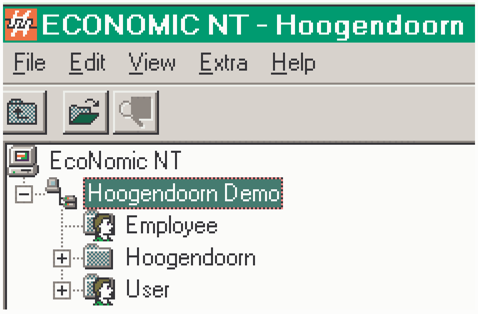
- You can now type in a name that means something to you.
- Enter the name "Operator" for example

- Explorer will then look like this:



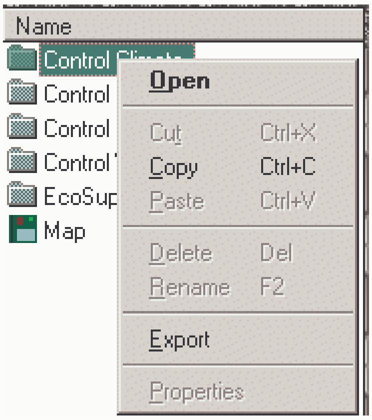
5.2. Adding folders with settings lists

We shall now add a folder with existing settings lists step by step:



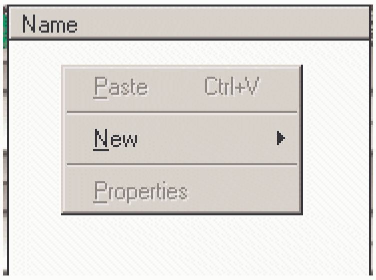
- Click on the "Hoogendoorn" folder

Let's say that you want the "Control Climate" folder in the "Operator" folder.
- Click on the "Control Climate" folder in the **file list**
- Press the **right mouse button**
- The menu below will appear:



- Move the mouse pointer to "Copy"

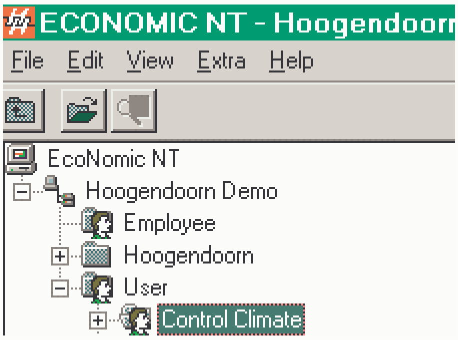
- Then click on the "Operator" folder
- Press the **right mouse button** in the file list
- The menu below will appear:



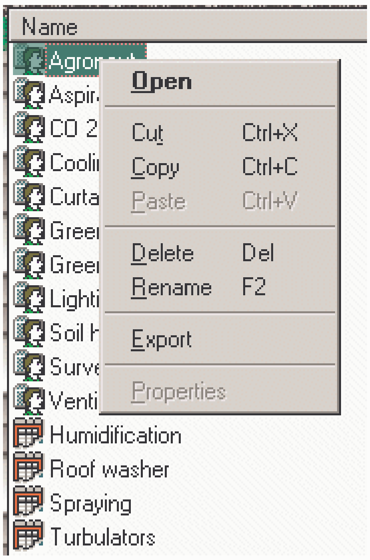
- Move the mouse pointer to "Paste"
- The "Control Climate" folder will now be copied to the "Operator" folder.

5.3. Deleting folders

We shall now delete a number of folders step by step:



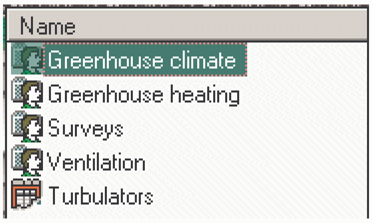
- Click on the "Control Climate" folder in Explorer
- Click on the "Agronaut" folder in the file list
- Click on the **right mouse button**
- The menu below will appear:



- Move the mouse pointer to "Delete"
- Then press the Ja key
- The "Agronaut" folder will now be deleted.

- Delete the following folders as above: Lighting, Soil Heating, CO2, Curtains, Econaut, Cooling, Aspirators, Humidification, Roof Washer and Turbulators.

- The screen below will be the result:



Help with User options and Configuration options

1. What does it do...

The **User options** and **Configuration options** are used to set your own preferences in *ECONOMIC* NT. Font type and font size are set here, for example. These windows are also used to add new users.

2. User options

Two processes can be set up in this window: *Windows* and *Edit display properties*

2.1. Windows

There are two options: open *one window* at a time or open *multiple windows* at the same time.

The first option means that only one window from each program can be open at any one time. If, for instance, a report is open and you open another report, the first report will be closed before the new report is opened. This is the default option that is switched on when you install *ECONOMIC* NT.

The second option means that several (different) windows from a program can be open at the same time. If, for instance, a report is on the screen and you open another report, two report windows will be open at the same time. You use the taskbar to switch from one report to the other.

Change:
- choose the option you want
- choose **Apply**

2.2. Edit display properties

The **Edit display properties** selection allows you to start the *Display Properties* window with the *Appearance* tab.
To change the font size:
- Click *"Message Text"* with the mouse
- In the *Size* check box select a different size for the text

The font and color can also be changed here.

To go back to the default *ECONOMIC* NT colors:
- In the *"Scheme"* field choose *ECONOMIC NT colors*

Change:

- To process the changes, choose *Apply*
- Then you have to restart the *ECONOMIC* programs to process the change (only the programs, not the whole system).

3. Configuration options

3.1. Modem

The following settings are available for the modem:

Number of rings:
This shows the number of rings before the modem picks up when a call comes in.

Dial prefix:
A *pre-select character* can be entered here, for example 0. This may be needed when *ECONOMIC* NT has to ring outside via a telephone exchange.

3.2. Tapestreamer

This window shows whether the Tapestreamer software has to be started.

Change:

- choose the option you want;
- restart the EBS.

3.3. Access control

This window is used to change a user's properties, add new users and delete existing users.

Before a user can use *ECONOMIC* NT he or she must have a *name* and *password*. It is recommended that each user is given his/her own name and password. Changes to settings are recorded by user. *ECONOMIC* NT also keeps up to date whenever a user logs on.

Remote control
When a user wants to log on to *ECONOMIC* NT from a Remote Control, he must use his name and password.

Ringing in
When a user with a remote control wants to ring in to an *ECONOMIC* NT, the system must allow him access. This can be set with the *Change* option.
With a Remote control connection via a Network, no permission to ring in is needed.

Setting Help

1. What does it do...

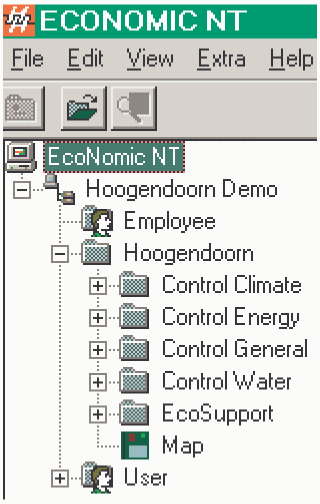
You can use this program to change settings.

The settings are subdivided into four categories:

- Settings
  These are the settings of a control.
- Status
  These settings show the status of the control(s).
- Alarms
  The alarm limits can be entered in these settings.
- Measurement & Actuation
  With these settings (often only visible under Service Access Level) the measurements can be adjusted and the actuations read out.

If you have searched for a settings list, then the four categories will appear in the form of tabs at the top of the screen. You can switch to a different category by clicking on the appropriate tab.

2. Searching for a settings list



We are going to search for the Greenhouse Climate settings. Follow the steps below:

- Click on the ⊞ for the "Control Climate"
folder - Click on **Greenhouse Climate**
- A **file list** containing settings and reports will appear

This is a symbol for a settings list
This is a symbol for a report

- Double click on the **Greenhouse Climate** folder in the **file list**
- The file list will then disappear and the map will appear
- Now you can select one or more groups

- You can select groups in different ways:

- Click **in a group** with the left mouse button. The group will change colour. You can add another group by holding down the [Ctrl] key while clicking on a different group with the left mouse button.
  You can also remove a group from the selection by holding down the [Ctrl] key while clicking on the group that you want to remove from the selection.
- Click **in the group** with the left mouse button and hold the left mouse button down as you drag the mouse pointer over other groups. As you drag the pointer the selected groups will change colour.
- Click **outside the greenhouse** with the left mouse button and hold the left mouse button down as you

drag the mouse pointer over the groups. You will then see a dotted box appear on the screen that indicates the selection. As soon as you release the left mouse button the selected groups will change colour.

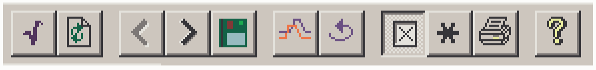
- Click on
- The settings for the selected group(s) will appear

You can select **all the** groups **quickly** by selecting **no** groups and immediately clicking on

The **order** in which you select groups is important. Once you have selected groups, the settings that appear on the screen are those of the **first group selected**

3. Operating setting program

If you have searched for a settings list, then the settings will appear on the screen with the buttons below at the top of the screen:



This is what these buttons do:

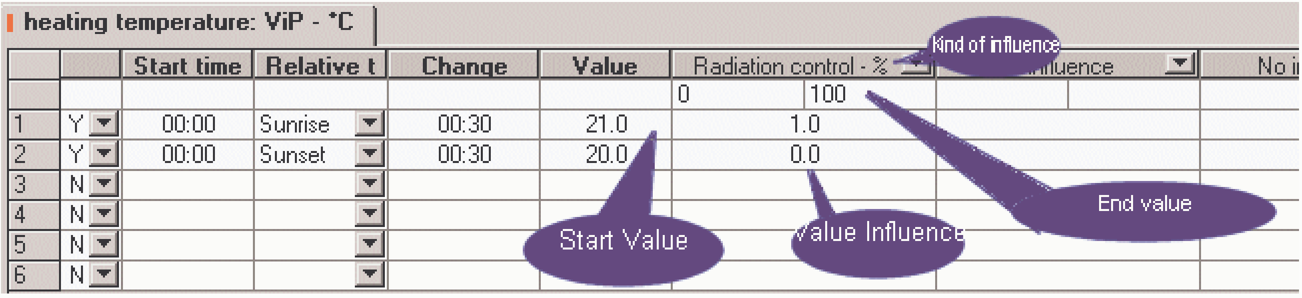
	If you change a setting, the colour of this setting will change to green. This allows you to see clearly which settings have been changed. After changing one or more settings the changes can be applied by clicking on this button. This method does not apply for ViP-settings.
	Click on this button to go back to the previous group.
	Click on this button to go to the next group.
	Click on this button and the map will appear and you can select one or more groups.
	If you select a ViP-setting and then click on this button, the ViP-setting will appear.
	You can filter out settings that you use rarely or not at all. By clicking on this button the control list will appear in which you can indicate which settings are to be active. The control list will disappear if you click on this button again.
	You can use the setting history to restore old values of settings. See also Operating setting history.
	You can mark a setting as 'changed' or as 'unchanged'. When you click on this button it stays depressed and the setting is changed. Click on it again and the setting is unchanged again. If you have changed a setting by entering a different number for example and you click on this button again, then the original (current) value is restored. In this way you can copy setpoints (including ViPs) to other groups without changing the setting in the cell or ViP-window.
	You can print the settings by clicking on this button. See also Printing settings
	Once you have selected a setting, you can obtain help by clicking on this button. You can also press the [F1] key.

If you point to a setting with the mouse pointer, then the minimum and maximum values of the setting will be displayed.

3.1. Operating ViP-setting

The screen consists of two sections:

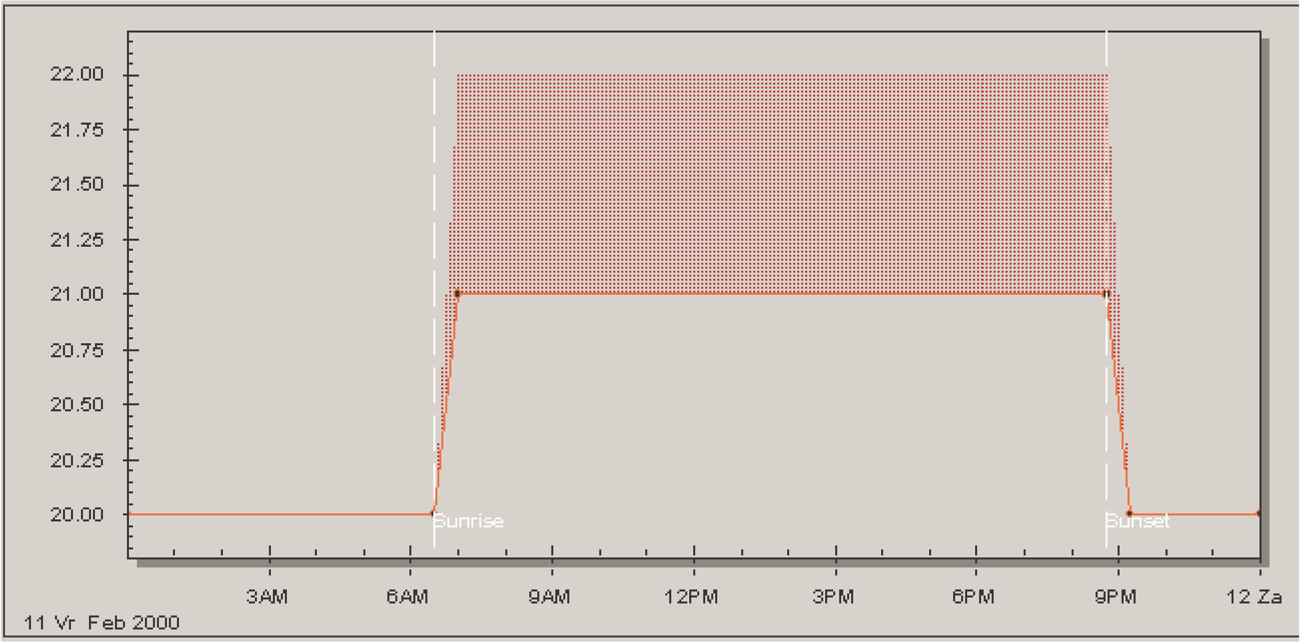
- the setpoints at the bottom of the screen
- the graph of the setpoints at the top of the screen



Period active	If a Y or an O appears in this column, the period setting is used. The O means use once. At the end of the period the period is automatically set to N. There are ViP-settings with two or with six periods per 24 hours.
Start time	Time at which a new period begins or time difference relative to sunrise or sunset. In the case of relative to sunrise and relative to sunset negative start times can also be entered here.
Relative to	The start time is relative to sunrise, sunset or clock (fixed time). The sunrise and sunset times are calculated using the degrees of longitude and latitude of the location of your business.
Transition	Transition time to the next period can be gradual. The value of the previous period is slowly increased from the start of the period. After the time entered here the value of the new period is reached in full.
Value	The setpoint during the period.
Influences	There are three influences possible. The influences that are possible have been fixed for each ViP-setting. The increases or reductions in the setpoint are added. However, a setpoint will never be increased or reduced beyond the biggest increase or reduction set.
start value	The start value shows when the influence is allowed to start working.
end value	The end value shows when the influence is at a maximum.
influence value	The influence value set

With a ViP you can also change the setpoint for a given period as a one-off. At the end of this period the normal value applies again.
Examples of this are increasing the minimum pipe after a cycle, or switching off the CO_2 dosing for a while under certain circumstances.
The calculated value of the ViP will be determined on the basis of the normal periods and the one-off periods. Once the one-off period has come to an end, it is automatically switched off ('O' changes to 'N').
So in this way it is easy to program a reduction or increase (jump) in the setpoint or an extension or shortening of a ViP period.

Repetition of a one-off action
Since the settings of the ViP periods are stored in the background, a one-off action previously programmed can be repeated later if necessary simply by resetting the indication of 'N' to 'O'.



The set value increased by the influences gives the calculated value. The set value can be seen as the bold line in the graph, the maximum influence is indicated by the shaded area.

OK Click this button to apply the changes.

Cancel Click this button to cancel the changes.

Print Click this button to print the setting.

Help Click this button to obtain help.

3.2. Operating setting history

You can use the setting history to restore the old values of settings. The latest set value before and on the given date is sought. The settings that have been changed in the period in question are marked green and take on the historical setpoint. You can view the values and change them if you wish. When you select apply they become definitive.

You can use the setting history to adjust settings for example on changes of crop or season. To this end you can compile a setting definition with the settings in question and read these settings back out of the historical data. Remember that you can only see the setpoints if they have been changed in the period in question. On the retrieval of the setting history only the settings on the visible tab change.

4. Changing settings list

A settings list can be changed entirely according to your own wishes. You can:
- add or delete settings
- change the order of settings
- filter out settings that you do not use

4.1. Adding settings

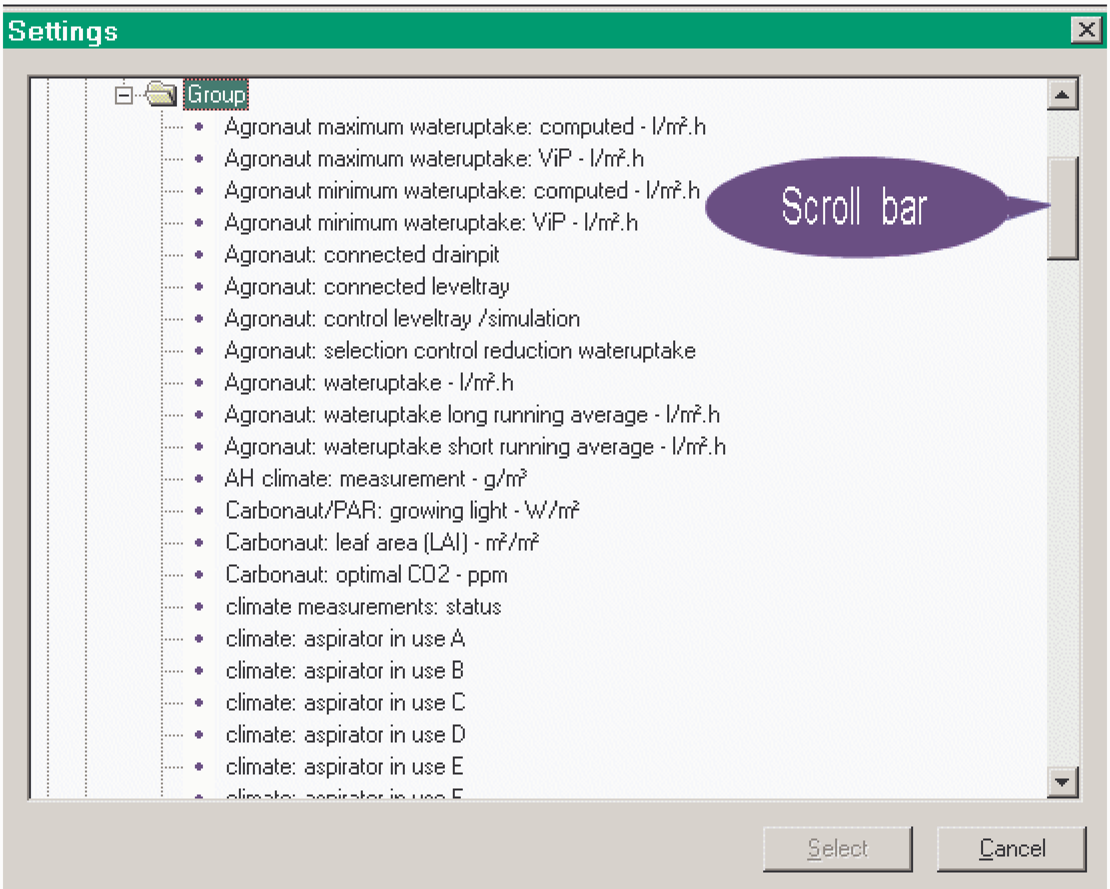
You can add settings after there has been a program change for example.
In the case of a program change a publication is always supplied in which the changes are described. There may be new settings for example.
You will of course want to include these new settings in your own user folders.

We shall now add a setting one step at a time:

- Double click on the **Greenhouse Climate** folder in the **file list**
- Then select Group 1 (double click on group 1)
- The Control, Greenhouse Climate settings will appear on the screen

- Select the "heating temperature: ViP" setting (click once with left mouse button)

- Then click on the +
- The window below will appear:



- Move the scroll bar until the desired setting is visible

- Click on this setting
- Then click on the Selecteren button

- The new setting will be added **under** the "heating temperature: ViP" setting.

4.2. Deleting settings

You can delete a setting if part of a control is not available (= has not been purchased).

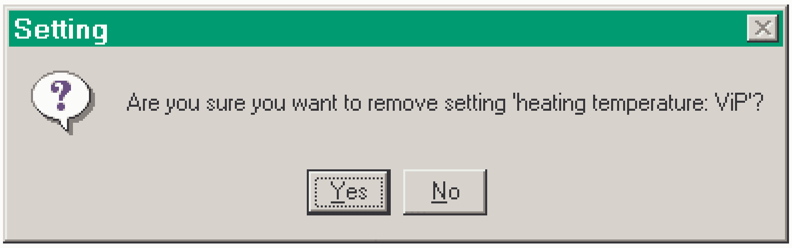
If you do not wish to see settings because you never (rarely) use them, then you will do better to filter them out rather than delete them.

We shall now delete a setting one step at a time:

- Double click on the **Greenhouse Climate** folder in the **file list**
- Then select Group 1 (double click on group 1)
- The Control, Greenhouse Climate settings will appear on the screen

- Select the "heating temperature: ViP" setting (click once with left mouse button)

- Then click on the
- The window below will appear:



- In this case click on the Nee

- If you want to delete a setting, then click on the Ja

4.3. Changing order of settings

The settings are placed in the order (standard order) in which they are most used.
In some cases it is conceivable that you will want to see one or more settings in a different order in the list.

The explanation on the help screens is geared to the standard order of settings. It is therefore best not to change the order of settings too much because otherwise the explanation on the help screens may not be what you want.

We shall now change the order of a setting one step at a time:

- Double click on the **Greenhouse Climate** folder in the **file list**
- Then select Group 1 (double click on group 1)
- The Control, Greenhouse Climate settings will appear on the screen

- Select the "heating temperature: ViP" setting (click once with left mouse button)

- Then click on the
- The setting will be moved down

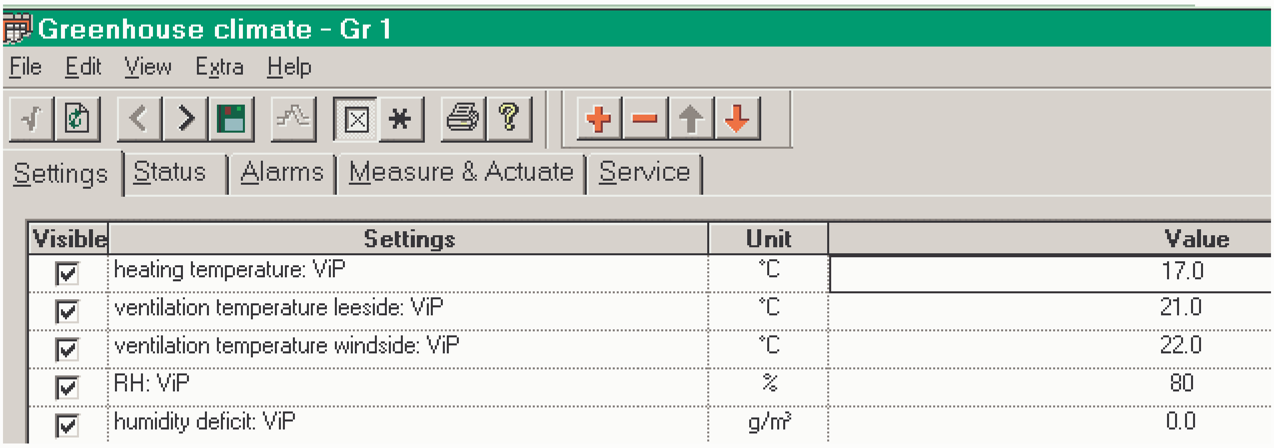
- Then click on the
- The setting will be moved up

4.4. Filtering out settings

We shall now filter out a number of settings one step at a time:

- Double click on the **Greenhouse Climate** folder in the **file list**
- Then select Group 1 (double click on group 1)
- The Control, Greenhouse Climate settings will appear on the screen

- Then click on the
- The window below will appear:



- You can indicate whether or not a setting is active in the "Active" column.

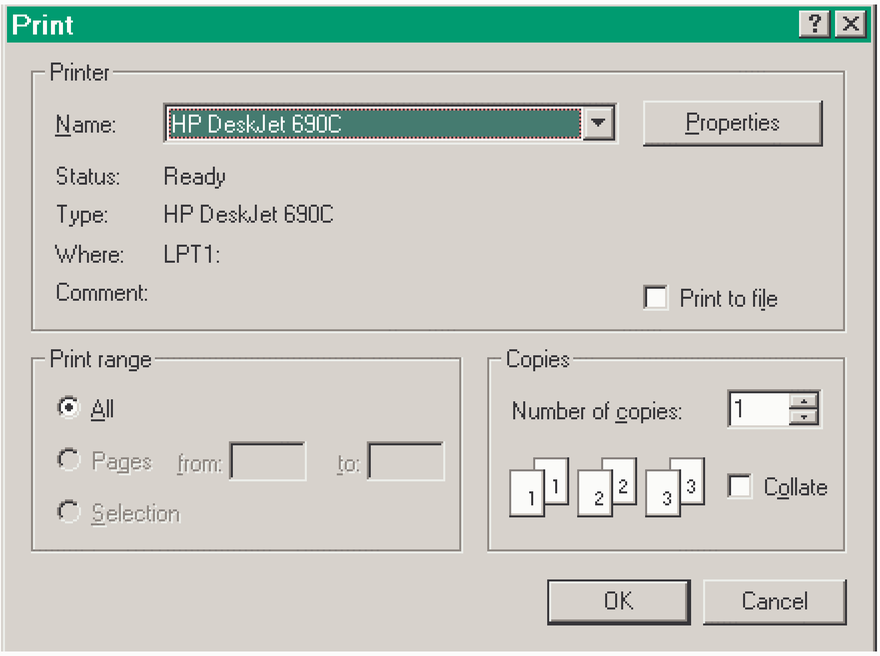
- Remove the "tick" from the settings that you want to filter out.

- Then click again on the
- The settings list will appear without the settings that have been filtered out.

5. Printing settings

You can print the settings by clicking on this button.

The window below will appear:



Press on OK to print the settings.

Survey of all influences in ViP settings

Each ViP setting has its own list of influences that can be used.

The table below lists all the available influences.
It also contains an example in each case.

<table>
<tr><th>Influence</th><th>Example:</th></tr>
<tr><td>Agronaut - l/m^2.h</td><td>Reduce the ventilation temperature if the actual water uptake is too low.

ventilation temperature lee side: ViP - °C
<table>
<tr><th></th><th></th><th>Start time</th><th>Relative t</th><th>Change</th><th>Value</th><th colspan="2">Agronaut - l/m².h</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>0.70</td><td>0.60</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>21.0</td><td colspan="2">-1.0</td></tr>
</table></td></tr>
<tr><td>Computed pipe temp. circuit 1 - ℃</td><td>Reduce the delay time close curtain if the computed pipe temp. of circuit 1 is sufficiently low.

curtain 1: ViP delay time close - min
<table>
<tr><th></th><th></th><th>Start time</th><th>Relative t</th><th>Change</th><th>Value</th><th colspan="2">Comput circuit temp 1 -</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>60</td><td>50</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>15</td><td colspan="2">-5</td></tr>
</table></td></tr>
<tr><td>Computed pipe temp. circuit 2 - ℃</td><td>Reduce the delay time close curtain if the computed pipe temp. of circuit 2 is sufficiently low.</td></tr>
<tr><td>Computed pipe temp. circuit 3 - ℃</td><td>Reduce the delay time close curtain if the computed pipe temp. of circuit 3 is sufficiently low.</td></tr>
<tr><td>Outside temperature - ℃</td><td>Increase the vent position humidity if the outside temperature is sufficiently high.

lee side vent position humidity: ViP - %
<table>
<tr><th></th><th></th><th>Start time</th><th>Relative t</th><th>Change</th><th>Value</th><th colspan="2">Outside temp - °C</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>7.0</td><td>12.0</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>0.0</td><td colspan="2">10.0</td></tr>
</table></td></tr>
<tr><td>Outside temperature change - ℃</td><td>Switch the roof sprinkling off if the outside temperature changes.</td></tr>
<tr><td>CO2 - ppm</td><td>Set a minimum vent position if the "natural" CO_2 level is too high.

leeside vent position minimum: ViP - %
<table>
<tr><th></th><th></th><th>Start time</th><th>Relative t</th><th>Change</th><th>Value</th><th colspan="2">CO2 - ppm</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>2000</td><td>2100</td></tr>
<tr><td>1</td><td>Y</td><td>01:00</td><td>Sunrise</td><td>01:10</td><td>0</td><td colspan="2">10</td></tr>
</table></td></tr>
<tr><td>CO2 MUST</td><td>Actuate a uni-switch in the CO_2 MUST situation. This ensures that, for example, a valve is opened or closed.

period 1: influences ViP (100=on; 0=off) -
<table>
<tr><th></th><th></th><th>Start time</th><th>Relative t</th><th>Change</th><th>Value</th><th colspan="2">CO2-MUST</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>0</td><td colspan="2">100</td></tr>
</table></td></tr>
<tr><td>Drain pit drainage - %</td><td>Reduce the delay time between 2 cycles if too little is drained (total drainage on that day).</td></tr>
</table>

delay time: ViP - m

		Start time	Relative t	Change	Value	Level drain tank - %	
						30	20
1	Y	00:00	Sunrise	00:30	30	-10	

Level tray drainage - %

Reduce the **delay time** between 2 cycles if too little is drained.

delay time: ViP - m

		Start time	Relative t	Change	Value	Drain leveltray - %	
						30	20
1	Y	00:00	Sunrise	00:30	30	-10	

EC drainage - mS

Increase the percentage of **drainage** if the EC value of the drainage water is too high.

leveltray drain: ViP - %

		Start time	Relative t	Change	Value	EC drain - EC	
						5.0	6.0
1	Y	10:00	Clock	00:22	30	10	

Energy demand - kW

Actuate a **uni-switch** in the event of a certain energy demand. A heating valve or pump, for example, is then actuated.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Energy demand - kW	
						600	700
1	Y	00:00	Sunrise	00:00	0	100	

Greenhouse temperature - ℃

Increase the **humidity crack in the curtain** if the greenhouse temperature is too high.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Greenhouse temp - °C	
						22.0	25.0
1	Y	01:00	Sunrise	00:00	10.0	10.0	

Drainage tank level - %

Increase the **recirculation EC value** if the water level in the drainage tank is too high so that more drainage water is used.

recirculation EC value: ViP - EC

		Start time	Relative t	Change	Value	Level drain tank - %	
						70	80
1	Y	00:00	Sunrise	00:00	1.0	1.5	

Vent position - %

Reduce the **minimum CO_2** if the vent is open more. The vent position is the sum of the leeward and windward sides.

minimum CO2: ViP - ppm

		Start time	Relative t	Change	Value	Vent position - %	
						10	20
1	Y	13:00	Sunset	00:00	700	-200	

Rain

Increase the **minimum pipe temperature** in the event of rain.

<table>
<tr><td></td><td>
circuit 1 pipe minimum: ViP - °C
<table>
<tr><td></td><td></td><td>Start time</td><td>Relative t</td><td>Change</td><td>Value</td><td>Rain</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>35</td><td>10</td></tr>
</table>
</td></tr>
<tr><td>Switch measurement</td><td>All kinds of measurement devices (greenhouse temperature, RH, pipe temperature, level tray etc.) can be connected to a uni-switch. This measurement can be used to switch a pump, valve and such like via the uni-switch.</td></tr>
<tr><td>Rising Agronaut - $l/m^2.h$</td><td>
Reduce the minimum pipe temperature if the current water uptake is rising too fast.

circuit 1 pipe minimum: ViP - °C
<table>
<tr><td></td><td></td><td>Start time</td><td>Relative t</td><td>Change</td><td>Value</td><td colspan="2">Agronaut rising - l/m².h</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td><td>0.10</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>50</td><td colspan="2">-10</td></tr>
</table>
</td></tr>
<tr><td>Radiation - W/m^2</td><td>
Reduce the minimum pipe temperature if the current radiation is too high.

circuit 1 pipe minimum: ViP - °C
<table>
<tr><td></td><td></td><td>Start time</td><td>Relative t</td><td>Change</td><td>Value</td><td colspan="2">Radiation - W/m²</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>300</td><td>400</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>40</td><td colspan="2">-15</td></tr>
</table>
The sun takes on the task of the minimum pipe temperature at approx. 300 W/m^2 radiation. The pipe temperature can then be turned down.
In this example, the pipe temperature is turned down to 25°C. If the "Pipe temperature: pump on" setting is set to 28°C (or hi gher), the heating pump is also switched off (3°C deviation).
</td></tr>
<tr><td>Radiation control - %</td><td>
Increase the heating temperature in the event of more radiation.

heating temperature: ViP - °C
<table>
<tr><td></td><td></td><td>Start time</td><td>Relative t</td><td>Change</td><td>Value</td><td colspan="2">Radiation control - %</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>20</td><td>80</td></tr>
<tr><td>1</td><td>Y</td><td>00:00</td><td>Sunrise</td><td>00:00</td><td>19.0</td><td colspan="2">1.5</td></tr>
</table>
The actual radiation is expressed as a percentage relative to the maximum computed radiation that could have been measured at approx. 13.00 hours on the present day.
</td></tr>
<tr><td>Radiation sum - %</td><td>Reduce the ventilation temperature at the start of the day if the day starts with high radiation, in order to keep the greenhouse cooler.

The actual radiation sum is expressed as a percentage relative to the computed radiation sum at any time of the day.</td></tr>
<tr><td>Radiation sum - J/cm^2</td><td>Increase the heating temperature after a sunny day. The radiation sum indicates at the end of the day how sunny it has been.</td></tr>
<tr><td>Radiation sum MeteoScope - J/cm^2</td><td>Reduce the ventilation temperature at the start of the day if a sunny day is expected (weather forecast).</td></tr>
<tr><td>Uni-influence</td><td>The heating temperature, ventilation temperature, vent position humidity and minimum pipe temperature can be increased or decreased using the uni-influence.

This can be used, for example, for a reduction at weekends.</td></tr>
<tr><td>Heating temperature</td><td>Increase and decrease the outside temperature close curtain depending on the computed heating temperature.
This means that the temperature at which the curtain will close is running with the same "rhythm" as the heating temperature. With one single ViP influence!</td></tr>
</table>

This is particularly useful if you are using a number of periods in the heating temperature and you wish to close the energy curtain at a fixed deviation between the heating and outside temperatures.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Heating temp - °C	
						18.0	21.0
1	Y	00:00	Sunrise	00:00	5.0	3.0	

Maximum Agronaut deviation - l/m².h

Reduce the **maximum vent position** in the event of a deviation between the actual and set maximum water uptake.

leeside vent position maximum: ViP - %

		Start time	Relative t	Change	Value	DevAgrMax - l/m².h	
						0.00	0.15
1	Y	00:00	Sunrise	00:00	100	-40	

Minimum Agronaut deviation - l/m².h

Increase the **vent position humidity** in the event of a deviation between the actual and set minimum water uptake.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	DevAgrMin - l/m².h	
						0.00	-0.05
1	Y	00:00	Sunrise	00:00	0.0	10.0	

Short average Agronaut deviation - l/m².h

Increase the **minimum pipe temperature** in the event of a deviation between the average water uptake and the set minimum water uptake.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Greenhouse temp - °C	
						22.0	25.0
1	Y	01:00	Sunrise	00:00	10.0	10.0	

Long average Agronaut deviation

Is not used in practice.

Outside temperature deviation - °C

Increase the **vent position humidity** in the event of a smaller deviation between the greenhouse and outside temperatures (greenhouse temperature minus outside temperature).

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Deviation outside temp	
						15.0	5.0
1	Y	00:00	Sunrise	00:00	0.0	10.0	

Ventilation temperature deviation - °C

Increase the **humidity crack in the curtain** in the event of a larger deviation between the greenhouse and ventilation temperatures.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Deviation vent temp - °	
						1.0	3.0
1	Y	10:00	Sunrise	00:00	10.0	10.0	

Heating temperature deviation - °C

Reduce the **vent position humidity** in the event of a smaller deviation between the greenhouse and heating temperatures.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Deviation vent temp - °	
						0.5	-0.5
1	Y	00:00	Sunrise	00:00	10.0	-10.0	

In this way you can prevent it from becoming too cold in the greenhouse because of the crack in the roof.
Let us assume the heating temperature is set to 20°C. If the greenhouse temperature falls from 20.5°C to 19.5°C, the crack will be reduced.

RH deviation - %

Increase the **minimum pipe temperature** in the event of too high an RH and/or reduce in the event of too low an RH.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value	Deviation RH - %	
						0	5
1	Y	00:00	Sunrise	00:00	40	10	

Let us assume the basic RH value is set to 80%.
The minimum pipe temperature will then be increased from 40 to 50°C if the RH rises from 80 to 85%.

Deviation HD - g/m^3

Increase the **minimum pipe temperature** in the event of too low a humidity deficit and/or reduce in the event of too high a humidity deficit.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value	Deviation HD - g/m³	
						0.0	-0.5
1	Y	00:00	Sunrise	00:00	30	10	

Humidity MeteoScope

Increase the **vent position humidity** if a high RH or AH is expected (weather forecast).

Wind direction dry

Increase the **wind influence** on the vents if there is a dry wind. This will mean that the vents are closed more in the event of a dry wind.

eside vent position humidity windinfluence: ViP - %

		Start time	Relative t	Change	Value	Wind direction Dry	
1	Y	00:00	Sunrise	00:00	50	20	

Wind direction cold

Increase the **wind influence** on the vents if there is a cold wind. This will mean that the vents are closed more if the wind comes from a cold direction.

eside vent position humidity windinfluence: ViP - %

		Start time	Relative t	Change	Value	Wind direction Cold	
1	Y	00:00	Sunrise	00:00	50	20	

Wind direction wet

Reduce the **wind influence** on the vents if there is a wet wind. This will mean that the vents are closed less if the wind comes from a wet direction.

eside vent position humidity windinfluence: ViP - %

		Start time	Relative t	Change	Value	Wind direction Humid	
1	Y	00:00	Sunrise	00:00	50	-20	

Wind direction warm

Reduce the **wind influence** on the vents if there is a warm wind. This will mean that the vents are closed less.

	eside vent position humidity windinfluence: ViP - % | | | Start time | Relative t | Change | Value | Wind direction Warm | | 1 | Y | 00:00 | Sunrise | 00:00 | 50 | -20 |
Wind speed - m/s	Reduce the **minimum CO_2** if there is more wind. minimum CO2: ViP - ppm | | | Start time | Relative t | Change | Value | Windspeed - m/s | | | | | | | | 2 | 6 | | 1 | Y | 00:00 | Sunrise | 00:00 | 600 | -200 |
Wind speed dry	Reduce the **radiation: sum start** if there is more wind from a dry direction. This will mean that a watering cycle will take place sooner.
Wind speed cold	Increase the **outside temperature close curtain** if there is more wind from a cold direction. This will mean that the curtain will close sooner.
Wind speed wet	Increase the **radiation: sum start** if there is more wind from a wet direction. This will mean that a watering cycle will take place later.
Wind speed warm	Reduce the **outside temperature close curtain** if there is more wind from a warm direction. This will mean that the curtain will close later.

Help with changing the system time

1. What does it do...

The date and time currently being used by *ECONOMIC* NT is shown here. You can change this time by clicking **Change date/time**, or by clicking the **Edit** menu and then clicking **Change date/time**.

2. Summer time/winter time

You decide when *ECONOMIC* NT switches over to summer time or winter time. This is not done automatically.

To switch over to summer time, proceed as follows:

1. Open the change window by clicking **Change date/time**.
2. Choose **summer time**
3. Put the clock forward 1 hour. If this means that the time on the clock goes past 23:59, you will also have to change the date. To switch over to winter time, choose **winter time** in the change window and put the clock back 1 hour.

Sunrise and sunset times are adjusted automatically when you switch from summer time to winter time and vice versa. All clock settings that can be assumed to be important to the crop rather than to work in the greenhouse will also be changed at the same time.

Clock times for blackout curtains and assimilation lighting will also be put back or forward 1 hour.

To avoid interference with controls that are running, it takes up to a maximum of 1 minute before the switch to summer time or winter time is completely processed. So wait 1 minute before you check your clock settings.

Help with reports

1. What does it do...

The reports program is used to look at the current values and retrieve various past reports.

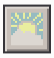
2. Types of reports

Actual
Report showing current values

Alarm
Alarm report (see Help with alarm report)

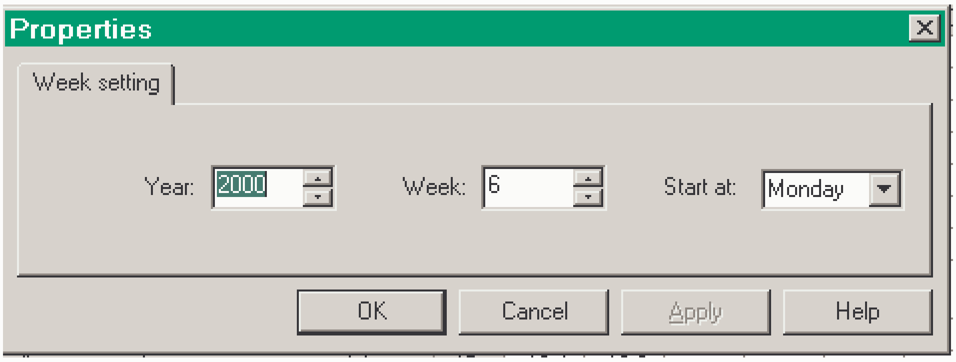
Period
Report showing weekly values in a specific period

Week
Report showing daily values in a specific week

 **Weather report**
Shows the report with weather data.

3. Operating the report program

 **Change**
With past reports you can choose a different period.
With a weekly report, the next window appears when you click the button:



You can change the year, week number and start day of the week here.

The following periods are possible:

Type of report	Period	Period selection
Current	actual time	no
Period	e.g.	year, period,

	week 49 to week 52 incl.	start day of week
Week	e.g. Mon 31/11 to Sun 07/12 incl.	year, week, start day of week

Replace
The values in the report are replaced.

Map
Choose a new group using the map (for past reports).

Print
Prints the report.

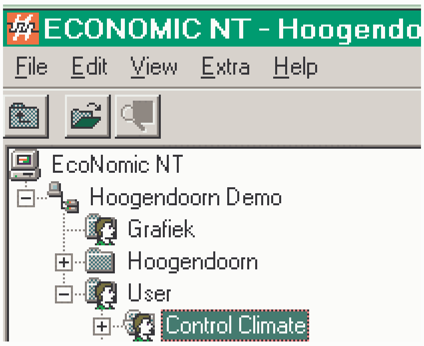
Help
Shows Help.

4. Compiling reports yourself

The quickest and easiest way to create a report is to:
- copy a report from the Hoogendoorn folder
- delete the settings you do not want in the report
- add your chosen settings that are not already in the report
- change the sequence of settings

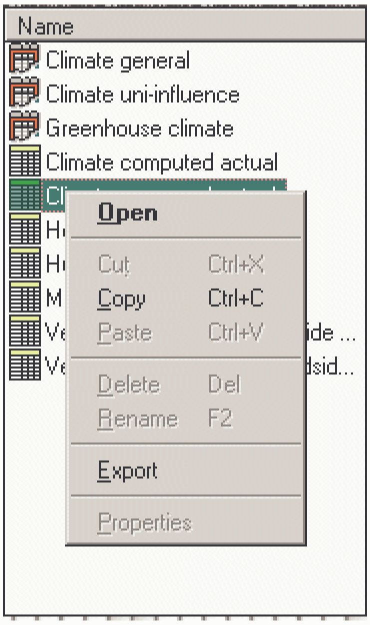
4.1. Copying a report from the Hoogendoorn folder

We will now take you through how to copy an existing report from the Hoogendoorn folder step by step:



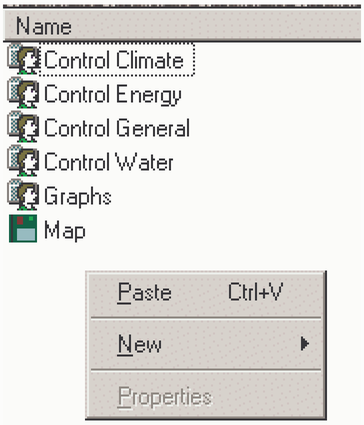
- Click the "Hoogendoorn" folder in Explorer

Suppose you want to copy the current report with the measured values.
- Double-click the "Control Climate" folder in the File list
- Double-click the "Greenhouse climate" folder
- Click "Climate measured actual" with the right mouse button
- The next window appears:



- Move the mouse pointer to "Copy"

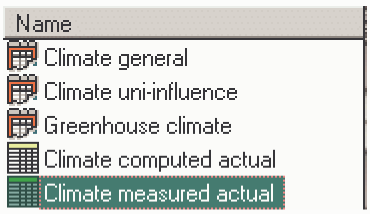
- Then click the "Control Climate" folder in the "Operator" folder
- Click in the File list with the right mouse button
- The next window appears:



- Move the mouse pointer to "Paste"
- The current report with the measured values will be copied.

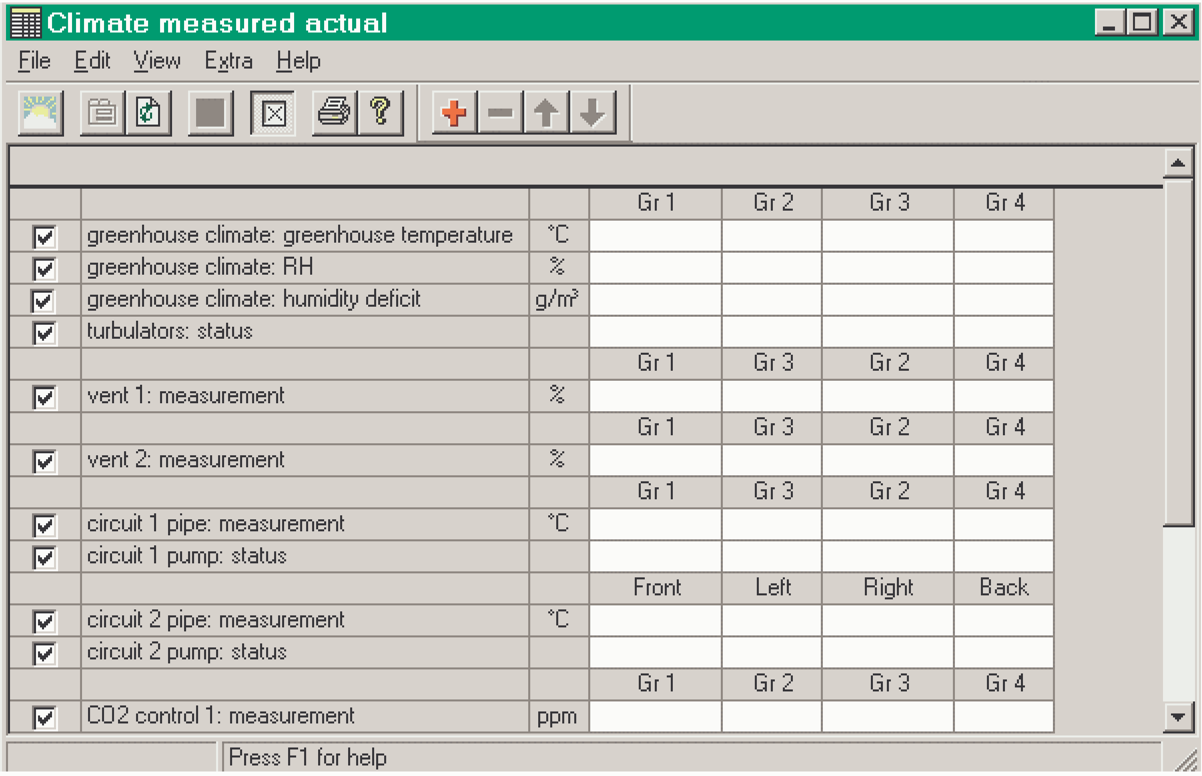
4.2. Deleting settings you do not want in the report

We will now take you through how to delete settings that you do not want in the report step by step:



- Double-click the "Climate measured actual" folder in the File list

- Then click
- The next window appears:



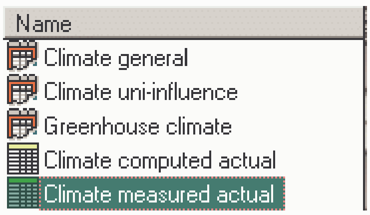
- The "Active" column indicates whether a setting is active or not.

- Now remove the check marks for the settings you want to filter out.

- Then click again.
- The report appears without the settings you filtered out.

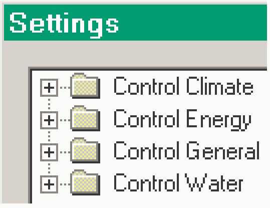
4.3. Adding your chosen settings that are not already in the report

We will now take you through how to add a setting step by step:



- Double-click the "Climate measured actual" folder in the File list

- Then click
- The next window appears:

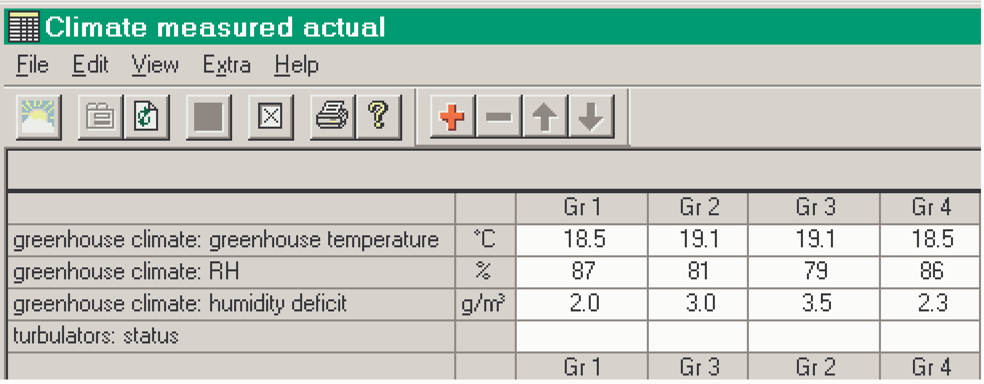


- Look in the **Control Climate, Greenhouse climate, Group** folder for the **heating temperature: ViP** setting
- Then click 

- The new setting will be added.

4.4. Changing the sequence of settings

We will now take you through how to change the sequence of settings step by step:



- Suppose you want to have the **heating temperature: ViP** setting at the top of the report
- Click heating temperature: ViP
- Click several times on  until the setting is at the top

Help with graphs

1. What does it do...
2. Operating the graph program

1. What does it do...

The graph program is used to show developments in the controls in graph form. You can compose the graph lines yourself.

2. Operating the graph program

The **New** option on the **File** menu can be used to create a new empty graph.
The **Save as** option is used to make a copy of the default graph.

 **Properties**

The minimum and maximum values of the vertical axis are set here.
The period of the graph can also be changed here.

 **Add setting**

A window appears in which you can choose a setting for which you want to produce a graph.

Delete setting

The graph line you selected in the graph window will be deleted.

Replace

Use the right mouse button to select an area that you want to see. When you release the mouse button this area will appear enlarged on the screen.
The "Replace" button gives you the original graph on screen again.

Grid

This button is used to show or filter out the gridlines.

Print

Prints the graph.

Help

Shows Help.

Color		Settings	Unit	Group	Factor	Axis	Min	Max	

Colour
Shows the colour of the graph line. Click the coloured option button to choose a different colour.

Active
The graph line will only be shown if this check box is checked. The purpose of this is to allow you to filter out the graph line temporarily.

Settings
The name of the setting.

Unit
The unit of the setting.

Group
The group of the setting. Clicking in the Group column causes
to appear. Click this and you will be able to use the map to choose a different group.

Factor
The value of the graph line can be increased or decreased.

Axis
Not yet applicable.

Minimum
The minimum value of the graph line calculated in this period.

Maximum
The maximum value of the graph line calculated in this period.

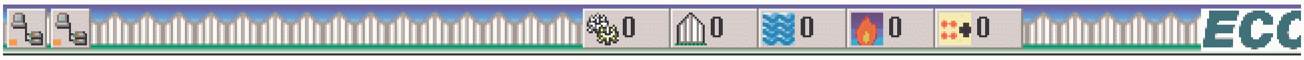
Average
The average value of the graph line calculated in this period.

Help with alarm report

1. What does it do...
2. Alarm report page
3. Sorting alarms

1. What does it do...

The alarm report gives you a summary of current and past alarms and recent detections.



You can decide yourself whether you want to see climate, energy, water, general or all alarms and detections in the report.

2. Alarm report page

Climate + Energy + Water + General	Group	Start time	End time
Climate: RH too low	3	26-08-1998 13:13:45	26-08-199
Climate: greenhouse temperature too high: maximum greenhouse	1	26-08-1998 10:50:42	26-08-199

The list contains a number of lines, which are coloured red or black. The most recent alarms are at the top of the list. Alarms that have not yet been solved are coloured red and alarms that have been solved are coloured black.

Programs can also give detections, e.g. MeteoScope if downloading of the weather forecast fails. Econaut also gives detections if something is not set up correctly. You can mask detections to show that they have been seen.

Climate + Energy + Water + General This shows the program modules for which alarms and detections will be shown in the report, the names of the program modules are given at the top of the column.

Group
The name or number of the group in which the alarm or detection occurred.

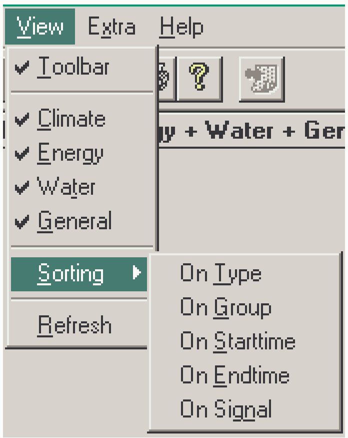
Start time
The time that the alarm or detection occurred.

End time
The time that the alarm or detection stopped.

Signal
The alarm can be split into 5 different outputs (option).
The climate alarm, for instance, can activate signal output 1 and the hooter may be connected to signal output 1. The watering alarm, for instance, can activate signal output 2 and the semaphone may be connected to signal output 2.
This is especially useful if different employees are responsible for specific parts of the computer system. Each employee then gets his "own" alarms.

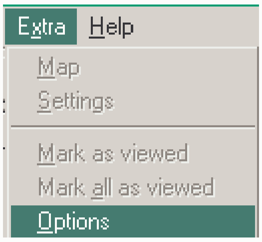
3. Sorting alarms

From the menu choose **View**
Move the mouse pointer to **Sorting**
The next window appears:

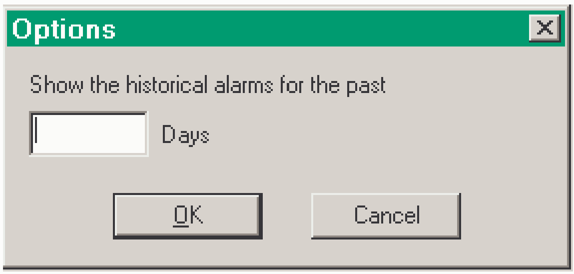


By default the list is sorted on Start time.
You can choose to sort on other criteria here.

4. Historical alarms



From the menu choose **Extra**
Move the mouse pointer to **Options**
The next window appears:



You can choose the period for which you want to see alarms and detections here.

5. Printing alarm report

From the menu choose **File**
The next window appears:

Print Setup
Print Setup is used to set the layout you want when the report is printed.

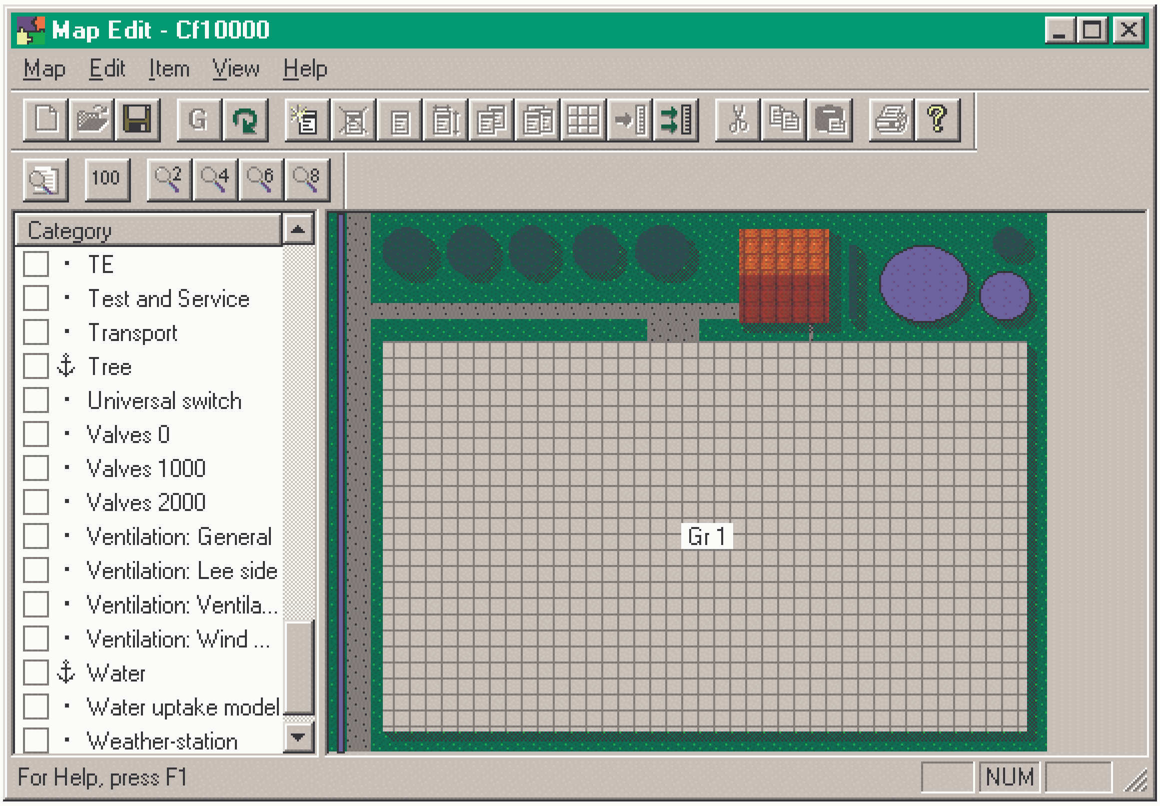
Print Preview
Print Preview shows you now on screen what the report will look like on paper.

Print
Choose **Print** to print the report.

 Clicking  also prints the report.

Map Editor

The site map is the starting point for operating the *ECONOMIC* NT. This map is unique to each site and is created on-site during commissioning of the system. There is a separate map for each program module. For example, the climate groups have a different map from that of the valves. The program modules, each with their own map, are listed on the left.

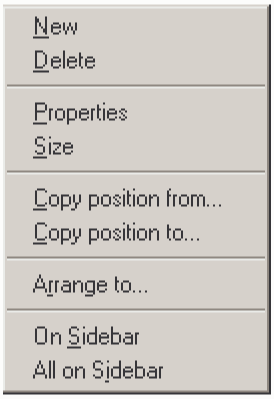


1. Using keys and functions

Map Editor's various functions can be used in three ways:

1. Via the toolbar with icons

2. Via the Item menu



3. Via the right mouse button
The same menu then appears as when the Item menu is chosen.

New
Add a (non-configuration-dependent) new module.

Size
The width and height of a selected module can be input using this button or item. The unit is decimetres. A group can also be resized by selecting the group and then clicking and dragging a corner.

Group sequence
This button is used to change the numbering of the groups on a map.
Example 1: Group 3 has to be swapped with group 5.
- Select group 3, press button G, select group 5.

Example 2: Create a different group sequence.
- Select group 1, press button G, choose the right location for group 1 and click this, then click the right location for group 2, group 3 etc.

Copy position to...
This function enables a map, once created, to be copied to other controls.
Example:

Copy the map of *'Climate: aspirators'* to *'Ventilation'*, and to *'Climate: group'*.
- Select the map of *'Climate: aspirators'* in its entirety.
- Choose **Copy position to...**.
- Select the controls which you wish to have the same map *('Ventilation' and 'Climate: group')*.

Copy position from...
This is the reverse of the Copy position to... function. The starting point for **Copy position from...** is the map which is to be edited.
Example:

Copy the map of *'Climate: aspirators'* to *'Ventilation'*.
- Select the map of *'Ventilation'* in its entirety.
- Choose **Copy position from...**.
- Select the map of *'Climate: aspirators'*.

On Sidebar
This option is used to move a group from the map and place it in a column on the right of the screen. Use the **On Sidebar** option particularly with groups which are not related to a map. An example of this is recipes.

All on Sidebar
This option is used to move all the groups from the map and place them in a column on the right of the screen.

Arrange over...
This option is used to arrange / distribute groups automatically over a different group. You have to specify the number of columns or rows over which they have to be arranged and over which group.

Example:

Arrange the valves in ascending order in four rows.
- Place the valves on the sidebar, select these valves in ascending order.
- Choose Arrange over and then 4 rows.

Useful key combinations:

- Press Ctrl and the left mouse button at the same time: select multiple groups
- Press Alt and the left mouse button at the same time: fine-positioning of the mouse pointer or selection

Update map in event of expansion:
Before the map can be updated, the new program relating to the expansion must first be installed. Then load the new configuration (UDA file) in Map Editor using the *Map - Edit* option. The new program modules (e.g. extra bays, valves etc.) can now be included in the maps of the various controls.

2. Working sequence

Preparation

- Collect detailed information relating to the site map. Plot dimensions, dimensions and position of the bays, packhouse and buildings etc. The drawings used during construction may be available.
- The most recent program must be installed. The configuration information (UDA) is used when creating the map.

Start program

- Map Editor is started from *ECONOMIC* NT via *Extra - Options service - Edit map*.

Create map

1. Enter the plot details (*Edit - Enter plot*). Set the size of the plot slightly larger than the greenhouse so that there is room to draw a packhouse, farmhouse, pond etc.
2. Create the greenhouse (go to the *Greenhouse* category and choose *New item*).
3. Create non-configuration-dependent items: buildings, ditches, pond, track, tree/bush. These items are indicated using the ⚓ symbol.
4. Once a map is finished, check it by clicking the rectangular box. This clearly identifies what is or is not finished.
5. Create the *Climate group: aspirators* map.
   Use the **Arrange over** option if the bays are of the same size. Enter the dimensions in figures if the bays are of a different size.
6. Create maps which are the same as *Climate group: aspirators*
   Use the **Copy size to** option.
7. Create the *Valves* map.
   Use **Arrange over** and **Group sequence**.
   Use Ctrl and the left mouse button to select multiple categories (maps).
8. Create the crop sections in consultation with the user. Place unused crop sections on the sidebar.
9. Place recipes and controls which are not related to a map on the sidebar.
10. Create the remaining maps.
11. Does the map run?

Exit
Once you have exited *Map Editor* (by clicking the *Close window* icon in the top right of the window), you are asked if you wish to save the new map. The file with the old map is then overwritten! You are next asked if you wish to apply the new map immediately. Choose ‘Yes’ if the map is finished. Exit the *ECONOMIC* operating program and start it again immediately. The new map is now in use.
If the new map is not yet finished, it must be stored under a different name on the hard disk or a diskette, and the *ECONOMIC* NT must continue to be operated using the original map.

Tip Create a copy of the original map in advance on the hard disk or on a diskette. Then make a copy of the new map on a diskette afterwards.

The map is stored in the CFxxxx.map file, in which xxxx represents the configuration number of the *ECONOMIC* NT. This file can be found in three locations:

- configuration diskette
- hard disk, in the ecodata\cfxxxx\cfxxxx.map folder
- hard disk, in the endxxxx\sysdata\ui\main\cfxxxx\cfxxxx.map folder

Econaut Help

1. What does it do...

The Econaut program displays the progress of the control in graphical form. You can use various settings relating to the control and display a current report for all the Econaut groups.
The weather forecast can also be displayed as a graph.

2. Operating Econaut

Refresh
All the Econaut data are recalculated. The graph lines are redrawn.

Map
When you make this choice the map containing the Econaut groups appears.
You can select several groups to set them simultaneously. The calculation is only done for the first group (chosen) however.

Reports
Click on this button to show which reports can be displayed. Once you have made a choice the reports program is started.

Set
This button gives you access to the setting screen on which you can make the Econaut settings.

Apply
In Econaut you can change all kinds of settings and for example see what the saving will be with the new settings or see how the Eco-line will go with the new settings without saving the changes.
The settings are not saved until you press this button.

Weather forecast
Press this button to display the weather forecast.

Print
Prints the Econaut screen on the printer.

Help

Displays help.

3.1 Econaut main screen

The main screen displays the various Econaut lines and calculated values of the chosen group. The starting point with Econaut is that control is based on a 24-hour temperature. This control proceeds as economically as possible.

For this purpose use is made of the weather forecast. The weather forecast is downloaded automatically every day at 07.00 and 11.00 and Econaut calculates the heating strategy for the day.
Every 30 minutes and immediately after Econaut settings are changed this heating strategy is checked on the basis of current data to see whether it needs any adjustment.

But it is up to you to decide between which minimum and maximum limits Econaut should work.
Between the minimum and maximum heating temperature Econaut tries to achieve the 24-hour temperature as economically as possible.
A big gap between minimum and maximum heating temperatures means ample scope for Econaut to heat as economically as possible, with considerable energy saving.

The limits for minimum and maximum heating temperatures differ for each crop.
As you set both lines with ViP-settings, you have precise control over the periods in which Econaut has more or less room (for manoeuvre).

On the main screen you can see a ***yellow line***, the setpoint for the 24-hour temperature.
The ***red line*** is the minimum heating line. The ***purple line*** is the maximum heating line.
The ***green line***, the Eco-line, is in two parts. The vertical ***black bar*** shows the current time. On the left of the black bar the measured (achieved) greenhouse temperature is shown. On the right of the black bar is the setpoint for the greenhouse temperature.

The ***blue line*** is the ventilation temperature leeside.
The ***white line*** is the indication of heating costs. The higher this line, the more expensive it is to heat. Econaut calculates this heating indication and in the process takes account of the weather forecast, curtain, lighting, minimum and maximum pipe, etc. Bottom right of the screen you can also see the expected minimum 24-hour temperature. This is the setpoint set for the 24-hour temperature inclusive of radiation sum increase.

The heating requirement is shown in degree days. If four degrees of heating is required over 12 hours and two degrees over the rest of the 24-hour period, then the heating requirement is three degree days.

The saving is shown in per cent. If you consider this saving in relation to the heating requirement, then you can see clearly on which days savings are made.
A high heating requirement and a high savings percentage gives substantial savings, but a low heating requirement and a high savings percentage gives little real saving.

3.2. Settings

Econaut: calculated 24-hour temperature
The 24-hour temperature calculated by Econaut.

heating temperature: ViP
The minimum heating temperature for Econaut.

maximum heating temperature: ViP
The maximum heating temperature for Econaut.

24-hour temperature: setpoint
The setpoint for the 24-hour temperature. If Econaut does not have sufficient scope (limited too much by the minimum of maximum heating temperatures), then it can happen that the 24-hour temperature set is not achieved.
The Econaut can be switched off temporarily by setting the setpoint for the 24-hour temperature a little below

the minimum heating temperature. Econaut will then always take the minimum heating temperature as heating temperature.

24-hour temperature: increase 100% radiation sum
The 24-hour temperature can be increased depending on the measured radiation sum. The increase begins at 0% and is at a maximum at 100% radiation sum. The percentage radiation sum shows the ratio between the calculated and the measured radiation sum at any time of the day.

temperature: maximum rise
The Eco-line may not rise faster than set in this setting. This is important above all to prevent the crop from getting wet. A practical value for this setting is approx. 1 ℃ per hour.
If the sun breaks through, then the greenhouse temperature can in the end rise faster (if this happens because of the sun, there is no getting wet).

temperature: maximum fall
The Eco-line may not fall faster than set in this setting.
If there is substantial ventilation, then the greenhouse temperature can in the end fall faster.

Econaut: expected 24-hour temperature
The 24-hour temperature expected by Econaut. In the heating season this will generally coincide with the setpoint 24-hour temperature set. In the summer the expected 24-hour temperature can come out higher because of the large amount of extra (free) heat from the sun.

Econaut: measurement of actual 24-hour temperature
The mean (24-hour) temperature achieved at this moment. At the end of the Econaut 24-hour period (just before 7 o'clock in the morning) this is the actual 24-hour temperature.

greenhouse climate: greenhouse temperature
The measured greenhouse temperature.

Remote control help

---

1. What does it do...

With a remote control you can operate an *ECONOMIC* NT remotely.
For example, you may want to operate the *ECONOMIC* NT in the greenhouse from your home. Or you may have more nurseries and you want to operate the *ECONOMIC* NT in one nursery from another.

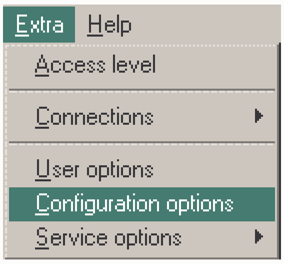
---

2. Base station

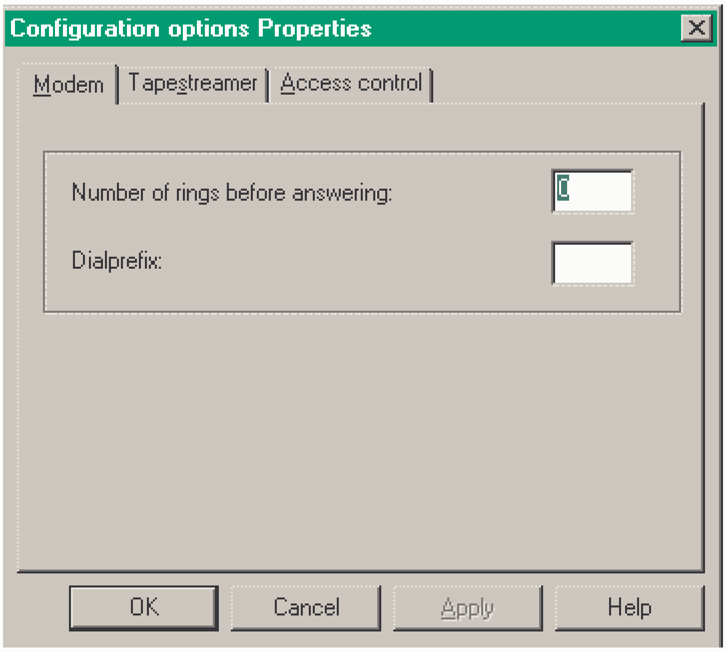
Before a remote control can be used a user has to be created on the *ECONOMIC* NT. Dial-in rights have to be granted as well.

We are now going to create a user one step at a time:

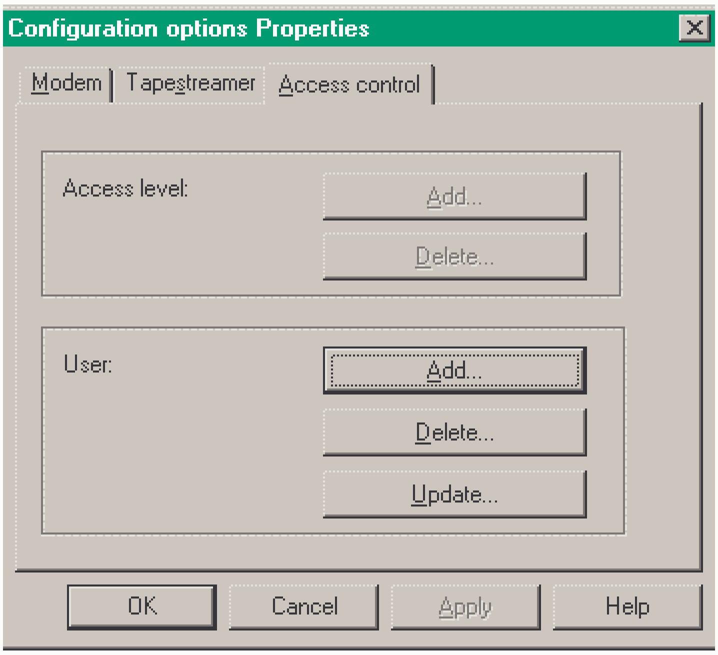
- From the menu select **Extra, Configuration options**



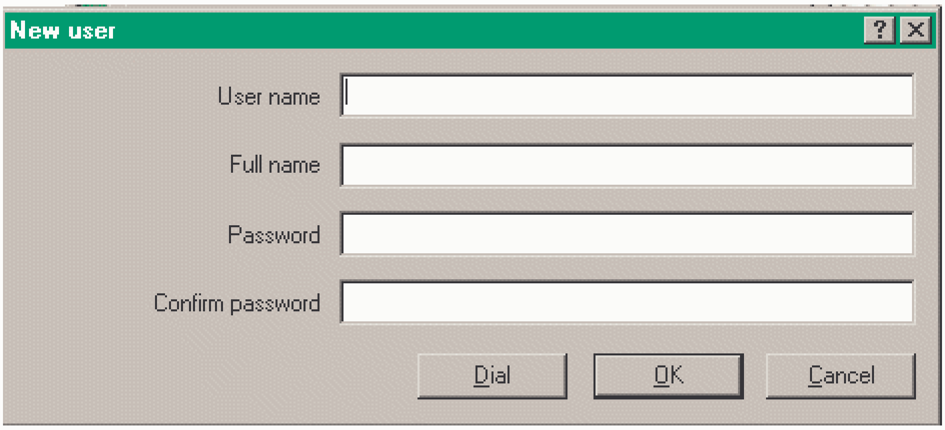
- The window below will appear:



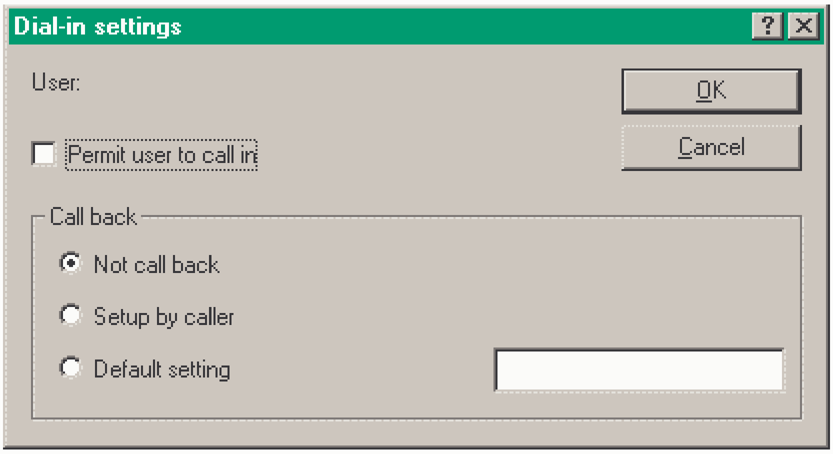
- Select the Access Control tab
- The window below will appear:



- Select Add
- The window below will appear:



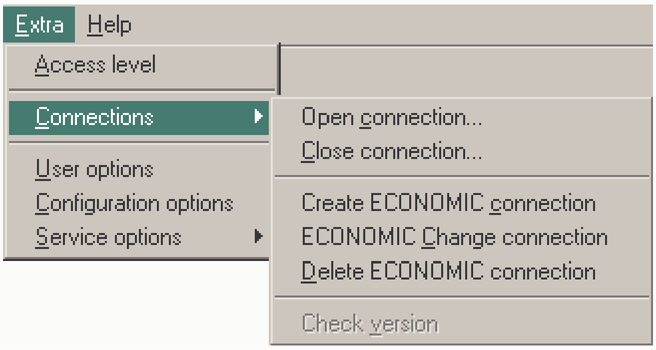
- Type in the User Name
- Type in the Full Name
- Type in the Password
- Confirm the password by typing it in again
- Select Inbellen
- The window below will appear:



- Now select "Permit user to call in"
- You can now apply the setting that the user cannot gain access until the *ECONOMIC* NT has called the user back.
Making contact with the *ECONOMIC* NT may take a little longer, but it does ensure security. In this way no unauthorised person can ever break into your *ECONOMIC* NT!
- At "Default setting" type in the telephone number to be called back.
- Then click the OK button three times

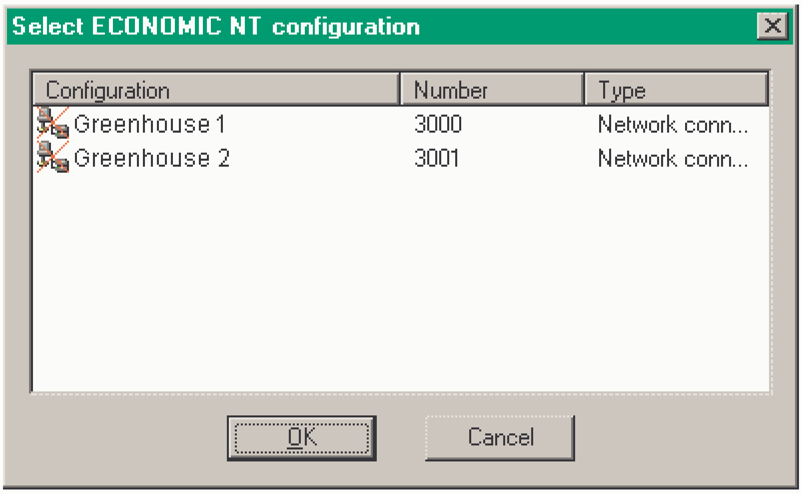
3. Remote control menu options

From the menu select **Tools**.
Move the mouse pointer to **Connections**.
The window below will appear:



3.1. Open connection

Choose **Open connection** and the window below for example will appear:

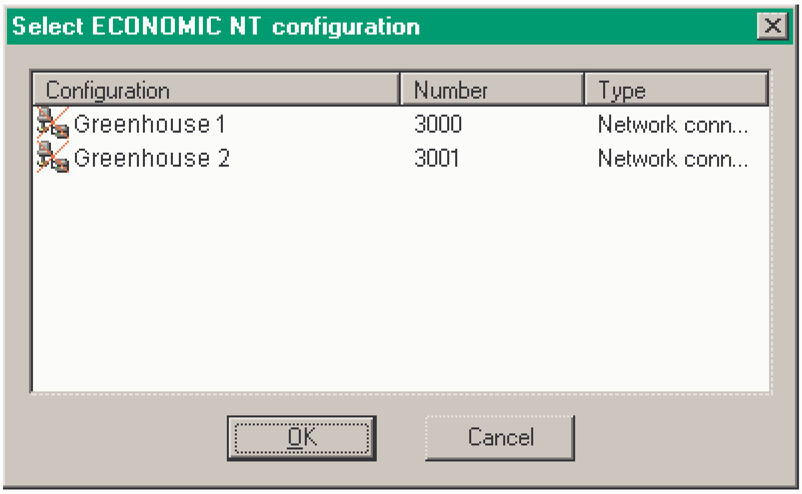


You can now select *Greenhouse 1* or *Greenhouse 2*.

By clicking on OK the connection to the selected configuration is opened.

3.2. Break connection

Choose **Break connection** and the window below for example will appear:

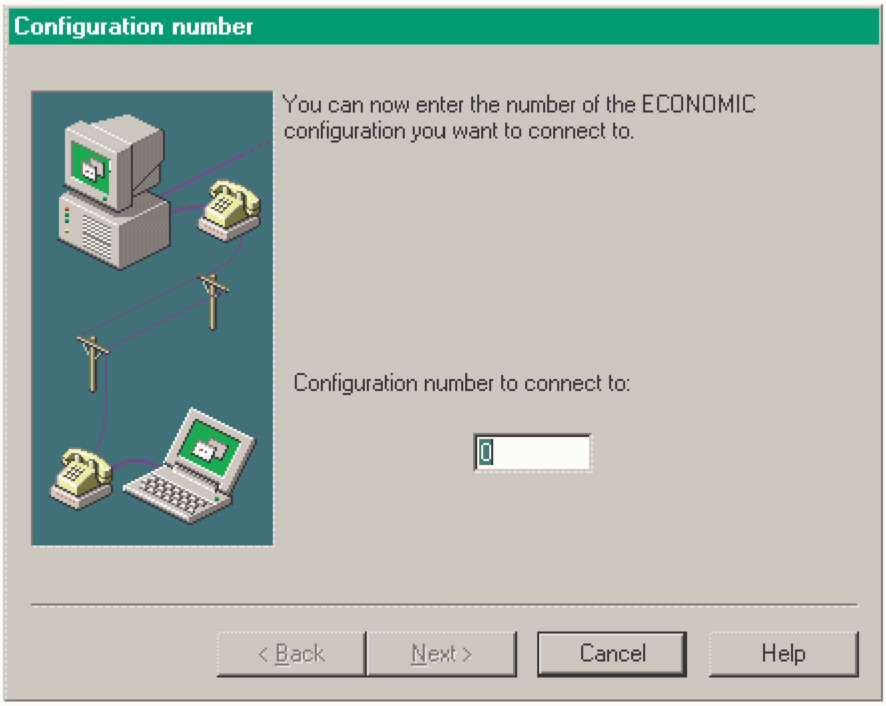


You can now select *Greenhouse 1* or *Greenhouse 2*.

By clicking on OK the connection to the selected configuration is broken.

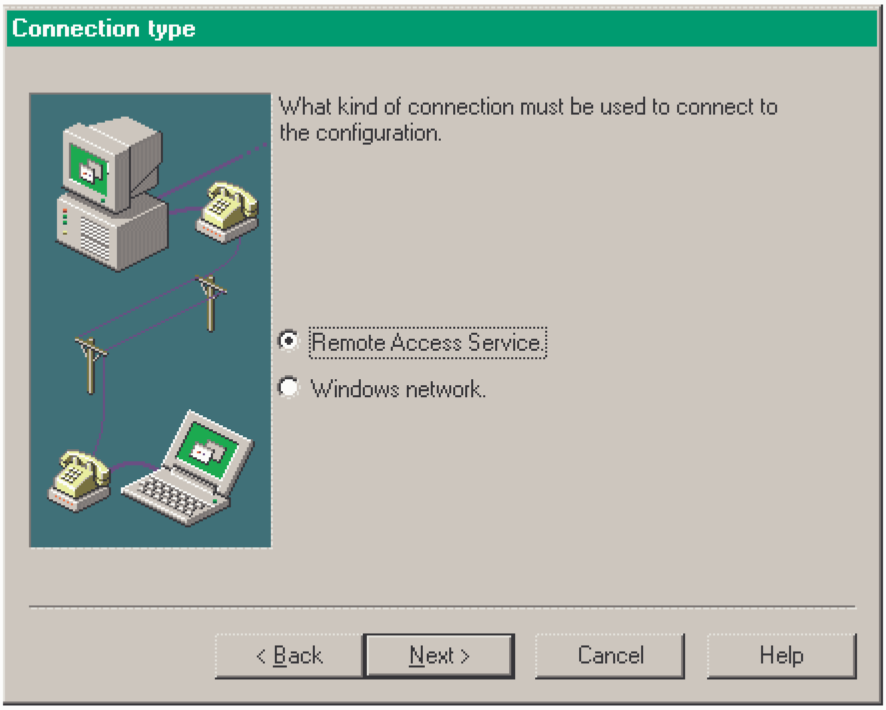
3.3. Create ECONOMIC connection

Choose **Create ECONOMIC connection** and the window below for example will appear:



With this option you can create a completely new connection.

Enter the configuration number and then click on the Volgende > button.
The window below will appear:



There are two types of connection:

- Choose dial-in connection if your remote control uses modems and the telephone line.
- Choose network connection if your remote control uses a network.

Then click on Volgende >.

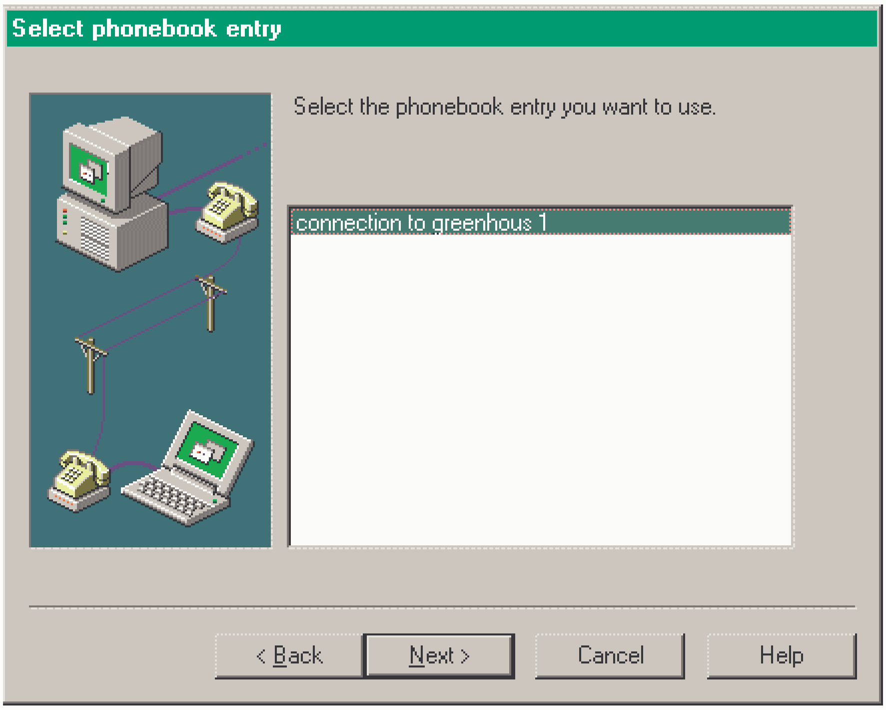
The window below will appear (for dial-in connection only):

In the case of a dial-in connection a telephone book input must be selected. The connection is brought about by way of this input.

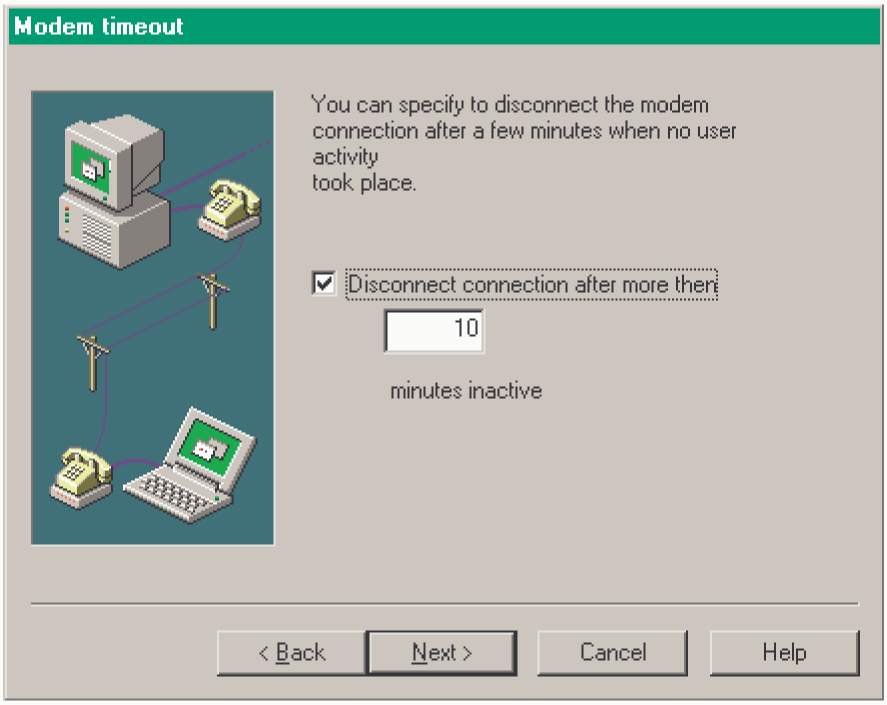
If you choose to create a new connection here you must create it first. Enter the name of the new connection, enter the telephone number of the system to be called and select connection via your modem. The precise details of this creation process will depend on your system. We shall not be describing the windows that you see any further here.

Tip You can also create this connection first via Windows external access/dial-in network.

Then click on Volgende >.
The window below will appear (for dial-in connection only):

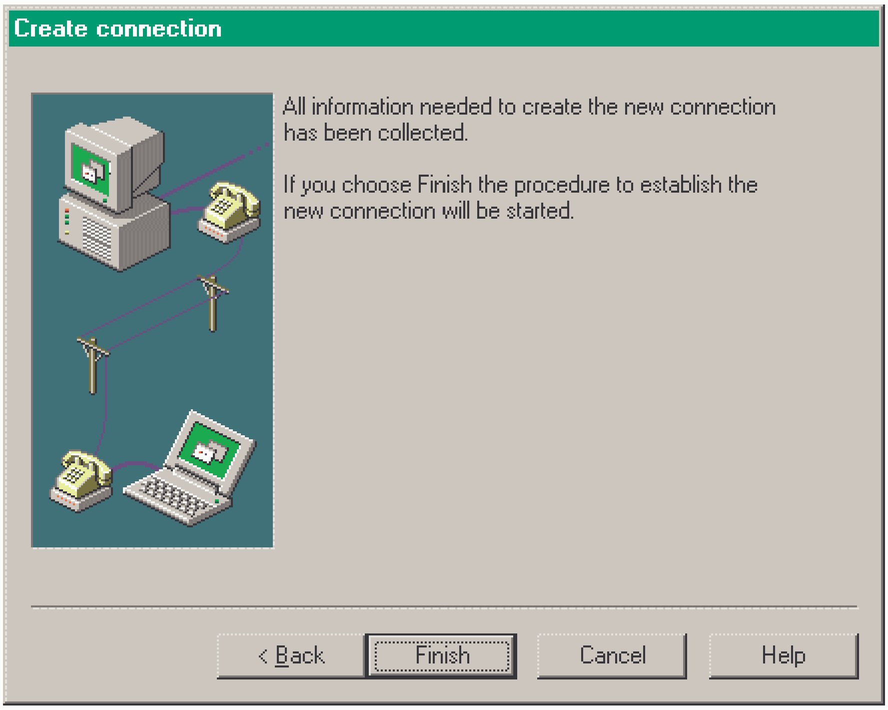


Then click on Volgende >.
The window below will appear (for dial-in connection only):



With a dial-in connection the connection is automatically broken after a period of time if you do not operate the remote control. This time is adjustable. If the connection is never to be broken, for example in the case of an internal connection via an exchange, then remove the tick in front of the *Disconnect connection after more then ... minutes inactive* option by clicking on it.

Then click on Volgende >.
The window below will appear:



Then click on Voltooien.
Now you can open the newly created connection.

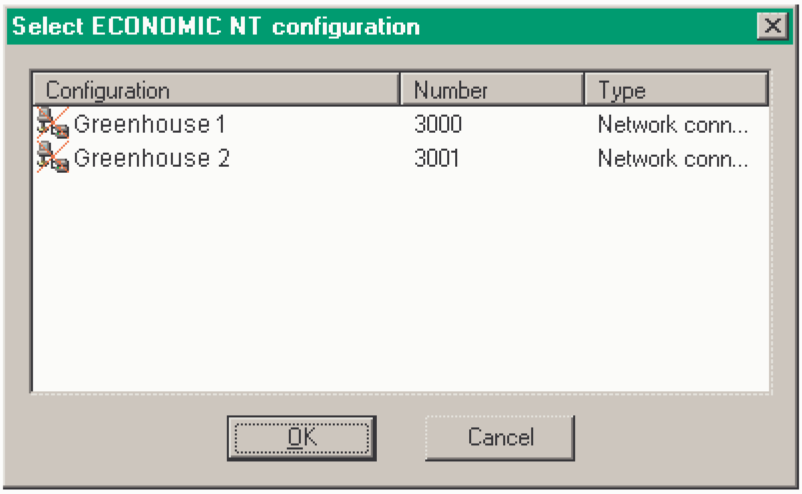
3.4. Change ECONOMIC connection

Changing the ECONOMIC connection is similar to Create ECONOMIC connection. The difference is that choices previously entered will now appear as defaults.

If you want to change the dial-in number or delete a telephone book input, you must do so via Windows external access/dial-in network.

3.5. Delete ECONOMIC connection

When you choose **Delete ECONOMIC connection** the window below for example will appear:



You can now select *Greenhouse 1* or *Greenhouse 2*.
Select OK to delete the connection with the selected configuration.

3.6. Check version

In validation you receive a message to say whether the version on the remote control is the same as or different from the base station version.

Help with making a backup

1. Introduction

This help file describes the procedures for making and restoring *ECONOMIC* NT backups. It starts with some general information about backups and backup media. It also gives some background on the way in which backups are made by the *ECONOMIC* NT and explains how automatic and manual backups can be made and restored.

2. Definitions

Backup

In general terms a backup is a copy of data that can be used to restore data if the original data have been lost. In the case of the *ECONOMIC* NT backup specifically means: a copy of data on a medium that is easy to remove from the *ECONOMIC* NT and consequently can be kept in a safe place.

Data copy

In *ECONOMIC* NT terms a data copy is a copy of the *ECONOMIC* NT data in a different location. The data are not changed by the *ECONOMIC* NT at this location.

The background process is temporarily stopped while a data copy is being made. Stopping the background process ensures that the *ECONOMIC* NT does not change the data while they are being copied. To ensure that the background process is stopped for as short a time as possible, the location to which the data copy is being copied must be on a fast medium, such as a local hard disc or a hard disc on the local network.

The data copy can then be copied to a slow backup medium, such as a tape, without the background process having to be stopped.

Tape

Tape is a backup medium for the storage of data. It is similar to a cassette tape on which music for example is recorded. On a tape the data are stored and read sequentially. This means that the data are stored and read in sequence, as a long stream. The tape has to be wound if the data are to be read or written. Consequently, a tape is a fairly slow backup medium.

ORB disc

An ORB disc is a backup medium that uses a removable disc for the storage of data. It is similar to the 3.5 inch diskettes that can be used in computers. The data on an ORB disc are addressable. This means that the data can be read directly from a given location and written to a given location, without the whole disk having to be searched. Consequently, an ORB disc is a fast backup medium.

An ORB disc has a capacity of approximately 2.2 GB (around 2,250 MB). This is more than 1,550 times greater than a 3.5 inch diskette.

3. What does it do...

Making a data copy/backup ensures that data can be restored if the data used by the *ECONOMIC* NT should be lost. The data can for example be lost as a result of fire, theft, lightning strike and defects in the hardware.

4. Inserting and removing tapes and ORB discs

Inserting tape

Hold the tape immediately in front of the opening of the tape drive with the tape window facing forward and the metal plate face down and push the tape straight into the tape drive. Part of the tape will remain protruding from the tape drive.

Removing tape

***Never* remove the tape while the drive is working!**
Always wait until the drive is ready (the lamp on the drive will go out).

Grasp the tape firmly and pull it straight out of the tape drive.

Inserting ORB disc

Hold the ORB disc immediately in front of the drive with the opening of the disc facing forward and the label face up. Lower the cover of the ORB drive and slide the ORB disc in. Once the ORB disc has gone all the way in, push it slightly downwards.

Removing ORB disc

***Never* use the button on the ORB drive to eject the disc!**
Using the button on the front of the ORB drive may cause data loss!

Start the 'ORB Tool' program from the start menu. On the 'Tools' menu click on 'Eject'. Click on 'Yes' in the confirmation dialog if the lamp on the front of the ORB disc is green.

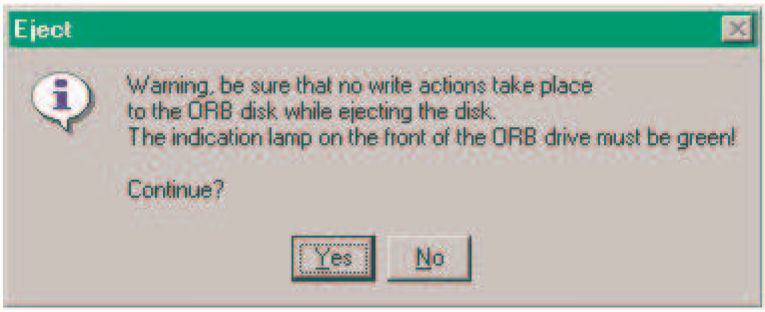


Figure 1: Confirmation dialogue for disc ejection

The ORB disc will be ejected after a few seconds.

5. Erasing ORB discs

Erasing a disc ensures that all information is removed from the disc and that a directory structure is created on the disc in which the *ECONOMIC* NT can save the backup. Even a new empty disc must be erased, because otherwise the directory structure will not be placed on the disc. Erasing the ORB disc should only be done with discs that have not previously been used for *ECONOMIC* NT backups and on which the directory structure is consequently not yet available.

To erase an ORB disc start the 'ORB Tool' program from the start menu. In the 'Tools' menu click on 'Erase ORB disc'. Click on 'Yes' in the dialog box where you are prompted to confirm. The disc will now be erased and a directory structure will be created on the disc in which the backup can be saved.

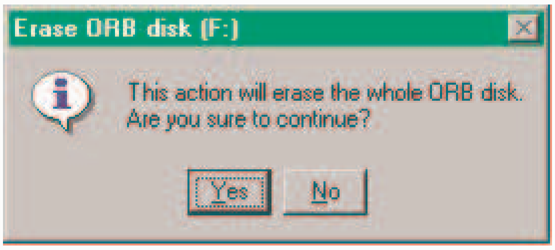


Figure 2: Confirmation dialog for erasing disc

6. Where to keep tapes/ORB discs

It is very important to keep backups in a safe place. It is not a good idea to keep the backups with the *ECONOMIC* NT. If the data in the *ECONOMIC* NT have been lost as a result of fire for example, there is a very good chance that the data on the backups will have been lost too.

A good place to keep backups is in a fireproof safe and/or in another building (such as the home).

7. Further information about backups

- Background
- Making a data copy/backup
- Restoring a data copy/backup

Data copy/backup background

Making a backup involves the following steps:

1. The data from the control station are copied to the operating station;
2. A data copy of the data at the operating station is made to another location on the hard disc. The background system of the *ECONOMIC* NT is temporarily stopped while the data copy is being made;
3. The data copy is copied to tape by the tape drive software.
4. The data copy is written to tape/ORB-disk. With tapes this is done automatically at a fixed time (is can also be done manually to make an extra backup). With ORB-disk the program ORB Tool should be used to write the data copy to the ORB-disk.

Restoration of a backup is the same but in reverse order.

ps. It is also possible that data copy/backup goes straight to the ORB disc and is not saved first at another location on the hard disc. This is however not recommended.

The figure below shows a schematic representation of making and restoring data copies/backups from both a tape drive and an ORB drive.

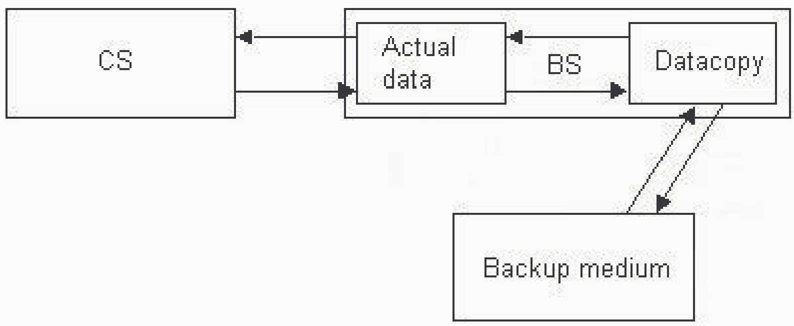


Figure 1. Schematic representation of data copy/backup

Help with making a data copy/backup

1. What does it do...

Data copies can be made both automatically and manually. The *ECONOMIC* NT makes a data copy of the data automatically each day. If you use an ORB drive as your backup medium, then the data copy will automatically be saved on the ORB disc each day. If you use a tape drive as your backup medium, then a data copy will be made on the hard disc each day and once a week a backup of the latest data copy will be made to tape.

2. Setting automatic data copies

To set automatic data copies go to: [Control General], [Data copy backup]. Ensure that [Data copy: switch off task] is set to 'No'. Set the desired start time for the data copy at [Data copy: copy start time] (standard time is 04:00). Set the desired destination location at [Data copy: destination location]. For backups to tape this must be a location on a hard disc (standard: C:\ENSOFT\BACKUP\TAPE). For backups to an ORB disk this is advised to be the backup location on the second partition (for example: D:\ENSOFT\BACKUP\TAPE).

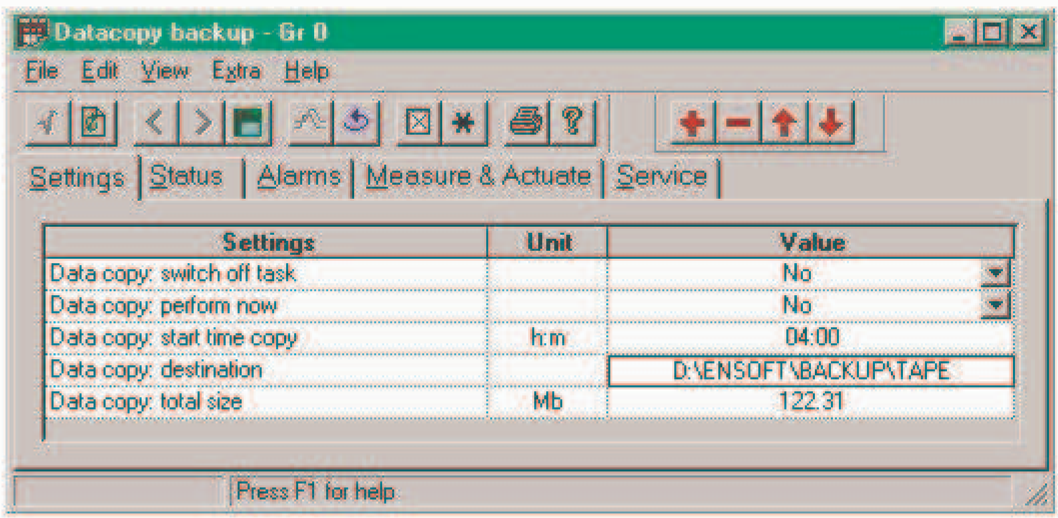


Figure 1. *ECONOMIC* NT data copy backup window

3. Setting automatic backup

For this topic it is assumed that an HP Colorado tape drive is being used with HP Colorado Backup II software

In Windows go to [Start], [Programs], [HP Colorado Backup II], [HP Colorado Backup II]. Check that '*ECONOMIC* NT data backup' is the opened backup job. If not, click on [Open] in the [Job] menu and select '*ECONOMIC* NT data backup'.

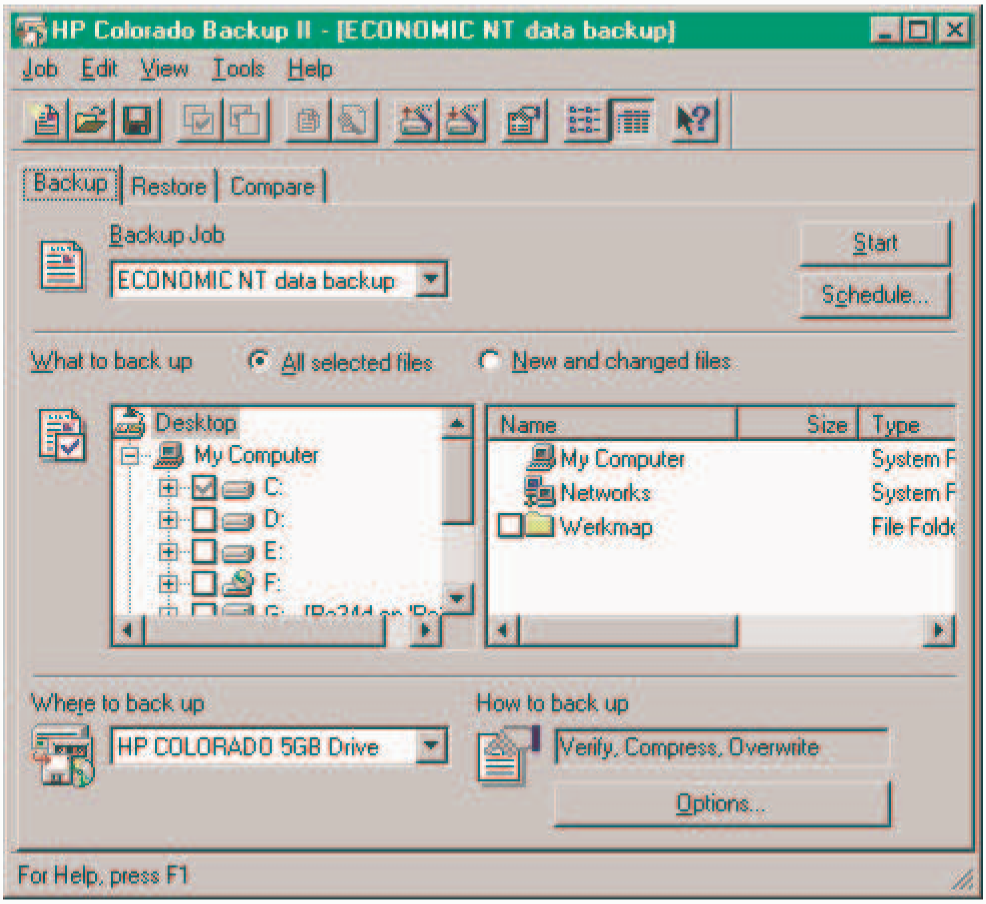


Figure 2. Colorado Backup II Backup window

Click on the [Schedule] button to create a schedule on which the backups will be started automatically.

Select 'Weekly' for a weekly backup and set the start time and start day. The standard start time is 23:00 and the standard start day is Monday. Click on [OK] and then on [Yes] to confirm the input. Click on [Yes] again to close the program. The schedule has now been entered.

NB: If a different destination location from the standard destination location for the data copies has been selected in the *ECONOMIC* NT, then the backup directory in the backup software will also have to be changed. This can be done by placing the ticks in the tree structure of the backup software in front of the correct directory.

4. Making a manual data copy

This can only be done with service access level!

Making a data copy consists of two steps: Step 1 is the copying of data blocks from the control station (ERS) to the operating station (EBS). Step 2 is the copying of all the data to another location.

Step 1 (perform at service level)

Go to [Control General], [Control System], [Control System], [Service] tab. From the perform task menu select [save data blocks]. Click on apply to start the copying of the data blocks.

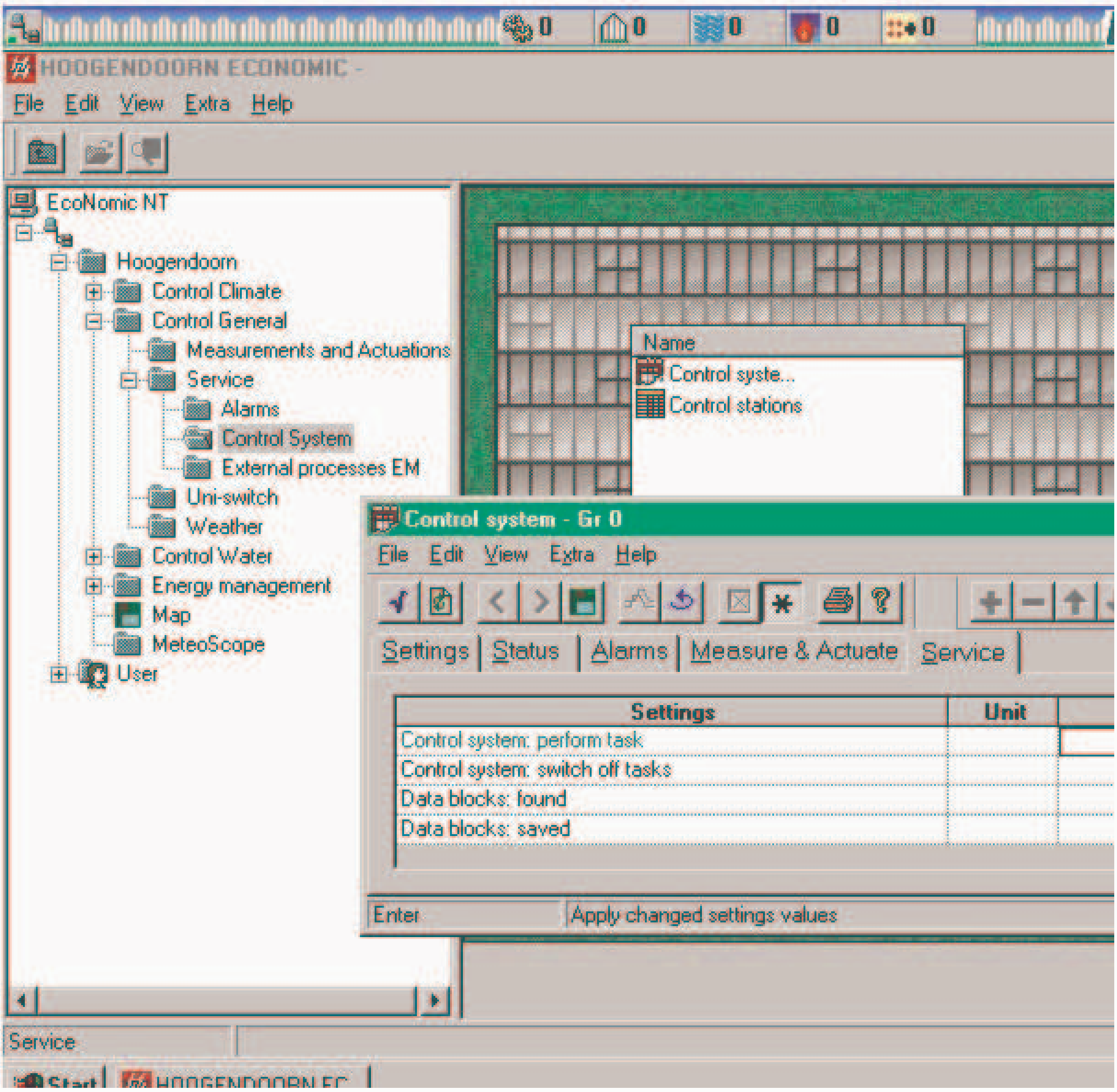


Figure 3. Control system

Figure 4. Perform task menu

Step 2

Go to [Control General], [Data copy backup]. Check that the destination location is correct (see setting automatic data copies for further information). Set perform immediately to [Yes] and click on apply to start making a data copy.

5. Making a manual backup

5.1. Making a manual backup with HP Colorado Backup II software

With this topic it is assumed that an HP Colorado tape drive is being used with HP Colorado Backup II software

In Windows go to [Start], [Programs], [HP Colorado Backup II], [HP Colorado Backup II]. Check that '*ECONOMIC* NT data backup' is the opened backup job. If not then click on [Open] in the [Job] menu and select '*ECONOMIC* NT data backup' (see also: setting automatic backup).

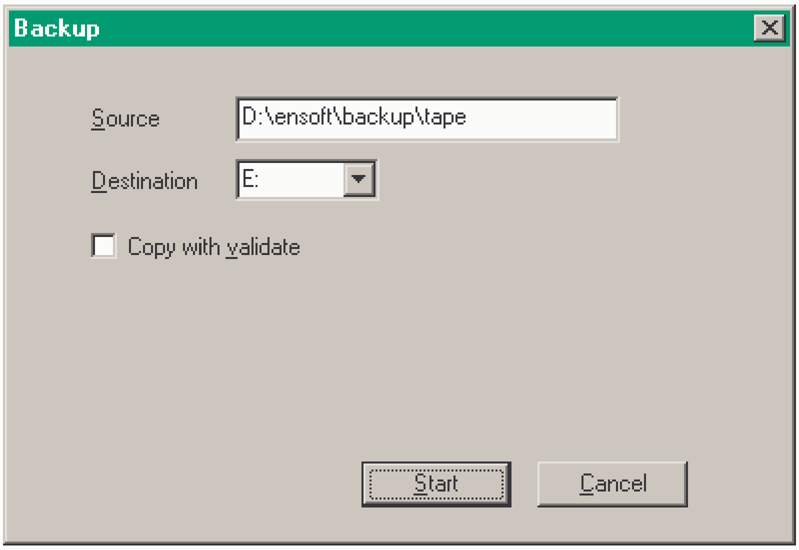
Click on the [Start] button to start the backup operation.

NB: If a different destination location from the standard destination location has been selected for the data copies in the *ECONOMIC* NT, then the backup directory in the backup software will also have to be changed. This can be done by placing the ticks in the tree structure of the backup software in front of the correct directory.

5.2. Making a manual backup on ORB-disk

In Windows go to [Start], [ORB disk] and start it.

Select from the menu [Backup] the option [Manual backup].



- Check if the source location is the same as in the setting "data copy: destination" and your ORB-disk is placed in the drive destination.
- Click on the [Start] button to start the backup operation.
- After writing the data to the ORB-disk you will be informed about the results.

6. View backup results

The result of the data copy and backup should be checked. If the last data copy was succesful can be seen in the setting "data copy: state". Where you can find the result of the backup depends on the type of backup media and the used software.

HP Colorado Backup II software
In Windows goto [Start], [Programs], [HP Colorado Backup II], [HP Colorado Backup II]. Select from menu [Tools], [Report], [View].
ORB-disk
In Windows goto [Start], [ORB Tool]. Select from menu [Backup], [View logbook].

Help with restoring a data copy/backup

1. What does it do...

A data copy must only be restored if the data have been lost or seriously damaged. The data from the data copy contain such things as data recording, user menus and control station data blocks. Restoration involves four steps:

1. Searching for a suitable data copy;
2. Restoring a backup;
3. Restoring a data copy in operating station;
4. Synchronising control station.

All of this ensures that the data from the data copy are restored in the original location in the original condition.

2. Searching for a suitable data copy

The first step is to search for the most suitable data copy for restoration. The data copy can come from different places. It is a question of finding the most up-to-date data copy that does not contain any problems. If the files have just been corrupted the latest data copy may be the best option because it is the most up to date. The latest data copy made will in many cases still be available at the destination location of the data copies. In very serious cases it may be that the only data copy still available has to be taken from the safe.

Only restore data copies that have been made with the current version of your *ECONOMIC* NT software.

3. Restoring a backup

If the backup is on an ORB disc, you can skip this step

In Windows go to [Start], [Programs], [HP Colorado Backup II], [HP Colorado Backup II]. Click on the [Restore] tab. Put a tick in front of the hard disc C:. In 'Where to restore' select the text [Alternate location] from the menu. In the field below type in the location at which the backup is to be restored (such as C:\Restore). If you want to use an existing directory, you can select it by clicking on the folder button next to the input field and selecting the desired directory. If you choose the same directory as the destination location for making data copies in the *ECONOMIC* NT, the existing data copy at this location will be lost. It is therefore better to use a different directory. If you type in a directory that does not exist, then it will automatically be created. Click on the [Start] button to start restoration.

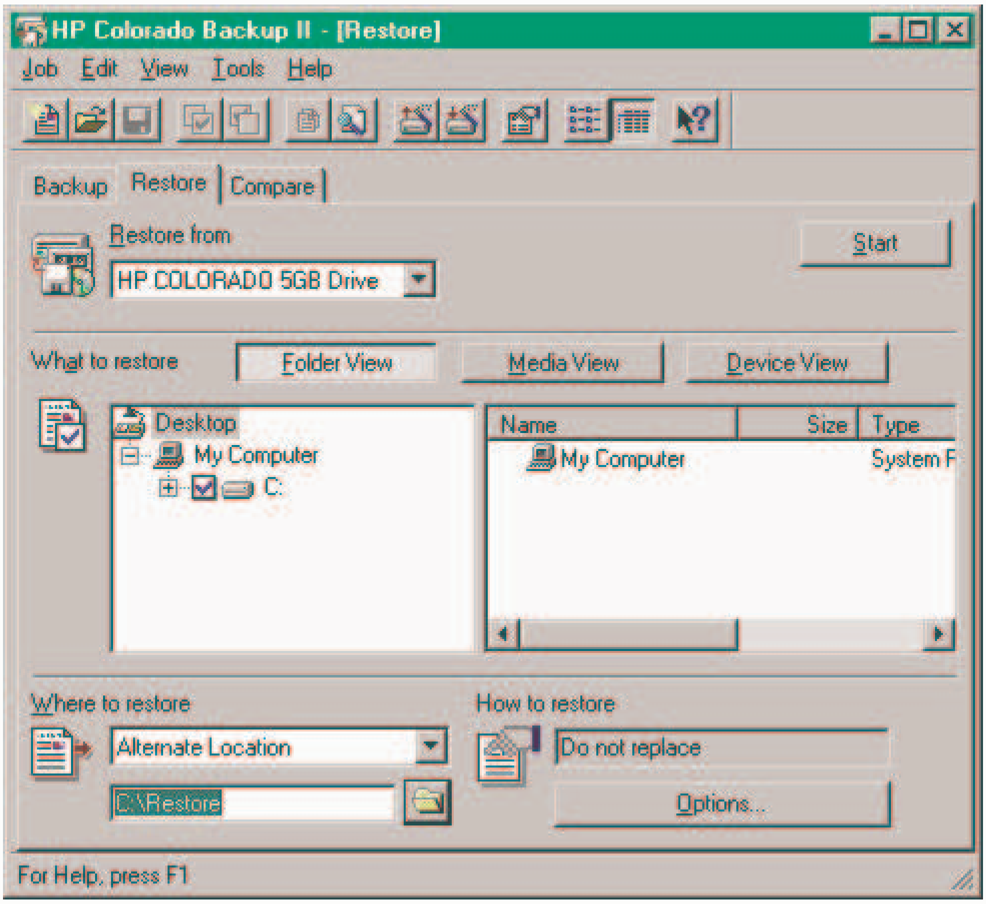


Figure 1. HP Colorado II Restore window

In the [Media Required] window click on the [OK] button to restore the backup.

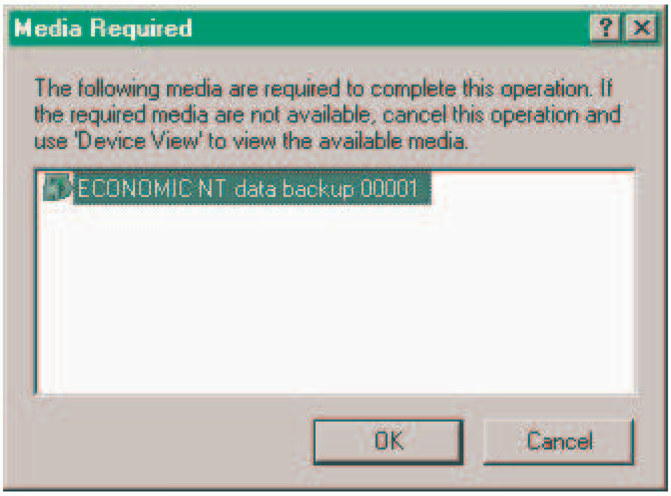


Figure 2. 'Media Required' window

4. Restoring a data copy in operating station

This can only be done with service access level!

Start the background manager by double clicking on the background manager icon in the taskbar.

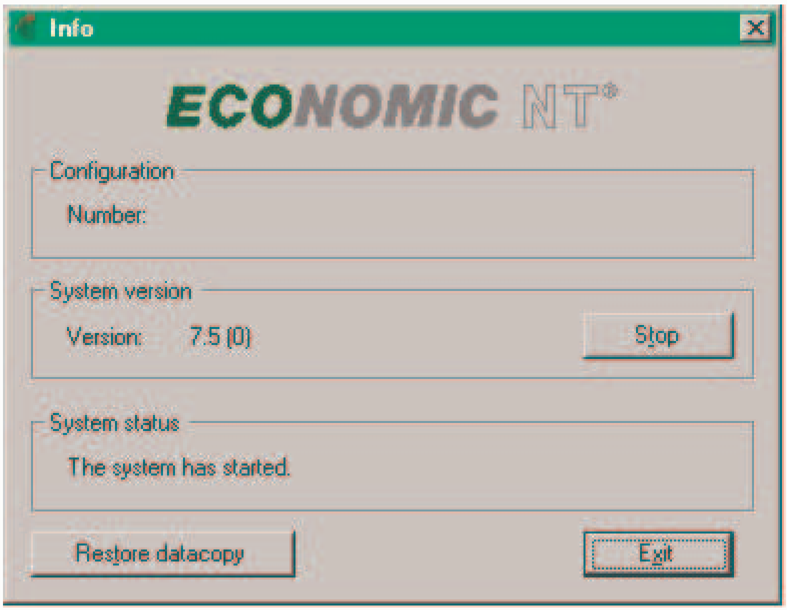


Figure 3. *ECONOMIC* NT background manager

Stop the background process by clicking on the [Stop] button. Click on the [Restore data copy] button to start the restore wizard.

In the wizard click on the [Next] button. Wait until the message 'Background system has been stopped.' appears in the wizard and click on next. Select the directory where the data copy is located. Where tapes are used as the backup medium this is a directory on a local hard disc (such as C:\Restore) or a directory on the network. If ORB disks are used this is a directory on the ORB disc (such as E:\ENSOFT\BACKUP\TAPE). Click on the [Next] button. Check that the version of the backup matches the installed *ECONOMIC* NT version and click on the [Finish] button if this is the case. The data copy will now be restored.

As soon as the data copy has been restored, restart the background process by clicking on the [Start] button in background manager.

5. Synchronising control station

This can only be done with service access level!

Go to [Start], [Program Files], [ECONOMIC NT], [Service], [Control stations], [Maintenance control station]. Click on the [Next] button. Select 'Save control station content' if the control station is still working properly and contains the right settings or select 'Reload control station content' if the control station is no longer working properly and click on the [Next] button. Click on the [Finish] button to start the reloading or the saving.

Legal stuff

1. Notes
2. Rights
3. General terms
4. Publications
5. Extra security

H. HOOGENDOORN AUTOMATION B.V.

NOTES

- Both you as the customer and the dealer are urgently requested not to install or run your own software on the *ECONOMIC* NT, unless this software is explicitly labelled in writing by Hoogendoorn as: "Suitable for *ECONOMIC* NT".
- Connecting an *ECONOMIC* NT to an existing or new permanent **network** may only be carried out by specially trained and authorised personnel of Hoogendoorn or its dealers.

Hoogendoorn disclaims all liability for the possible consequences of failure to compy with these two points.

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EXTRA SECURITY. It is the responsibility of the user of our products to avoid possibly hazardous situations that may cause property damage or personal injury. Therefore the user must always protect technical installations against computer failure by means of preventive and safety measures, independent of the computer control system.

The following general terms have been translated from Dutch. In case of contradictions between the Dutch and the English text, as well as between the interpretation of these two texts, the Dutch text or interpretation shall prevail over the English text or interpretation: **only the Dutch version is definitive**.

UNETO

Association of Electrical Entrepreneurs
Bredewater 20, 2715 CA Zoetermeer

General Terms of Contracting Installing Companies, ALIB 1992

Determined by the: Association of Electrical Entrepreneurs - Uneto, Association of Installing Companies The Netherlands (VNI), Association for the Lift Industry The Netherlands (NVL).

I GENERAL STIPULATIONS

Applicability

1 These general terms are applicable to all offers formulated by the contractor and to any agreement which has been closed between the latter and the client. They also apply to all obligations arising from agreements which have been closed at a later date between contracting parties. The application of any general terms which are appealed to by the client, is specifically refused.

Definition

2 By work as referred to in these terms, is understood the agreed activities in their entirety (including any possible designs) and/or deliveries.

II OFFER

3 The offer is free of engagement, includes a statement of the method of payment and gives an indication of the price and the price-making method: fixed price contract or cost-plus.

4 The documents which form a part of the offer (such as drawings, technical descriptions and the like) are of as accurate a nature as possible, are not binding, however, and remain the (intellectual) property of the contractor. They are not permitted to be used, copied or handed over to a

third party or made public in any other manner, without his consent.
5 Be it the case, that the client does not accept the offer, he is obliged to immediately return to the contractor, all the information referred to in the previous section.
6 The contractor is entitled to charge the costs involved in the offer, provided that he has supplied the client in advance, with a written indication if these costs.

III THE COMING ABOUT OF THE AGREEMENT

7 Be it the case, that the offer of the contractor is accepted, the agreement only comes into being at the moment when the contractor:
– either confirms the acceptance within a reasonable period of time,
– or commences the execution of the work.
8 The contractor can only be required to commence work, after he has gained possession of all the information necessary for this purpose and the agreed payment (instalment) has been received by him.

IV EXECUTION OF THE AGREEMENT

Obligations on the part of the contractor
9 The contractor is obliged to cover his liability risk by way of insurance, in accordance with what is common practice in the sector. To this end, he shall at least take out a liability insurance policy for businesses (AVB policy) with an insured amount of at least one million guilders per incident, in case of which a series of related events is considered as one incident.
10 On request by the client, the contractor shall submit the documents which show that he has taken out this insurance policy.
11 With the execution of the work, the contractor shall take into account those regulations which have been declared applicable. Any possible financial consequences of alterations to these regulations which may take place between the time of the offer and the date of completion of the work, shall be insured as additional work.
12 In those cases necessary, the contractor shall inform and instruct the client or the person appointed by the latter, on the subject of the setting into action and keeping operable of the work delivered. The extent, date of commencement and duration of the obligations referred to, shall be determined in reasonableness, by the contractor.
Obligations on the part of the client
13 The client is obliged towards the contractor to make possible the execution of the work within the normal working hours of the contractor and under those conditions which meet the legal safety requirements and any other government regulations.
14 The client shall ensure that the contractor has at his disposal on time, the documents of approval required for the work (such as permits and exemptions) and the information to be provided by him for the benefit of the work.
15 The client shall make available on time, the provisions for connection for the benefit of the power required for the work and the testing thereof. The client is responsible for the costs of the required power.
16 The client is responsible for the application for connection of the installations to the mains of the utility company concerned, or otherwise to the various public transmission mains. The connection charges are to be made to the client. The contractor shall provide instructions with regard to this matter, within his field of profession.
17 The client is obliged to ensure, that all activities to be performed by a third party (such as those of a constructional nature) and/or those deliveries which do not form a part of the work of the contractor, are executed in such a manner, that the completion of the work is not subjected to any delay which may result from this. Be it the case, that a delay as referred to in this section nevertheless occurs, the client is obliged to inform the contractor of this matter immediately.
18 Be it the case, that the commencement and the progress of the work are delayed due to circumstances for which the client bears responsibility (of the kind referred to in section 17, for example), the resulting damage suffered by the contractor is to be compensated for by the client.
19 The client is responsible for the being available on time of the proper and safe auxiliary appliances for the horizontal and vertical shifting of any heavy components required for the work and for the accessibility of the place of execution of the work, as well as for the suitability of the paths of access to the place of work.
20 The client shall bear the risk for any damage to and loss of materials, components or tools which have been brought in to the place of work, if and insofar as he is responsible for the guarding thereof.
21 The client shall bear the risk for any damage which is caused by the faulty or unfit nature of any objects which belong to him or, as the case may be, the use of which has been prescribed, or which are to be obtained from a particular supplier, and for the failure to deliver or failure to deliver on time, of the objects referred to.
22 The client shall bear the risk for any damage which is caused by any errors or defects in relation to the drawings, calculations, constructions, work specifications and work instructions which have been supplied by him.
23 The client shall bear the risk in case of inadequate compliance with the agreement, which is to be attributed to the assistant workers whom he requires to be employed.
24 The client shall bear the risk for any damage which can be attributed to the wrongful acts of additionally employed contractors and their assistant workers.
25 The client shall bear the risk for the design which has been drawn up by the contractor, if and insofar as it has been approved by him.
26 The client shall indemnify the contractor from all third-party claims for damages which remain payable by the client by virtue of these terms, including any damages resulting from infringements on intellectual and industrial rights of ownership.
27 The client shall permit the contractor the application of any indication of name or advertising at the work site or on the work itself.
Activities for which the agreement fails to provide
28 The client shall not be not entitled to order any of the persons who have been called in by the contractor to assist in the completion of the work, to perform activities which are not related to the work.
The taking into account of additional or less work
29 Additional or less work shall be taken into account:
a if there are changes in the specifications (alterations to work specifications, the work itself or the conditions with regard to the execution of the work);
b if there are differences in provisional sums, estimated quantities and/or adjustable quantities;
c in those cases, as have been determined under these terms.
Each one of the totals, or else the balance of the additional payments and deductions resulting from alterations to the work plan, must not exceed to more than 15 or 10% of the contract sum.
30 The additional work shall be taken into account by lump sum, on the occurrence of the next term of payment. Should an instalment plan not have been agreed to, on completion thereof.
31 The less work shall be taken into account by lump sum in the final payment.
32 Be it the case, that the sum total of the less work should exceed that of the additional work, the contractor shall be entitled to a sum equal to 15% of the difference between these two sums.
33 The absence of a written order for additional work shall leave intact the right to the taking into account thereof on the part of the contractor.
Cost-increasing circumstances
34 On the occurrence of cost-increasing circumstances, the contractor is obliged to inform the client of this matter as quickly as possible.
35 Cost-increasing circumstances, for which the contractor cannot be held responsible shall be taken into account as additional work.
Force Majeure
36 In case of force majeure, the contractor is qualified without judicial intervention to either suspend the execution of the work for six months at the longest, or to cease work at a stage of non-completion, without his being liable for any damages. All expenses having been incurred by the contractor up to that time, shall be claim-able at once and fully.
37 Understood by force majeure, are those circumstances which could not, in fairness, have been required to be anticipated by the contractor

at the time of the closing of the agreement and which were not known to him either. Included in these circumstances are, amongst other things, the failure to meet obligations by the suppliers of the contractor, problems with transport, fires, strikes or work stoppages, loss of the parts to be processed, import or trade embargo's.

Completion and Acceptance

38 The agreed time of completion shall be observed as much as possible, though shall never be considered to be a deadline. In case the time of completion is exceeded, the contractor shall enter into consultation with the client.

39 The work shall be considered completed and accepted:

– either, when the contractor has informed the client that the work has been completed, tested and is ready for operation and the work has been approved or accepted by the latter;

– or, when a term has expired of eight days at the most, after the contractor has submitted a written declaration to the client, stating that the work has been completed, tested and is ready for operation and the latter has neglected to approve or else accept the work within this term;

– or, when the client brings the work into operation (prematurely), on the understanding that by putting a part of the work into operation (prematurely), this part shall be considered as delivered.

40 Minor defects which can be repaired within the period of guarantee and which are of no influence on the proper functioning of the work, shall not stand in the way for withholding approval.

41 On completion, the contractor is relieved of all liability for any defect which should, in fairness, have been discovered by the client at that point in time.

42 As a result of completion, the risk in relation to the work is transferred from the contractor to the client.

Rescission

43 Without prejudice to the rights to which he is further entitled, the contractor is qualified without judicial intervention and without proof of default, to either suspend the execution of the work, or cease work at a stage of non-completion, if the client:

a. has applied for a moratorium, or if the latter has been granted to him;

b. has been declared to be in a state of bankruptcy or has submitted an application to this effect;

c. has failed to meet a certain obligation or if it is to be foreseen by the contractor that he shall fail in this respect.

Cessation and suspension shall take place by means of a declaration in writing, without the contractor's being liable for the payment of any damages or the awarding of any guarantee.

44 All possible claims against the contractor, which the client may have or may arrive at in those cases, shall be payable at once and fully.

V PAYMENT

Security

45 After the agreement has been entered into, the contractor is entitled to demand sufficient security from the client, if he has proper reason to fear that the client shall fail to meet his obligation to payment. Section 43 shall apply in a corresponding manner, should the client fail to provide the security demanded by the contractor.

Price adjustment system

46 All prices are VAT extra and are to be charged in accordance with the 'installation price adjustment system'*. The installer shall inform the client in that case, about the ratio of wages to material which is used in the offer.

Payment

47 Payment by the client shall take place in instalments, in proportion to the progress (cost-plus) or duration (contracting) of the work, without his being eligible for any discount or deduction.

48 With the cost-plus method, payment must always take place within thirty days at the most, after the invoice date. Payment in advance shall take place within seven days at the most, after the making of the agreement.

49 With the fixed price contract, payment shall take place as follows:

– 30% within seven days at the most, after the making of the agreement;

– 30% within thirty days at the most, after the expiry of 30% of the total duration of the work;

– 30% within thirty days at the most, after the expiry of 60% of the total duration of the work;

– 10% within thirty days at the most, after completion of the work.

50 Payment of the additional work shall take place in accordance with section 48.

51 Be it the case, that payment has failed to take place on time, the client is considered to be in default and the contractor shall be qualified to suspend work and discontinue the guarantee, without prejudice to any further rights to which he has a claim.

52 After the client has come to be in default, the contractor is qualified without further proof of default, to proceed with the collection of the amount payable to him. All legal and non-legal expenses involved are to be charged to the client, unless the contractor prefers to determine these expenses by way of a lump sum, at 15% of the amount payable.

53 For the period of time, during which the client has made default in payment, the contractor may charge interest on the amount payable to him. On an annual basis, this interest shall equal the legal rate of interest, increased by 2%.

54 A payment made by the client shall in the first place, be deducted from all costs payable and interest due and shall finally be deducted from the bills claim-able, which have been outstanding for the longest time, even if the client states that the payment applies to later bills.

Conditions of Ownership

55 The contractor shall remain to be the owner of all objects (such as materials and components), as long as the client has failed to meet his obligations to payment by virtue of this agreement, including that which the client may come to be owed in connection with his being remiss in his obligations.

VI GUARANTEE

56 The contractor undertakes, within the limits of the following stipulations, to repair free of charge any defects which were already present at the time of completion but only became apparent within six months after completion.

57 This obligation only extends to defects which in fairness, could not be perceived at the time of completion and which become apparent under normal operating circumstances and with the proper use of the work. It does not extend to any defects which are the result of insufficient maintenance by the client, of alterations having been applied without the written permission of the contractor or of repairs having been performed by the client, or to the normal wear and tear or those defects for which the client is responsible in pursuance of sections 21 to 23 inclusive.

58 In order to be able to appeal to the rights deriving from section 56, the client is obliged:

– to inform the contractor forthwith, in writing of the defects having been detected;

– to make a reasonable case to the contractor that the defects are to be attributed to the lesser quality or inadequate completion of the work, if and insofar as the contractor is responsible for the design of the work, that they are the direct result of an error for which the contractor is to blame, without prejudice to the stipulations of section 25;

– to render full assistance to the contractor, in order to enable him to remove the defects within a reasonable period of time.

59 The faulty components having been replaced by the contractor, become the property of the latter.

60 Be it the case, that in the opinion of the contractor, the costs of repair bear no relation to the interests involved on the part of the client in the repair, the client is entitled to damages.

VII LIABILITY ON THE PART OF THE CONTRACTOR

Before completion

61 The contractor shall repair at his own expense, any damage to the work which has occurred prior to the completion of the work, unless he is not responsible for the cause of this damage or it is unreasonable on any other grounds that this damage is to be charged to him, without prejudice to the stipulations of section 20.

62 The contractor is liable for any damage which has been suffered by the client to either persons or objects other than the work, insofar as this

damage was brought about through the execution of the work and is to be blamed on the contractor or on persons employed by him, if and insofar as this liability is covered by his insurance.
63 The two previous sections both apply in a corresponding manner, if the contractor performs any activities under the terms of the guarantee which he is obliged to provide in pursuance of section 56.
After completion
64 After completion, the contractor is only liable for defects concerning the work, insofar as the fulfilment of his obligation to the provision of guarantee, as described in sections 56 to 60 inclusive, is concerned.
65 The contractor is only liable for damage which has been suffered by the client as a result of defects as referred to in section 56, if and insofar as this liability is covered by his insurance.
Amount of damages
66 Be it the case, that in pursuance of sections 62 and 65, the contractor is liable for compensation of the damage which is suffered by the client, this compensation shall amount to no more than the sum total of the excess amounts of his insurance and the payment made by the insurance.
67 For any damage other than referred to in the previous sections, which could be suffered by the client, the contractor can never be held liable.
68 The restrictions included in the previous sections do not apply if the damage is caused by intent or gross guilt on the part of the contractor or his subordinates in charge.
69 All claims to compensation or repair for damages suffered before or after completion are cancelled, if they not have been made known on the day of completion or on the day on which the period of guarantee expires, at the latest.
70 The legal claim to damages or to repair of client towards the contractor in pursuance of these terms, becomes prescribed when one year has passed after the client has issued a protest regarding a certain matter.

VIII FINAL STIPULATION

71 To the agreement and to any agreement arising from it, Dutch law applies exclusively.
72 Every dispute between contractor and client, shall be settled to the exclusion of the ordinary judge by the Court of Arbitration for the Metal Industry and Trade (Raad van Arbitrage voor de Metaalnijverheid en -Handel).
73 The contractor is qualified, in contravention to the previous section, to let the dispute be settled by the common courts of law in the town or district in which the contractor is established.

* INSTALLATION PRICE ADJUSTMENT SYTEM
Adjustment modifications to labour costs: (L2-L1)/L1 x 100% = - %
L1: Wage level as of date of offer. L2: Wage level as of date of modification. Wage level: Wages per hour, in accordance with Central Statistical Office regulations, construction and installation companies. Adjustment material prices (M2-M1)/M1 x 100% = - %
M1: Price-index figure as of date of offer M2: Price-index figure as of date of modification.
Price-index figure: Central Statistical Office index figures of seller's prices domestic sales.

The ALIB 1992 in Dutch is registered at the Arrondissementsrechtbank The Hague on 22 september 1992 number 162/1992

Supplement to the General Terms of Contracting Installing Companies, ALIB 1992

Hoogendoorn Automation

PO Box 108, 3130 AC Vlaardingen, Westlandseweg 190, 3131 HX Vlaardingen, The Netherlands.

Hoogendoorn Automatisering B.V.(including Indal Tuinbouwautomatisering B.V.), H. Hoogendoorn Automation B.V. and JB Systems B.V. are using as General Terms the ALIB 1992 together with the following supplements which collectively form the General Terms of Hoogendoorn/JB Systems as these have been lodged with the Delft-The Hague Chamber of Commerce and the Central Holland Chamber of Commerce, The Netherlands,

The numbers refer to the articles of ALIB 1992.

1 The following is added after the first full sentence: "The term contractor shall also be deemed to include the supplier of hardware and/or computer-programs and of all services connected with said supplies."

2 The following is added after the first full sentence: "The term work shall be deemed to also include maintenance activities."

62 The text is amended as follows: "The contractor is liable for any damage which has been suffered by the client to either persons or objects other than the work, insofar as this damage was caused by the execution of the work and is to be blamed on the contractor or on persons employed by him. The contractor is liable for this damage if and insofar as this liability is covered by his insurance, unless this would be unacceptable by measures of ration and reason, in which case the liability of the contractor is limited per event to no more than 50% of the contract sum (taxes excluded) with a maximum of Dfl.100,000.00."

65 The text is amended as follows: "The contractor is only liable for damage which has been suffered by the client as a result of defects as referred to in section 56, if and insofar as this liability is covered by his insurance, unless this would be unacceptable by measures of ration and reason, in which case the liability of the contractor is limited per event to no more than 50% of the contract sum (taxes excluded) with a maximum of Dfl.100,000.00.".

65A An article is inserted concerning maintenance activities: "The contractor is only liable for any direct damage which has been suffered by the client as a result of maintenance activities executed by the contractor if and insofar as this liability is covered by his insurance, unless this would be unacceptable by measures of ration and reason, in which case the liability of the contractor is limited per event to no more than twice the amount of the annual maintenance contract sum (taxes excluded)."

66 (Formerly ALIB 1992 Article 67.) The text is amended as follows: "For other forms of damages than those set forth in the previous sections, such as consequential damages, intangible damages, corporate or environmental damage, including damage to crops and damage as a result of soil-structure deterioration, or (other) damages to the soil itself or to other substances or materials which are in any way involved in the fertilisation of crops, the contractor shall never be liable."

67 (Formerly ALIB 1992 Article 66.) The text is amended as follows: "Without prejudice to the above mentioned sections, the contractor is only liable for any damage if and insofar as this liability is covered by his insurance, unless this would be unacceptable by measures of ration and reason, in which case the liability of the contractor is limited per event to a maximum of Dfl.100,000.00.".

68 The text is amended as follows: "The liability limitations set forth in the previous sections shall not apply if the damages are the result of deliberate action or gross negligence on the part of the contractor or one of his employees inasmuch as this liability arises out of any product liability law which shall be applicable, mutatis mutandis. The limitations set forth in these present conditions in connection with liability is applicable both in the case of contractual as well as non-contractual liability."

VII-A INTELLECTUAL PROPERTY RIGHTS

The ALIB 1992 conditions do not contain any regulations pertaining to intellectual property rights. Therefore, in addition to the ALIB 1992 the following conditions are applicable:

70A Copyright as well as all other rights of intellectual or industrial property on computer programs, equipment and other materials shall be solely retained by Hoogendoorn/JB Systems or its licensor.

70B Hoogendoorn/JB Systems grants the client only a non-exclusive right to use the computer program(s) which is/are made available to the client (hereinafter: the software). This right of use solely encompasses the right to start up the software, make it visible, and use it for processing the data for which the software was designed. The software may only be used by the client within its own company.

70C The right of use may only be transferred to a third party with the previous written permission of Hoogendoorn/JB Systems. The client shall be prohibited from selling, renting, alienating or conveying the software as collateral, or deploying the software in any manner whatsoever to, with, for, or by any third party. The client shall refrain from amending the software, placing it at the disposal of a third party, or allowing the software to be used by any third party. The source code of the software shall not be made available to the client.

70D Hoogendoorn/JB Systems may insert technical protections in the software and the hardware to prevent it from illegal use, copying, reverse engineering etc.. The client is not permitted to remove or evade such protections. Should these protections result in the client being unable to make a spare copy (back-up) of the software, then Hoogendoorn/JB Systems shall provide such a spare copy to the client at his first request.

70E The client has the right to make one single spare copy of the software except when Hoogendoorn/JB Systems provides a copy of the software to the client.

70F Information concerning the interoperability of the software can be requested to Hoogendoorn/JB Systems by the client in writing. Such request must make mention of the specifications of the nature of the interoperability in question. Hoogendoorn/JB Systems shall inform the client within reasonable time as to whether or not this information shall be made available to the client and under which financial and other conditions.
Should the client discover defects in the software, then he shall report this to Hoogendoorn/JB Systems without delay. In- or in relation with these Terms and Conditions a defect is deemed to be: the failure to meet the contractual specifications, or, in default thereof, the functional specifications provided by Hoogendoorn/JB Systems; a defect shall solely be deemed to exist if it can be reproduced. Solely

when Hoogendoorn/JB Systems remains in default in curing a defect which forms a serious obstacle to the functionality of the software, after the expiry of a reasonable time period and after a written notice of being in default has been issued, the client is entitled to cure the defect itself.

2. Control General

Astronomy

Astronomical times (sunrise and sunset times) are calculated every day based on the location of the *ECONOMIC* NT (latitude and longitude) and the date.
The maximum radiation level in the middle of the day is also computed automatically each day.

The "Astronomy" settings relate to the clocks and the astronomical times in the *ECONOMIC* NT.

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longitude time zone
This is 15 degrees for the Netherlands and Belgium. All time zones refer to the solar time of a degree of longitude, which is a multiple of 15. Great Britain refers to the 0 degree meridian. The east coast of America refers to the 75 degree WL meridian (set as -75).

correction deviating timezones
A few countries in the world have a time that differs from the time used in most countries of the world by a period of time that is not a whole number of hours.
Central Australia, a few South American countries and India are examples. This setting can be used to correct the time in these countries.
This setting must, therefore, be on 0 for the Netherlands and Belgium.

sunrise
sunset
The computed times for sunrise and sunset are saved in these settings.
These times are computed using the latitude and longitude of your business location.

day period: type of start time
day period: start time
day period: type of stop time
day period: stop time
A 24-hour period consists of a day period and a night period.
The above settings are used to enter the times that the day period starts and ends in connection with the recording of climate data in reports and graphs.

EXAMPLE 1:
To set the day period from sunrise to sunset.

day period: type of start time	sunrise
day period: start time	00:00
day period: type of stop time	sunset
day period: stop time	00:00

EXAMPLE 2:
If you grow chrysanthemums, for example, and so you black out from 18.00 to 07.00, you can set the day period from 07.00 to 18.00.

day period: type of start time	clock
day period: start time	07:00
day period: type of stop time	clock
day period: stop time	18:00

time: daylight saving time
This setting indicates whether it is summer time or winter time.
location nursery: latitude
location nursery: longitude
This setting is used to enter the latitude and longitude. These settings are used to calculate the times of sunrise and sunset, maximum radiation level and maximum radiation sum.

The latitude and longitude must be set by the location of the nursery:

	latitude	longitude
Aalsmeer	52,3	4,8
Alkmaar	52,8	4,8
Almere	52,3	5,3
Arnhem	52,0	6,0
Asten	51,3	5,8
Breda	52,0	4,3
Brielle	52,0	4,3
De Kring	52,0	4,5
Eindhoven	51,5	5,5
Emmeloord	52,8	5,8
Enkhuizen	52,8	5,3
Erica	52,8	7,0
Gameren	51,8	5,3
Groningen	53,3	6,5
Hapert	51,3	5,3
Made	51,6	4,8
Nijmegen	51,8	5,8
Sexbierum	53,3	5,5
Tilburg	51,5	5,0
Utrecht	52,0	5,0
Veghel	51,7	5,5
Venlo	51,3	6,3
Venray	51,5	6,0
Weert	51,3	5,8
Westland	52,0	4,3
Antwerp	51,5	4,5
Brussels	50,8	5,5
Dunkirk	51,0	2,5
Gent	51,0	3,8
Hasselt	51,0	5,5

time: seconds
Once you have retrieved this setting, you can call it up again and again. This allows you to check whether the clock is running.

time: minutes
time: hours
time: day
time: month
time: year
These settings are for registration purposes.

time: day of the week
The day of the week is entered here.

Control System

The background task SysSrv counts amongst its responsibilities the following:

- recompressing the user folders;
- backing up the data blocks from the control station;
- downloading the memory configurations of all the connected control stations;
- downloading various settings relating to RAS and user accounts.

User folders are packed in a cabinet file 10 minutes after the last change (for each installed language). This file is placed in the End*xxxx*\SysData\Cabinet directory. In this way the remote control can (at the request of the user) retrieve the most recent user folder from the base station.

The data blocks from the control station are backed up daily at 00:10. This backup can be found in the End*xxxx*\SysData\Datablck directory. All the data and conf files from the control station are placed here with the extension .bck. If such a file already exists, the existing .bck file will first be copied to .bck2. In this way there are always two backups of each data block available. This backup is of data from a running system and must be reset via SetupCS.

Five minutes after the system is started the memory configuration will be retrieved from all the connected control stations. The information downloaded is the name, the type and the number of the control station and also the amount of SRAM and FLASH memory in the system. The memory configuration can only be downloaded from an ERS-2 (or higher) system. In the case of an ERS-1 system only name, number and type will be displayed.

The above information can also be downloaded on request by way of a setting list (service access level). Information about RAS and user accounts is only retrieved by internal processes and is not visible for the user.

Data copy

The proper management of digital data requires a regular backup copy to be made. To make a proper backup copy of the *ECONOMIC* NT data it is not enough just to start a backup copy program. The *ECONOMIC* NT has special facilities for this purpose.

The data copy task ensures that the system is temporarily paused and the *ECONOMIC* NT data are copied to a backup copy directory. The data copy can be set so that it starts automatically each day. The data include the data recording, the user menus, the data blocks from the control station and various other internal *ECONOMIC* NT data.

The restoration of a data copy is only available to Service and must only be performed if the existing data have been lost or seriously damaged. There is a wizard available that is started via the background control tasks. The changes made since the last data copy will be lost.

CS: SRAM total
CS: SRAM available
CS: SRAM maximum modules
CS: SRAM modules loaded

CS: FLASH total
CS: FLASH available
CS: FLASH maximum modules
CS: FLASH modules loaded
CS: FLASH sector size

These settings contain the indicators for the memory configuration of an ERS-2 (or higher) control station. The 'CS: SRAM total' setting shows the net space in the SRAM available for data and programs. This space is the total space less overhead for RAM disk and directory module. The 'CS: SRAM available' setting shows the space that is currently still free and available for the storage of data and programs. The number of data blocks and programs loaded in the memory can be read from the 'CS: SRAM modules loaded' setting. The limitation of this number is shown at 'CS: SRAM maximum modules'.

If the system contains FLASH memory, the FLASH settings will also contain a value.

CS: node id
CS: node name
CS: type

The above show the name and the number of a control station connected to the base station. The control station type is also shown (0 for ERS-1, 2 for ERS-2).

Control system: status
Control system: perform task
Control system: switch off tasks

The **Control system: status** setting shows what the System Service (SysSrv) is working on and how the most recent action was concluded. The **Control system: perform task** setting can be used to start an action manually. The service will execute the selected task within 5 seconds. Tasks that are not to be executed for whatever reason can be indicated by the **Control system: switch off tasks** setting. If the service has been instructed to make a daily backup of the data blocks from the control station and the control station is of the ERS-1 type, then the service will switch off this task automatically.

Data blocks: saved
Data blocks: found

During and after a backup of data blocks from the control station the above setting shows how many data blocks are actually saved on disk and how many there should be. These settings will normally be the same. Any difference means that the saving of one or more data blocks has been unsuccessful. This situation is also reported in the alarm report.

Data copy: switch off task
If this is set to **Yes**, the facility for making data copies is turned off. If a data copy is in progress, it is cancelled.

Data copy: perform now
Setting this to **Yes** starts the data copy task immediately, irrespective of the **Data copy: start time copy** setting.

Data copy: start time copy
This setting indicates the time of day when the data copy process starts automatically.

Data copy: destination
The data copy files will be written to this destination (= folder). Enter an existing destination. If the destination folder does not already exist, the data copy will fail. It is possible to select a destination on a different computer in the network.

Data copy: status
This setting displays information about the current data copy status.

Data copy: total size
Once the data copy has been made, the total amount of disk space used for the data copy is shown here. The number of MB used so far is displayed as the data copy is being made.

Emergency power

The emergency power program ensures that major power consumers are not actuated during a power cut when the generator set is running. The actuators which may be enabled, must be phased in to avoid large peaks in current.

The emergency power program is enabled when the emergency power detector cuts in.

After the emergency power program has been enabled, the power consumers are switched on in phases. When mains power comes back on, the emergency power program is not switched off immediately. It remains enabled for a while to avoid unnecessary repeat starts if the mains power cuts out again all too readily after it has come back on.

Circulation pumps

The circulation pumps are actuated inversely. This means that they are activated if the voltage from the computer cuts out. All actuators are blocked in the first minute of the emergency power program but the circulation pumps will still be activated. In most circumstances the generator set will be able to supply sufficient power in this situation for the circulation pumps, because big consumers of power such as the pad & fans will still be off. If not, a hardware solution will have to be found to ensure that the circulation pumps are off.

The circulation pumps are switched off after a general block has lasted for 1 minute. The valves are not actuated and so remain in their last position. If the heating circuits can have a delayed start, the pump actuation from the control will be released again, at the same time as the valve actuations are released.

The anti-rust program of the pumps will be filtered out completely as long as the emergency power is enabled, even after the circuit actuations have been released.
Soil heating and transport are handled in the same way as the circuits.

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emergency power start: detection
emergency power start: gross detection
emergency power release: detection
emergency power release: gross detection
The emergency power program ensures that major power consumers are not actuated during a power cut when the generator set is running.

'emergency power start: detection' must cut in immediately after the mains power fails. All actuators are switched off (if this has not already happened due to the power cut) and the controls are put into the right starting condition for operating with emergency power. This detection must remain enabled as long as there is no power from the mains.

'emergency power release: detection' is the signal that the generator set is running properly.
The phased switch-on of the actuators can only start 1 minute later. The emergency power program remains enabled as long as both detections measure 100.

emergency power weather influences >100 = warm: ViP
emergency power: actual weather influence (1=warm 2=cold 4=off)
Depending on weather conditions, you can give preference to leaving the boiler on and the pad & fan off or vice versa.
In the 'emergency power weather influences >100 = warm: ViP' setting, the ViP influences, outside temperature, radiation and wind, can be used to enter what is warm and what is cold. A computed value greater than or equal to 100 means "warm". Warm and cold must be treated as relative concepts. In the summer you can adjust the setting so that "warm" means very hot weather and "cold" is moderate weather.

As soon as the emergency power program is enabled, the actual emergency power influence is entered in the 'emergency power: actual weather influence (1=warm 2=cold 4=off)' setting. This will then not change during the current emergency power cycle, even if the weather conditions change.
You can, however, change the setting yourself. If you notice that the 'emergency power weather influences >100 = warm: ViP' setting is not adjusted properly, you can still switch over to "warm" or "cold" by changing the 'emergency power: actual weather influence (1=warm 2=cold 4=off)' setting.

Control Energy, Boiler, Boiler - Settings
boiler temperature minimum: ViP
boiler temperature maximum heat demand: ViP
The resulting "warm" or "cold" influence is used as a ViP influence in the boiler control settings, for example maximum boiler temperature.

Control Climate, Cooling, Cooling - Settings
cooling: stages emergency power warm weather
cooling: stages emergency power cold weather

Control Climate, Cooling, Cooling humidification - Settings
humidification: stages emergency power warm
humidification: stages emergency power cold

Control Climate, Cooling, Cooling dehumidification - Settings
dehumidification: stages emergency power warm
dehumidification: stages emergency power cold

With universal cooling, you can enter for each group whether the stages may start and how many stages may start. You have the option to leave the pad & fan off completely, to run them on half power or to fully release them. Control General, Weather - Alarms
alarm 1: selection alarm signal on

emergency power: alarm signal automatically on after stop
If in the 'alarm 1: selection alarm signal on' setting, the emergency power option is selected, the siren will come on when the emergency power program is enabled.
As soon as you notice the siren is on for the emergency power situation, you can deselect the emergency power option in the 'alarm 1: selection alarm signal on' setting, so that the siren is available for a new alarm.

If the 'emergency power: alarm signal automatically on after stop' setting is on Yes, the emergency power option will be automatically selected again after the mains power comes back on. **emergency power: delay time start**
emergency power: delay time stop
emergency power: counter delay time start
emergency power: counter delay time stop
'emergency power: delay time start' serves to prevent the program being enabled unnecessarily in the event of occasional faulty measurements from the start emergency power detector.
'emergency power: counter delay time start' serves first of all as a counter for the delay time start. As soon as the emergency power program starts, the counter counts minus numbers and continues to do so at least until the release detector cuts in. After that the counter shows the time that the delayed start of the actuations is busy.
If there is a tendency for the power to cut out again after briefly coming on, the emergency power program can remain enabled for a while after the mains supply comes back on via 'emergency power: delay time stop'. This avoids imbalance in the actuators. The delay time can also be used to filter out the occasional failure to measure the emergency power detections.

emergency power?
This setting shows whether there is emergency power.

emergency power: delay hot air
emergency power: delay heating circuits
emergency power: delay soil heating
emergency power: delay vents
emergency power: delay roof washer
emergency power: delay roofsprinkling/misting
emergency power: delay fans
emergency power: delay CO2
emergency power: delay curtains
emergency power: delay assimilation lighting
emergency power: delay cyclic lighting
emergency power: delay uni-switch
emergency power: delay transport
emergency power: delay boiler
emergency power: delay tank
emergency power: delay temperature control watering
emergency power: delay watering pump
If there is a power cut, the emergency power program will be enabled after 1 minute (set delay time). You can phase the startup of controls to avoid large peaks in current.
The delay can be set in the above settings.

When the setting is on 00:01, this means there is NO delay (though there is always a minimum delay of 1 second per group). When it is on 00:00, this means that the actuation can NEVER be enabled while the emergency power is on. **status emergency power**
status emergency power: hot air
status emergency power: heating circuits
status emergency power: soil heating
status emergency power: vents
status emergency power: roof washer

status emergency power: roofsprinkling/misting
status emergency power: fans
status emergency power: CO2
status emergency power: curtains
status emergency power: assimilation lighting
status emergency power: cyclic lighting
status emergency power: uni-switch
status emergency power: transport
status emergency power: boiler
status emergency power: tank
status emergency power: temperature control watering
status emergency power: watering pump
These settings provide information on whether a particular actuator has been released or not while the emergency power was on. '

Greenhouse and crop

Greenhouse: absorption roof radiation Greenhouse: height ridge
The distance from the greenhouse floor to the ridge.

Greenhouse: height gutter
The distance from the greenhouse floor to the gutter.

Greenhouse: span width
This is the distance between the gutters.

Greenhouse: reflection soil radiation
This setting indicates how much light is reflected by the floor.

Guidelines:

- Floor entirely covered with white plastic: 40%
- Floor covered with white anti-root cloth: 30%
- Floor covered with concrete: 20%
- Floor uncovered: 10%

Most of the radiation is "intercepted" by the crop before it can reach the floor, consequently the effect of this setting on the optimal heating temperature line is not very great. If the crop is (still) very small, the effect on the control is greater.

Greenhouse: absorption roof radiation
This setting shows which portion of the overall radiation is absorbed by the glass roof.

Guidelines:

- Normal glass: 2%
- Plastic roof: 4%

Greenhouse: emmision coefficient roof heat
This setting shows to what extent the roof emits heat to the outside environment.

Guidelines:

- The standard value for a glass roof is 0.84
- For a plastic roof the value 0.70 suffices

The influence of this setting on the optimal heating temperature line is not very great.

Greenhouse: transmission roof radiation
With this setting you enter the light permeability of the greenhouse roof as a percentage from 0 to 100%.

Guidelines:

- Standard setting: 68%. Normally speaking this is a correct value.
- If chalk has been applied to the roof, then the value must be reduced.
    - For a thick, "permanent layer" of chalk: 30 to 40%.
    - For a thin layer of chalk: 50%

Measurements and Actuations

The measurements and actuations of the *ECONOMIC* NT are connected to the DSATs.
The bigger the configuration, the more measurements and actuations are needed, and the more DSATs are needed.

The DSATs are connected to the *ECONOMIC* NT via circuits. There are three possible circuits. A maximum of 7 DSATs can be connected to each circuit.

4 alarm circuits can be connected to a DSAT.
The minimum alarm thermostat of an aspirator and a thermal protective device to protect the ventilation motor or curtain motor, for example, can be included in an alarm circuit. As soon as a protective device responds, the alarm circuit breaks and the DSAT sends an "external alarm" through to the *ECONOMIC* NT.
A DSAT consists of a power supply section and a measurement and actuation section. As soon as a defect appears in a particular section, the DSAT sends an "internal alarm" through to the *ECONOMIC* NT.

A DSAT alarm can be switched off with the "Measurement and Actuation" settings. This is especially useful if the system has not yet been brought fully into operation or while a DSAT is being repaired. You can also choose which siren must be activated by a DSAT alarm (alarm-splitting option).

---

switch off DSAT alarm
yes/no This setting is used to stop the DSAT generating alarms and to switch off the siren. Only use if the DSAT has not been installed yet, or is being repaired.

Circuit 1-3: DSAT alarm status
This setting indicates which alarms are available.

- **EPROM error** : EPROM is wrong
- **RAM error** : RAM is wrong
- **power board** : power board is defective
- **extra board** : extra board is defective
- **analog board** : analog board is defective
- **external alarm** : there is an external alarm
- **comm. Control station :**

there is no communication with the control station

Circuit 1-3: siren number(s)
This setting is used to indicate which sirens must be activated for an alarm (option).

MeteoScope

The MeteoScope program is used for downloading the weather forecast.

This weather forecast is prepared exclusively for users of a Hoogendoorn computer by *METEOCONSULT* in Wageningen.

The weather forecast is automatically downloaded by the computer four times a day (at 04.00, 07.00, 11.00 and 16.00) and is accurate for an area measuring 2 x 2 km at a height of 4 metres. Specially prepared for your garden!

The forecast consists of:

- Radiation
- Outdoor temperature
- Humidity
- Wind speed
- Cloudiness

The unit for cloudiness is 1/8.
0/8 means clear sky, 4/8 means half-covered sky, 8/8 means heavy cloud.

Use of the weather forecast

The weather forecast can be used for:

- Planning work
- Econaut
- ViP-influences

Planning work
If you are planning crop protection in the afternoon for example, then you will not want any wind. By looking at the weather forecast you can see when calm weather is expected.

Econaut
The weather forecast is used in the Econaut program to determine the times in a 24-hour period when heating is relatively cheap. In this way Econaut can help you save energy.

ViP-influences
ViP-influences can be set in various settings in MeteoScope.

EXAMPLE: Ventilating more extensively in the morning in fine weather
As summer approaches we have to ventilate rather more in the morning on sunny days. Otherwise it will be hot in the greenhouse early in the day. Once the heat is in the greenhouse, it is difficult to ventilate it out again.

ventilatietemperatuur luwezijde: ViP - °C

		Begintijd	T.o.v.	Overgang	Waarde	Str.som MeteoSc - J/c	
						1500	1800
1	J	-02:00	Zon op	02:00	20.0	-2.0	
2	J	00:00	Zon op	02:00	20.0	0.0	
3	J	00:00	Zon onder	01:00	18.0	0.0	

MeteoScope: way of retrieval
The options here are:

- **fixed times**
  Five fixed times can be set, for instance: 07:00, 11:00, 16:00, 21:00, 01:00.
- **repeated**
  The weather forecast can be retrieved repeatedly between a start time and a finish time.

MeteoScope: fixed time retrieval 1
MeteoScope: fixed time retrieval 2
MeteoScope: fixed time retrieval 3
MeteoScope: fixed time retrieval 4
MeteoScope: fixed time retrieval 5

MeteoScope: fixed time expiration 1
MeteoScope: fixed time expiration 2
MeteoScope: fixed time expiration 3
MeteoScope: fixed time expiration 4
MeteoScope: fixed time expiration 5
The fixed times at which the weather forecast is to be retrieved can be entered in these settings.
If the telephone line is busy, one or more further attempts can be made to retrieve the weather forecast at an adjustable interval. No further attempts are made once the expiry time has passed.

MeteoScope: repetitive retrieval number
MeteoScope: repetitive retrieval start time
MeteoScope: repetitive retrieval end time
MeteoScope: repetitive retrieval expiration time
The weather forecast is retrieved repeatedly between the start time and the finish time. The time between retrievals is calculated on the basis of the number of retrievals and the time between start time and finish time.
If the telephone line is busy, one or more further attempts can be made to retrieve the weather forecast at an adjustable interval. Set the expiry time approx. 5 minutes less than the time between the retrieval times.

MeteoScope: time next forecast retrieval
This setting shows when the next weather forecast will be retrieved.

MeteoScope: call attempts maximum repetitions
MeteoScope: call attempts remaining number
MeteoScope: call attempts interval time
If the telephone line is busy, a further attempt to retrieve the weather forecast will be made once the interval has elapsed.

MeteoScope: Meteoconsult user name
MeteoScope: Meteoconsult password
MeteoScope: Meteoconsult telephone number (BBS)
The user name and the password will be supplied by *METEOCONSULT* once a subscription has been taken out.
The *METEOCONSULT* telephone number can be preceded by "0" for example if the telephone connection is made through an exchange.

MeteoScope: radiation
MeteoScope: outside temperature
MeteoScope: wind speed
MeteoScope: outside RH
MeteoScope: expected outside AH
MeteoScope: cloudiness
MeteoScope: expected radiation sum
The **MeteoScope** program enters values for these settings.
They are retrieved entirely automatically at 7.00 and 11.00 in the morning.
The Econaut program makes use of the weather forecast with energy efficient heating and no loss of production.

MeteoScope: status last call attempt
The following terms may appear:

- **weather forecast retrieval successful**
- **weather forecast retrieval unsuccessful**
- **weather forecast not yet retrieved**
- **weather forecast already retrieved**

MeteoScope: subscription weather forecast?
Set to YES if the client has a subscription to the weather forecast. Only then will all the controls work with the weather forecast, e.g. MeteoScope ViP-influences can be set. Set to NO if there is no weather forecast available. In this way unwanted effects, such as the old weather forecast alarm, can be avoided.
MeteoScope: time retrieval last weather forecast
The time at which the weather forecast was last successfully retrieved. **Vip-influence humidity**
MeteoScope: selection

You can use this setting to choose whether the ViP-influence "MeteoScope Humidity" works on the basis of the expected absolute humidity (AH) or the relative humidity (RH).
The absolute humidity is calculated on the basis of the expected RH and the measured outside temperature.

Service

Graphs can be produced from (almost) all computed and measured values.
You can use these graphs to check whether a control is doing what you expect.
Graphs can also be used to find the cause of a breakdown.

The "Service" settings can be used by a service engineer of Hoogendoorn Automation BV to set up *extra* graph lines to follow controls.

---

sample graph?
graph setting: number datablock
graph setting: function block
graph setting: number section
graph setting: type number (1-8)
graph setting: number setting
service: value graph sample
These settings can be used by a service engineer to set additional graph lines.
Graphs can be created for (almost) all the values calculated and measured. These graphs can be used to check whether a control is doing what you expect.

A total of 30 service registrations can be set. From the point at which a service registration has been set this setting or measurement is registered by the ECONOMIC. To draw a service registration the service registration must be linked to a graph line in the graphs program.

Some examples of service graph codes:

Description of setting	Function block	Section number	Type number	Group + setting
Calculated prefactor pipe	2	2	3	124
Calculated prefactor light influence	2	2	3	114
Measured wet bulb temp. deg. C	2	0	5	103
Measured burner position in per cent	6	3	5	103

Data block number = 1 for standard program

System

The "System" settings can be used by the R&D department of Hoogendoorn Automation BV.

Uni-switch

The Uni-switch program is a simple way of taking care of all kinds of on/off switchings.
You can use ViP-settings to specify time periods when the switch is active. With influences you can use measurements (such as radiation measurement) as a basis for on and off switchings.
A minimum time on and a minimum time off are possible. The minimum switching time is 1 minute.

---

1. Uni-switch function: week switch

This is the basic function of the Uni-switch.
You can use ViP-settings to effect a wide range of switching functions, in part according to weather conditions, etc.
The switching behaviour can be influenced by a sensor by means of a sampling inlet.

Examples

Outdoor lighting on when it is dark

You can effect various on and off switchings with a uni-switch.

EXAMPLE:
The outdoor lighting is switched automatically by way of a Uni-switch.
The switch contact must become effective at a radiation of less than 2%, and go off at a radiation of greater than 5%.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Radiation control - %	
						5	2
1	Y	00:00	Sunrise	00:00	0	100	

Control General, Uni-switch, General

uni-switch: type of switch	week switch

Packhouse lighting on during the day when it is dark, except at the weekend

You can effect various on and off switchings with a uni-switch.

EXAMPLE:
The packhouse lighting is switched automatically by way of a Uni-switch.
The switch contact must become effective during the day between 07.00 and 18.00 on working days at a radiation of less than 20% and go off at a radiation greater than 50%.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Radiation control - %	
						50	20
1	Y	07:00	Clock	00:00	0	100	
2	Y	18:00	Clock	00:00	0	0	

period 1: days active	Monday to Friday

Control General, Uni-switch, General

uni-switch: type of switch	week switch

Watering by way of a tensiometer

A tensiometer can be connected to a uni-switch.

EXAMPLE:
On a chrysanthemum site watering is required in the morning at least once every three days. A tensiometer is used to measure the humidity of the soil. If the humidity of the soil is too low, watering is required.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Meas uniswitch	
						30.0	20.0
1	Y	01:00	Sunrise	00:00	0	100	
2	Y	03:00	Sunrise	00:00	0	0	

Control General, Uni-switch, General

uni-switch: type of switch	week switch

Set the watering program as a continuous program with a delay time of 4,320 minutes (= 3 days).
The switch contact can start the watering program during this delay time as a start contact.

Watering by way of a water content meter

A water content meter can be connected to a uni-switch.

EXAMPLE:
The humidity of the substrate mat can be measured with a water content meter. If the humidity of the mat at the end of the day is too low, watering must start earlier the next day.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Meas uniswitch	
						70.0	40.0
1	Y	01:00	Sunrise	00:00	0	100	

Control General, Uni-switch, General

uni-switch: type of switch	week switch

The switch-on level is 40%, the switch-off level 70%.
Have the watering program start at 02.00 for example with a delay time of six hours. The switch contact can then start the watering program during this delay time as a start contact.

Actuating heating valve according to energy demand

Heating systems such as lower circuit, upper circuit, pipe rail, growth pipe, hot-air heaters or soil heating can

be automated with the standard heating controls.
If a valve actuation is required that cannot be controlled with such controls, then a uni-switch may be the answer.

EXAMPLE:
A heating valve must be opened at an energy demand of 800 kW and closed at an energy demand of 700 kW.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Energy demand - kW	
						700	800
1	Y	01:00	Sunrise	00:00	0	100	

Control General, Uni-switch, General

uni-switch: type of switch	week switch

Weekend decrease

The heating temperature, ventilation temperature, minimum pipe and vent position moisture can be influenced using a uni-influence.

EXAMPLE:
The heating temperature is 20 ℃ during the day and 19 ℃ at night. Transitions from day to night and vice versa take place astronomically.
At the weekend day and night temperatures must remain at 19 ℃.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value
1	Y	01:00	Sunrise	00:00	100

period 1: days active	Saturday, Sunday

Control General, Uni-switch, General

uni-switch: type of switch	week switch
uni-influence: influence type selection	actuation

heating temperature: ViP - °C

		Start time	Relative t	Change	Value	Uni-influence	
						0.0	100.0
1	Y	00:00	Sunrise	01:00	20.0	-1.0	
2	Y	00:00	Sunset	01:00	19.0	0.0	

Control Climate, Greenhouse climate, Climate uni-influence

uni-influence: connected uni-switch climate	

Uni-switch 1 must be set so that the actuation of the uni-switch is only active (= 100) over the weekend.

Reducing maximum pipe according to mat temperature

If it is cold, the pipe temperature can rise significantly. As a result the root temperature also increases and if root pressure is too high splits can occur in the fruits (such as tomatoes). This can be prevented by linking the maximum pipe to the mat temperature.

EXAMPLE:
The maximum pipe during the day is 80 ℃ and at nig ht 90 ℃. Transition from day to night and vice ver sa take place astronomically.
If the mat temperature exceeds 21 ℃, then the maxi mum pipe must be reduced.

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Meas uniswitch	
						20.0	21.0
1	Y	00:00	Sunrise	00:30	80	-30	
2	Y	00:00	Sunset	00:30	90	-30	

Control General, Uni-switch, General

uni-switch: type of switch	week switch
uni-influence: influence type selection	measurement

---

2. Uni-switch function: pattern switch

You can use a ViP-setting to specify time periods when the switch is active. With influences you can also use measurements (for example radiation measurement) as a basis for switching on and off. A minimum time on and a minimum time off are possible. The minimum switching time is 1 minute.
The days on which the uni-switch must be active can be chosen within a cycle time of 15 days.

Examples

Changing lighting day by day

A uni-switch can be used to switch the lighting in a given pattern.

EXAMPLE:
A uni-switch is used to switch the lighting in groups 1 and 2 automatically.
With a cycle time of two days the switch contact must become effective every day in a subsequent climate group between 20.00 and 02.00. At 12.00 switch over to the next day.

Control General, Uni-switch, Pattern switch: 1

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value
1	Y	02:00	Clock	00:00	0
2	Y	20:00	Clock	00:00	100
3	N				
4	N				
5	N				
6	N				

pattern switch: cycle time days	2
pattern switch: days active	day 1
pattern switch: start time new day	12:00
pattern switch: days active	1

Control General, Uni-switch, General: 1

uni-switch: type of switch	pattern switch

Control General, Uni-switch, Pattern switch: 2

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value
1	Y	02:00	Clock	00:00	0
2	Y	20:00	Clock	00:00	100
3	N				
4	N				
5	N				
6	N				

pattern switch: cycle time days	2
pattern switch: days active	day 2
pattern switch: start time new day	12:00
pattern switch: days active	1

Control General, Uni-switch, General: 2

uni-switch: type of switch	pattern switch

Preventing transport pump becoming rust-bound

Increasingly two separate pumps are being used in a transport pipe.
Low and high speeds can be actuated from the program. The first pump is connected to low speed and the second pump to high speed.
As it grows warmer (summer), the high-speed pump will be used less and less, becoming rust-bound in consequence. This can be prevented by switching the pumps in a given pattern.

EXAMPLE:
With a cycle time of two days every day the other pump must be activated as low-speed pump. At 12.00 switch over to the next day.

Control General, Uni-switch, Pattern switch: 1

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value
1	Y	02:00	Clock	00:00	0

pattern switch: cycle time days	2
pattern switch: days active	day 1
pattern switch: start time new day	12:00
pattern switch: days active	1

Control General, Uni-switch, General

uni-switch: type of switch	pattern switch

The installation engineer can use the uni-switch outlet to switch the transport pumps day by day.

---

3. Uni-switch function: control loop (option)

If the "control loop" function is selected, the Uni-switch will work as a simple on/off controller.
The ViP-setting then serves as a setpoint and it is compared with the measured value of the connected sensor. This can for example be a temperature detector.
Another example of use is the connection of a tensiometer or scales. If the measurement of such a sensor comes below the setpoint, the "on" actuation can serve as an external start signal for the watering program.

To control a modulating valve the Uni-switch must be provided with two outlets.

Examples

Watering by way of a water content meter

A water content meter can be connected to a uni-switch. The uni-switch outlet serves as an external start contact for the watering program.

EXAMPLE:
The humidity of the substrate mat is measured with a water content meter.
Watering must start in the morning one hour after sunrise. The water content must then be increased from 30% to 70% in three hours. The content must be reduced to 40% eight hours before the sun sets. After sunset delayed to 30%.

Control General, Uni-switch, Control loop

uni-switch: setpoint -

		Start time	Relative t	Change	Value
1	Y	01:00	Sunrise	03:00	70.0
2	Y	-08:00	Sunset	08:00	40.0
3	Y	00:00	Sunset	06:00	30.0

Control General, Uni-switch, General

uni-switch: type of switch	control loop

4. Uni-switch function: mixing control (option)

If the "mixing control" function is selected, the Uni-switch will work as a simple on/off controller.
Two measurements are connected and control is according to the ratio of two measured values.
A specific application for this is the feed water mixing control for the watering system. This involves controlling a modulating valve so that the feed flow from a basin on the one hand and a main water tank on the other is controlled by means of two flow meters in a set ratio (0 - 100%).

Examples

Reuse of drain water on a flow measurement basis

Two flow meters can be connected to a uni-switch. The grower can set the percentage of basin water and main water to be used.

EXAMPLE:
The basin water flow is measured with measurement 1. The main water flow is measured with measurement 2. For every 100 litres of water the grower wants to use 75 litres of basin water and 25 litres of main water.

$$\frac{75}{75 + 25} \times 100\ \% = 75\%$$

Control General, Uni-switch, Mixing control

uni-switch: setpoint -

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:00	75.0

Control General, Uni-switch, General

uni-switch: type of switch	mixing control

5. Uni-switch function: switching valve (option)

This function works on the basis of the difference between two sampling inlets. If the difference is greater than the calculated value from the ViP setting, then the outlet is energised.
This action can for example be used for controlling a switching valve in the heating system by which the feed water can be directed to the coldest side of the greenhouse.

Examples

Reversing direction of flow in heating circuit

Depending on the conditions outside (wind, rain, etc.) and the greenhouse characteristics, a temperature difference can develop in the greenhouse. This difference can be eliminated by reversing the direction of flow of the water in the heating circuit.

EXAMPLE:
The greenhouse temperature is measured in two places in the greenhouse (one on the left and one on the right of the greenhouse). If the difference between the two greenhouse temperatures is greater than 1°C, then reverse the direction of flow of the water.

Control General, Uni-switch, Switching valve

uni-switch: setpoint -

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:00	1.0

Control General, Uni-switch, General

uni-switch: type of switch	switching valve

6. Uni-switch function: actuate addition (option)

If the "actuate addition" function is selected, the Uni-switch will work as an adder.

Examples

Flushing through sand filter

A uni-switch can be used for flushing through the sand filter. The switch can activate the flushing process for each quantity of flow set.

EXAMPLE:
You want to flush through your pipes every 2,040,560 litres. So you use the settings below to activate the actuation for 10 minutes after this number of litres, with the result that the flushing process is set in motion. You must wait at least two hours before flushing through again.

addition: actuation x 1	2
addition: actuation x 1.000	40
addition: actuation x 1.000.000	560
minimum time on	00:10
minimum time off	02:00

The litre count is kept up to date in the settings below. Following activation of the actuation, everything is reset to 0.

addition: consumption x 1	0
addition: consumption x 1.000	0
addition: consumption x 1.000.000	0

adding: scaling value addition
This setting only applies to analogue measurements that are added. At no time may the day/night sum exceed 32,000 or the hour prediction 1,000. If necessary, the sum can be scaled smaller with this setting. Example: uni-measurement in MW, scaling value for addition of 0.001 gives a consumption in GJ.

adding: unit of time pulse counter
adding: unit of time analogue measurement
This is where a unit of time can be chosen for the addition settings according to the application, for example per hour in the case of a uni-measurement in m³/hour or per minute in the case of a uni-measurement in litres/minute.

addition: actuation x 1
addition: actuation x 1.000
addition: actuation x 1.000.000
If your uni-switch is equipped with this option, you can activate the actuation of the uni-switch from a given consumption addition, for the set minimum time.
In the introduction you will find an example of the flushing out of a sand filter.

You make this control active by setting "actuate addition" at "uni-switch: type of switch".
At the "addition: actuate" settings set the consumption at which actuation is to start. As soon as actuation begins, the consumption addition settings are reset to 0. **addition: consumption x 1**
addition: consumption x 1.000
addition: consumption x 1.000.000
On the basis of these values you can read off the total addition count. You can also set these settings to give them a suitable initial value, such as read off the gas meter value once a year and enter here.
The monitor uses three settings to keep the energy consumption up to date. All three settings count from 0 to 999. The first setting counts individual values, while the second setting counts multiples of 1,000. The third value records multiples of 1 million.

A value of 123456089 is spread over 3 settings as follows: 123 456 89.

The consumption addition settings are kept up to date when the add option is on at "measurement 1: type of registration".

uni-switch: type of switch
Options:

- week switch
- pattern switch
- control loop
- mixing control
- switching valve
- send addition

type of uni-influence
With this setting you can choose from:

expected hour total	the uni-influence assumes the value of the maximum energy monitoring hour prediction
expected hour total + actuation	the uni-influence assumes the value of the maximum energy monitoring hour prediction if the uni-switch is actuated on
uni-measurement	the uni-influence assumes the value of the uni-measurement

actuation	the uni-influence = 0 if the uni-switch is not actuated and 100 if it is actuated on
uni-measurement + actuation	the uni-influence assumes the value of the uni-measurement if the uni-switch actuation is on
not in use	the uni-influence is switched off

computed uni-influence
This setting shows the calculated uni-influence.

uni-measurement
uni-measurement 2
These settings show the scaled delayed measurement.

uni-switch on (100=on)
This setting shows the status of the uni-switch.

control-mixing-switching: deviation actuation
The deviation actuation works positively and negatively. The upper threshold is the setpoint plus the deviation. The lower threshold is the setpoint minus the deviation.
The ratio is calculated as follows:
ratio = (measurement 1 x 100 %) / (measurement 1 + measurement 2)

If the ratio is lower than or equal to the lower threshold, it will be opened. If the ratio is higher than or equal to the upper threshold, it will be closed. If the ratio is between the lower and upper thresholds, it will not be actuated.

control-mixing: actuation factor
control-mixing: interval actuation
control-mixing: minimum actuation time
control-mixing: actuation timer
control-mixing: counter interval actuation
Setting a very small actuation interval allows continuous actuation.
The actuation time is calculated as follows:
actuation time = (ratio - setpoint) * actuation factor (sec.)

The maximum actuation time is 30 seconds.

counter time on
This counts down the 'minimum time on'.

counter time off
This counts down the 'minimum time off'.

detection 2 use as external synchronization signal
The power company can supply a signal that specifies when the new hour begins. This can be different from the whole hours.

energy monitoring: computed hour expectation
energy monitoring: minimum time historic consumption
The uni-measurement with the power is added per clock hour. The **calculated hour prediction** is calculated for the clock hour in progress. This is the consumption that may be expected, assuming that the current power remains constant for the remainder of the clock hour. The hour prediction is calculated from the measured consumption at the start of the hour. If the measured consumption period at the start of the hour is too short, this can make a significant difference to the hour prediction. A chance upward peak for instance will result in an unnecessarily high prediction. To avoid this you can use the **minimum history time** setting to give the period with measured powers a minimum length.

energy monitoring: computed maximum hour expectation
With the uni-influences the gas consumption can be reduced at various controls if the calculated hour prediction threatens to become too high. Once such an influence has become active, for example the burner position has been lowered, the hour prediction will then be lower again too, which means that the burner

position can go back up again (influence ceases again). The consequence: an erratic control. To prevent this it is not the calculated hour prediction that is used as uni-influence but the **calculated maximum hour prediction**. This is calculated in the same way, with the highest measured power in the hour in progress being used instead of the current power.

energy monitoring: missing uni-measurement
If the computer has been without power for some time, no history of the uni-measurement is known before this time. The power that you yourself set with this setting is taken into account for the missing portion.
Tip: Enter a sufficiently high value. It is better to calculate a peak value in error (in the calculated hour prediction) than actually to miss a peak.

measurement 1/2: type of measurement
The following types are possible:

- level measurement
- flow measurement
- pH measurement
- EC measurement
- CO2 measurement
- vent position measurement
- electronic RH
- pipe temperature 0-200
- greenhouse temperature
- voltage 100mV
- voltage 200mV
- voltage 1V
- voltage 5V
- none of the above

measurement 1/2: measurement type of average
The degree of delay of the measurement can be entered here.
There is a choice of an average of 1, 10 and 60 seconds or 2, 5, 10 and 30 minutes.

pulse counter: counter pulses in measurement interval
The time recorded between the pulses is averaged over the chosen interval. In this way noise, etc., can be averaged out, but the result may also be better where pulses follow one another quickly. For instance, if the pulse is recorded as alternating around 2 and 3 seconds, the average interval is 2.5 seconds. The accuracy is now 0.5 seconds in spite of the fact that the DSAT only measures on a second basis.
A choice between 1, 2 or 5 minutes is recommended for energy monitoring.

pulse counter: maximum wait time pulse
If no new pulse is measured after the time entered here, a uni-measurement of 0 is assumed.

measurement 1: not scaled not delayed correction
Service:
measurement 1: not scaled not delayed measurement
The measurement and correction of the uni-switch.

measurement 1: gross measurement
measurement 1: measurement 0% input
measurement 1: measurement 100% input
These settings are only important if a level measurement or a vent position measurement have been selected.

measurement 1: temperature for EC
measurement 1: correction temperature for EC
This temperature measurement is only used in combination with an EC-measurement as compensation for temperature. The calculated EC-measurement (compensated for temperature) is shown in 'measurement 1: measurement delayed' and 'uni-measurementuni-meting'.

measurement 1: detection

measurement 1: gross detection
The uni-switch detection.

measurement 1: type of CO2-measurement
The following types are possible: linear, 3,000 ppm, 6,000 ppm and 10,000 ppm.

measurement 1: maximum range linear CO2-measurement
measurement 1: gauge value flowmeasurement
These are the same settings as those of the standard CO2 measurement and flow measurement.
measurement 1: measurement delayed
measurement 1: scaling value
Settings:
uni-measurement
The measurement will be delayed according to the 'measurement 1/2: measurement type of average' entered, and scaled according to the 'measurement 1: scaling value'.
The measurement is delayed first and then scaled. Scaling value 0.10 means divide by 10.
Scaling value 10.00 means multiply by 10.

measurement 1: type of CO2-measurement
The following types are possible: linear, 3,000 ppm, 6,000 ppm and 10,000 ppm.

measurement 1: maximum range linear CO2-measurement
measurement 1: gauge value flowmeasurement
These are the same settings as those of the default CO_2 measurement and flow measurement.

measurement 1: not scaled not delayed measurement
Measurement & Actuation:
measurement 1: not scaled not delayed correction
The measurement and correction of the uni-switch.

The measurement is delayed according to the 'measurement 1/2: measurement type average' entered and scaled according to the 'measurement 1: scaling value'.
The measurement is first delayed and then scaled. Scaling value 0.10 means divide by 10. Scaling value 10.00 means multiply by 10.

measurement 1: scaling value
For a pulse counter enter the consumption that corresponds to one pulse.

measurement 1: measurement delayed
For a pulse counter what you see here is the added number of pulses per pulse counter unit of time set by you.

measurement 1: measurement scaled delayed
For a pulse counter what you see here is the number of pulses per set unit of time x the scaling value. So this is the same value as the uni-measurement to be calculated.

measurement 1: type of registration

hour prediction	The hour prediction and the maximum hour prediction are also calculated for settings that are added. Always make this choice active at energy monitoring.
adding	The values for the day/night recording are added. A sum total counter is also kept up to date and is used in energy monitoring for example.
averaging	The values for the day/night recording are averaged.

measurement 1: process as pulse counter
Where a pulse counter is used, this setting must be set to Yes, in all other cases to No.

adding: unit of time pulse counter
This is where a unit of time can be chosen according to the application, for example m³/hour or litres/minute.

measurement 1: value low pulse
measurement 1: value high pulse
For determining when a pulse is low and high. In fact these are the 0 and 100 edges of the pulse, at which the signal is transferred.

measurement 2: not scaled not delayed correction
Service:
measurement 2: not scaled not delayed measurement
The measurement and correction of the uni-switch.

measurement 2: gross measurement
measurement 2: measurement 0% input
measurement 2: measurement 100% input
These settings are only important if a level measurement or a vent position measurement have been selected.

measurement 2: temperature for EC
measurement 2: correction temperature for EC
This temperature measurement is only used in combination with an EC-measurement as compensation for temperature. The calculated EC-measurement (compensated for temperature) is shown in 'measurement 2: measurement delayed' and 'uni-measurement 2uni-meting 2'.

measurement 2: detection
measurement 2: gross detection
The uni-switch detection.

measurement 2: measurement delayed
measurement 2: scaling value
Settings:
uni-measurement 2
The measurement will be delayed according to the 'measurement 1/2: measurement type of average' entered, and scaled according to the 'measurement 2: scaling value'.
The measurement is delayed first and then scaled. Scaling value 0.10 means divide by 10.
Scaling value 10.00 means multiply by 10.

measurement 2: type of CO2-measurement
The following types are possible: linear, 3,000 ppm, 6,000 ppm and 10,000 ppm.

measurement 2: maximum range linear CO2-measurement
measurement 2: gauge value flowmeasurement
These are the same settings as those of the default CO_2 measurement and flow measurement.

measurement 2: not scaled not delayed measurement
Measure & Actuate:
measurement 2: not scaled not delayed correction
The measurement and correction from the uni-switch.

The measurement is delayed according to the 'measurement 1/2: measurement type average' entered and scaled according to the 'measurement 2: scaling value'.
The measurement is first delayed and then scaled. Scaling value 0.10 means divide by 10. Scaling value 10.00 means multiply by 10.

measurement 2: scaling value
For a pulse counter enter the consumption that corresponds to one pulse.

measurement 2: measurement delayed
For a pulse counter what you can see here is the added number of pulses for each pulse counter unit of time set by you.

measurement 2: type of CO2-measurement
The following types are possible: linear, 3,000 ppm, 6,000 ppm and 10,000 ppm.

measurement 2: maximum range linear CO2-measurement
measurement 2: gauge value flowmeasurement
These are the same settings as those of the standard CO2 measurement and flow measurement. **uni-measurement: unit selection 1**
uni-measurement: unit selection 2
uni-measurement: sum unit
You can use these settings to set the unit of the measured value. The list begins in setting **uni-measurement: unit selection 1** and is continued in setting **uni-measurement: unit selection 2**. The chosen unit is given in the current overview.
The setting **uni-measurement: sum unit** contains the unit for the total consumption settings and the other period additions.

uni-measurement: sum - 24 hours
This value is the sum of measured values for the past 24 hours.

uni-switch: actuations
This setting shows the actuations from the uni-switch.

Mixing control

uni-switch: setpoint
uni-measurement
uni-measurement 2
mixing control: ratio uni-measurement 1 & 2
If the ratio is higher than the setpoint, a close actuation will be given. If the ratio is lower than the setpoint, an open actuation will be given.
The actuation time gets longer the greater the deviation.

The ratio is calculated as follows: ratio = (measurement 1 x 100 %) / (measurement 1 + measurement 2)

Pattern switch

period 1: influences ViP (100=on; 0=off)
This ViP setting is used to set the period(s) of the day when the uni-switch must be enabled.

pattern switch: cycle duration days
You can set a cycle of 1 to 15 days for the pattern switch. This means that you are not tied to a weekly cycle of 7 days.

pattern switch: days active
This setting is used to indicate the days on which the pattern switch must be enabled.
The 'period 1: influences ViP (100=on; 0=off)' setting is used to adjust the switch pattern over the day.

minimum time on
minimum time off
The switch will be switched on when the computed influence is greater than or equal to 100 AND the minimum time off has elapsed.
The switch will be switched off when the computed influence is less than or equal to 0 AND the minimum time on has elapsed.

pattern switch: start time new day
This setting is used to indicate when the next day must start.

pattern switch: day number
This setting automatically updates how many days of the cycle have gone by.
You can change this setting yourself if uni-switches are 'out of line'.

Control loop

uni-switch: setpoint
uni-measurement

If the measurement is higher than the setpoint, a close actuation will be given. If the measurement is lower than the setpoint, an open actuation will be given.
The actuation time gets longer the greater the deviation.

Week switch

period 1: influences ViP (100=on; 0=off)
period 1: days active
period 2: influences ViP (100=on; 0=off)
period 2: days active
period 3: influences ViP (100=on; 0=off)
period 3: days active
3 periods per uni-switch can be set. Which period applies depends on the days of the week set.
If the days of the week set overlap, both periods will be used.
Actuations which turn or leave the switch on have priority over those which turn it off.

period 3 extended: start day
period 3 extended: start month
period 3 extended: start year
period 3 extended: stop day
period 3 extended: stop month
period 3 extended: stop year
Period 3 can be extended by a period to be defined by a start date and stop date. Within this date range, all days of the week count as period 3. The stop date is also included in period 3.

minimum time on
minimum time off
The switch will be switched on when the computed influence is greater than or equal to 100 AND the minimum time off has elapsed.
The switch will be switched off when the computed influence is less than or equal to 0 AND the minimum time on has elapsed.

Switching valve

uni-switch: setpoint
uni-measurement
uni-measurement 2
switching valve: deviation uni-measurement 1 & 2
If the deviation is greater than the setpoint, a continuous close actuation will be given. If the deviation is less than the setpoint, a continuous open actuation will be given.

VDM

Weather

The measuring instruments on the weather-station mast take readings of the outside climate.
Outside climate consists of:

- outside temperature
- radiation
- wind speed
- wind direction
- rain

Outside temperature
The outside temperature is processed in the following controls among others:

- pre-control of the ventilation control
- pre-control of the heating control

- protection of the vents against frost
- energy curtain control
- as ViP influences in various ViP settings

That is why it is important that the outside temperature is measured accurately.
Think carefully about the position of the weather-station mast (not too close to the boiler house, in the smoke from the chimney).
There are different alarm thresholds each month for when the outside temperature is too high or too low.

Radiation
Radiation can be measured with a Kipp solarimeter or a light sensor.
The first difference between a solarimeter and a light sensor is the price. A solarimeter is more expensive than a light sensor.
However, the solarimeter is more suitable for use with the controls. This is because the solarimeter measures energy as well as light. This is especially important for the pre-control of the ventilation and heating controls. A solarimeter measures the actual radiation in W/m^2 and the global radiation sum in J/cm^2. A light sensor measures actual radiation.

Radiation is processed in the following controls among others:

- pre-control of the ventilation control
- pre-control of the heating control
- reason for start for watering
- shading curtain control
- assimilation lighting
- as ViP influences in various ViP settings

That is why it is important that radiation is measured accurately.
Think carefully about the position of the weather-station mast (not too close to trees, in the shadow of large trees).
You must check that the glass of the solarimeter is clean and must be cleaned at least 2 x per year. If the glass is dirty, clean it with a dry cloth.
The desiccant granules must also be checked. If the granules are pink/transparent they need replacing. This probably means that moisture is getting into the measuring chamber of the solarimeter. Investigate what is causing this (porous sealing ring, crack in the glass etc.). If the granules are blue, it is OK.

Wind speed
Wind speed is shown in meters per second, abbreviated to m/s, on the *ECONOMIC* NT .
A rule of thumb for comparing with the weather forecast on radio and television is:

wind speed on ECONOMIC NT = 2 x wind speed on radio and television

Wind speed is processed in the following controls among others:

- pre-control of the ventilation control
- pre-control of the heating control
- protection of the vents against storm
- as ViP influences in various ViP settings

That is why it is important that wind speed is measured accurately.
Think carefully about the position of the weather-station mast (not too close to trees, in the lee of large trees).

Wind direction
The wind is measured from 8 different directions, i.e. north, north-east, east, south-east, south, south-west, west and north-west.

Wind direction is used in the ventilation controls to determine which vents are on the lee side and which are on the wind side.
The service engineer can set how the controls should respond to this for each greenhouse.

Rain
The system measures whether it is raining or not.
The "rain box" is used to set the sensitivity of the rain sensor.

The rain reading is used in the ventilation controls to limit the opening of the vents when it rains to prevent it raining in.

That is why it is important that the rain reading is measured accurately.
The rain sensor must be cleaned at least 2 x per year with a liquid cleaning agent (not with spirit or an abrasive cleaner!).

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alarm 1: selection alarm signal on
Options:

Wind speed above 40 m/s	The wind speed is an important measurement with an impact on a great many controls. The alarm signal can be set off if the wind speed is too high.
Outside temperature beyond limit	The outside temperature is an important measurement with an impact on a great many controls. The alarm may be set off if the outside temperature is too high or too low for the time of year.
Operating station no communication	The alarm may be set off if communication between the operating station and the control station has ceased.
Old weather forecast	The alarm signal may be set off if automatic downloading of the weather forecast has been unsuccessful.
Emergency power	The emergency power program may become active if the mains power fails (option). In this case the alarm signal may also be set off.

alarm 2: selection alarm signal on
You can use this setting to show which alarms require an alarm signal to be set off.

available alarms 1
This setting shows which alarms are available.

- **no actuations** : the actuations have been blocked
- **emergency power** : the emergency power program is active
- **weather forecast old** : no weather forecast received today
- **illegal wr.** : write error in the control station
- **OS communication** : operating communication was broken
- **communic.start** : start program change or dump
- **system error** : system error in control station (*)
- **power fail** : power failure in control station (*)
- **program defect.** : control station program is defective (*)
- **DSAT board def.** : board in DSAT is defective (*)
- **DSAT link** : communication fault with DSAT (*)
- **limit beyond t** : outside temperature is beyond limit
- **wind sp too high** : wind speed is above 40 m/s

(*) when this alarm occurs most of the controls and ALL the actuations are blocked

available alarms 2
This setting shows which alarms are available.

- **Time difference found: clock control has been adjusted**
  The running clock may have been interrupted because of a voltage cut-off in the control station. If this happens, the control station resynchronises its clock with the base station as soon as they are both active again.

- **No vent actuations**
  This error message is the consequence of the outside temperature beyond limit alarm. The result is that all the vent actuations are stopped to prevent any possibility of damage.
- **Communication EM: failure**
  This failure report is given if communication with another control station is disturbed. This setting only applies to clusters with several control stations.

algemeen: number(s) alarm signal
You can use this setting to show which alarm signals are to be set off in the event of an alarm (option).

available alarms 1
This setting indicates which alarms are available.

- **no actuations** : the actuations have been blocked
- **emergency power** : the emergency power program is enabled
- **old weather forecast** : no weather forecast received today
- **illegal write** : write error in the control station
- **BS communication** : communication operation was broken off
- **communic.start** : start program switches or dump
- **system error** : system error in control station (*)
- **no power** : no power in control station (*)
- **defective program** : control station program is defective (*)
- **DSAT board def.** : board in DSAT is defective (*)
- **DSAT link** : breakdown in communication with DSAT (*)
- **outside temp. threshold** : outside temperature is outside thresholds
- **wind speed too high** : wind speed is above 40 m/s

(*) when this alarm goes off, most controls and ALL actuations are blocked

computed maximum radiation level this day
computed maximum radiation sum actual
radiation sum actual
Miscellaneous ViP settings can be influenced by the radiation or radiation sum.
The maximum radiation level and the maximum radiation sum are calculated using the date and the latitude and longitude of your nursery location.

light sensor: maximum light level 21 June
light sensor: maximum light level 21 December
The above settings apply to a light sensor.
The normal values for these settings are:

- 21 June on 950
- 21 December on 350

By setting the settings slightly lower, a light correction will come into operation more quickly. **frost temperature: ViP**
When the outside temperature is lower than the set frost temperature, the vents will be kept closed (even if a minimum vent position has been set) because the vents can get frozen stuck.
The reports will also indicate **Frost**.
This control is a safeguard against ventilation in freezing weather.

Frost temperature is a ViP setting. It allows you to set a different day and night frost temperature and you also have the option to apply a radiation influence.
When there is sufficient sunlight in winter and not too much wind, it is still safe to ventilate at temperatures slightly below 0 ℃ without the risk o f the venting machinery freezing up. Of course, it is necessary to take great care when doing this.

light: measurement
light: correction
Measurement for the light sensor.

Adjustment method for light sensor of the balloon-housing type:

- run the light sensor dark, with a wire connector for example
- read the **light: measurement** setting
- adjust the correction so that the measurement is 0

Adjustment method for type 96 light sensor:

- loosen the light sensor connection on the HQ board
- read the measurement
- enter the correction so that the light measurement is 0
- reconnect the light sensor

minimum outside temperature January
minimum outside temperature February
minimum outside temperature March
minimum outside temperature April
minimum outside temperature May
minimum outside temperature June
minimum outside temperature July
minimum outside temperature August
minimum outside temperature September
minimum outside temperature October
minimum outside temperature November
minimum outside temperature December
maximum outside temperature January
maximum outside temperature February
maximum outside temperature March
maximum outside temperature April
maximum outside temperature May
maximum outside temperature June
maximum outside temperature July
maximum outside temperature August
maximum outside temperature September
maximum outside temperature October
maximum outside temperature November
maximum outside temperature December
When the outside temperature is too high or too low for the time of the year, an alarm will go off. What is too high or too low varies according to where you are located in the world. An appropriate temperature can be set here for each month.

name: number climate computer
name: series
name: binnumber
name: reorganisation
name: binnumber special software
production: day
production: month
production: year
These settings relate to the name and the production date of the control program of the *ECONOMIC* NT.

outside temperature: measurement
Outside temperature measurement.

part diffuse radiation

radiation: gauge value solarisensor
This is the calibration value shown on the solarimeter.

radiation: measurement (I/O)
radiation: correction
Measurement for the solarimeter.

Adjustment method:

- put 75 Ohm (150//150) resistor on the connectors, to which the solarimeter is normally fitted
- read the **radiation: measurement** setting
- adjust the correction so that the measurement is 0

There are desiccant granules in the solarimeter to keep it free of condensation. The desiccant granules are blue when they are unsaturated and pink/transparent when they are saturated.

rain sensor: measurement (0=rain - 5000=dry)
rain sensor: correction
Rain sensor measurement.

dry = 5000
rain = 0

rain sensor: delay time start rain
rain sensor: delay time stop rain
Rain or *no rain* will not be reported immediately. A delay time applies. **rain sensor: start threshold rain**
When the rain sensor measurement is below this threshold, rain is detected.
This setting is normally on 3000.

rain sensor: stop threshold rain
When the rain sensor measurement is above this threshold, NO rain is detected. This setting is normally on 3900.
Do not set it lower than about 500 points above the start threshold rain.

selection wind direction: wind dry
selection wind direction: wind humid
selection wind direction: wind cold
selection wind direction: wind warm
The wind direction can influence the controls in various ViP settings. You can set the wind directions that correspond to the above winds yourself.

EXAMPLE:
You have set the wind influence on the ventilation control at 50%.
This influence can be increased if the wind comes from a "dry direction".

You can also set what you mean by "dry direction" yourself.
In this example a wind from the north, north-east and east.

selection wind direction: wind dry	N NE E

snow detector: delay time start snow
snow detector: delay time stop snow
snow detector: timer start snow
snow detector: timer stop snow
The snow program is enabled as soon as the detector has been active for the set number of seconds. The purpose of the 'snow detector: delay time start snow' setting is to prevent the snow program being enabled unnecessarily when occasional incorrect measurements occur.
When the snow program is enabled, the heating condition ViP-influence snow can be set for thaw. To avoid imbalance in the heating, the snow program can be extended if the snow detector cuts out during the delay time stop snow.

snow detector: detection
snow detector: gross detection
Snow detection.

status alarm signals
This shows which sirens are enabled. If there are no active sirens, it shows: "no alarm"

For correct interpretation of the wind speed measurement see table below for conversion of wind speed to the Beaufort scale:
Wind speed (Beaufort scale)

wind speed: measurement (I/O)
wind speed: correction
Wind speed measurement real-time.

wind direction: measurement (I/O)
wind direction: correction
Wind direction measurement real-time. The wind direction is corrected in the Dsat if necessary. No correction is therefore required in the *ECONOMIC* NT.

- N = 00
- E = 90
- S = 180
- W = 270
- NE = 45
- SE = 135
- SW = 225
- NW = 315

Wind speed (Beaufort scale)

The wind speed measurement in the *ECONOMIC* is averaged out slightly. This is to prevent disturbance in the climate controls . It is consequently difficult to compare the *ECONOMIC* wind speed measurement with the wind force reports (Beaufort scale) on the news or in the newspaper for example. The table below gives the *ECONOMIC* wind speed measurement against the wind speed according to the Beaufort scale.

Wind force	Description	*ECONOMIC*	Remarks
0	calm	0 - 0.6	smoke rises vertically
1	light air	0.7 - 2.3	smoke shows wind direction
2	light breeze	2.4 - 4.4	leaves start to rustle
3	gentle breeze	4.5 - 6.6	leaves/small branches start to sway
4	moderate breeze	6.7 - 8.9	dust/paper blows around
5	fresh breeze	9.0 - 11.3	small trees sway
6	strong breeze	11.4 - 13.8	trees begin to bend
7	moderate gale	13.9 - 16.4	large trees sway
8	fresh gale	16.5 - 19.0	twigs break from trees
9	strong gale	19.1 - 21.8	branches break from trees
10	whole gale	21.9 - 24.8	trees are uprooted
11	storm	24.9 - 28.2	widespread damage
12	hurricane	more than 28.2	structural damage

wind direction: maximum interval switch
The wind direction changes if the new wind direction is different from the old wind direction throughout the whole **interval**.
The interval is reduced as wind speed increases.
This setting is normally on 15.

wind speed storm
When the wind speed is higher than this setting and the curtain is open (or there is no curtain), the vents will be actuated to the **storm VentPos**.

wind speed storm curtain
When the wind speed is higher than this setting and the curtain is closed, the vents will be actuated to the **storm curtain VentPos**.

wind speed storm curtain running
When the wind speed is higher than this setting and the curtain is running, the vents will be **closed**.
The reports will also indicate **Storm**.
This control is a safeguard for the greenhouse against storms and works independently of the set wind influence.

Make sure that this setting is not too low. Otherwise, when the shading curtain is being used, the following situation could arise: it is windy and the shading curtain closes because there is too much sun; it is hot in the greenhouse; the vents close because the curtain is running and it gets even hotter under the curtain.

3. Control Climate

Agronaut

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1. What is Agronaut?

The Agronaut program consists of 2 parts:

- Agronaut measurements: record water uptake
- Agronaut actuations: control water uptake

This chapter describes all the controls that work with water uptake.
For each control you are given information on the settings that you can use, which graph you can set and which overview is best for monitoring the control.

First some background information about transpiration, the connection between watering and water uptake and between climate and water uptake.

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2. What is transpiration?

The air in the leaf cavities is saturated with moisture. The RH is 100%. The amount of moisture in the leaf cavities is dependent on the temperature of the leaf. The higher the temperature, the more moisture the air will contain.
At a leaf temperature of 20℃ the air contains 17.5 g water vapour per m^3. At 22℃ the figure is 19.5 g/m^3.
When the air in the greenhouse contains less water vapour than the air in the leaf cavities, transport of water vapour from leaf to greenhouse air will take place. Nature strives to achieve a balance. The plant starts to transpire.

The greater the difference, the greater the transport and the more the plant transpires. The difference increases as the temperature of the plant increases or the humidity of the air in the greenhouse decreases. Radiation from the sun and heating system causes the plant temperature to increase. Transpiration causes

the plant temperature to fall again (this is also a very important function of transpiration).
The discharge of moisture through condensation and ventilation reduces the humidity of the air in the greenhouse.

Measuring transpiration

There are two ways to measure transpiration:

1. If a level tray is used in cultivation, the water uptake of the crop can be determined by the fall in the water level in the level tray.
2. Using an intelligent model in Agronaut allows the leaf temperature of the active part of the crop to be calculated. To be able to calculate the crop temperature, the energy flows around the crop are determined. The plant is heated up by sunlight, the heating pipes and the temperature of the air in the greenhouse. The plant is cooled down again by transpiration and heat radiation up to the greenhouse roof. You have to work with a dynamic model because these processes influence each other. The model works out the crop temperature from the energy flows. This model was developed at Wageningen Agricultural University (LUW). When the crop temperature is known, the humidity level in the stomata can be determined. The difference between the humidity level in the stomata and that of the air in the greenhouse is a measure of crop transpiration. At night the water uptake of the crop can be measured by subtracting the drainage water from the water applied to the plants. 5 to 8% of this is used by the crop or fruit to grow. The rest is given off by the plant as water vapour. This figure is used to check the model. Measuring the humidity of the air in the greenhouse does not present any problems.

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3. Watering based on radiation sum or Agronaut

It is important that the plants get water when they need it. This is often based on solar radiation. The solarimeter gives the computer a measure of the amount of solar radiation in W/m^2. This radiation determines the crop temperature to a very large extent.
Heat radiated from the pipes or the plant up to the greenhouse roof is not included in this. The humidity of the greenhouse air is not taken into consideration either when watering is based on the radiation sum. Only afterwards, based on the drainage water, can you see whether you have watered enough, too much or too little.
With a number of influences in the 'ViP radiation sum start' the cycles based on solar radiation can be allowed to come on earlier or later. Because the effects of a number of influences are not easy to predict, it is very important to check carefully.

Using Agronaut water-uptake sum removes a lot of uncertain factors, because they are already included in the model and the measurement of the humidity in the greenhouse.
What's more, Agronaut is also enabled when there is no sunlight. Agronaut also determines nighttime transpiration.
Using Agronaut for your watering allows you to be sure that you are giving enough water and the amount of water given is linked to the transpiration of the crop. All in all using Agronaut offers you an element of certainty in operation that you do not have if your watering is based on radiation sum.

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4. Climate and water uptake

After the longest day the air gets more humid, and extra attention needs to be paid to climate to keep the change of air in the greenhouse on target.

In a dull period the crop has to be encouraged to transpire. This causes the plant to take up water so that it also takes up the nutrients it needs. The plant also remains active and produces new roots. This helps the crop to cope better with a switch to sunny conditions.
Crop transpiration has to be increased to encourage water uptake.
Agronaut can increase the minimum pipe temperature to do this. This increase in temperature creates extra air movement, changing the microclimate around the leaves. The humidity of the air around the leaves is reduced, so that the plant will transpire more. Increasing the minimum pipe temperature also increases the greenhouse temperature, so ventilation is increased.

Agronaut can also increase the vent position so that moist greenhouse air is replaced by less humid air from outside.

Water stress

'Water stress' is something you often hear mentioned. This is where the stomata in part of the plant close up. There are many circumstances that can cause it, e.g. too much transpiration, a poor root system, too high EC in the mat, a high CO_2 level etc.

If the plant is well trained and gets enough water, it will not be so quick to suffer from a shortage of water. Research has shown that it will not then be necessary to intervene so quickly.

If it happens that the plant is still transpiring so much and you are afraid that it will not last out the whole day, you can use Agronaut to make the vents on the wind side a little narrower in the afternoon, for instance. This reduces the ventilation and so reduces moisture loss. The difference in moisture levels between plant and greenhouse air is reduced, so the plant does not have to transpire as much.

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5. Installing Agronaut

Create an **Agronaut** user folder containing an **Agronaut installation** user folder and copy the following settings lists to it
- **Agronaut** from the *Control Climate|Agronaut* folder
- **Curtain 1 general** from the *Control Climate|Curtains|Curtain 1* folder
- **Greenhouse climate** from the *Control Climate|Greenhouse climate* folder
- **Level tray** from the *Control Water|Level tray* folder
- **Crop section control** from the *Control Water|Crop sections* folder
- **Water uptake model** from the *Control Climate|Agronaut* folder

When installing Agronaut you set the settings such that the water uptake can be recorded.
You can then gain experience with water uptake. How high the water uptake is on a sunny day or a dull day, what the relationship is between radiation, wind, vent position, RH, water uptake etc.
Once you have some experience with recording water uptake, you can enable each control system to control based on water uptake.

So that registration (later ‘control’) is carried out properly, the following settings must be checked and/or properly set:

Agronaut

Agronaut: average water uptake time short	00:15
Agronaut: average water uptake time long	3

In the ViP settings you can opt to control based on a current water uptake, on a short average water uptake or on a long average water uptake.
You can have the ventilation, for example, respond to a current water uptake, or the heating pipes to a short average water uptake etc.

Agronaut: selection influence rising	rising rate

It is often felt that too high a current water uptake is damaging to the crop. It turns out in practice, however, that it is precisely the rise in the water uptake which must not be too high.
Various ViP settings give you the opportunity to control based on "rising Agronaut". The options in this setting are:

short-long average
This option can be used to respond to a change in weather from a number of days of dull weather back to sunny weather. During the dull period the long average will be low. During the subsequent sunny period the short average will be high. The difference between the short and long averages indicates the change in weather.
To ensure sufficient variation in the long average, the long average is only adjusted between sunrise and sunset.

rising rate

If the water uptake rises rapidly, there is the risk of the plant becoming stressed because it is unable to adapt quickly to the changing conditions.

Curtain 1 General (Service)

curtain 1: simulation light permeability	100

Because less radiation is reaching the crop, the plant does not become as hot and will therefore transpire less.

Greenhouse climate

Agronaut: selection control reduction water uptake	no selections

The shading curtain does not (yet) have to be closed and the roof sprinkling does not (yet) have to be switched on if the water uptake is too high. For this reason do not make any selections in this setting.

Agronaut: connected level tray	

Enter the number of the level tray which belongs to this climate group in this setting. If you have no level tray, enter 0.

Agronaut: connected drain pit	

Enter the number of the drain pit which belongs to this climate group in this setting. If you have no drain pit, enter 0.

Agronaut: control level tray/simulation	level tray

With this setting Agronaut carries out control actions based on the level tray's water uptake. If the level tray's water uptake is 0, Agronaut will automatically switch to the water uptake derived from the water uptake simulation model.

simulation tune selection level tray/drain pit	level tray

The water uptake simulation model can compute the heat flows in the greenhouse. How much heat is entering the greenhouse from the sun; how much heat emission there is; how much heat is given off by the pipes; how much heat is exchanged through the vents; how much heat is required for transpiration .
The outcome of this calculation of heat flows is a computed water uptake by the crop.
However, the model does not know how much the crop has grown (increase in water uptake), or how many fruits have been picked (decrease in water uptake), or how much deleafing has been carried out (decrease in water uptake). The model therefore has to be tuned to take account of the actual water uptake. This actual water uptake is derived from the level tray or the drain pit.

Level tray (Settings)

level tray water uptake: correction	100

Enter the figure 100 in this setting at the start of cultivation. This correction is automatically adapted as more roots grow into the drainage channel.

Level tray (Service)

level tray control: switch off correction	no selections

The 'water uptake: correction' setting ensures that the computed water uptake matches the measured water uptake (supply - drainage). If the correction mechanism cannot work (e.g. because there is no drain counter), this setting can be used to switch off the adjustment of the 'water uptake: correction' setting.

Crop section control

crop section: connected climate group Agronaut	

This connection is needed to make the level tray supply and drainage figures available to the simulation model.

Water uptake model (Settings)

simulation: light permeability greenhouse roof	68

The light permeability of the greenhouse roof must be entered for use by the water uptake simulation model. Pay attention to dirt and lime on the greenhouse roof!

Clean greenhouse roof: 70%
Lime-coated greenhouse roof: 30 to 50%

Water uptake model (Service)

simulation water uptake active	Yes

Simulation of the water uptake is activated once the level tray or drain pit number is entered.

simulation: crop size factor	5

The water uptake simulation model is tuned at the end of every day. This involves comparing the water uptake sum computed by the model with the actual water uptake sum (total supply - total drainage).
If there is a difference, this normally means that the crop has grown, fruit has been picked or deleafing has been carried out. In the event of a difference, the crop size factor setting will be adjusted.
For vegetable crops this setting varies between 2 and 4. For a young crop this figure is set to 0.5

It is possible, in the event of a defective flow sensor or drain counter, that the flow or drainage will not be measured properly.
In such cases the crop size factor setting will not be adjusted properly. For this reason it is important for the flow and drainage to be checked regularly.

simulation: reflection soil	0.40

This setting indicates how much light is reflected by the soil. This depends on the material with which the soil is covered (white plastic = 0.40).

simulation: projected area greenhouse roof	1.113 (Venlo)

This setting specifies the number of m² greenhouse roof per m² floor area. The figure in this setting therefore depends on the slope of the greenhouse roof. The steeper the greenhouse roof, the higher the figure (20°: 1.064, 26°: 1.113, 30°: 1.155).

simulation: loss of water uptake	0

This setting is only required for tuning the water uptake simulation model with a drain pit. Enter the percentage of the water uptake that can evaporate directly from the soil. The water loss can also be caused by leakage in the watering system.
This is 0% for a crop on rockwool.

simulation: maximum days without water level tray	3
simulation: maximum days without water drain pit	3

This setting is used when tuning the water uptake with a level tray or drain pit. There is normally a period without watering at the end of cropping before the crop is cleared. For the program this is the indication that a new, young crop is being planted, so that the system starts automatically with a crop size factor of 0.5.
During the cultivation period, however, it is also possible that no watering is carried out for several days in succession, especially in the winter months. The crop size factor does not then have to be set automatically to 0.5!
A "maximum number of days without water" can be set in the above settings to prevent this.

simulation: projected pipe area circuit 1,2,3	0.064

This contains an area in m² for the pipe area (projected onto the ground) per m² floor area.

simulation: position of circuit 1,2,3 relative to crop	0.0

This setting indicates the position of the circuit relative to the crop. This is important for the influence of the circuit on the crop.
This setting can be entered as follows:
- pipe rail system: 0.0
- growth pipe halfway up the crop: 0.5
- pipe above the crop: 1.0

5.1. Before you begin controlling with Agronaut

Before you begin controlling based on water uptake you must first know: What is water uptake? What is a high and a low water uptake? What is the relationship between radiation, wind, vent position, RH, water uptake etc.?
Create the following graphs to understand more about water uptake:

Graph 1: Relationships to water uptake
You can use this graph to determine the maximum and minimum water uptake. You can also see the relationship between sun, wind and water uptake. What will happen to the water uptake if ventilation is increased or if the wind speed increases?

Control General|Meteo

radiation: measurement - W/m²	x 0.1
wind speed: measurement - m/s	x 1

Control Climate|Greenhouse heating|Circuit 1/2/3

circuit 1 pipe temperature: computed - ℃	x 1

Control Climate|Ventilation|Lee side

lee side vent position: computed - %	x 1

Control Climate|Ventilation|Wind side

wind side vent position: computed - %	x 1

Control Climate|Greenhouse climate|Group

Agronaut: water uptake - l/m².h	x 100

Graph 2: Water uptake and radiation
You can use this graph to determine the relationship between water uptake and radiation and between water uptake sum and radiation sum.

Control General|Meteo

radiation: measurement - W/m²	x 0.1
radiation sum measurement - J/cm²	x 0.01

Control Climate|Greenhouse climate|Group

Agronaut: water uptake - l/m².h	x 100

Graph 3: Water uptake
You can use this graph to determine the correct settings for the minimum and maximum water uptake.

Control Climate|Greenhouse climate|Group

Agronaut minimum water uptake: ViP - l/m².h	x 100
Agronaut maximum water uptake: ViP - l/m².h	x 100
Agronaut: water uptake - l/m².h	x 100

Graph 4: Leaf and greenhouse temperature
You can use this graph to view the differences between leaf temperature and greenhouse temperature. The leaf temperature is computed by the water uptake simulation model and is an average temperature of the active part of the crop.

Control Climate|Water uptake model

Agronaut: average leaf temperature - ℃	x 1

Control Climate|Greenhouse climate|Group

greenhouse temperature climate: measurement - ℃	x 1

Graph 5: counter water uptake sum
You can use this graph to check whether the crop is being watered sufficiently quickly. The counter counts up. As soon as a dripping cycle is given, this counter is reduced by the supply minus the set drainage. If the counter rises too far, this means that the wait before a dripping cycle is too long.

Control Water, Crop sections

Agronaut: counter sum start - l/m²	x 100

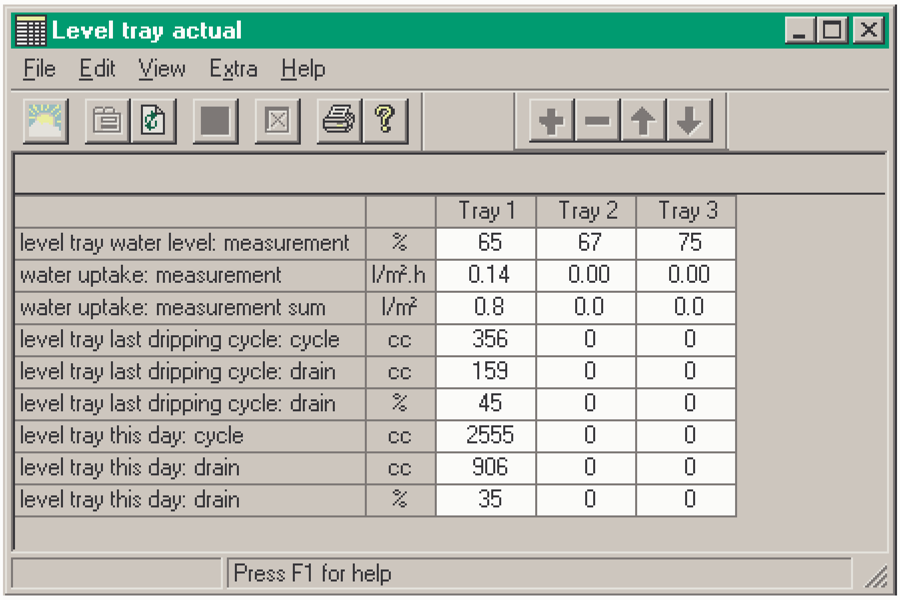
7. Monitoring the level tray and drain counter

It is important to monitor the level tray and drain pit regularly.

7.1. Level tray

Check the supply to the level tray:

1. Insert each dripper into a bottle or beaker.
2. Change the **phase 2:supply** and **level valve phase 2 supply maximum: ViP** settings to 2 minutes.
3. Start the crop section.
4. Weigh the volume collected.
5. Compare the total weighed quantity with the figures in the current level tray overview.



		Tray 1	Tray 2	Tray 3
level tray water level: measurement	%	65	67	75
water uptake: measurement	l/m².h	0.14	0.00	0.00
water uptake: measurement sum	l/m²	0.8	0.0	0.0
level tray last dripping cycle: cycle	cc	356	0	0
level tray last dripping cycle: drain	cc	159	0	0
level tray last dripping cycle: drain	%	45	0	0
level tray this day: cycle	cc	2555	0	0
level tray this day: drain	cc	906	0	0
level tray this day: drain	%	35	0	0

If there is a large difference between the weighed and the recorded quantities, you can change the **water supply: correction level tray** setting.

$$\text{New value} = \frac{\text{old value} \times \text{weighed total amount}}{\text{supply last dripping cycle}}$$

7.2. Drain counter

Check the drain counter drainage:

1. Collect the drainage over the entire day using a measuring jug, for example.
2. Compare the total drainage collected with the figure in the overview.

If there is a large difference between the collected and the recorded quantities, you can change the **drain counter: spoon contents** setting.

$$\text{New value} = \frac{\text{old value} \times \text{weighed total amount}}{\text{total drain}}$$

8. Level control without level tray

Agronaut can determine the plant's water uptake by using the water uptake measurement from the level tray or the water uptake simulation model.

In both cases tuning to actual conditions is required. This can be based on total supply and drainage from a level tray or drain pit.

The level tray cannot be used with certain substrates such as pumice stone, Agrofoam or for bucket-grown plants. This means that an accurate water uptake figure cannot then be measured.

An alternative to this is to collect the drainage from a group of plants.
The drainage can then be recorded via the Level control program. Supply is recorded via the flow sensor.

In addition to the settings normally used, a number must be set ‘properly’ or given extra attention.

8.1. Settings

In the **Agronaut** user folder create a **Level control without level tray** user folder and copy the following settings lists to it:
- **Greenhouse climate** from the *Control Climate|Greenhouse climate* folder
- **Valves** from the *Control Water|Valves* folder
- **Level tray** from the *Control Water|Level tray* folder
- **Recipes** from the *Control Water* folder
- **Crop section control** from the *Control Water|Crop sections* folder

Greenhouse climate

Agronaut: connected level tray	
Agronaut: control level tray/simulation	simulation
simulation tune selection level tray/drain pit	level tray

Valves
Select a level valve and slave valve.

Level tray (Settings)

greenhouse area level tray	
level tray water supply: number of drippers level tray	
water supply: correction level tray	100
drain counter: spoon contents	5.00
level tray water uptake: correction	100

Level tray (Service)

level tray control: switch off correction	do not adjust correction water uptake

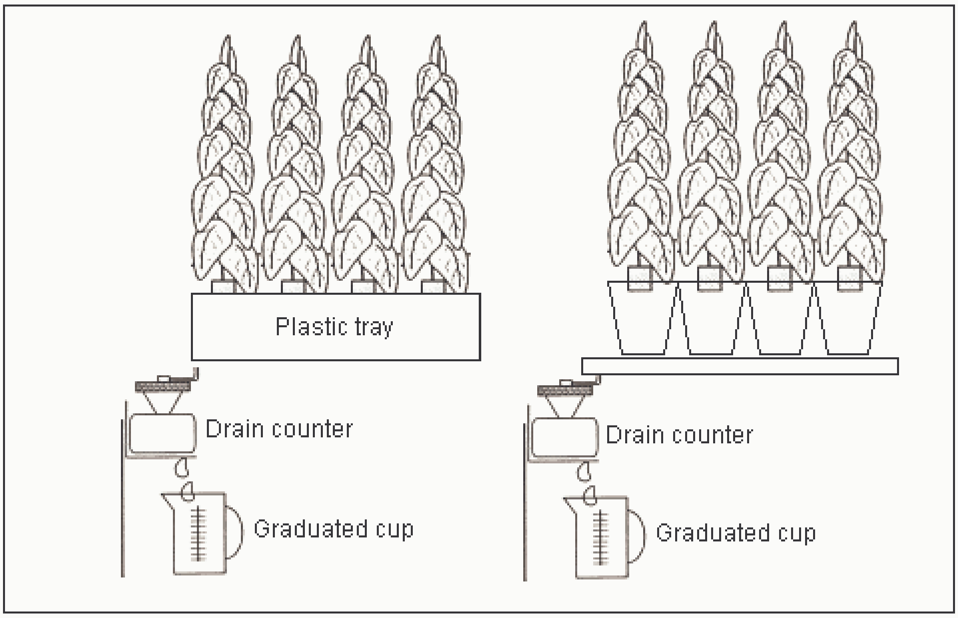
Recipes

start and stop conditions	water uptake sum
Agronaut: start relative to	clock
Agronaut: start time	09:00
Agronaut: stop relative to	clock
Agronaut: stop time	18:00
Agronaut sum start: ViP	0.15
Agronaut threshold start: ViP	0.05
Agronaut drain: ViP	25

Crop section control

crop section: connected climate group Agronaut	
crop section: connected level tray	

8.2. Setup



Agronaut: rising per hour
All the data relating directly to the plant itself is collated to provide you with even more information. The above information can only be seen if the relevant options are live in your *ECONOMIC* NT.

Agronaut: time average water uptake short
Agronaut: time average water uptake long
The water uptake can be (re)adjusted by means of the heating, vents, shading curtain or roof sprinklers. It can be adjusted to a short average or long average water uptake.
These settings are used to set the time for the short and long periods.

Agronaut: selection influence rising
This setting enables you to choose the content of the "Rising Agronaut" ViP influence.
You can choose from:

Rising speed	Speed with which the momentary water uptake rises
Short-long average	Short average minus long average water uptake

CO2

There are a number of different ways to supply CO_2 in the greenhouse:

- via CO_2 heaters
- via the boiler with a central unit
- via the boiler with a central unit with chimney valves
- with pure CO_2 (cold CO_2)

CO_2 is usually supplied with the boiler first. The settings for this are in "CO2 1".
When the boiler cannot supply enough CO_2, pure CO_2 can be added. The settings for this are in "CO2 2".

CO2 - control 1

channel number CO2 measurement
This setting specifies the channel number of the CO_2 sensor. If there is no selector, this is set to -1.

connected CO2 sensor
This setting indicates which group incorporates the CO_2 sensor.

connected CO2 unit
This setting indicates which group incorporates the CO_2 unit.

CO2 control 1: absolute minimum
The minimum CO_2 level can be reduced using the vent position and the wind speed. Any reduction below the CO_2 absolute minimum is cancelled.

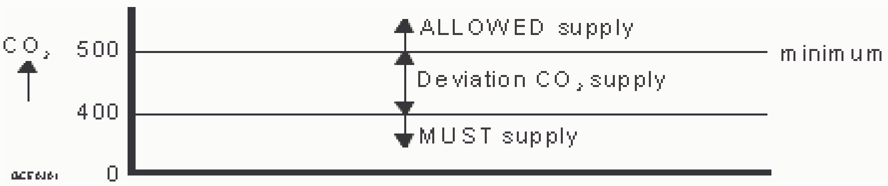
CO2 control 1: actuations (1=on 2=off)
This setting indicates whether the computer is operating the heater or valve.

- **Off**
  The heater is not in operation or the valve is closing.
- **On**
  The heater is in operation or the valve is opening.

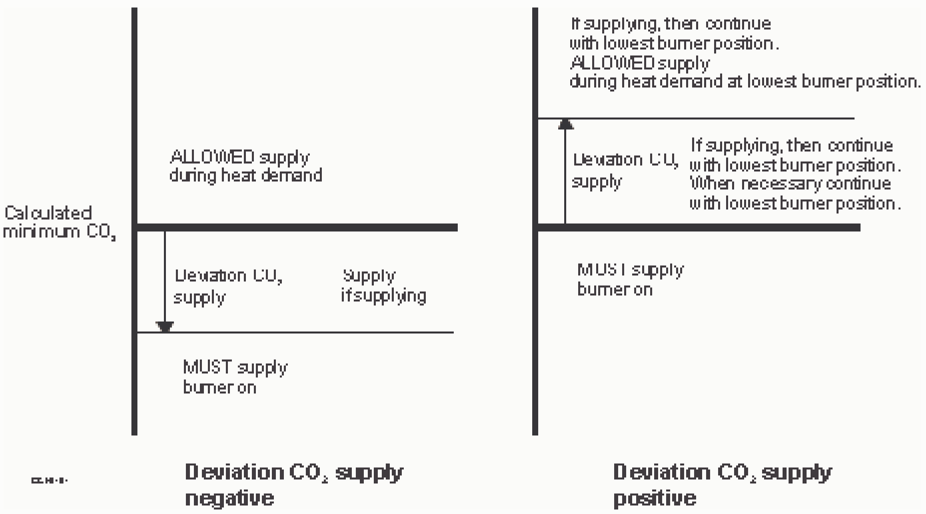
CO2 control 1: deviation supply
To prevent the CO_2 control from being repeatedly switched on and off, a deviation from the minimum level car below which the unit is operated.

EXAMPLE:
The minimum CO_2 level is set to 500 ppm. Supply if the CO_2 level falls below 400 ppm.

CO2 control 1: deviation supply	-100



CO_2 control in combination with heat buffer
In order to prevent the burner from being frequently switched on and off for CO_2, the burner is not switched off set minimum CO_2 is reached in the greenhouse, but instead is actuated to its lowest position. The burner will t on.
The result is that the optimum CO_2 supply is achieved, with the burner being switched on and off less frequent prevents wear on the burner, but also saves a lot of gas which is otherwise needed for preliminary flushing ea is started up.



Advice on settings:

1. When supplying pure CO_2 via the central supply unit actuation it is best to set the CO_2 supply deviation

figure because of the cost price of this CO_2. Furthermore, the CO_2 level has a tendency to rise a little fu systems when supply is ended in these cases.

2. When supplying by means of a boiler or CHP in combination with a tank, a positive CO_2 supply deviatic choice. It is necessary to begin CO_2 supply as soon as possible (when the minimum CO_2 is reached) so does not fall too far. This is because it always takes some time before the CO_2 produced actually arrive greenhouse. Excessive starting/stopping of the boiler can be avoided by not setting the CO_2 supply dev
3. When supplying by means of a boiler without a tank it is possible to opt for either a negative or a positiv Setting a negative value can be necessary if it is very difficult to discharge the heat produced. Setting a results in a better CO_2 level.

CO2 control 1: measurement
This setting is for registration purposes.

deviation maximum CO2 supply unit
If the measured CO_2 level is higher than the set maximum plus the set deviation, an alarm is triggered.

maximum CO2 supply unit: ViP
There are 3 situations:

- **MUST supply**
  If the CO_2 level is below the minimum level, the system MUST supply, even if there is no heat demand:
  - the boiler is then started OR
  - the CO_2 heaters are started OR
  - pure CO_2 is supplied
- **ALLOWED to supply**
  If the CO_2 level is between the minimum and maximum levels, supply is ALLOWED. This is then carrie a heat demand, when the boiler or boilers are already operating.
- **NOT ALLOWED to supply**
  If the CO_2 level is above the set maximum level, supply is NOT ALLOWED outside the supply times.

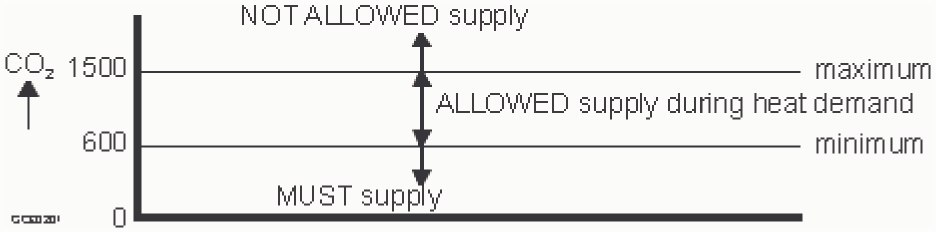
The system always ceases supplying when the CO_2 level is above the maximum. If the measured CO_2 level is minimum, the unit goes into supply mode even if there is no heat demand.

Adjustable influences:

Radiation control	%
RH deviation	%
Humidity deficit deviation	g/m^3

EXAMPLE:
Minimum CO_2 level 600 ppm. Maximum CO_2 level 1500 ppm.

minimum CO2: ViP	600
maximum CO2 supply unit: ViP	1500



measurement: time since measurement
This setting indicates the time that has elapsed since the last measurement.

status CO2 control
This setting indicates what is currently happening with the control system.

- **Boiler allowed high**
  The boiler is allowed to operate in high-speed mode for CO_2 supply.
- **Valves closed**
  The valves are closing.
- **NOT ALLOWED clock**
  Outside the set times; supply is not allowed.
- **NOT ALLOWED alarm**
  There is a CO_2 alarm; supply is not allowed.
- **NOT ALLOWED CO2**
  The CO_2 level is too high; supply is not allowed.
- **ALLOWED heat demand**
  Supply is allowed if there is a heat demand.
- **MUST low CO2**
  Supply must be carried out because the CO_2 level is too low.

supply: type of start time
supply: start time
supply: type of stop time
supply: stop time
The times at which supply is allowed.

EXAMPLE:
Supply in the morning from 30 minutes before sunrise to 1 hour before sunset in the evening.

supply: type of start time	Sunrise
supply: start time	-00:30
supply: type of stop time	Sunset
supply: stop time	-01:00

type of valves control
If there are valve actuations in a group, a special valve control (CO2 MUST priority) can be used, if you wish.

The control then operates as follows:

Main group	Group	Valve actuation
ALLOWED	ALLOWED	Open
MUST	ALLOWED	Closed
MUST	MUST	Open

This is useful when a boiler is unable to supply sufficient CO_2 for all groups.

unit: influence supply off
unit: influence supply on
These settings relate only to a central supply unit and indicate the influence of the relevant group on operation supply unit.
Switching off has precedence over switching on. Set a figure between 0 and 100.

EXAMPLE 1:
There are 3 climate groups. CO_2 supply is carried out by a central supply unit.

Climate group 1:

unit: influence supply off	100
unit: influence supply on	100

Heat can be discharged via the minimum pipe temperature in all the groups during CO_2 supply.

EXAMPLE 2:
There are 3 climate groups. CO_2 supply is carried out by a central supply unit. The CO_2 is measured using a s

Climate group 1:

unit: influence supply off	100
unit: influence supply on	34

Climate group 2:

unit: influence supply off	100
unit: influence supply on	34

Climate group 3:

unit: influence supply off	100
unit: influence supply on	34

If too high a CO_2 value is measured in one of the groups, the supply unit is switched off (total influence 100).
If too low a CO_2 value is measured in all the groups, the supply unit is switched on (total influence = 34-

EXAMPLE 3:
There are 3 climate groups. CO_2 supply is carried out by a central supply unit. The CO_2 is measured using a s group has a separate CO_2 valve for supply purposes (valve control).

Climate group 1:

unit: influence supply off	34
unit: influence supply on	100

Climate group 2:

unit: influence supply off	34
unit: influence supply on	100

Climate group 3:

unit: influence supply off	34
unit: influence supply on	100

The valve control ensures that the groups in the MUST situation (CO_2 too low) receive CO_2.

CO2 - control 2

minimum CO2: deviation minimum
This setting enables the minimum CO_2 level of control 2 to be set with reference to control 1.

deviation maximum CO2 extra control
If the measured CO_2 level is higher than the set maximum plus the set deviation, an alarm is triggered.

CO2 - external processes

CO2 general: connected process id
Apart from the EM cluster the process ID must always be set to 1.

manifold CO2: connected process id
Apart from the EM cluster the process ID must always be set to 1.

CO2 - General

channel number outside CO2
This setting specifies the channel number of the outside CO_2 sensor.

If there is no selector, this is set to -1.

CO2 outside: measurement
This setting is for registration purposes.

CO2 sensor: measurement
CO2 sensor: correction
The measurement range options are linear or non-linear with a scale of 3000, 6000, 10,000 ppm (see **measur**
sensor)

Adjusting the procedure:

1. Measure the voltage (0-100 mV) at the output with a multimeter.
2. Read off the 'CO2 sensor: measurement' setting.
3. Calculate the difference between these two values.
4. Adjust the correction by this difference.

The CO2 measurement can be read from the table below:

Voltage [mV]	Gross measurement	10000	6000	3000	Li
0	0	0	0	0	0
10	500	375	160	130	15
20	1000	780	360	280	30
30	1500	1300	640	450	45
40	2000	1950	920	650	60
50	2500	2650	1240	880	75
60	3000	3600	1720	1150	90
70	3500	4750	2340	1490	10
80	4000	6200	3140	1890	12
90	4500	8000	4200	2400	13
100	5000	10000	6000	3000	15

CO2 unit: actuations
This setting indicates whether the unit is being actuated.

- **On**: the supply unit is in operation

CO2 unit: influence on
CO2 unit: influence off
These settings are only of importance for the central supply unit and are input by the computer.
They indicate whether the central unit has to be actuated or not.

- **Influence on** at 100: supply unit is in operation
- **Influence off** at 100: supply unit is not in operation

control CO2 unit: influence burner higher
Influence on at 100 means that with a tank control system the burner may be operated at a higher level becau
level. This will actually be implemented if the tank temperature allows it.

control CO2 unit: influence burner low
With a setting of 100 and with a tank control system available, the burner will be operated at a low level becau
above the minimum.

linear sensor: maximum range
Enter the maximum range here for a linear CO_2 sensor.

measurement: channel number active
This setting is input by the computer.

measurement: suction time
Once the suction time has elapsed, the CO_2 level is measured for 10 seconds.
The suction time has to be matched to the maximum measurement distance.
As a guideline, allow 60 seconds for every 100 metres.
The switch-over time for the selector must be set 20 seconds longer than the suction time.

measurement: type of CO2 sensor
Enter the range of the CO_2 sensor here (linear, 3000, 6000 or 10,000 ppm).

selector: measurement
selector: correction
The use of a selector enables several metering points to be measured with one CO2 sensor.
A resistance circuit is closed with the aid of relay contacts to detect the correct measuring channel.
This results in an output voltage which depends on the channel selected and which is processed by the compu

The gross measurement can be read from the table below:

Channel no.	Lower threshold	Upper threshold
0	0	150
1	310	610
2	770	1070
3	1230	1530
4	1690	1990
5	2150	2450
6	2610	2910
7	3070	3370
8	3530	3830

Connecting 2 selectors:
The 2 selectors must be connected to each other such that the metering points are monitored in sequence fro
the other.
The unit's diaphragm pump, in which no metering point is measured, is then disabled.
The selectors' connections and jumper setting are described in the *ECONOMIC terminal guide*. **status centra**
This setting indicates what is currently happening with the control system.

- **Boiler allowed high**
  The boiler is allowed to operate in high-speed mode for CO_2 supply.
- **Unit OFF**
  The unit is not in operation because the CO_2 is too high.
- **ALLOWED to supply**
  The unit is operated if there is also a heat demand.
- **MUST supply**
  The unit is in operation because the CO_2 is too low.

status measure

This setting indicates what is currently happening with the control system.

- **Waiting time active**
  System waiting for switching to a different channel.
- **Suction active**
  The CO_2 is being drawn in.
- **Measurement active**
  The CO_2 is being measured (10 seconds).

Cooling

The universal cooling program is used for:

- cooling (5 stages)
- humidification (3 stages)
- dehumidification (3 stages)

The actuations operate based on the on/off principle.

Cooling - Cooling

counter time position padvent adjusting
The computed pad vent position is adjusted when the cooling system changes stage or after the set interval.

counter dry time pad
This counter shows how long the pad dry time has already been in progress.

actuation timer padvent
This counter indicates how long the pad vent is still to be actuated.

greenhouse temperature cooling: measurement
RH cooling: measurement
HD cooling: measurement
AH cooling: measurement
dewpoint cooling: measurement
Measurements of the greenhouse climate conditions.

greenhouse temp too high: deviation cooling temperature
computed alarmthreshold deviation cooling temperature
An alarm is triggered if the greenhouse temperature is higher than the cooling temperature by the set deviatio
threshold is increased in proportion to the increase in radiation (up to 3x the alarm limit at 1000 W/m^2).

increasing position padvent: ViP
interval position padvent adjusting
cooling position padvent: computed

Control Climate, Cooling
stage 1: position padvent
stage 2: position padvent
stage 3: position padvent
stage 4: position padvent
stage 5: position padvent

Control Climate, Cooling, Humidification
dehumidification stage 1: position padvent
dehumidification stage 2: position padvent
dehumidification stage 3: position padvent

Control Climate, Cooling, Dehumidification
humidification stage 1: position padvent
humidification stage 2: position padvent
humidification stage 3: position padvent

A pad vent position can be set for each cooling, humidification or dehumidification stage.
This value is further raised by the set increase. In order to maintain smooth operation, the computed pad vent
changed if either the stage changes or the interval has elapsed.

cooling stage 1: actuations
cooling stage 2: actuations
cooling stage 3: actuations
cooling stage 4: actuations
cooling stage 5: actuations
For each cooling stage you can set which actuations have to be active.
The pad vent is not operated using these actuations but rather by means of separate settings for each cooling

EXAMPLE:
Actuation 1 = 1st pad cooling fan stage
Actuation 2 = 2nd fan stage
Actuation 3 = pad water pump etc.

cooling: minimum interval time add stage
The default minimum interval for adding a cooling stage (stage 1 to stage 2 to stage 3 etc.) is 1 minute.
The interval can be increased using this setting. This can be necessary to avoid excessive temperature shock

cooling: type of greenhouse temperature measurement
You can choose here to adjust to: average temperature, maximum temperature or minimum temperature.

cooling: type of RH measurement
You can choose here to adjust to: average RH, maximum RH or minimum RH.

cooling: connected aspirator A
cooling: influence aspirator A
cooling: connected aspirator B
cooling: influence aspirator B
cooling: connected aspirator C
cooling: influence aspirator C
cooling: connected aspirator D
cooling: influence aspirator D
cooling: connected aspirator E
cooling: influence aspirator E
cooling: connected aspirator F
cooling: influence aspirator F
cooling: connected aspirator G
cooling: influence aspirator G
cooling: connected aspirator H
cooling: influence aspirator H
cooling: connected aspirator I
cooling: influence aspirator I
cooling: connected aspirator J
cooling: influence aspirator J
cooling: connected aspirator K
cooling: influence aspirator K
cooling: connected aspirator L
cooling: influence aspirator L
A maximum of 12 aspirators are possible for each climate group (aspirators A to L).
If you are working with the average temperature or average RH, an influence or a weighting factor must be en

EXAMPLE 1:
The nursery consists of 2 bays.
Each bay (group) has a separate heating control and ventilation control.

The curtain has 1 control system and extends over both bays.

Control Climate, Aspirators, Climate (Group 1)

climate: connected aspirator A	1
climate: influence aspirator A	100
climate: connected aspirator B	0
climate: influence aspirator B	0

Control Climate, Aspirators, Heating (Group 1)

heating: connected aspirator A	1
heating: influence aspirator A	100
heating: connected aspirator B	0
heating: influence aspirator B	0

Control Climate, Aspirators, Ventilation (Group 1)

ventilation: connected aspirator A	1
ventilation: influence aspirator A	100
ventilation: connected aspirator B	0
ventilation: influence aspirator B	0

Control Climate, Aspirators, Curtains (Group 1)

curtains: connected aspirator A	1
curtains: influence aspirator A	100
curtains: connected aspirator B	2
curtains: influence aspirator B	100

Control Climate, Aspirators, Climate (Group 2)

climate: connected aspirator A	2
climate: influence aspirator A	100
climate: connected aspirator B	0
climate: influence aspirator B	0

Control Climate, Aspirators, Heating (Group 2)

heating: connected aspirator A	2
heating: influence aspirator A	100
heating: connected aspirator B	0
heating: influence aspirator B	0

Control Climate, Aspirators, Ventilation (Group 2)

ventilation: connected aspirator A	2
ventilation: influence aspirator A	100
ventilation: connected aspirator B	0
ventilation: influence aspirator B	0

Control Climate, Aspirators, Curtains (Group 2)

curtains: connected aspirator A	0
curtains: influence aspirator A	0
curtains: connected aspirator B	0
curtains: influence aspirator B	0

EXAMPLE 2:
The nursery consists of 4 bays.
Bay 1 (group 1) is a large bay with an extra aspirator for measuring the temperature and RH in the coldest par

Control Climate, Aspirators, Climate

climate: connected aspirator A	1
climate: influence aspirator A	100
climate: connected aspirator B	2
climate: influence aspirator B	0

Control Climate, Aspirators, Heating

heating: connected aspirator A	1
heating: influence aspirator A	75
heating: connected aspirator B	2
heating: influence aspirator B	25

Control Climate, Aspirators, Ventilation

ventilation: connected aspirator A	1
ventilation: influence aspirator A	75
ventilation: connected aspirator B	2
ventilation: influence aspirator B	25

interval fast cooling switch off
This setting is important for the 'deviation heating temperature all cooling off' setting.

cooling: counter delay next stage
This counter indicates when the next stage can be activated.

cooling: counter interval stage
This counter indicates how long the current stage has been active.

cooling: selection stages
This setting is used to select one or more cooling stages.
The maximum number is 5 stages.
The stages are switched in numerical order, irrespective of the temperature settings.
Stage 1 is therefore followed by stage 2 etc.

deviation heating temperature all cooling off
If the greenhouse temperature falls below the heating temperature plus this deviation, the cooling is rapidly sw

cooling: stages emergency power warm weather
cooling: stages emergency power cold weather
When running on emergency power, you can choose to leave the boiler running and the pad and fan switched depending on the weather conditions.
In the case of universal cooling, you can specify for each group whether the stages may be switched on and h may be switched on.
It is therefore possible to opt to leave the pad and fan switched off completely, running at half power or running

cooling: status
The current cooling stage is shown in this status.

cooling: status actuations
The current actuations (1-15) are shown in this status.

cooling: status measurements
This setting indicates the status of the measurements:

- **aspirator fan off**
- **connected aspirator?**
  No aspirator number has been entered, or the aspirator number is wrong.
- **RH measurement error**

The wet bulb is dry (bottle empty or sock blocked).

revolving actuations
interval actuations revolving
counter interval actuations revolving
If the pad and fans are always activated in a fixed order, this results in uneven wear.
In many cases the temperature distribution in the house will not be uniform either.
The program therefore offers the facility to actuate a different fan first.

Specify the actuations which are used to actuate the fans. Each time the interval has elapsed, the next fan is t actuated.

dry time pad
The pad has to be dried after cooling or humidification. The desired dry time can be set here.

padvent: actuations
This setting shows the current actuation (open/close) of the pad vent.

pump pad: actuations
Select the actuation(s) which are required to activate the pad pump.
If one of these actuations is off, it is assumed that the pump is off.

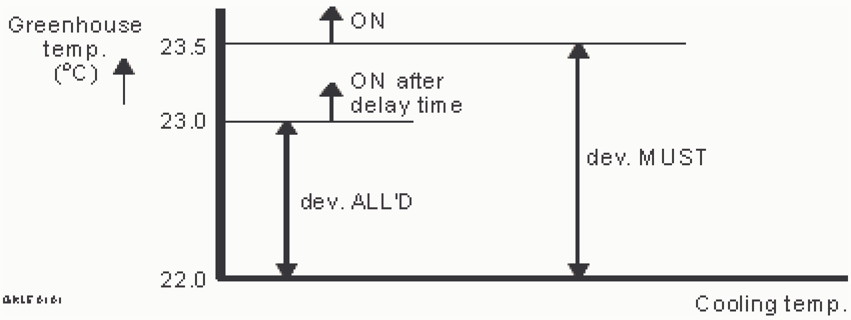
drying pad: actuations
After the pump has stopped, the actuations set here are activated during the pad dry time.
These actuations must ensure that the pad dries.

running time padvent
Actuation of the pad vent is based on the vent's total running time.
Time this action and enter the appropriate figure.

temperature cooling: ViP
stage 1 ON: deviation cooling temperature ALLOWED
stage 1 ON: delay time
stage 1 ON: deviation cooling temperature MUST
A cooling stage is used if the greenhouse temperature rises above the cooling temperature plus the **MUST** de
A cooling stage is also used if the greenhouse temperature is continuously above the cooling temperature plus
deviation for the delay time.

This specification applies to stages 1-5.

EXAMPLE:
Cooling temperature 22℃. Cooling ALLOWED if higher than 23℃ for 20 mins. Cooling MUST at 23.5℃.



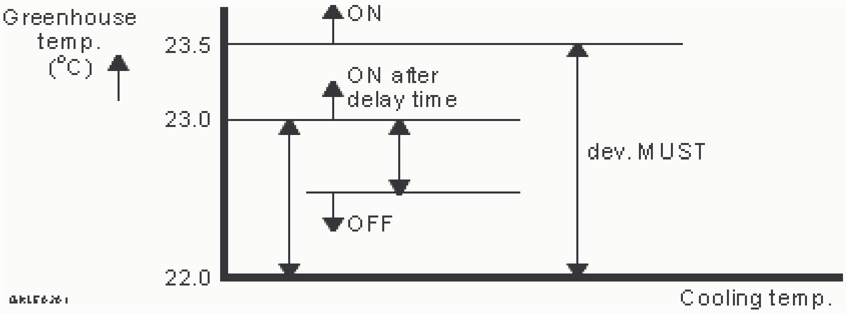
temperature cooling: ViP	22.0
stage 1 ON: deviation cooling temperature ALLOWED	23.0
stage 1 ON: delay time	00:20
stage 1 ON: deviation cooling temperature MUST	23.5

stage 1 OFF: deviation cooling temperature ALLOWED

stage 1 OFF: minimum time on
A cooling stage remains in operation for at least the minimum time.
If the greenhouse temperature falls below the cooling temperature plus the deviation, the stage is switched off

This specification applies to stages 1-5.

EXAMPLE:
The cooling stage must remain on for at least 5 minutes. Switch off once the temperature is 0.5°C lower than t temperature.



stage 1 OFF: deviation cooling temperature ALLOWED	-0.5
stage 1 OFF: minimum time on	00:05

Cooling - Humidity

counter delay next stage dehumidification
This counter indicates when the next stage is switched on.

counter delay next stage humidification
This counter indicates when the next stage is switched on.

de- or humidification: minimum interval time add stage
The default minimum interval for adding a humidification stage (stage 1 to stage 2 to stage 3) is 1 minute. The increased using this setting. This can be necessary to avoid excessive temperature shocks for the plants.

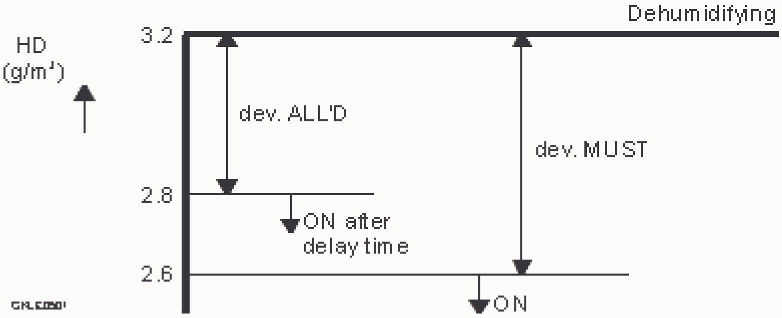
interval fast de- or humidification switch off
If the HD is threatening to become too high or too low, the minimum on time is cancelled and the stages are ra

counter interval stage humidity control
This counter shows how long the current humidification or dehumidification stage has been active.

HD dehumidification: ViP
dehumidification stage 1 ON: deviation HD ALLOWED
dehumidification stage 1 ON: delay time
dehumidification stage 1 ON: deviation HD MUST
A stage is switched on if the HD is below the set HD plus deviation MUST.
A stage is also switched on if the HD is continuously below the set HD plus deviation ALLOWED for the delay

This specification applies to stages 1-3.

EXAMPLE:
Humidity deficit 3.2 g/m^3. Dehumidification MUST if the HD is 0.6 g/m^3 too low. Dehumidification ALLOWED if too low for 20 minutes.

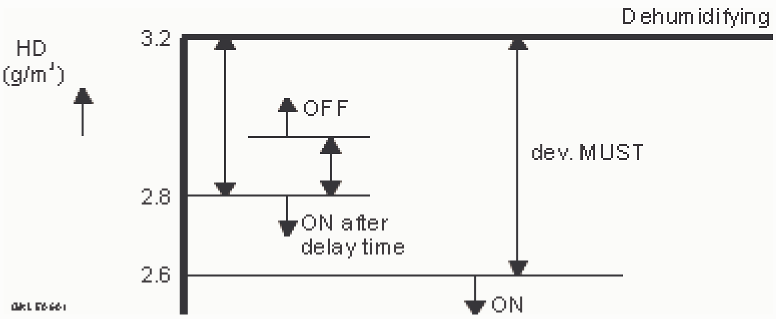


HD dehumidification: ViP	3.2
dehumidification stage 1 ON: deviation HD ALLOWED	-0.4
dehumidification stage 1 ON: delay time	00:20
dehumidification stage 1 ON: deviation HD MUST	-0.6

dehumidification stage 1 OFF: deviation HD ALLOWED
dehumidification stage 1 OFF: minimum time on
A dehumidification stage remains in operation for at least the minimum time.
If the HD is above the set HD plus deviation ALLOWED ON plus deviation HD ALLOWED OFF, the stage is sw

This specification applies to stages 1-3.

EXAMPLE:
The cooling stage must remain on for at least 5 minutes. If the HD is 0.2 g/m^3 too high, then switch off.



dehumidification stage 1 OFF: deviation HD ALLOWED	0.2
dehumidification stage 1 OFF: minimum time on	00:05

dehumidification: selection stages
This setting is used to select one or more dehumidification stages. The maximum number is 3 stages. The sta
switched in numerical order, irrespective of the dehumidification settings. Stage 1 is therefore always followec

dehumidification: stages emergency power warm
dehumidification: stages emergency power cold
When running on emergency power, you can choose to leave the boiler running and the pad and fan switched
depending on the weather conditions.
In the case of universal cooling, you can specify for each group whether the stages may be switched on and h
may be switched on.
It is therefore possible to opt to leave the pad and fan switched off completely, running at half power or runnin

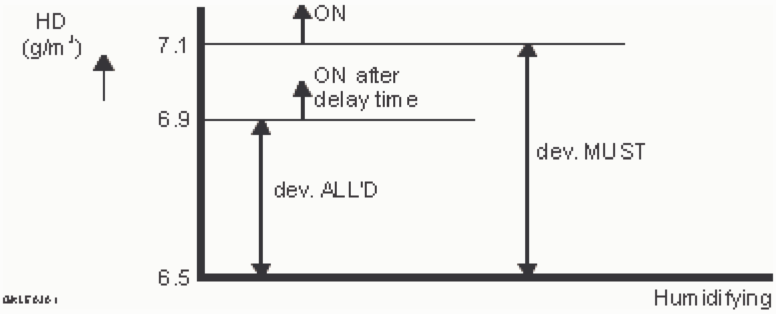
dehumidification: status
This setting shows the current dehumidification stage.

dehumidification stage 1: actuations
dehumidification stage 2: actuations
dehumidification stage 3: actuations
For each dehumidification stage you can set which actuations have to be active.
The pad vent is not operated using these actuations but rather by means of separate settings for each dehum

HD humidification: ViP
humidification stage 1 ON: deviation HD ALLOWED
humidification stage 1 ON: delay time
humidification stage 1 ON: deviation HD MUST
A stage is switched on if the HD is above the set HD plus deviation MUST.
A stage is also switched on if the HD is continuously above the set HD plus deviation ALLOWED for the delay

This specification applies to stages 1-3.

EXAMPLE:
Humidity deficit 6.5 g/m^3. Humidification MUST if the HD is 0.6 g/m^3 too high. Humidification ALLOWED if the too high for 20 minutes.

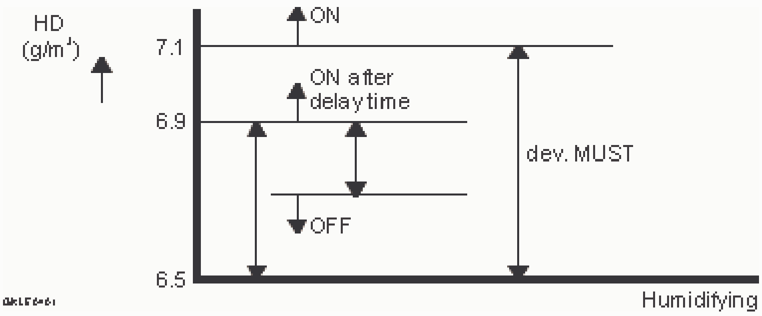


HD humidification: ViP	6.5
humidification stage 1 ON: deviation HD ALLOWED	0.4
humidification stage 1 ON: delay time	00:20
humidification stage 1 ON: deviation HD MUST	0.6

humidification stage 1 OFF: deviation HD ALLOWED
humidification stage 1 OFF: minimum time on
A humidification stage remains in operation for at least the minimum time.
If the HD is below the set HD plus deviation ALLOWED ON plus deviation HD ALLOWED OFF, the stage is s

This specification applies to stages 1-3.

EXAMPLE:
The cooling stage must remain on for at least 5 minutes. If the HD is 0.2 g/m^3 too low, then switch off.



humidification stage 1 OFF: deviation HD ALLOWED	-0.2
humidification stage 1 OFF: minimum time on	00:05

humidification: selection stages
This setting is used to select one or more humidification stages. The maximum number is 3 stages. The stag switched in numerical order, irrespective of the humidification settings. Stage 1 is therefore always followed b

humidification: stages emergency power warm
humidification: stages emergency power cold
When running on emergency power, you can choose to leave the boiler running and the pad and fan switchec depending on the weather conditions.

In the case of universal cooling, you can specify for each group whether the stages may be switched on and h
may be switched on.
It is therefore possible to opt to leave the pad and fan switched off completely, running at half power or runnin
freely.

humidification: status
This setting shows the current humidification stage.

humidification stage 1: actuations
humidification stage 2: actuations
humidification stage 3: actuations
For each humidification stage you can set which actuations have to be active.
The pad vent is not operated using these actuations but rather by means of separate settings for each humid

Crop condensation

crop condensation: connected aspirator
This setting is used to determine from which aspirator you take the data which are included in the mathemati
crop condensation model. We recommend that you connect the aspirator which, in your view, is located in th
You then have the opportunity to connect a separate aspirator whose location you determine yourself, withou
applicable to the normal climate control system.

crop condensation: connected group greenhouse climate
The crop condensation model can be used and viewed by bay. You can use this to set which group of measu
in which bay.

fruit shape
This version of the crop condensation model includes the mathematical models which have been developed
(spherical fruit), cucumber (cylindrical fruit) and paprika (hollow spherical fruit). Select the type of fruit which y
growing.

diameter biggest fruit
If the fruit temperature is lower than the greenhouse temperature, the diameter of the largest fruit is an impor
Care must always be taken in this calculation to ensure that the diameter of the biggest fruit is entered.

temperature coldest fruit
This figure is an instantaneous indication of the temperature of the computed coldest fruit.

dewpoint temperature
This figure is an instantaneous indication of the computed dewpoint temperature.

deviation condensation temperature
This computed figure indicates the computed deviation from the condensation temperature. The lower this fig
the risk of condensation on the crop and/or fruits.

Curtains

There are 6 possible curtains for each group: curtain 1 to curtain 6.
All curtains can be set up as energy, shading and blackout curtains.

Control of heating and ventilation is connected to the curtain.
Do not leave a curtain that is connected to the heating and ventilation control on 'manual operation', because
will then allow for an incorrect curtain position. This will cause the heating or ventilation control to operate inc
When a curtain is not in use, switch the program for that curtain off.

1. Curtain general
   Examples
   - Curtain shut with permanent crack
   - Shading curtain with crack based on greenhouse temperature

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1. Curtain general

Curtain general contains the settings for the energy curtain, the shading curtain and the blackout curtain.

When the curtain is about to close, it is first closed temporarily for 10 seconds as a warning to finish any work
(blackout) curtain.
That is followed by an adjustable waiting time. The heating is automatically turned down during the waiting tir
greenhouse temperature from getting too high when the curtain is closed.
After the waiting time the curtain runs directly to the right position if the humidity crack is greater than 5%. If tl
is less than 5%, the curtain will first close completely and then the (small) humidity crack will be set.
Blackout curtains and energy curtains can be opened in several steps.
Shading curtains open fully at once, not in steps.

Examples

Curtain shut with permanent crack

The simplest crack in a curtain is a permanent crack.

EXAMPLE:
The curtain must have a permanent 5% crack.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Outside temp - °C	
						11.0	10.0
1	Y	00:00	Sunrise	00:00	5.0	0.0	

A permanent crack is also possible with the **curtain 1: ViP crack RH openingcurtain 1: ViP crack RH oper**

Shading curtain with crack based on greenhouse temperature

When the shading curtain is closed, there is less ventilation. This can cause the greenhouse temperature to r crack in the curtain increases the ventilation capacity.

EXAMPLE:
A 10% crack must be set in the shading curtain when the greenhouse temperature is above 22 ℃.
When the greenhouse temperature is above 24 ℃, the crack must be 20%.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Greenhouse temp - °C		Greenhouse temp - °C	
						21.9	22.0	23.9	24.0
1	Y	00:00	Sunrise	00:00	0.0	10.0		20.0	

Energy curtain with crack based on RH and outside temperature

RH can rise underneath a closed energy curtain. A crack can be set in the curtain depending on the RH. If it g outside, reduce the crack as a kind of pre-control. This is to avoid having a crack when the weather is very cc

EXAMPLE:
The basic value for RH is 80%.
There must be a 5% crack in the energy curtain if the outside temperature is higher than 10 °C and the RH is

curtain 1: ViP crack RH opening - %

		Start time	Relative t	Change	Value	Deviation RH - %		Outside temp - °C	
						0	5	10.0	5.0
1	Y	00:00	Sunset	00:00	0.0	5.0		-5.0	

Control, Climate control, Greenhouse climate

RH: ViPRH: ViP	80

Blackout curtain with crack when it is dark

Closing the blackout curtain causes the greenhouse temperature to rise. That is why a crack must be set. Ho be no crack around sunset and sunrise. Otherwise the blackout curtain will not be closed long enough.

EXAMPLE 1:
There must be a 5% crack in the blackout curtain when the greenhouse temperature is above 22 °C. There n the curtain around sunrise and sunset.

urtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Greenhouse temp - °C	
						21.5	22.0
1	Y	-01:00	Sunrise	00:00	0.0	0.0	
2	Y	01:00	Sunset	00:00	0.0	5.0	

EXAMPLE 2:
The blackout curtain is also used as a shading curtain in the daytime. A permanent 20% crack must be set in curtain.

curtain 1: ViP crack greenhouse temperature opening - %

		Start time	Relative t	Change	Value	Greenhouse temp - °C	
						21.5	22.0
1	Y	-01:00	Sunrise	00:00	0.0	0.0	
2	Y	01:00	Sunrise	00:00	20.0	0.0	
3	Y	-01:00	Sunset	00:00	0.0	2.0	
4	Y	01:00	Sunset	00:00	0.0	5.0	

Postpone closing curtain when it is too warm

The energy curtain closes if it gets too cold outside. By that time the heating pipes will often have heated up a the curtain would cause the greenhouse temperature to rise. That is why the heating is turned down before th closes. The heating is turned down during the delay time.

EXAMPLE:
The delay time must be increased if it is still too warm in the greenhouse, to prevent it from getting too warm curtain.

curtain 1: ViP delay time close - min

		Start time	Relative t	Change	Value	Deviation heating temp	
						1.0	3.0
1	Y	00:00	Sunrise	00:00	5	10	

Open curtain in steps

Energy and blackout curtains can be opened in steps. This is to prevent a sudden drop in temperature.

EXAMPLE:
The curtain must open in 3 steps. Open by 2% per step with 10 minute intervals.

curtain 1: open number of stepscurtain 1: open number of steps	3
curtain 1: ViP interval opencurtain 1: ViP interval open	10
curtain 1: opening per stepcurtain 1: opening per step	2.0

Open curtain all at once

The curtain (energy or blackout) has to open all at once (without steps).

EXAMPLE:
The curtain must open in 1 step.

curtain 1: open number of stepscurtain 1: open number of steps	0
curtain 1: ViP interval opencurtain 1: ViP interval open	0
curtain 1: opening per stepcurtain 1: opening per step	0.0

---

2. Energy curtain

The energy curtain is used to save energy.
There is a connection between the curtain program and the heating program. The heating is turned down wh closed to stop it from getting too warm underneath the curtain. When the curtain is opened, the heating is tur a sudden drop in temperature.
There is also a connection with the ventilation program. When the curtain is closed, the **lee side vent positic**

curtain: ViPlee side vent position maximum curtain: ViP, **wind side vent position maximum curtain: V** **position maximum curtain: ViP** and **vent position storm curtainvent position storm curtain** settings app wind sides.

The energy curtain closes when the outside temperature **AND** the amount of sunlight are low enough a the outside temperature **OR** the amount of sunlight are high enough.

Examples

Close curtain at night when it is too cold

The most simple way to use the energy curtain is to close it at night when it is too cold outside and to open it

EXAMPLE:
The curtain must be closed at night when the temperature outside is below 10 °C. The curtain must always b daytime between sunrise and sunset.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Windspeed - m/s	
						1	6
1	Y	00:00	Sunrise	00:30	-40.0	0.0	
2	Y	00:00	Sunset	00:30	10.0	2.0	

Close curtain when it is too cold and too much heating is being used

The colder it gets outside, the more the temperature of the heating pipes will be increased but the curtain mu sooner if the temperature of the pipes gets too high.

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise curtain must close as soon as the temperature outside falls below 5 °C. However, if the pipe temperature goe the curtain has to close sooner.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Comput circuit temp 1 -	
						50	60
1	Y	00:00	Sunrise	00:30	5.0	2.0	
2	Y	00:00	Sunset	00:30	10.0	0.0	

curtain 1: ViP crack greenhouse temperature opening -

		Start time	Relative t	Change	Value	Outside temp - °C	
						11.0	10.0
1	Y	00:00	Sunrise	00:00	3.0	0.0	

Close curtain when it is too cold and it is raining

When it rains, the greenhouse roof cools down. This means that more heating is needed. The energy curtain sooner when it is raining so there is no need for more heating.

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise curtain must close as soon as the temperature outside falls below 5 °C. When it rains the curtain has to close

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Rain
1	Y	00:00	Sunrise	00:30	5.0	2.0
2	Y	00:00	Sunset	00:30	10.0	0.0

Close curtain sooner when the wind is blowing hard

When it is windy it feels colder than it is (this is known as the wind-chill factor). So the energy curtain has to c

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise curtain must close as soon as the temperature outside falls below 5 °C. The harder the wind is blowing outsic curtain must close.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Windspeed - m/s	
						2	6
1	Y	00:00	Sunrise	00:30	5.0	3.0	
2	Y	00:00	Sunset	00:30	10.0	0.0	

urtain 1: ViP crack greenhouse temperature opening -

		Start time	Relative t	Change	Value	Outside temp - °C	
						11.0	10.0
1	Y	00:00	Sunrise	00:00	3.0	0.0	

Close curtain early when the wind is blowing hard from a 'cold corner'

When it is windy it feels colder than it is (this is known as the wind-chill factor). So the energy curtain has to c

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise curtain must close as soon as the temperature outside falls below 5 °C. The harder the wind is blowing outsic corner (N , NE, E), the sooner the curtain must close.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Windspeed Cold - m/s	
						2	6
1	Y	00:00	Sunrise	00:30	5.0	3.0	
2	Y	00:00	Sunset	00:30	10.0	0.0	

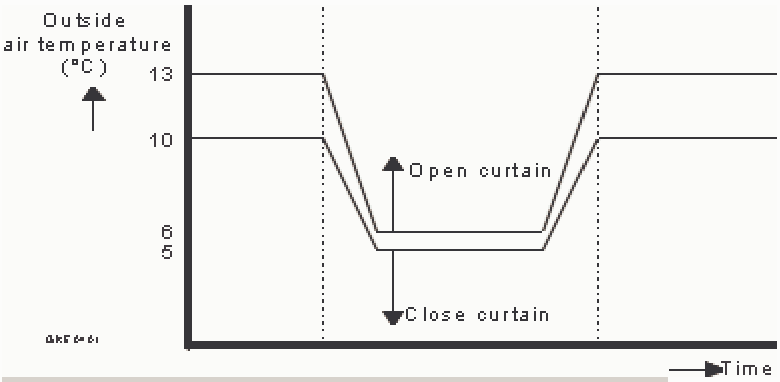
Control, Basic data, Weather

selection wind direction: wind coldwind direction selection: cold wind	N, NE, E

Prevent oscillation of curtain

Various influences can be set in the setpoint for the outside temperature at which the curtain closes. Wind sp can be responsible for the computed outside temperature at which the curtain closes (and opens) varying a g can cause the curtain to oscillate.

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. The curtain may only open aga outside temperature is above 13 °C. In the daytime between sunrise and sunset, the curtain must close as sc temperature outside falls below 5 °C. The curtain may only open again when the outside temperature is abov



curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	5.0
2	Y	00:00	Sunset	00:30	10.0

urtain 1: ViP outside temperature deviation open - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	1.0
2	Y	00:00	Sunset	00:30	3.0

Curtain closed when it is too cold but open if it is sunny

The setpoint for the outside temperature at which the energy curtain closes can be set at different values for
nighttime. In winter when there is little light, the grower will want to open the curtain as soon as it gets light to
of the sunlight.

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise
curtain must close as soon as the temperature outside falls below 5 °C. The sunnier it is, the further the setpo
temperature at which the curtain has to close can be lowered. This will make the curtain open when it is sunn

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Radiation - W/m²	
						200	400
1	Y	00:00	Sunrise	00:30	5.0	-5.0	
2	Y	00:00	Sunset	00:30	10.0	0.0	

Open and close curtain based on sunlight

The setpoint for the outside temperature at which the energy curtain closes can be set at different values for
nighttime. In winter when there is little light, the grower will want to open the curtain as soon as it gets light to
of the sunlight.

EXAMPLE:
The curtain must be closed at night when the temperature outside is below 10 °C. In the daytime between su
the curtain must close as soon as the temperature outside falls below -2 °C. As soon as the actual solar radia
morning goes above 400 W/m^2 the curtain must open. When the actual solar radiation in the evening is less t
curtain must close again.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	5.0
2	Y	00:00	Sunset	00:30	10.0

hading curtain 1: ViP radiation close - W/m²

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	200

energy curtain 1: ViP radiation open - W/m²

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	400

Close curtain early if there is a lot of heat radiation (pyrgeometer)

When there is an 'open sky', a lot of heat is lost through radiation. The temperature of the upper part of the cr (known as 'cold heads').
Loss of heat through radiation can be measured with a pyrgeometer. This measurement can be used to close sooner when a lot of heat is being lost by radiation. The pyrgeometer can be connected via a uni-switch. Econaut does not make any allowance for the "Uni-influence".

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. If heat radiation is above 400 V must close sooner. In the daytime between sunrise and sunset, the curtain must close as soon as the outside below 5 °C.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value	Uni-influence	
						300.0	400.0
1	Y	00:00	Sunrise	00:30	5.0	0.0	
2	Y	00:00	Sunset	00:30	10.0	4.0	

Allow curtain to operate with heating temperature

For some crops, different values are set for heating temperature throughout the 24-hour day. The grower will curtain to close in response to an outside temperature as a deviation value with respect to the heating tempe

EXAMPLE:
The heating temperature is set at 20 °C in the daytime between sunrise and sunset and at 18 °C at night. Frc there is a nighttime reduction of 1 °C. Between 11.00 and 13.00 there is an increase of 1 °C. The setpoint for temperature at which the curtain closes must be set 10 °C lower than the heating temperature.

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	7.0
2	Y	00:00	Sunset	00:30	10.0

Control, Climate control, Greenhouse climate

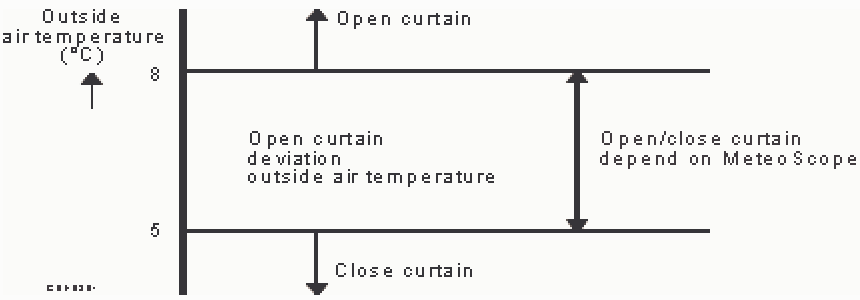
heating temperature: ViP - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Clock	00:30	21.0
2	Y	20:00	Sunrise	01:00	20.0
3	Y	00:00	Sunrise	00:30	17.0
4	Y	11:00	Clock	01:00	18.0
5	Y	13:00	Sunrise	00:30	20.0
6	Y	23:00	Clock	00:30	18.0

Close curtain with MeteoScope (weather forecast)

In practice, the energy curtain sometimes closes too late in the afternoon. The pipe temperature has already
the curtain closes. The curtain should have closed sooner to save energy.
The weather forecast will have to be retrieved in the late afternoon.

EXAMPLE:
The curtain must close at night when the outside temperature is below 5 °C. The curtain may only open agair
temperature outside is above 8 °C. In the daytime between sunrise and sunset, the curtain must be open all t
curtain will have to close sooner depending on the MeteoScope.



curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	-40.0
2	Y	00:00	Sunset	00:30	5.0

urtain 1: ViP outside temperature close MeteoScope - °(

		Start time	Relative t	Change	Value	Cloudiness - 1/8	Windspeed MeteoScop
						3 | 1	3 | 5
1	Y	00:00	Sunrise	00:30	-40.0	0.0	0.0
2	Y	00:00	Sunset	00:00	2.0	3.0	1.0

urtain 1: ViP outside temperature deviation open - °(

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	1.0
2	Y	00:00	Sunset	00:30	3.0

The program computes the average expected outside temperature, the average expected cloudiness and the
expected wind speed for the period that the curtain should be closed.
Suppose the average expected degree of cloudiness is 2/8 and the average expected wind speed is 2 m/s, tl
outside temperature close MeteoScope is 3.5 ℃. If the average expected outside temperature is below 3.5 °
outside temperature is measured at between 8 and 5 ℃, the curtain closes.

Curtain 1 MeteoScope actual

File Edit View Extra Help

		1	3	2	4
curtain 1: actual period expected windspeed	m/s	6	6	6	6
curtain 1: actual period expected cloudiness	1/8	7	7	7	7
curtain 1: actual period expected outside temperature	°C	12.1	12.1	12.1	12.1
curtain 1: actual period ViP-waarde	°C	-3.0	-40.0	-40.0	-40.0
curtain 1: energy curtain status		off	off	off	off
curtain 1: next period start time	h:m	05:26	05:26	05:26	05:26
curtain 1: next period stop time	h:m	05:26	05:26	05:26	05:26
curtain 1: next period expected windspeed	m/s	6	6	6	6
curtain 1: next period expected cloudiness	1/8	7	7	7	7
curtain 1: next period expected outside temperature	°C	12.1	12.1	12.1	12.1
curtain 1: next period ViP-waarde	°C	-3.0	-40.0	-40.0	-40.0

Press F1 for help

Information:
In this report you can read what the expected average wind speed, cloudiness and outside temperature are f period and the next period of the 'curtain 1: ViP outside temperature close MeteoScope' setting.
If these periods differ by group, the expected readings will not be the same, of course.
If the expected outside temperature is below the computed ViP value for the relevant period, the curtain will c
In the example above, both curtains are open but curtain 1 will close in the next period, at 17.30. The ViP valu curtain 2 indicates that it is not being operated for this group based on the MeteoScope, but probably on the ViP outside temperature close' setting.

Leave curtain open for a short period at night

The closing and opening of the energy curtain has a big influence on the climate in the greenhouse. For this number of times that the curtain closes and opens should be kept as few as possible.
That is why in the night period, before the curtain is actually closed, a check is carried out to see whether it w for long enough. The night period is from ½ hour before sunset to ½ hour after sunrise.

EXAMPLE:
The curtain must close at night when the temperature outside is below 10 °C. In the daytime between sunrise curtain must close as soon as the temperature outside falls below 5 °C and the actual solar radiation is less t soon as the actual solar radiation goes above 400 W/m^2 the curtain must open despite the fact that it is cold
Once the curtain has closed as an energy curtain, it remains closed for at least 30 minutes.
The curtain may only close at night for outside temperature, if it is expected to remain closed for at least 4 ho

curtain 1: ViP outside temperature close - °C

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	5.0
2	Y	00:00	Sunset	00:30	10.0

shading curtain 1: ViP radiation close - W/m²

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	200

energy curtain 1: ViP radiation open - W/m²					
		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:30	400

curtain 1: minimum time closedcurtain 1: minimum time closed	00:30
curtain 1: minimum desired closing period nightcurtain 1: minimum desired closing period night	04:00

Suppose that sunrise is at 06:15. At 05.00(in the night period) the outside temperature is below 10 °C. Norma would then be closed. But at that time an estimate will be made of how high the outside temperature and sola at 09.00 (4 hours later) .
If the estimated outside temperature for 09.00 is high enough, the curtain will not close at 05.00.

3.Shading curtain

Too much sunlight can damage the plants. That is why it is a good idea to shade them. This reduces the sola reaches the plants.

Examples

Close curtain based on sunlight

The most simple way to close the shading curtain is based on sunlight.

EXAMPLE:
Close the shading curtain when the solar radiation is above 600 W/m^2. When the radiation is below 500 W/m open again.

shading curtain 1: ViP radiation close - W/m²					
		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:00	600

shading curtain 1: ViP radiation deviation open - W/m					
		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:00	-100

Close curtain quickly for a young crop

With a young crop it is desirable that the curtain closes as soon as the sun shines through strongly. This is to young plants being scorched.

EXAMPLE:
The shading curtain must close quickly when the sun comes through.

curtain 1: radiation type of delaycurtain 1: radiation type of delay	rapid

Type of delay will normally be on average.

Prevent oscillation of curtain

When the weather is changeable, the curtain can start to oscillate. For this reason the solar radiation must re
for a number of minutes before the program decides that the curtain can open again.

EXAMPLE:
Close the shading curtain when the solar radiation is above 600 W/m^2. If the radiation remains below 450 W/
10 minutes, the curtain can open again.

curtain 1: radiation delay time opencurtain 1: radiation delay time open	10

Suppose the weather is changeable. The radiation has just risen above 600 W/m^2 and another cloud passes
sun. The radiation drops within 5 minutes to 400 W/m^2. A little later the cloud has gone again and the radiatic
W/m^2.
Normally the shading curtain would first have closed, then opened and then closed again. This is prevented t
minimum time and the curtain stays properly shut after it first closes`.

Close curtain based on humidity deficit

If the humidity deficit in the greenhouse is high, the plants will transpire a lot. If the plants have to transpire to
become stressed.
Closing the shading curtain allows less moisture to disappear because the moist air cannot escape directly tl
There is less radiation coming in from the sun so the temperature will increase less quickly. There is also less
up from the ground.
Because of the high humidity deficit, the plants will continue to transpire a lot. The humidity deficit decreases.
the plants will also cause the temperature to fall. Whether this works in practice or not depends on the transp
the plants.

EXAMPLE:
The basic value for humidity deficit is 3.5 g/m^3. If the humidity deficit increases above 6 g/m^3 the shading cur
closed. If the humidity deficit falls below 4.5 g/m^3 the curtain can open again.

:hading curtain 1: ViP radiation close - W/m²

		Start time	Relative t	Change	Value	Deviation HD - g/m³	
						1.0	2.5
1	Y	00:00	Sunrise	00:00	600	-600	

:hading curtain 1: ViP radiation deviation open - W/m

		Start time	Relative t	Change	Value
1	Y	00:00	Sunrise	00:00	-100

Control, Climate control, Greenhouse climate

humidity deficit: ViPhumidity deficit: ViP	3.5

Close curtain based on Agronaut (water uptake)

When water uptake is high, this means that the plants are transpiring a lot. If the plants have to transpire too
become stressed.
Closing the shading curtain allows less moisture to disappear because the moist air cannot escape directly tl
There is less radiation coming in from the sun so the temperature will increase less quickly. There is also less
up from the ground.
Transpiration by the plants will cause the temperature to fall. Whether this works in practice or not depends o
capacity of the plants.

EXAMPLE:
The basic value for maximum water uptake is 0.7 l/m^2 per h. When water uptake is higher than 0.8 l/m^2 per h
curtain must be closed. If water uptake falls below 0.6 l/m^2 per h and there is less than 70% solar radiation, tl
can be opened again.

curtain 1: Agronaut uptake deviation closecurtain 1: Agronaut uptake deviation close	0.10
curtain 1: Agronaut uptake deviation open/closecurtain 1: Agronaut uptake deviation open/close	-0.10
curtain 1: Agronaut radiation opencurtain 1: Agronaut radiation open	70
curtain 1: Agronaut computed radiation opencurtain 1: Agronaut computed radiation open	

Control, Climate control, Greenhouse climate

Agronaut maximum water uptake: ViPAgronaut maximum water uptake: ViP	0.70

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4. Blackout curtain

Blackout curtains are used to give the plants a specified length of night period. When the weather is fine or it greenhouse, it has to be possible to postpone the use of the blackout curtain by a maximum set time. This mu change in the length of the night.

Examples

Close curtain at night at a set time for a set night length

The simplest way to use the blackout curtain is to close the curtain at the same time each evening for a set le

EXAMPLE:
The curtain must close each evening at 17.00. The curtain must remain closed for 13 hours.
The running time of the curtain is 8 minutes. The heating must be turned down 10 minutes before the curtain it will get too warm underneath the curtain.

curtain 1: start time closecurtain 1: curtain 1: start time close start time close	17:00
curtain 1: time closecurtain 1: time close	13:00

Control, Climate control, Curtains, Curtain 1, General

curtain 1: ViP delay time closecurtain 1: ViP delay time close	10

The curtain gets the signal to close at 17.00. The curtain closes by 5% (if you are working underneath the cur that the curtain is going to close). There is then a 10-minute wait to allow the heating to be lowered. After that minutes for the curtain to close. This means that the curtain will be fully closed at 17.18. From that time the cu closed for 13 hours.
At 06.18 the curtain will open again (in steps as set).

Postpone closing of blackout curtain based on greenhouse temperature

If the greenhouse temperature is high when it is time for the blackout curtain to close, this can have an adver climate in the greenhouse. The plants will transpire a lot so that the humidity deficit in the bay gets too low. B is closed, ventilation does not remove moisture and heat very effectively.
Postponing the closing of the blackout curtain when the greenhouse temperature is high allows a lot of heat, humidity, to be discharged by ventilation.

EXAMPLE:

The curtain has to close each evening at 17.00. The curtain must remain closed for 13 hours.
If the greenhouse temperature is above 25 °C, the closing of the blackout curtain must be postponed by up tc 30 minutes.

curtain 1: start time closecurtain 1: start time close	17:00
curtain 1: time closecurtain 1: time close	13:00
curtain 1: maximum delay time temperature or radiationcurtain 1: maximum delay time temperature or radiation	00:30
curtain 1: greenhouse temperature close postponecurtain 1: greenhouse temperature close postpone	25.0

The curtain gets the signal to close at 17.00. If the greenhouse temperature is above 25 °C, the curtain has tc maximum of 30 minutes. The curtain must close after 30 minutes. If the greenhouse temperature falls below : delay time, the remaining delay time will be ignored.

Postpone closing of blackout curtain based on sunlight

Sunlight is important for plant growth and is cheaper than assimilation lighting. If it is not certain that the next then it is very worthwhile postponing blackout the evening before. This way the plants benefit from the extra s

EXAMPLE:
The curtain has to close each evening at 17.00. The curtain must remain closed for 13 hours. If the solar radi W/m^2, the closing of the blackout curtain should be postponed by up to a maximum of 30 minutes.

curtain 1: start time closecurtain 1: start time close	17:00
curtain 1: time closecurtain 1: time close	13:00
curtain 1: maximum delay time temperature or radiationcurtain 1: maximum delay time temperature or radiation	00:30
curtain 1: radiation threshold close postponecurtain 1: radiation threshold close postpone	500

The curtain gets the signal to close at 17.00. If the solar radiation is above 500 W/m^2, the curtain has to wait maximum of 30 minutes. The curtain must close after 30 minutes. If the radiation falls below 500 W/m^2 within the remaining delay time will be ignored.

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uni-influence: connected uni-switch curtains
Various ViP settings have a so-called uni-influence. The ViP setting can therefore be influenced by a uni-swit This setting enables you to connect the control unit to a uni-switch via the map.

Such a connection can be made with the following control units among others:

- greenhouse heating, for a uni-influence on the minimum pipe temperature or on the heating temperatu in combination with Econaut)
- ventilation, for a uni-influence on the humidity vent position or on the ventilation temperature
- assimilation lighting, for a uni-influence to switch the lighting on or off
- curtains, for a uni-influence on the energy curtain, the shading curtain or the crack in the curtain
- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

Curtains - General

curtain 1: type of control
Options:

Detector closed	This option enables the curtain to be closed if the detector is active. Ideal for closing the outside-wall curtain when lighting or sprinkling.

	The crack can be set.
Open	This option enables the curtain to be set continuously open. Opening occurs in steps (if set).
Closed with crack	This option enables the curtain to be set continuously closed. The curtain closes after 3 minutes. The crack can be set.
Auto shading	This option enables you to specify whether the curtain has to close as a shading curtain.
Auto energy	This option enables you to specify whether the curtain has to close as an energy curtain.
Auto blackout	This option enables you to specify whether the curtain has to close as a blackout curtain.

curtain 1: ViP crack RH opening
curtain 1: ViP crack greenhouse temperature opening
Two cracks are possible for a better climate. One crack for RH and one crack for greenhouse temperature.

Adjustable influences for RH crack:

Radiation control	%
Outside temperature	℃
RH deviation	%
Humidity deficit deviation	g/m^3
Radiation	W/m^2
DeviationAgronautL	$l/m^2.h$
DeviationAgronautK	$l/m^2.h$
Wind speed	m/s

Adjustable influences for greenhouse temperature crack:

Radiation control	%
Outside temperature	℃
Greenhouse temperature	℃
Heating temp. deviation	℃
Vent. temp. deviation	℃
Radiation	W/m^2
DeviationAgronautL	$l/m^2.h$
DeviationAgronautK	$l/m^2.h$
Wind speed	m/s

curtain 1: crack status
This setting indicates the curtain crack status.

- **Humidity crack set**
  The humidity crack is set.
- **Spraying**
  The automatic spraying program is active.
- **Counter closed**
  The curtain is closed because of the counter.
- **No crack clock**
  No crack set outside the set times.
- **No crack wind**
  No crack because the wind speed is too high.
- **No crack RH**
  No crack because the RH is too low.

- **Crack greenhouse temperature**
  Crack because the greenhouse temperature is too high.
- **Crack outside temperature**
  Crack because the outside temperature is high enough.

curtain 1: crack spraying opening
The curtain can be closed by means of Counter curtain closed or the automatic spraying program. The crack percent (0% = curtain fully closed; 100% = curtain fully open).

curtain 1: crack close wind speed
The crack is removed at a user-defined wind speed because there is less necessity for a crack at higher winc

EXAMPLE:
The crack in the curtain must close at 10 m/s (approx. force 5).

curtain 1: crack close wind speed	10

curtain 1: crack minimum interval change
Once a crack has been set or removed, this minimum interval applies before the crack can be changed agair to be changed because of the wind speed, it is changed immediately.

EXAMPLE:
The crack in the curtain may not be changed more frequently than once every 5 minutes.

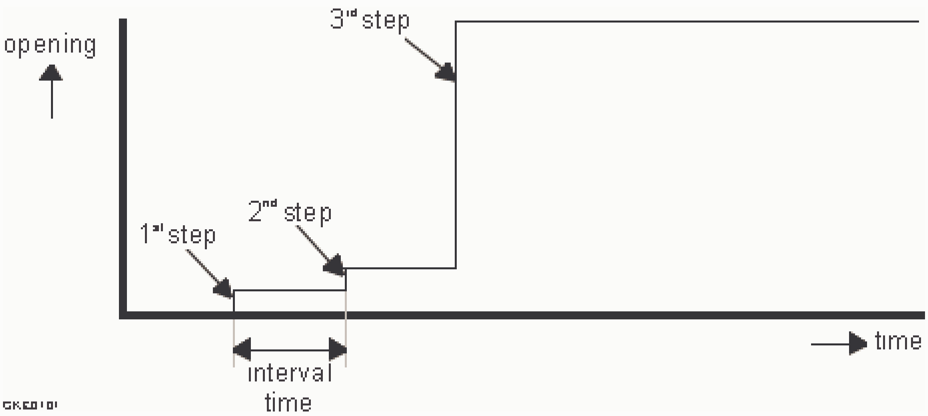
curtain 1: crack minimum interval change	00:05

curtain 1: hysteresis crack
curtain 1: crack counter interval
If the interval has elapsed, the crack changes if the deviation is greater than the hysteresis.

curtain 1: open/close counter interval
The interval is used to prevent the curtain from being repeatedly switched on and off.

curtain 1: open number of steps
curtain 1: ViP interval open
curtain 1: opening per step
These settings apply to the opening of the curtain.

- The curtain is opened a crack (opening per step).
- The curtain then waits (interval).
- This is repeated a number of times (number of steps).
- The curtain then opens fully.



If there is already a crack on opening, the number of steps is reduced by 1.
One hour before the curtain opens, the heating temperature can be temporarily increased (adjustable) to prev coldness.

EXAMPLE:
Before the curtain is fully open, 3 steps each of 5% must first be set with an interval of 5 minutes.

curtain 1: open number of steps	3
curtain 1: ViP interval open	5
curtain 1: opening per step	5.0

curtain 1: wind speed curtain direct open
If the wind speed is higher than the value set here, the curtain is fully opened directly to prevent possible stor
curtain by flying glass.

EXAMPLE:
The curtain has to be opened directly at 18 m/s (approx. force 9).

curtain 1: wind speed curtain direct open	18

curtain 1: measurement deviation curtain position alarm
curtain 1: measurement delay time alarm
If the computed and measured curtain positions differ (curtain is manually operated), an alarm can be trigger
time has elapsed.

EXAMPLE:
If the curtain position deviates by more than 5% for longer than 10 minutes, an alarm must be triggered.

curtain 1: measurement deviation curtain position alarm	5.0
curtain 1: measurement delay time alarm	00:10

curtain 1: measurement counter delay time alarm
If the curtain position deviates too much, the curtain actuation is activated again.
If the curtain position still deviates too much after the delay time, an alarm is triggered.

curtain 1: counter closed with crack spraying
This setting can be used to close the curtain temporarily with a crack.

curtain 1: counter open
This setting can be used to open the curtain temporarily.
The curtain opens. If set, the curtain opens in a number of steps.

curtain 1: running time
Number of minutes required by the curtain to open or close FULLY.
When the curtain is opening or closing fully, the running time is automatically increased by 10% to ensure tha
fully open or closed.

curtain 1: counter actuation time
Indicates how many more seconds the curtain still has to run.

curtain 1: factor pipe
This setting determines the reduction in the pipe temperature for the pre-control of the heating with the curtai
A setting of 75 means 25% lower pre-control, i.e. LOWER pipe temperature.
The smaller the insulation value, the greater this factor.
Set this factor to a high figure (between 90 and 100) for roller curtains. If 1 roller curtain is closed, the heating
controlled at all, while with 4 closed roller curtains the heating is pre-controlled to the correct value.
If outside-wall curtains do not influence the heating, the pipe factor can be set to 100.

Example 1:
A group contains: 4 roller curtains under the greenhouse roof (curtains 1 to 4) and 1 outside-wall curtain (curt
curtains are normal shading curtains (LS10).
Settings:
Curtain 1: pipe factor................................. 90

Curtain 2: pipe factor................................. 90
Curtain 3: pipe factor................................. 90
Curtain 4: pipe factor................................. 90
Curtain 5: pipe factor.................................100
If all 4 roller curtains are closed, they form a curtain with a pipe factor of 90% x 90% x 90% x 90% = 65%.

Example 2:
A group contains 2 normal, horizontal curtains. Both curtains insulate well.
Settings:
Curtain 1: pipe factor................................. 60
Curtain 2: pipe factor................................. 80
If the grower has two normally configured curtains, the pipe factor of the second curtain has to be set at betw

Note:
Heating problems during the day can be caused by an incorrect value in **curtain: factor pipe**. For exa
greenhouse temperature remains too low during the day. The factor then has to be lowered (lower fact
with curtain closed and therefore higher pipe factor, leading to a higher pipe temperature being achiev

curtain 1: influence control switch off
This setting enables the influence of the curtain on controls to be switched off.

heating off	This switches off the process of turning the heating down when the curtain is closed and heating up when the curtain is opened. Always switch off the influence on the heating with an outside-wall curtain.
ventilation off	This enables the 'lee side vent position maximum curtain: ViP' setting to be cancelled.
actuation correction off	The curtain actuation is not corrected on the basis of the curtain position measurement device.

curtain 1: simulation light permeability
This setting is used by the Agronaut program and indicates the light permeability of the curtain.
This depends on the curtain material. A number of known values are given in the table below.

Material	Licht permeability [%]	Material	Licht permeability [%]
Perithem blackout	0	EAL-55	39
EV-2 super	0,1	ES-super	40
LS-1	1	Isotex-50 alu	41
EV-2 super	1	Isotex-55	44
Isotex-100	1	LS-14	45
Giesverpak alu	6	Isotex-20	51
LS-11	2	Verzi-white	55
Valvac	2	Isotex-45	68
TO-black	2	Ls10	85
Tyvec-silver	2	EH-super	68
Tyvec-gold	2	Giesverpak clear	68
Verzu-alu	7	EH-P	68 (*)
TD-alu	15	Ls10-plus	71
LS-17	19	LS10-ultima	71 (*)
LS-16	23	Ls10-ultra	71 (*)
EAL-77	23	Phormilux	71 (*)
Peritherm optic	26	Anticondensing droplet foil dry	75-83
LS-56	27	Sidac ac 85	78
EAL-66	28	Normal extra clear foil dry	83
Td-white	33	Opac-86E	83

LS-16	35	Flexfilm	83
Gieverpak white	38	Hyklac	83

(*) = estimated

curtain 1: influence snow
Options:

Curtain open	The curtain opens if it is snowing
Curtain closed	The curtain closes if it is snowing
No influence	The curtain is not influenced if it is snowing

curtain 1: time influence snow delay
Once the snow has melted, the snow indication stilll remains active for this set time. As a result the curtain sti position set during "Snow" for this period. Control Climate, Curtains, Curtain General - Settings
curtain 1: time influence snow delay
Once the snow has melted, the snow indication stilll remains active for this set time. As a result the curtain sti position set during "Snow" for this period.

curtain 1: counter time influence snow delay
The relevant counter.

curtain 1: open/close status
This setting indicates what is currently happening with the curtain.

- **Curtain open**
  The curtain is open.
- **Curtain closed**
  The curtain is closed.
- **Curtain opening**
  The curtain is opening.
- **Curtain closing**
  The curtain is closing.
- **Crack opening**
  The crack is opening.
- **Crack closing**
  The crack is closing.
- **Open: wind speed**
- **Detector closed**
  The curtain is closed because of the detector.
- **Counter open**
  The curtain is open because of the counter.
- **Counter closed**
  The curtain is closed because of the counter.
- **Phase open**
  The curtain is open because of the phase.
- **Phase closed**
  The curtain is closed because of the phase.
- **Shading**
  The curtain is operating as a shading curtain.
- **Energy**
  The curtain is operating as an energy curtain.
- **Blackout**
  The curtain is operating as a blackout curtain.
- **Agronaut**
  The curtain is closed because of the Agronaut.

curtain 1: actuations

This setting indicates whether the computer is actuating the curtain.

- **Curtain closed**
  The curtain is closing.
- **Curtain open**
  The curtain is opening.

curtain 1: closed detection
curtain 1: closed gross detection
These settings show the detector status.

- 100 = curtain detector active, therefore curtain closed
- 0 = curtain detector inactive

curtain 1: measurement
This setting is for registration purposes.

curtain 1: measurement
curtain 1: gross measurement
curtain 1: gross measurement input 00 %
curtain 1: gross measurement input 100 %
Curtain position measurements.

Curtains - Energy

curtain 1: ViP outside temperature close
The energy curtain is closed if the outside temperature is lower than this setting.

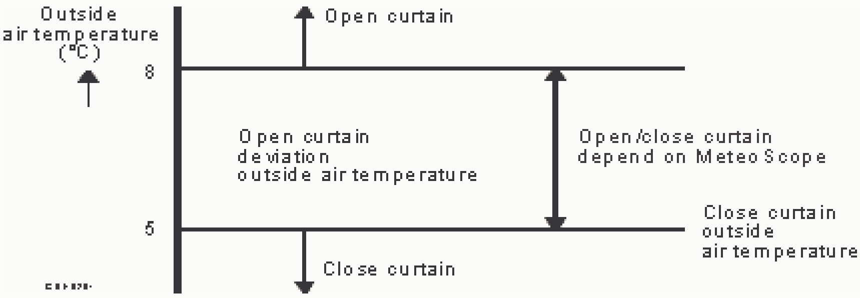
Adjustable influences:

Radiation control	%
Radiation	W/m^2
Wind speed	m/s
Rain	Y/N
Uni-influence	
Wind speed Warm	m/s
Wind speed Cold	m/s
Wind speed Humid	m/s
Wind speed Dry	m/s
Heating temp.	℃
Computed Pipe Circuit 1	℃
Computed Pipe Circuit 2	℃
Computed Pipe Circuit 3	℃

curtain 1: ViP outside temperature close MeteoScope
The energy curtain is closed if the anticipated outside temperature is lower than this setting and the outside te
too high.

Adjustable influences:

Cloudiness	1/8
Wind sp. MeteoScope	m/s



curtain 1: ViP outside temperature deviation open
The energy curtain is closed if the outside temperature is lower than the 'curtain 1: ViP outside temperature c
outside temperature rises to the set deviation above the 'curtain 1: ViP outside temperature close' setting, the
again.

Adjustable influences:

Radiation control	%
Radiation	W/m^2

energy curtain 1: ViP radiation close
The energy curtain closes if the measured radiation is lower than this setting AND the outside temperature is

Adjustable influences:
Wind speed m/s

energy curtain 1: ViP radiation open
The energy curtain opens if the measured radiation is higher than this setting (irrespective of the outside tem

Adjustable influences:
Wind speed m/s

EXAMPLE:
The energy curtain has to close if the outside temperature is low enough and the radiation is lower than 200 W
open if the radiation is higher than 400 W/m^2.

energy curtain 1: ViP radiation close	200
energy curtain 1: ViP radiation open	400

curtain 1: ViP delay time close
Before the curtain closes, the system waits for this set time. This time gives the heating the chance to adjust
falls).

Adjustable influences:

Radiation control	%
Outside temperature	℃
Wind speed	m/s
Rain	Y/N
Heating temp. deviation	℃

curtain 1: minimum time closed
When the curtain closes, it remains closed for at least this set time.

EXAMPLE:
When the energy curtain closes, it must remain closed for at least 30 minutes.

curtain 1: minimum time closed.	00:30

curtain 1: minimum desired closing period night
The energy curtain is closed during the night if it is anticipated that the curtain will remain closed for at least tl

EXAMPLE:
The energy curtain may close during the night if it remains closed for longer than 4 hours.

curtain 1: minimum desired closing period night	04:00

Control Climate, Curtains, Energy curtain - Settings
curtain 1: minimum time closed
When the curtain closes, it remains closed for at least this set time.

curtain 1: counter time closed
The relevant counter.

curtain 1: energy curtain status

- **Closed outside temp/MeteoScope**
  Closed because of ViP outside temperature close AND because of Outside temperature MeteoScope
- **Open energy**
  Set as energy curtain, Outside temperature and Outside temperature MeteoScope too high to close.
- **Open snow**
  Open because of snow.
- **Open storm**
  Open because of a storm.
- **Open minimum time**
  Open, remaining closing period is too short.
- **Closed minimum time**
  Remains closed until end of minimum time closed.
- **Open counter**
  Opened with counter; curtain open.
- **Closed outside temperature**
  Closed because of ViP outside temperature close.
- **Closed MeteoScope**
  Closed because of ViP outside temperature MeteoScope close.
- **Open radiation**
  Outside temperature or Outside temperature MeteoScope are low enough to close, though open beca radiation.
- **Off**
  Curtain not in use because of energy.

Curtains - Shading

shading curtain 1: ViP radiation close
shading curtain 1: ViP radiation deviation open
The shading curtain is closed if the measured radiation is higher than Radiation close. The curtain is opened radiation is lower than Radiation close minus Radiation deviation open.

Adjustable influences:

Rain	Y/N
Deviation HD	g/m^3

curtain 1: radiation delay time open
In order to prevent the shading curtain opening too quickly in changeable weather, the delayed radiation mus below the set radiation threshold for the set number of minutes before the curtain is opened.

EXAMPLE:
The shading curtain must close if the radiation is higher than 500 W/m^2. It must open again if the radiation is
W/m^2 for 10 minutes continuously.

shading curtain 1: ViP radiation close	500
shading curtain 1: ViP radiation deviation open	-100
curtain 1: radiation delay time open	00:10

curtain 1: shading type of start time
curtain 1: shading start time
curtain 1: shading type of stop time
curtain 1: shading stop time
This setting is used to specify the period in which the curtain may be closed as a shading curtain.

curtain 1: radiation delay time open
In order to prevent the shading curtain opening too quickly in changeable weather, the delayed radiation mus
below the set radiation threshold for the set number of minutes before the curtain is opened.

curtain 1: counter number or minutes below radiation threshold
The relevant counter.

curtain 1: radiation type of delay
This setting only applies to the shading curtain and can be set to slow, average or fast.

Slow	The radiation is increased or decreased with a smooth delay (10 W/m^2).
Average	The radiation is increased quickly (maximum average radiation in last 10 minutes) and with a smooth delay (10 W/m^2).
Fast	The radiation is increased without delay and decreased with a smooth delay (10 W/m^2).

You can determine which option - slow, average or fast - is right for you by creating a graph of:

- curtain: position
- radiation: measurement [W/m2]
- radiation: type of delay average (shading curtain) [W/m2]
- radiation: type of delay fast (shading curtain) [W/m2]

You can find the three radiation curves in the Control General - Meteo folder. The "radiation: measurement" s
the "delay slow" option.

curtain 1: Agronaut uptake deviation close
curtain 1: Agronaut uptake deviation open/close
curtain 1: Agronaut radiation open
curtain 1: Agronaut computed radiation open
The curtain can be closed if the water uptake is too high. It can be reopened if the water uptake is too low AN
low enough.

This setting only applies to the shading curtain and can be set to slow, average or fast.

Slow	The radiation is increased or decreased with a smooth delay (10 W/m^2).
Average	The radiation is increased quickly (maximum average radiation in last 10 minutes) and with a smoo W/m^2).
Fast	The radiation is increased without delay and decreased with a smooth delay (10 W/m^2).

EXAMPLE:

The curtain has to close if the water uptake is higher than 0.8 $l/m^2.h$. It may reopen if the water uptake is lowe
and the current radiation is lower than 70%.

curtain 1: Agronaut uptake deviation close	0.00
curtain 1: Agronaut uptake deviation open/close	-0.20
curtain 1: Agronaut radiation open	70

Greenhouse climate:

Agronaut maximum water uptake: ViP	0.80

Curtains - Blackout

curtain 1: start time close
The time when the curtain has to close.

curtain 1: time close
The period that the curtain has to remain closed.

curtain 1: maximum delay time temperature or radiation
The closure time can be postponed for this set time at the maximum based on the greenhouse temperature c

curtain 1: greenhouse temperature close postpone
The closure time can be postponed if the greenhouse temperature is higher than this setting.

curtain 1: radiation threshold close postpone
The closure time can be postponed if the radiation is higher than this setting.

curtain 1: maximum delay time temperature or radiation
The closure time can be postponed for this set time at the maximum based on the greenhouse temperature c

curtain 1: counter number or minutes to close postponed
The relevant counter.

Econaut - Curtains

curtain 1 Econaut: transmission radiation
The percentage of the total radiation that is transmitted by the curtain. In other words, this is the light permea
material. Consult the table of curtain types for the correct value.

curtain 1 Econaut: reflection radiation
The percentage of the total radiation that is reflected by the curtain. Consult the table of curtain types for the
The absorption is computed by the program. The sum of transmission, reflection and absorption for a curtain
100%.

curtain 1 Econaut: transmission heat
The percentage of the long-wave heat radiation that is transmitted by the curtain. A low transmission therefor
energy savings. Consult the table of curtain types for the correct value.

curtain 1 Econaut: reflection heat
The percentage of the long-wave heat radiation that is reflected by the curtain. A high reflection therefore me
savings. Consult the table of curtain types for the correct value.
The absorption is computed by the program. The sum of transmission, reflection and absorption for a curtain
100%.

curtain 1 Econaut: air leak
The amount of air which the curtain lets through. This factor indicates the curtain's "openness". Consult the ta
types for the correct value. If the air leak is not recorded in that table, the table below can be used.

Type of curtain	Air leak
Densely woven	0.001
Foil	0.000
10% open	0.010
20% open	0.020
30% open (or more)	0.030

curtain 1 Econaut: covering area
Enter 100 for a horizontal curtain running from gutter to gutter.
Enter 17 for 6 curtains running the length of the glass.

curtain 1 Econaut: sequence curtain
Enter the curtain sequence here. The top curtain is sequence 1, the next curtain is sequence 2 etc.
Enter 0 for outside-wall curtains.

Table of curtain types

Curtain type	Light reflection	Light transmission	Heat reflection	Heat transmission	Air
SLS-10	10	85	25	36	0.00
SLS-10 Ultra	10	87	19	66	0.00
SLS-14	31	60	28	24	0.00
SLS-15	42	50	29	18	0.00
SLS-16	53	35	30	12	0.00
SLS-17	59	25	31	9	0.00
SLS-18	62	20	31	7	0.00
SLS-Obsc A+B	75	0	32	1	0.00
ULS-10	10	80	8	80	0.00
ULS-15	36	50	17	45	0.00
ULS-16	49	35	23	32	0.00
ULS-17	53	25	25	28	0.00
ULS-18	59	20	27	23	0.00
ULS-15F	31	50	16	50	0.03
ULS-16F	46	35	21	35	0.03
ULS-17F	50	25	24	25	0.03
ULS-18F	57	20	26	20	0.02
ILS-10 Ultra	10	80	8	80	0.00
ILS-50 Ultra	43	50	17	45	0.00
ILS-60 Ultra	53	35	23	32	0.00
ILS-70 Ultra	59	25	25	28	0.00
ILS-80 Ultra	62	20	27	23	0.00
LS-11	75	0	32	1	0.00
LS-16	53	35	27	14	0.00
TD-55		54	15	22	
TD-56		47	15	11	
TD-85		50	13	13	
TD-1486/209		43	20	5	
Verzuu GPA white	10	50	10	12	
Verzuu 1Z4W	8	50	10	12	

Verzuu 1Z3W	8	51	9	12	
Verzuu 1Z2W	7	50	11	11	
Verzuu 1Z1W	6	51	10	11	
Verzuu 2Z1W	4	51	11	11	
Verzuu 3Z1W	3	51	9	10	
Verzuu 4Z1W	2	50	11	10	
Verzuu GP weft Z		52	8	12	
Verzuu GPV		39	25	3	
Verzuu GPA opged.		22	13	3	
Verzuu GPA strips		35	33	4	
Ph EH-S T	10	85	8	80	
Ph EH-S T/BD	10	83	10	76	
Ph EV-1	2	3	11	9	
Ph EV-2		41	22	3	
Ph E-AL P55	43	48	17	45	
Ph E-AL P66	47	47	23	32	
Ph E-AL P77	53	43	25	28	
Ph E-AL P98	2	2	22	1	
Ph EV-AL	75	0	17	1	
Ph GEV-AL-White	75	0	57	2	

Where figures for light reflection are missing, this is because they are not known.
In such cases the light reflection can be calculated using the following equation:

Light reflection = % aluminium area x 0.75 + % white area (transparent) x 0.10

EXAMPLE:
40% white, 60% aluminium
light reflection = 60 x 0.75 + 40 x 0.10 = 49%

Econaut

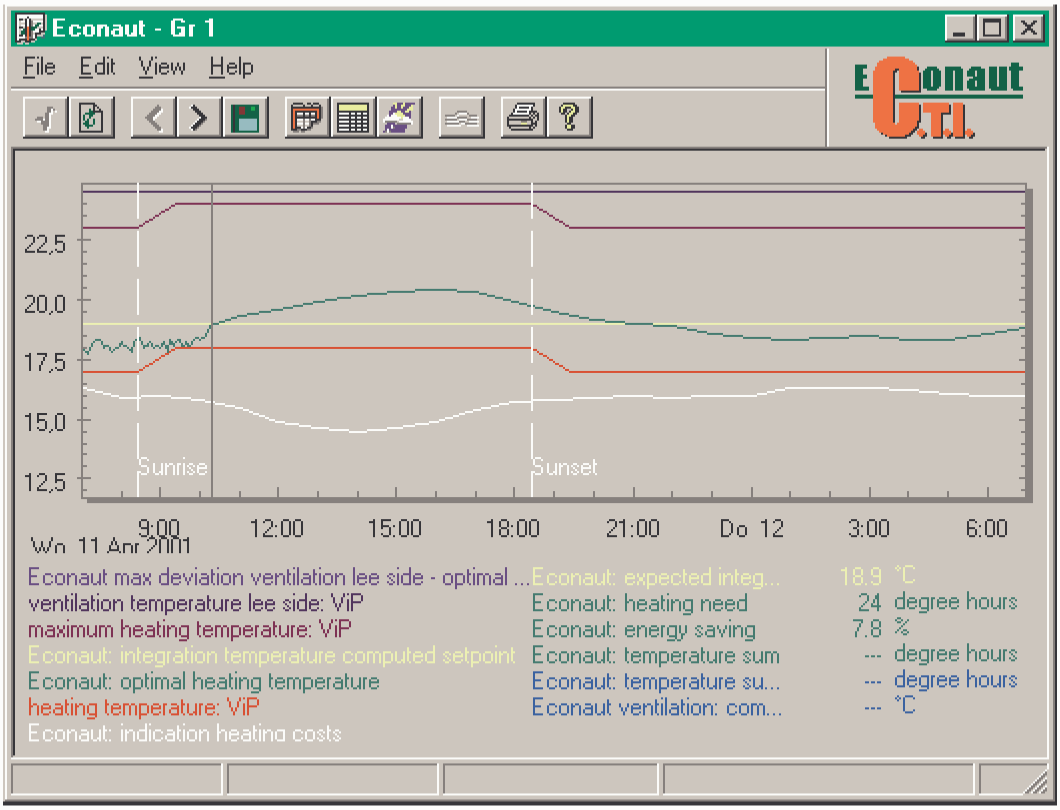
The fundamental criterion for Econaut is that the control system is based on a 24 hours temperature. This me as economical as possible.

Use is made of the weather forecast for this. The weather forecast is automatically downloaded every day at and Econaut computes the heating strategy for the current day.
Every 30 minutes and immediately after any change in Econaut settings the system checks whether this heat needs to be adapted on the basis of current data.

However, you determine for yourself the minimum and maximum thresholds between which Econaut may wo Econaut tries to implement the 24 hours temperature as economically as possible between the minimum and heating temperatures.
A large gap between the minimum and maximum heating temperatures means a great deal of room for manc and therefore a large energy saving.

The thresholds for the minimum and maximum heating temperatures are different for each crop.
Since you set both lines using ViP settings, you have precise control over the periods in which Econaut has r for manoeuvre (in control terms).

Econaut's initial screen is termed the "saving screen".



In this screen you can see a ***yellow line***, the integration temperature (setpoint for the 24 hours temperature). The ***red line*** is the heating temperature (minimum heating line). The ***purple line*** is the maximum heating tem The ***green line***, the optimal heating temperature, consists of 2 parts. The vertical ***grey line*** indicates the actu of the grey line is the measured (actually achieved) greenhouse temperature. To the right of the grey line is tl greenhouse temperature.

The ***blue line*** is the ventilation temperature on the lee side.
The ***white line*** indicates the heating costs. The higher this line, the more expensive it is to heat. Econaut con heating indication taking account of the weather forecast, curtain, lighting, minimum and maximum pipe temp can also see the expected minimum 24 hours temperature at the bottom right of the screen. This is the setpo hours temperature, including the radiation sum increase.

The heating need is shown in degree-hours. If you have to increase the temperature by 4 degrees for 12 hou degrees for the rest of the 24 hours, the heating need is 72 degree-hours.

The saving is given as a percentage. If you view this saving in relation to the heating need, you can clearly se the savings are made.
A high heating need and a high percentage saving results in major savings; however, a low heating need anc percentage saving yields a low saving in real terms.

Switching Econaut off temporarily

If you wish to switch Econaut off temporarily (because, for example, it is the start of summer and little or no h required), this can be done by setting the maximum heating temperature and the integration temperature low minimum heating temperature.
Econaut will then regulate the heating in accordance with the set minimum heating temperature.
However, ventilation via the deviation setting remains active.

Econaut - General

Econaut: start tasks manually
You can choose from:

validate settings	Monitoring greenhouse properties and group connections. In the event of an incorrect message is displayed in the alarm overview.
carry out all calculations	Initial calculations, such as after downloading a new weather forecast.

Econaut: switch off
This setting enables Econaut to be switched off by group. This is normally done if the group is an outside-wal group is controlling the heating in the packhouse.
The heating operates in accordance with the heating temperature (classic method).

Switch Econaut off temporarily
If you wish to switch Econaut off temporarily (because, for example, it is the start of summer and little or no h required), this can be done by setting the maximum heating temperature and the integration temperature low minimum heating temperature.
Econaut will then regulate the heating in accordance with the set minimum heating temperature.
However, ventilation via the deviation setting remains active.

Econaut: time 24-hours evaluation
It is possible to spread integration over several days with the Econaut CTI. The evaluation of the completed 2 be arranged for any full hour between 04:00 and 09:00. Any change in this evaluation hour is carried out at 1 integration period must be set for each Econaut group, while the evaluation time applies to all the groups. Ec

Group

Econaut DIF: first hour day
This setting enables you to set the time at which the first hour of the day starts according to the Econaut cont average daytime temperature is computed over the period from this set time until "Econaut DIF: first hour nig

Econaut DIF: first hour night
This setting enables you to set the time at which the first hour of the night starts according to the Econaut cor average nighttime temperature is computed over the period from this set time until "Econaut DIF: first hour da

Econaut DIF: minimal deviation day - night
Use this setting to specify the minimum difference between the average daytime and nighttime temperatures.
If the value is positive, the daytime figure is higher than the nighttime figure.
If the value is negative, the daytime figure is lower than the nighttime figure.

Econaut DIF: controlling DIF
This setting enables you to switch the DIF control system on or off.

The DIF control system can be set on both the one-day and the multi-day version of Econaut.

ventilation temperature lee side: ViP
Econaut ventilation:
Econaut max deviation ventilation lee side - optimal temp: ViP
Econaut max deviation ventilation wind side - optimal temp: ViP
Two forms of ventilation are possible on the lee and wind sides:

- via the ventilation temperature
  The ventilation temperature must then be set higher than the 'maximum heating temperature: ViP' sett
- via a deviation from the optimal heating temperature
  This setting is often used if an "active climate" is required.

A mode can be switched off by setting a high value for the relevant setting.

If you wish to switch Econaut off temporarily (because, for example, it is the start of summer and little or no h required), this can be done by setting the maximum heating temperature and the integration temperature low minimum heating temperature.
Econaut will then regulate the heating in accordance with the set minimum heating temperature.

However, ventilation via the deviation setting remains active.

Econaut ventilation: temperature sum start
Econaut ventilation: temperature sum maximum
Econaut ventilation: maximal decrease
The temperature sum indicates by how much it has been too hot or too cold in the greenhouse. This sum is e
degree-hours.
The accumulated temperature sum can be reduced by reducing the ventilation temperature. This reduction is
computed maximum heating temperature + 0.5℃ (inclu ding influences). This is termed active ventilation.

The currently accumulated temperature sum is computed every 5 minutes by comparing the measured green
temperature with the computed integration temperature.
The decrease in the ventilation temperature starts with the original value and is at its maximum at the final va
Econaut ventilation: maximum decrease setting it is only possible to enter a positive figure.

EXAMPLE:

Econaut ventilation: temperature sum start	20
Econaut ventilation: temperature sum maximum	40
Econaut ventilation: maximal decrease	2

It is 6 degrees too hot in the greenhouse for 5 hours during the day over a 24-hour period in the summer.
The accumulated temperature sum is 30 degree-hours.
The decrease in the ventilation line is then 1℃.

You are recommended to set a larger margin in degree-hours so that you can achieve a greater energy savir
of the order of several hundred degree-hours. The acceptable margin in degree-hours varies for each crop. F
your horticultural adviser for more information.

Decreasing the ventilation temperature only works in the multi-day version of Econaut. The integration
be set to more than 1 day.

Econaut: connected assimilation lighting
Econaut: connected soil heating
Econaut: connected greenhouse
Econaut: connected circuit 1
Econaut: connected circuit 2
Econaut: connected circuit 3
Econaut: connected curtain 1
Econaut: connected curtain 2
Econaut: connected curtain 3
Econaut: connected curtain 4
Econaut: connected curtain 5
Econaut: connected curtain 6
Use these settings to indicate to which controls Econaut is connected.
Do not enter any connection for outside-wall curtains.

Stralingsinvloed op etmaalgemiddelde
Two types of radiation sum influence are possible:

- radiation sum in J/cm²
- radiation sum in %

Econaut: influence radiation sum J
Econaut: influence radiation sum J start value
Econaut: influence radiation sum J end value
With the radiation sum influence in J/cm² the radiation sum expected by MeteoScope is taken as the starting
morning, therefore, a set influence can already work on the radiation sum in J/cm².

EXAMPLE:

Econaut: integration temperature setpoint	20.0

Econaut: influence radiation sum J	2.0
Econaut: influence radiation sum J start value	1000
Econaut: influence radiation sum J end value	1200

If the expected radiation sum at 07:00 is 1100 J/cm², the system is adjusted to a 24 hours temperature of 21°

The expected radiation sum is adjusted during the day as a function of the measured radiation sum. Thus if tl expected by MeteoScope is not correct, this is adjusted in the course of the day.
In this way the expected radiation sum will always be the same at the end of the day as the measured radiati

Econaut: influence radiation sum %
Econaut: influence radiation sum % start value
Econaut: influence radiation sum % end value
In the case of the influence on the radiation sum in % the radiation sum in J/cm² expected by MeteoScope is the computed maximum radiation sum. This computed maximum radiation sum is computed via an astronom function of the date and the location of the HOOGENDOORN ECONOMIC system on the Earth.
Here too, the expected radiation sum is adjusted during the day as a function of the measured radiation sum.

EXAMPLE:

Econaut: integration temperature setpoint	20.0
Econaut: influence radiation sum %	2.0
Econaut: influence radiation sum % start value	70
Econaut: influence radiation sum % end value	90

If you wish to have a permanent increase in the 24 hours temperature, both summer and winter, this is best a means of an influence on the radiation sum in %.
If you only wish to have an increase in the 24 hours temperature on very sunny days, this can be set by mear on the radiation sum in J/cm².

Econaut: integration temperature setpoint
Econaut: integration temperature computed setpoint
The set 24 hours temperature and the computed value on the basis of which the control system is operating a query.

Econaut: leaf area index
In order to estimate the transpiration by the crop, the size of the leaf area of the cultivated crop must be spec bay.

$$LAI = \frac{\text{leaf area } [m^2]}{\text{ground area } [m^2]}$$

A young crop has an LAI of 0.5.
The Leaf Area Index of a normal, fully-grown fruit vegetable crop is approx. 3 (depending on the planting den number of rows in the system). This means 3 m² leaf area per 1 m² ground area.
A rose or chrysanthemum crop can even achieve an LAI of 5-6.

The LAI can also fall again when the crop is at a certain stage. An old rose crop can even fall from an LAI of ! because of an excess of old leaves and leaf fall.

It is therefore advisable to adjust the LAI regularly to the crop especially in the first few weeks of cultivation. If plants at several different stages of growth, their average LAI must be set. **Econaut: maximum temperature**
Econaut: maximum temperature fall
Econaut can compute an optimal heating temperature which rises or falls significantly. This can have major c humidity management in the greenhouse (great RH fluctuations). It is particularly important to avoid an exces temperature rise which could wet the crop.
For this reason the rise and fall of the optimal heating temperature can be limited.

Econaut: optimization?
This setting is used to enable optimisation. If optimisation is disabled, the 24 hours temperature is achieved b accordance with the reference temperature.

Econaut: period temperature integration
With the Econaut CTI you can specify over how many days you wish to adjust the temperature integration (op
this between 1 and 7 days.

Econaut: temperature sum
This setting indicates the temperature sum of the previous 24-hour period.

Econaut: maximal temperature sum compensation
This is the maximum value for the number of degree-hours that the integration control may be greater or less
computed temperature sum. If this number of degree-hours is exceeded, no extra compensation is made for
set to 0 every 24 hours.

The consequence of having a much higher or lower figure than the desired temperature sum is that the meas
temperature is not equal to the set 24 hours temperature in the long term because the control system's aim is
desired temperature sum. However, if this effect is not desired, you can opt to set the temperature sum to 0 u
"Service" access level. **heating temperature: ViP**
maximum heating temperature: ViP
Econaut computes a heating temperature which is limited between the (minimum) heating temperature and th
heating temperature.

Fans

The fans program controls the recirculation fans depending on:

- the time that the fans come on and off
- whether the curtain is closed or not
- the outside temperature
- the RH

---

counter time fans off
counter time fans on
These settings can be used to switch the fans on or off temporarily.
The counter counts down.
Once the counter reaches 0, the fans are switched on or off, as appropriate.

fans on influences: ViP (100=on)
This setting enables the fans to be switched on in response to radiation, outside temperature, wind, RH or Ag
The fans are switched on if the influence is 100%.

fans off: vent position
The fans are switched off above this (average) vent position.
The average vent position is VENT1 + VENT2 divided by 2.

control: interval fans
The minimum interval before the fans are switched on or off.

fans on: curtain closed
fans on: number curtain
When the fans have to run with the curtain closed, this setting can be used to choose the curtain conditions u
fans have to run.

The following options are possible:

Blackout	Fans on if the curtain is closed as a blackout curtain
Energy curtain	Fans on if the curtain is closed as an energy curtain
Shading curtain	Fans on if the curtain is closed as a shading curtain
Phase curtain closed	Fans on if the curtain is closed as a result of Phase curtain closed

Detector curtain closed	Fans on if the curtain is closed as a result of a detector
Closed snow	Fans on if the curtain is closed as a result of snow

When the curtain opens, the fans remain on until the curtain is fully open.

fans: actuations

- **On** The fan is in operation.

fans: status control
This setting indicates the fan status.

- **Fan on**
  The fans are in operation.
- **Fan off**
  The fans are not in operation.
- **Interval**
  The system waits with switching on or off until the interval has finished.
- **On because of counter**
  The fans are switched on because of the counter.
- **On because of RH**
  The fans are switched on because the RH is too high.
- **On because of outside temperature**
  The fans are switched on because the outside temperature is too high.
- **On because of curtain**
  The fans are switched on because one or more curtains are closed.
- **Off because of counter**
  The fans are switched off because of the counter.
- **Off because of vent position**
  The fans are switched off because the vents are open too far.

fans: status measurements
This setting indicates the status of the measurements:

- **aspirator fan off**

- **connected aspirator?**
  No aspirator number has been entered, or the aspirator number is wrong.
- **RH measurement error**
  The wet bulb is dry (bottle empty or sock blocked).

vent position average
The average of VENT1 and VENT2 of the relevant group.

counter interval
Counter for the number of minutes on or off.

Greenhouse climate

The settings under 'Greenhouse climate' are the **basic settings** which control the climate in the greenhouse, temperature, RH, humidity deficit, water uptake and CO_2.
All other setpoints that you can set in *ECONOMIC* NT which relate to temperature, RH, humidity deficit, wate are set with respect to these basic settings.

RH, for example, has settings in the ventilation control. These settings are **deviation settings** with respect tc setting in 'Greenhouse climate'.
Changing the basic RH setting in 'Greenhouse climate', also changes all other RH settings. This is a very qui

friendly way to change settings.

EXAMPLE: Minimum vent position on humidity
For a minimum ventposition on humidity, it is best to use the "vent position humidity" setting.
Suppose the basic setting for RH is 80%. A vent position has to come in above 82%. If the RH is 87%, there
vent position.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Deviation RH - %	
						2	7
1	Y	-01:10	Sunrise	00:00	0.0	5.0	

If the basic setting is now changed from 80% to 85%, the vent position will come in above 87%. If the RH is 9
be a 5% vent position.

Greenhouse Climate - Aspirators

aspirator: actuations
This setting indicates whether the aspirator fan is being actuated.

- **Fan off**
  The fan is not in operation.

greenhouse temperature: measurement aspirator
greenhouse temperature: correction
wet bulb temperature: measurement
wet bulb temperature: correction
RH: measurement aspirator
RH: correction
Measurement of greenhouse temperature, wet bulb temperature and RH.

RH too high: alarm measurement wrong
RH too high: delay time alarm
RH too high: delay time counter alarm
If the RH measurement is higher than the set "RH too high: alarm measurement wrong" by the set delay time
triggered. The counter above indicates how long the RH has been too high.
Operation of the ViP-influences "RH deviation" and "HD deviation" is also cancelled.
These settings are intended to ensure that there are no unwanted impacts in the event of a faulty RH measur
example if a wet bulb is too dry.
These settings are therefore not designed to trigger an alarm to indicate that the relative humidity is too high.
sensor
You can choose between an electronic measurement and a wet bulb measurement.

Greenhouse Climate - External prosesses

manifold energy: connected process id
Apart from the EM cluster the process ID must always be set to 1.

transport: connected process id
Apart from the EM cluster the process ID must always be set to 1.

Greenhouse climate - General

circulation pump: time activation
circulation pump: length of activation
If the pumps are not running for a long period (in the summer, or if the house is empty) there is a chance that
To prevent this, the circulation pumps (circuits 1, 2, 3, transport or soil heating) can be activated every 24 hou
settings.

The pumps are activated group by group. This is done to prevent brief periods of high power consumption.
If the pump has a high/low speed selector switch, it is operated at low speed.

EXAMPLE:
Activate the pumps for 2 minutes every day at 07.00 hours.

circulation pump: time activation	07:00
circulation pump: length of activation	00:02

delay time CO2 selector alarm
The CO2 selector scans all the connected channels in turn.
If a channel has not been scanned for a relatively long period, an alarm is triggered.
Enter the delay time for the alarm here.
A figure of 16 minutes is usual.

emergency start: stop everything and restart

This must be set to Yes once the automatically stored data blocks of the control station have been reset. If se following happens:

- The actuators are disabled for a maximum of 1 minute.
- The settings relating to delayed weather station data are entered using the current measurements.
- The watering settings are initialised.
- Open curtains are opened during the running time. Closed curtains are closed during the running time. crack is possibly reset.

Always check a few minutes after setting this setting to Yes that the system is operating correctly. No points in particular:

- Is the status of the crop sections correct?
- Are the curtains in the position indicated by the computer?

See also the section entitled "Replacing the control station" in the general Help with Service manual.

universal cooling: switch in delay
After a power failure not all the cooling and moisture-control stages may be switched on simultaneously (high
Each time the switch-on delay has elapsed, a stage of one group can be activated.

Greenhouse climate - Group

Agronaut minimum water uptake: ViP
Agronaut maximum water uptake: ViP
The Agronaut program enables the water uptake to be (re)adjusted by means of the heating, vents, shading (sprinklers.

The water uptake can be derived from the level control system or the water uptake model. The choice is your

With a level control system, the water uptake adjustment stops once the water uptake has reached 0.0
Adjustment starts once the water uptake is greater than 0.02 l/m2.h and the water level in the level tray
30%.

Agronaut: connected level tray
Use this setting to specify which level tray belongs to this climate group.

Agronaut: connected drain pit
Use this setting to specify which drain pit belongs to this climate group.

Agronaut: control level tray /simulation
For this setting you can choose from:

Simulation	The Agronaut operates with the water uptake from the water uptake model (simulation).
Level tray	The Agronaut operates with the water uptake from the level tray.

simulation tune selection level tray/drain pit
The water uptake model calculates a water uptake. The water uptake is measured with the level tray or with a
closed crop system.
Comparing the computed and the measured water uptakes and any necessary adjustment of the model is ter

You can decide for yourself whether tuning should be based on the water uptake of the level tray or of the dra

EXAMPLE 1:
Climate groups 1, 2 and 3 are adjusted to the water uptake of level tray 1.

Climate group 1:

Agronaut: connected level tray	1

Climate group 2:

Agronaut: connected level tray	1

Climate group 3:

Agronaut: connected level tray	1

EXAMPLE 2:
Climate group 1 is adjusted to the water uptake of level tray 1.
Climate groups 2 and 3 are adjusted to the water uptake of level tray 2.
Climate group 4 is not adjusted to water uptake.

Climate group 1:

Agronaut: connected level tray	1

Climate group 2:

Agronaut: connected level tray	2

Climate group 3:

Agronaut: connected level tray	2

Climate group 4:

Agronaut: connected level tray	0

Agronaut: selection control reduction water uptake
This setting enables you to choose how to reduce the crop's water uptake if it is too high.

Roof sprinkling	The roof sprinklers can be activated.
Shading curtain	The shading curtain can be closed.

Agronaut: water uptake
Agronaut: water uptake short running average
Agronaut: water uptake long running average
Econaut: expected integration temperature
Econaut: leaf area (LAI)
MeteoScope: expected radiation sum
All the data relating directly to the plant itself are collated to provide you with even more information. The abc
can only be seen if the relevant options are live in your *ECONOMIC* NT.

climate controls switch back to old version
This can be used, if necessary, to switch off various control system components.

The **Econaut** option enables you to ensure that the ViP influence uni-switch is available in the heating tempe
example for reductions at weekends, in **climate groups without Econaut**. This setting enables Econaut to b
group.
The heating operates in accordance with the heating temperature (classic method).

Switch Econaut off temporarily
If you wish to switch Econaut off temporarily (because, for example, it is the start of summer and little or no h required), this can be done by setting the maximum heating temperature and the integration temperature low minimum heating temperature.
Econaut will then regulate the heating in accordance with the set minimum heating temperature.
However, ventilation via the deviation setting remains active.

The other options enable program modules to be disabled in the event of unexpected problems in the
These disabling options should never be used unless advised in advance to do so by Hoogendoorn.
They may also only be used for the concrete problem for which this is permitted.
The content of this setting and its effect vary for each program series.

climate: number(s) alarm signal
You can use this setting to specify which alarm signals must be initiated in the event of an alarm (option).

CO2 influence: connected group CO2 measurement
The minimum vent position can be influenced with a CO_2 influence. If there is a CO_2 sensor, leave this settin
If there is no CO_2 sensor, then refer to a climate group where the CO_2 is measured. **greenhouse temperatu**
deviation heating temperature
An alarm is triggered if the greenhouse temperature is lower than the heating temperature by the set deviatio

greenhouse temperature too high: deviation ventilation temperature
computed alarm threshold deviation ventilation temperature
An alarm is triggered if the greenhouse temperature is higher than the ventilation temperature by the set devi limit is increased in proportion to the increase in radiation (up to 3x the alarm limit at 1000 W/m^2).

greenhouse temperature too high: maximum greenhouse temperature
An alarm is triggered if the greenhouse temperature rises too high.

RH too low
An alarm is triggered if the RH falls too far.

computed factor pipe curtain
This setting indicates the influence of the curtains on the heating control system.
One 'curtain 1: factor pipe' should be set for each curtain which indicates in percent how far the heating contr be turned down if the curtain is closed.
If the curtain is opened, the factor during the opening operation is set to 120 (in association with coldness).

connected circuit 1 (for ventilation)
connected circuit 2 (for ventilation)
connected circuit 3 (for ventilation)
These settings are used to connect the circuits to the group.
This is important for pre-control of the vent position.

connected recirculation fans
If vents 1 and 2 of this climate group have to be included in the calculation for the average vent position used recirculation fan, enter the number of the group in which the recirculation fan is located.

registration: connected assimilation lighting
This setting is used to connect the climate group to the lighting block.
It is used for registration purposes in weekly/period reports.

connected assimilation lighting
extra connected assimilation lighting
power assimilation lamps
More and more nurseries are working with artificial lighting.
In practice this proves to cover a substantial portion of the house's energy requirement.
These settings are used to set the influence of the lighting on the heating control system.
You can specify for each climate group which lighting group in the climate group is active and the electrical p + fitting per unit of surface area in W/m^2.

A climate group sometimes encompasses several lighting groups. In that case an extra group number can be

EXAMPLE:
The nursery consists of two bays (climate groups). Each bay has 2 lighting groups. The power is 25 W/m^2.

Climate group 1:

connected assimilation lighting	1
extra connected assimilation lighting	2
power assimilation lamps	25

Climate group 2:

connected assimilation lighting	3
extra connected assimilation lighting	4
power assimilation lamps	25

heating temperature: ViP
The heating temperature is achieved by regulating the pipe temperature.
The heating system can consist of 1, 2 or 3 heating circuits. These heating circuits are regulated separately.

ventilation temperature lee side: ViP
ventilation temperature wind side: ViP
If the greenhouse temperature is higher than the ventilation temperature, the vents are opened to reduce the temperature.
In the above settings the ventilation temperature can be set separately for vents on the lee side and the winc
This means that the vents are actuated independently of each other.

EXAMPLE 1:
Daytime heating temperature 18^{o}C, nighttime temperature 16°C. In the transition from the nighttime to the da daytime figure must have been reached by sunrise. The day ends at sunset.
In sunny weather a heating temperature of 19℃ must be set.

heating temperature: ViP - °C

		Start time	Relative t	Change	Value	Radiation control - %
						30 60
1	Y	-01:00	Sunrise	03:00	18.0	1.0
2	Y	00:00	Sunset	03:00	16.0	0.0

Notes:
Every day the system calculates the maximum radiation level for that day (based on the longitude and latitud location).
The set radiation influence begins at 30% radiation and is at its maximum at 60% radiation.

On a June day a maximum radiation level of, for example, 1000 W/m^2 is calculated. The heating temperature as follows:

Radiation W/m^2	Radiation %	Heating temperature ℃
0	0	18.0
300	30	18.0
400	40	18.3
500	50	18.7
600	60	19.0
1000	100	19.0

On a December day a maximum radiation level of, for example, 300 W/m^2 is calculated. The heating temper adjusted as follows:

Radiation W/m^2	Radiation %	Heating temperature ℃

0	0	18.0
90	30	18.0
120	40	18.3
150	50	18.7
180	60	19.0
300	100	19.0

EXAMPLE 2:
Daytime heating temperature 18^{o}C, nighttime 16^{o}C. In the transition from the nighttime to the daytime figure figure must have been reached by sunrise. The day ends at sunset.
After a sunny day the day has to be extended to 2 hours after sunset.

heating temperature: ViP - °C

		Start time	Relative t	Change	Value	Radiation sum - J/cm²	
						1000	1200
1	Y	-02:00	Sunrise	02:00	18.0	0.0	
2	Y	00:00	Sunset	01:00	16.0	2.0	
3	Y	02:00	Sunset	01:00	16.0	0.0	

Notes:
During the day the plant has made a lot of sugars (assimilates). These assimilates have to be transported fro the growing parts of the plant where they are converted into cell material. A lot of assimilates are produced o higher (24-hour) temperature promotes their processing.

If the radiation sum is greater than 1200 J/cm^2, a temperature of 18^{o}C is maintained until 2 hours after sunse

The influence on the radiation sum in J/cm^2 can be used until sunrise on the next day. At sunrise the r which the influence refers is set to zero.

EXAMPLE 3:
Daytime ventilation temperature 19^{o}C, nighttime 17^{o}C. In the transition from the nighttime to the daytime figu figure must have been reached by sunrise. The day ends at sunset.
The basic RH value is 80%. In order to 'save moisture', the ventilation temperature must be adjusted to 22^{o}C lower than 65%.

ventilation temperature leeside: ViP - °C

		Start time	Relative t	Change	Value	Deviation RH - %	
						-10	-15
1	Y	-02:00	Sunrise	02:00	19.0	3.0	
2	Y	00:00	Sunset	01:00	17.0	0.0	

Notes:
The set influence for RH begins at 70% and reaches its maximum at 65%. **RH: ViP**
humidity deficit: ViP
The humidity in the air can be expressed as Relative Humidity (RH) or Moisture Deficit (MD). The term RH is common, firstly because it can be measured directly, and secondly because it fits better with the general exp moisture.

In glasshouse horticulture RH and MD are used equally.
With regard to the greenhouse climate, RH gives a more direct indication of the risk of condensation on the c fruits. This is an important cause of the germination of mould spores and such like.
MD indicates how much more moisture the greenhouse air can absorb and thus has a more direct correlation crop transpiration (only if the crop temperature is the same as the greenhouse temperature). **influence mod controls switch off**
This enables you to switch off the Econaut and Crop condensation models for each climate group. For Econa that the system starts to operate based on the minimum heating temperature, and for the Crop condensation that the ViP influence is no longer active. It can also be used to switch off the alarm.

minimum CO2: ViP

Supply is initiated if the measured CO_2 is below the minimum value, even if there is no heat demand.

This minimum level can be increased or decreased depending on the radiation, radiation sum, wind, vent po:

EXAMPLE 1:

In summer when houses are ventilated a great deal, it is possible for more moisture to be exchanged than th evaporate. The RH will fall. With decreasing RH the stomata will close more. A high CO_2 level is then undesi

The setpoint RH is 80%. Reduce the minimum level if the RH is too low.

minimum CO2: ViP - ppm

		Start time	Relative t	Change	Value	Deviation RH - %	
						-20	-30
1	Y	00:00	Sunrise	00:00	600	-250	

Notes:

If the RH falls below 60%, the decrease in the minimum CO_2 begins. This decrease is at its maximum at an I

EXAMPLE 2:

The minimum CO_2 must be increased by 200 ppm if the assimilation lamps are on.

minimum CO2: ViP - ppm

		Start time	Relative t	Change	Value	Assim. lighting	
1	Y	00:00	Sunrise	00:00	400	200	

selection measurements alarm signal on

Options:

Wet bulb dry	With this option the alarm signal is triggered if the wet bulb (temperature sensor in the aspirator with the sock) is dry.
RH: too low	With this option the alarm signal is triggered if the measured RH is lower than the 'RH too low' setting.
Aspirator error	With this option the alarm signal is triggered if the aspirator is incorrectly connected.
CO2: too high	With this option the alarm signal is triggered if the CO2 measurement is too high (default is 500 ppm above maximum).
CO2: selector	With this option the alarm signal is triggered if there is no communication with the selector.
Econaut communication	With this option the alarm signal is triggered if there is no communication with Econaut.
VentPos 1	With this option the alarm signal is triggered if the vent position of vent 1 rises above 100%.
VentPos 2	With this option the alarm signal is triggered if the vent position of vent 2 rises above 100%.
Roof washer fault	If there is an alarm in the roof washer, the alarm signal is initiated if the "Roof washer fault" option is selected.
Maximum greenhouse temperature	With this option the alarm signal is triggered if the greenhouse temperature is higher than the 'greenhouse temperature too high: maximum greenhouse temperature' setting.
GreenhTemp too high	With this option the alarm signal is triggered if the greenhouse temperature is higher than the ventilation temperature by the deviation set in 'greenhouse temperature too high: deviation ventilation temperature'.
GreenhTemp too low	With this option the alarm signal is triggered if the greenhouse temperature is lower than the heating temperature by the deviation set in 'greenhouse temperature too low: deviation heating temperature'.
Curtain position	With this option the alarm signal is triggered if the curtain position

error	is incorrectly measured.

uni-influence: connected uni-switch climate
Various ViP settings have a so-called uni-influence. The ViP setting can therefore be influenced by a uni-swi
This setting enables you to connect the control unit to a uni-switch via the map.

Such a connection can be made with the following control units among others:

- greenhouse heating, for a uni-influence on the minimum pipe temperature or on the heating temperatu work in combination with Econaut)
- ventilation, for a uni-influence on the humidity vent position or on the ventilation temperature
- assimilation lighting, for a uni-influence to switch the lighting on or off
- curtains, for a uni-influence on the energy curtain, the shading curtain or the crack in the curtain
- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

uni-influence: uni-switch RH/HD influence ViP (100=off)
This setting is used to enter the group number of the uni-switch. The "RH deviation" or "HD deviation" ViP in
switched off by setting a uni-influence to 100. This can be used, for example, during spraying or sprinkling. H
measured RH is then not correct. **vent position limit: detection**
vent position limit: gross detection
Indication of whether the detector for the vent position limit is active.

- 100 = vent position limit detector active
- 0 = vent position limit detector inactive

This indication is needed to limit the vent position.
This control can be used to limit the vent position during roof sprinkling.

Greenhouse heating

The pipe temperature of the heating system is calculated using, among other factors, heat demand, the pre-
increases to the minimum pipe temperature.

The pre-control is a control which processes outside influences on the greenhouse climate.
When it gets colder outside, it will also get colder inside. The normal temperature control will absorb that. Ho
gets too cold in the greenhouse,
the pre-control will ensure that the heating is adjusted a bit higher to prevent it from getting too cold in the gr

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Greenhouse heating - Circuit 1 / 2 / 3

circuit 1 Econaut: pipe area
This is the total surface area of the circuit's pipes per m^2 soil.

EXAMPLE 1:
Four 51" per bay of 3.20 m (pipe rail) give
(2 x pi x 0.051 / 2) x 4 / 3.20 = 0.20
where pi = 3.14

EXAMPLE 2:
Two 27" per bay of 4.00 m (growing pipes) give
(2 x pi x 0.027 / 2) x 2 / 4.00 = 0.042

circuit 1 pipe minimum: ViP
circuit 1 minimum pipe CO2: ViP

circuit 1: pipe maximum heat discharge
circuit 1 pipe maximum: ViP
The greenhouse temperature is regulated by means of the pipe heating system.
The pipe temperature is limited by a minimum and a maximum.
The minimum pipe temperature can be increased or decreased via **influences** to take account of, for examp
uptake.
The 'uni-influence' enables you to limit the maximum pipe temperature, for example via a mat temperature se
temperature threatens to become too high.

The 'circuit 1 minimum pipe CO2: ViP' is used if CO2 MUST be supplied to discharge heat from the boiler.

In 'circuit 1: pipe maximum heat discharge' a figure may be entered up to which the temperature may rise in
discharge heat from the TE system cooling water or to discharge heat from an excessively full tank.

EXAMPLE 1:
The minimum pipe temperature is 50℃ from 07:00 to 09:00.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value
1	Y	07:00	Clock	00:00	50
2	Y	09:00	Clock	00:00	0

EXAMPLE 2:
Reduce the minimum daytime pipe temperature as a function of the light.
The minimum daytime pipe temperature from sunrise to sunset is 45℃.
In sunny weather 20℃. Overnight 35℃.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value	Radiation - W/m²	
						250	350
1	Y	00:00	Sunrise	00:30	45	-25	
2	Y	00:00	Sunset	00:30	35	0	

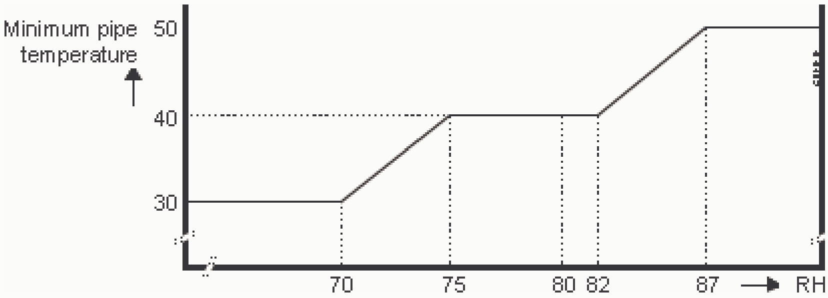
EXAMPLE 3:
If the RH is very high, the plant is almost unable to continue transpiring. There is then no water uptake. No w
means no uptake of nutrients. The plant's activity ceases. In addition, there is a greater risk of disease with a

If the minimum pipe temperature is increased, the RH in the vicinity of the plant will be reduced. The minimu
temperature also ensures air movement and an increase in the greenhouse temperature. This provides for m

The desired RH is 80%.
The minimum pipe temperature is 40°C. Increase this minimum pipe temperature if the RH reaches 82%. Th
increase of 10°C must have been reached with a range of 5%. If the RH is sufficiently low (e.g. 70%), the mi
temperature can be set to 30℃.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value	Deviation RH - %		Deviation RH - %	
						2	7	-5	-10
1	Y	00:00	Sunrise	00:00	40	10		-10	

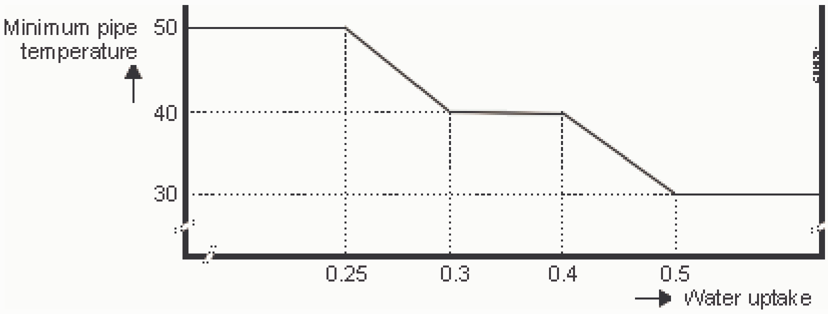


EXAMPLE 4:
The RH is not always a measure of the plant's activity.
It is possible for the temperature and the RH to be satisfactory, but for the water uptake to be zero.
The water uptake will be stimulated by increasing the minimum pipe temperature.

The minimum water uptake is 0.3 l/m^2.h.
The minimum pipe temperature is 40°C. Increase this minimum pipe temperature if there is a deviation in the
The maximum increase of 10℃ must have been reached with a range of 0.05 l/m^2.h. If the water uptake is s
(e.g. 0.5 l/m^2.h), the minimum pipe temperature can be set to 20°C.

circuit 1 pipe minimum: ViP - °C

		Start time	Relative t	Change	Value	DeviationAgrL - l/m².h		DeviationAgrL - l/m².h	
						0.00	-0.05	0.10	0.20
1	Y	00:00	Sunrise	00:00	40	10		-10	



This control system only works if the water uptake is measured with a level control system or compute uptake model.

circuit 1 pipe: computed
The computed pipe temperature.

circuit 1 pipe: measurement (I/O)
circuit 1 pipe: correction
Measurement of the pipe temperature.

circuit 1 pump: status

- **Low**
  2-speed pump at low speed.
- **High**
  2-speed pump at high speed.
- **On**
  Pump is on.
- **Off**
  Pump is off.

circuit 1: actuation factor
The actuation factor determines the actuation time where there is a deviation from the water temperature for

actuation.
The actuation factor depends on the valve's running time.

The actuation factors for the various valves are:

- 8-minute valve: 2.5 - 4
- 4-minute valve: 1.5 - 2.5
- 2-minute valve: 0.5 - 1.5

The smaller the actuation factor, the shorter the actuation time and the smoother the control.

circuit 1: actuation timer
The actuation timer indicates the number of seconds that the valve will still remain open or closed (from the r
command is given) (- = close).

circuit 1: actuations

- **Pump high off**
  The pump's high-speed mode is switching off.
- **Pump low off**
  The pump's low-speed mode is switching off.
- **Valve closed**
  The valve is closing.
- **Valve open**
  The valve is opening.

circuit 1: computed pipe heat demand
The computed pipe temperature in the event of a heat demand.

circuit 1: connected energy manifold EM
Enter the group number of the EM manifold to which the circuit has to copy its heat demand.

circuit 1: connected transport EM
Enter the group number of the connected transport group to which the heat demand has to be copied.

circuit 1: deviation pipe temperature pump off
The circulation pump is switched off if the computed pipe temperature is lower than the measured pipe temp
deviation.

circuit 1 pump: pipe temperature on
circuit 1 pump: pipe temperature high speed
The circulation pumps of the heating circuits are switched on and off independently of each other.

The circulation pump is switched on if:

- the computed pipe temperature is higher than **circuit 1 pump: pipe temperature on**
- the actuations are not performed, for example, if the system has broken down or the program is repla
  event of a mains power failure
- the greenhouse temperature is too low

The circulation pump is switched off if:

- the computed pipe temperature is lower than **circuit 1 pump: pipe temperature on** (-3℃) AND
- the measured greenhouse temperature is higher than the heating temperature

Various factors play a role in whether the circulation pump is switched on or not. The pump in the first pipe u
on as soon as there is a heat demand. As far as the second and third pipes are concerned, the pump is swit

as the circuit has to be activated in response to a heat demand, irrespective of the 'circuit 1 pump: pipe temp setting.

EXAMPLE:
The pump must be switched on if the computed pipe temperature is higher than 25℃.
At 50℃ the system must switch to stage 2.

circuit 1 pump: pipe temperature on	25
circuit 1 pump: pipe temperature high speed	50

circuit 1: energy demand diameter pipe
circuit 1: energy demand length circuit
Enter the diameter of the pipe in mm, for example 51 mm.
Enter the total length of the circuit in metres; any feed section for the circuit may be ignored.
ALWAYS enter both settings.

circuit 1: factor pipe capacity
This setting indicates the proportion of the circuit as a percentage of the total heating system.
With a more accurate P-controller (offices, canteens and climate-controlled units) the pipe capacity factor ha

Do not set a factor of less than 30.
The sum of the factors must be 100.

EXAMPLE:

circuit 1: factor pipe capacity	70
circuit 2: factor pipe capacity	30

In this example circuit 1, for instance, has 4 pipes and circuit 2 has 2 pipes.

circuit 1: heat discharge actuation pulse protection
This setting specifies the length of the actuation pulse with which the mixing valve is opened if the cooling wa rises above the heat discharge threshold plus the deviation.
The actuation pulse is emitted every 20 seconds.
Do not set higher than 5.

circuit 1: P-controller P-factor
There is a separate P-factor for each circuit.
The minimum pipe temperature is adjusted by the P-factor for each degree of deviation.
The default is 35.

circuit 1: status
This setting indicates what the control system is doing.

- **Heat demand**
  There is a heat demand.
- **Heat discharge**
  Heat is being discharged (TE).
- **House regulation**
  The greenhouse temperature is too low.
- **Maximum pipe temperature**
  The computed pipe temperature is limited to its maximum.
- **Pipe temperature low**
  The measured pipe temperature is 30℃ lower than th e computed pipe temperature.
- **Transport pump**
  The transport pump is in operation.
- **Pump anti-rust**
  The pump is in operation for the anti-rust program which prevents seizure.

- **Pump high**
  The 2nd stage of the pump is in operation.
- **Pump control**
  The computed pipe temperature is higher than the temperature with the pump on; the pump is in ope
- **Boiler protection: not open**
  The boiler temperature is lower than the protective temperature; the valves are not being actuated.
- **Boiler protection: closed**
  The boiler temperature is much too low (risk of condensation in the boiler); valves are closing.

control circuit 1: sequence heating
The heating system can consist of 1, 2 or 3 separate heating circuits.
These heating circuits (circuits 1, 2 or 3) must be adjusted separately.
For each circuit it is possible to specify whether this circuit has to be adjusted as the 1st, 2nd or 3rd circuit.
A circuit can be switched off by entering 0 for this setting. However, the minimum pipe temperature is still ap

control circuit 1: switch over temperature
This setting is used to specify the circuit's (computed) pipe temperature, at which the system switches to the
If 2 circuits are set to the same figure, the system switches to the next circuit once both circuits have reache
temperature.

EXAMPLE:
Circuit 1 is the 1st circuit to be adjusted. Circuit 2 is adjusted once the computed pipe temperature is higher t

Control Climate, Greenhouse heating, Circuit 1

control circuit 1: sequence heating	1
control circuit 1: switch over temperature	70

Control Climate, Greenhouse heating, Circuit 2

control circuit 2: sequence heating	2
control circuit 2: switch over temperature	0

steamheat 1: computed ventiles continuously
This setting shows the number of valves that may be continuously actuated in accordance with the compute
temperature.

steamheat 1: computed pulse length
In addition, the next valve is also actuated in pulsating mode with a pulse duration equal to the computed pu

steamheat 1: interval counter pulse
The interval counter is the time that the current pulse interval time is active.

steamheat 1: pulse counter
The pulse counter counts down the time that the pulsating valve still has to be actuated.

steamheat 1: interval time pulse
steamheat 1: minimum pulse length
The steam heat valve which is the last to be activated is actuated in pulsating mode.
A new pulse begins once the set pulse interval time has elapsed.

The duration of the control pulse is at least the set **minimum pulse length**. This must be set to the shortest
which still allows the system to operate properly.
The longer the minimum pulse, the longer the **interval time** must be.

A long interval time means longer pulses on average and therefore less switching on and off.
If, however, the interval time is set unnecessarily long, the system reacts too sluggishly to changes in the gr
temperature.

In the event of an extravagantly large adjustment of the computed pipe temperature the interval time is inter

steamheat 1: range pipe temperature ventile 1
steamheat 1: range pipe temperature ventile 2
steamheat 1: range pipe temperature ventile 3
steamheat 1: range pipe temperature ventile 4
steamheat 1: range pipe temperature ventile 5
steamheat 1: range pipe temperature ventile 6
The "computed pipe temperature" is converted to opening a number of valves.
The higher the computed pipe temperature, the more valves will be opened.
One valve is actuated in pulsating mode and with a variable pulse length.

The range is the deviation between the initial pipe temperature of the next valve and the initial pipe tempera
specified valve number.

EXAMPLE:
Assuming the valves have the same capacity:

Set the maximum pipe temperature to 80℃.
Set the pipe temperature range for all valves to:
(maximum pipe temperature - average heating temperature) divided by the number of valves.

If a valve is not available or is temporarily switched off, the relevant pipe temperature range must be s

steamheat 1: status actuations
This setting shows which valves are currently being actuated.
A maximum of 1 valve may be switched per minute.
The boiler protection can temporarily block further opening or even switch valves off.

Greenhouse heating - External processes

heat discharge: connected process id
Apart from the EM cluster the process ID must always be set to 1.

Greenhouse heating - General

uni-influence: connected uni-switch greenhouse heating
Various ViP settings have a so-called uni-influence. The ViP setting can therefore be influenced by a uni-sw
This setting enables you to connect the control unit to a uni-switch via the map.

Such a connection can be made with the following control units among others:

- greenhouse heating, for a uni-influence on the minimum pipe temperature or on the heating temperat work in combination with Econaut)
- ventilation, for a uni-influence on the humidity vent position or on the ventilation temperature
- assimilation lighting, for a uni-influence to switch the lighting on or off
- curtains, for a uni-influence on the energy curtain, the shading curtain or the crack in the curtain
- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

Greenhouse heating - Group

greenhouse heating: computed I-action
After testing, for example, a circulation pump, ventilation unit or curtain, the heating control system can be e
disrupted.
To ensure that the control system is operating properly again, the **computed I-action** can be changed as fo

- Too hot: reduce I-action
- Too cold: increase I-action

computed P-action
This setting is input by the computer.

control: light influence
The radiation influence must be set using a number between 0 and 100.
If you have a **solarimeter**, leave this setting on 50!
If you have a **light sensor**, this setting can be changed if the daytime greenhouse temperature (in winter) ca
controlled with high radiation.

Greenhouse temperature too low: set lower, e.g. 45
Greenhouse temperature too high: set higher, e.g. 55

This setting must be set to 0 for offices, climate-controlled units and canteens.

cooling water temperature threshold: discharge
This setting is important if a TE (Total Energy) system is being operated.
If the cooling water temperature is higher than the threshold, the pipe temperature is increased from 'circuit 1
temperature on' with a certain delay to a maximum of 'circuit 1: pipe maximum heat discharge'. In this way th
discharged to the house.

EXAMPLE:

cooling water temperature threshold: discharge	75

Control Climate, Greenhouse heating, Circuit 1

circuit 1: pipe maximum heat discharge'.	40
circuit 1 pump: pipe temperature on	25

If the cooling water rises above 75℃, the minimum pipe temperature is increased from 25℃ to 40° C with a

heat discharge: deviation protection
heat discharge: range control
If the TE cooling water temperature is higher than the threshold, the minimum pipe temperature is increased
delay.
If the cooling water temperature is higher than the threshold plus the range, the 'circuit 1: pipe maximum hea
used completely (with a certain delay).
If the cooling water temperature is higher than the threshold plus the setting under 'heat discharge: deviation
is discharged rapidly.

cooling water temperature: dead zone cooling water
If the cooling water temperature changes within the set dead zone, no action will be undertaken. This ensure
operation.

factor rain
This setting influences the increase in the pipe temperature if it is raining.
The default is 110%.
For Hortiplus glass the factor has to be set to 120 because Hortiplus glass insulates less.

greenhouse heating: computed factor pipe
greenhouse heating: computed factor radiation influence

Do not change these settings.

If the heating control is not operating properly, the control system can be rectified by adjusting the computed
setting 'Rapid adjustment'.

increasing heating temperature before opening curtain

This setting is used to restrict coldness during opening of the curtain.

This function is incorporated in Econaut.
This setting is therefore not applicable in combination with Econaut.

minimum factor pipe
maximum factor pipe
The pipe factor is used to calculate the pre-control.
The pre-control is increased by the pipe factor for every 10°C deviation between the greenhouse temperatu
outdoor temperature.
The pipe factor is adjusted once daily (at 04.00 hours).
Minimum default: 10, maximum 55.

The pipe factor is automatically adjusted between the set minimum and maximum values. These values can
extreme cases, if there is a great deal of heating capacity available and the pipe factor is limited at its lower
reducing the 'minimum factor pipe'.

In some cases the 'maximum factor pipe' can be changed.

If the minimum and maximum values are the same, the system is set to a fixed pipe factor.

minimum factor radiation influence
maximum factor radiation influence
The pipe factor radiation influence is a correction of the pipe factor.
This is adjusted as a function of the radiation.
The radiation influence may vary between the minimum and the maximum radiation influence.
Minimum default: 15, maximum 80.

normal/rapid adjustment
The following option is available in this setting:

Rapid adjustment	Can be entered if the heating has to be rapidly adjusted (e.g. after adjustment of the pipe factor). This option is automatically cancelled (at 04.00 hours) if the rapid adjustment is finished.

P-factor
This P-factor is important in eliminating sudden changes in the greenhouse temperature.
The pipe temperature is adjusted by the P-factor for each degree of deviation.
This P-factor depends on the amount of circuits and their capacity.

For groups with 1 circuit set the P-factor between 6 and 12.
For groups containing circuits with a pipe capacity factor of 50, set the P-factor between 5 and 7.5.
For groups containing a circuit with a pipe capacity factor of less than 50, never set the P-factor higher than
actual P for that circuit will become much too large.

Reduce the above figures if the operation of the computed pipe is very jerky.
Increase the P-factor if the computed pipe responds too sluggishly.

Greenhouse heating - Hot air

hot air continuously on: type of start time
hot air continuously on: start time
The hot-air heaters are activated for CO_2 production once the start time has passed.
The heaters then run in the first stage.

hot air continuously on: type of stop time
hot air continuously on: stop time
The hot-air heaters are switched off once the stop time has passed.

hot air continuously on greenhouse temperature off: ViP
The hot-air heaters are switched off once the greenhouse temperature is higher than this setting.

EXAMPLE:
The hot-air heaters are being used for CO_2 production.
The heaters have to be switched on in the morning one hour after sunrise.
They have to be switched off again at noon.
They have to be switched off if the temperature rises above 25℃.

hot air continuously on: type of start time	Sunrise
hot air continuously on: start time	01:00
hot air continuously on: type of stop time	Clock
hot air continuously on: stop time	12:00
hot air continuously on greenhouse temperature off: ViP	25.0

hot air deviation heating temperature: ViP
The hot-air heaters or throttle valves are activated to adjust the greenhouse temperature if the greenhouse t
lower than the heating temperature by the set deviation.

EXAMPLE:

heating temperature: ViP	20.0
hot air deviation heating temperature: ViP	-2.0

The hot-air heaters are activated when the greenhouse temperature is lower than 18℃.

The hot-air heaters can also be used to produce CO_2. The heaters then run at low speed.
If there are only hot-air heaters, the system is adjusted to the heating temperature (without allowance for the

hot air: actuation factor
The actuation factor determines the actuation time where there is a deviation from the greenhouse temperat
throttle valve actuation.
The actuation factor depends on the valve's running time.

The actuation factors for the various valves are:

- 8-minute valve: 2.5 - 4
- 4-minute valve: 1.5 - 2.5
- 2-minute valve: 0.5 - 1.5

The smaller the actuation factor, the smaller the actuation and the smoother the control.

hot air: actuation timer
The actuation timer indicates the number of minutes that the throttle valve will still remain open or closed (fro
that the command is given) (- = close).

hot air: actuations
This setting indicates whether the heaters/throttle valves are in operation.

- **High**
  The heaters are switching to high speed / the throttle valve is closing
- **On**
  The heaters are in operation / the throttle valve is opening

hot air: status
This setting indicates the status of the heaters.

- **High**
  The heaters are switching to high speed.
- **On**
  The heaters are in operation.
- **Off**
  The heaters are not in operation.

hot air: status control
This setting indicates what is currently happening with the control system.

- **Low: CO2**
  The heaters are switching to low-speed mode for CO_2 production.
- **High: temperature**
  The heaters are switching to high-speed mode because the greenhouse temperature is too low.
- **Low: temperature**
  The heaters are switching to low-speed mode because the greenhouse temperature is too low.

hot air: temperature deviation high speed on
This setting is only used for hot-air heaters with 2 speeds.
Use this setting to specify by how much the greenhouse temperature may deviate before high-speed mode i

EXAMPLE:

heating temperature: ViP	20.0
hot air deviation heating temperature: ViP	-2.0
hot air: temperature deviation high speed on	-1.0

The hot-air heaters are activated when the greenhouse temperature is lower than 18°. The system switches mode if the greenhouse temperature is lower than 17°C.

hot air: temperature deviation hot air on
This setting is used to prevent the hot air from being repeatedly switched on and off.

EXAMPLE:

heating temperature: ViP	20.0
hot air deviation heating temperature: ViP	-2.0
hot air: temperature deviation hot air on	-1.0

The hot-air heaters are activated when the greenhouse temperature is lower than 17°C.
The heaters are switched off again when the greenhouse temperature is higher than 18°C.

Humidification

The humidification program allows you to choose roof sprinkling or misting.

Roof sprinkling for use with roof sprinklers. Roof sprinkling can be used to increase the RH or to lower the g temperature.
The humidification actuator can directly enable the roof sprinkling. Another option is to enable an external cc actuator. A sprinkling program will be started via the external contact. This gives extra options, for cyclic actı roof sprinklers, for example.

Misting is the raising of the RH by putting moisture into the greenhouse.

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humidification: actuation timer
The actuation timer is updated every minute with the computed pulse length.

humidification: counter time on
This setting records how long the misting or roof sprinkling system is on.

humidification: actuations
This setting indicates the humidification status.

- **Humidification on**: humidification is in operation

humidification: selection control
For this setting you can choose from: misting, roof sprinkling or off.

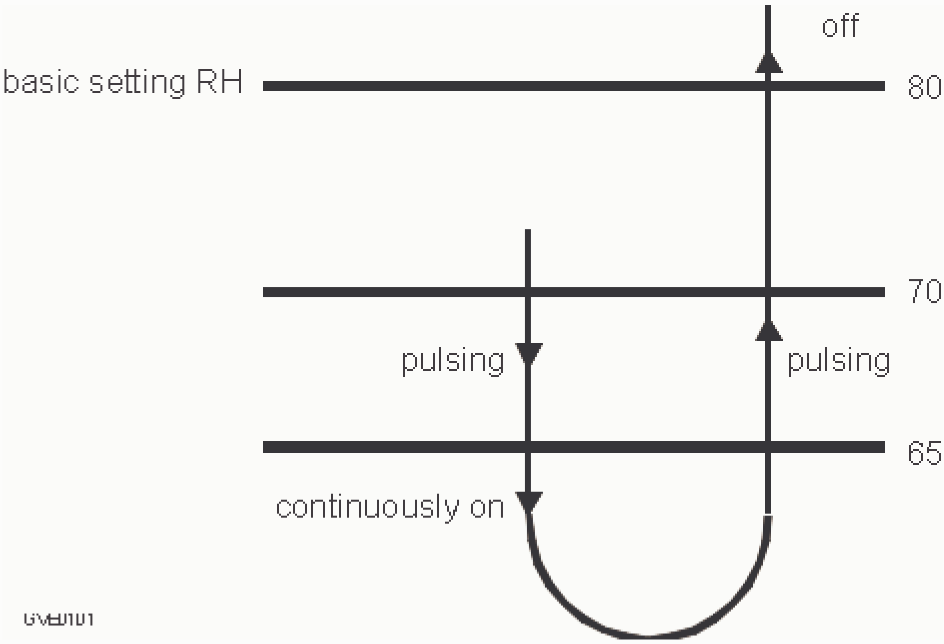
humidification: status (1=off, 2=on)
This setting is for registration purposes and indicates the humidification status.

misting deviation RH on: ViP
misting deviation RH continuously on: ViP
Misting is actuated in pulsing mode if the RH is lower than the basic RH value minus the deviation. If the RH
the system is actuated continuously.

EXAMPLE:

Basic RH value 80%.
Switch the misting system on if the RH falls below 70%, and continuously on if the RH falls below 65%.

misting deviation RH on: ViP	-10.0
misting deviation RH continuously on: ViP	-15.0



misting: minimum pulse length
misting: maximum pulse length
The misting program gives an actuation pulse (after the interval) if the RH is in the area where pulsing mode
The optimal pulse length is determined automatically, but is limited by the minimum and maximum pulse len

misting: interval pulsing
misting: counter interval pulsing
The misting program gives an actuation pulse after the interval has elapsed if the RH is in the area where pu
required. The interval is the time **between the start of pulses**.
Example: if **misting: maximum pulse length** is set to 10 seconds and **misting: interval pulsing** is set to 2
minimum time without misting is 25 - 10 = 15 seconds.

misting: computed pulse length
The computed pulse length.

roofsprinkling influence on: ViP (100=on)
roofsprinkling influence off: ViP (100=off)
roofsprinkling: minimum time on
These ViP settings are used to specify when the roof sprinkling system has to be switched on or off. Switchi precedence over switching on.

When the roof sprinkling system is on, it remains on for the minimum time.
The minimum time on is always maintained, even when the 'roofsprinkling influence off: ViP (100=off)' settin via an influence.
if the value set under 'roofsprinkling influence off: ViP (100=off)' is equal to 100, the minimum time on is can

The minimum time on is maintained if the 'roofsprinkling influence on: ViP (100=on)' setting reaches 100 via
If the value set under 'roofsprinkling influence on: ViP (100=on)' is equal to 100, the minimum time on is can

EXAMPLE 1:

The basic RH value is 85%.
Switch the roof sprinkling on if the RH is lower than 70% and have it stop at an RH of 78%.

roofsprinkling influence on: ViP (100=on) -

		Start time	Relative t	Change	Value	Deviation RH - %	
						-14	-15
1	Y	00:00	Sunrise	00:00	0	100	
2	Y	01:00	Sunrise	00:00	0	0	

roofsprinkling influence off: ViP (100=off) -

		Start time	Relative t	Change	Value	Deviation RH - %	
						-8	-7
1	Y	00:00	Sunrise	00:00	0	100	
2	Y	-01:00	Sunset	00:00	0	0	

The roof sprinkling system comes on if the RH is lower than 70% and remains on until the RH has risen to 7

EXAMPLE 2:

The basic RH value is 85%.
Switch the roof sprinkling on if the RH is lower than 70% and the greenhouse temperature is higher than 26

roofsprinkling influence on: ViP (100=on) -

		Start time	Relative t	Change	Value	Deviation RH - %	
						-14	-15
1	Y	00:00	Sunrise	00:00	0	100	
2	Y	01:00	Sunrise	00:00	0	0	

roofsprinkling influence on: ViP (100=on) -

		Start time	Relative t	Change	Value	Greenhouse temp - °C	
						26.0	25.9
1	Y	00:00	Sunrise	00:00	0	100	
2	Y	-01:00	Sunset	00:00	0	0	

Switching off has precedence over switching on.
The roof sprinkling system comes on if the RH is lower than 70%. As soon as the greenhouse temperature i 26^{o}C the roof sprinkling system is switched off.

EXAMPLE 3:

The basic RH value is 85%.
Switch the roof sprinkling on if the RH is lower than 70%. The roof sprinkling must remain on for at least 4 h may not start after 16.00 hours. After 18.00 hours the roof sprinkling must always be off, even if it has not ye operation for 4 hours.

roofsprinkling influence on: ViP (100=on) -

		Start time	Relative t	Change	Value	Deviation RH - %	
						-14	-15
1	Y	08:00	Clock	00:00	0	100	
2	Y	16:00	Clock	00:00	0	0	

roofsprinkling influence off: ViP (100=off) -

		Start time	Relative t	Change	Value
1	Y	08:00	Clock	00:00	0
2	Y	16:00	Clock	00:00	100

roofsprinkling: minimum time on	04:00

The 'roofsprinkling: minimum time on' setting is always maintained, even when the 'roofsprinkling influence c setting reaches 100 via an influence.

If the value set under 'roofsprinkling influence off: ViP (100=off)' is equal to 100 (after 18.00 hours in this exa 'roofsprinkling: minimum time on' setting is cancelled.

The 'roofsprinkling: minimum time on' setting is maintained if the 'roofsprinkling influence on: ViP (100=on)' s 100 via an influence. If the value set under 'roofsprinkling influence on: ViP (100=on)' is equal to 100, the 'ro minimum time on' setting is cancelled.

Lighting

The lighting is divided up into blocks. The lighting program can contain blocks for both assimilation lighting a

1. Assimilation lighting
   Examples
   - Timed lighting
   - Timed lighting, off when too much sunlight
   - Lighting not on for a short time
   - Preventing lighting coming on and going off frequently
   - Timed lighting, off when too much sunlight and supplementary lighting
   - Lighting with MeteoScope (weather forecast) and supplementary lighting
   - Less lighting following a number of bright days
   - Blocking lighting (type of extra off-hours) with several TE units
   - Lighting off during peak-rate hours
   - Lighting off during peak-rate hours, indicated by signal
   - Blocking lighting when blackout curtains not closed
   - Lighting as extra heat source
   - Lighting when CHP running
2. Cyclic lighting

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1. Assimilation lighting

Assimilation lighting is one of the means available to improve production and quality, especially in periods w much light.
If temperature, RH, water and CO_2 are at optimal levels, available sunlight is the factor that limits growth. Inc

amount of light with the aid of assimilation lighting enables the plant to assimilate more nutrients and so to g
result is higher production and batter quality.

Examples

Timed lighting

Assimilation lighting can be switched on between a start time and a stop time. The period may pass midnigh

EXAMPLE:
The lighting comes on at 22:00 until 07:00 the following day.

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value
1	Y	07:00	Clock	00:00	0
2	Y	18:00	Clock	00:00	0

Timed lighting, off when too much sunlight

Assimilation lighting can be switched on between a start time and a stop time. When there is a lot of sunligh
be switched off.

EXAMPLE:
The lighting comes on at 22:00 until 16:00 the following day.
In the daytime the lighting goes off when the solar radiation is above 280 W/m².

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²	
						200	280
1	Y	16:00	Clock	00:00	0	0	
2	Y	22:00	Clock	00:00	100	-100	

delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o
below 200 W/m² for 15 minutes before the lighting comes on again.

Lighting not on for a short time

Assimilation lighting can be switched on between a start time and a stop time. When there is a lot of sunligh
be switched off. The lighting cannot be swtched on shortly before the stop time.

EXAMPLE:
The lighting comes on at 22:00 until 16:00 the following day.
In the daytime the lighting goes off when solar radiation is above 280 W/m².
The lighting may not be switched on again half an hour before the stop time.

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²	
						200	280
1	Y	16:00	Clock	00:00	0	0	
2	Y	22:00	Clock	00:00	100	-100	

lighting: minimum time on	00:30

delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o
below 200 W/m² for 15 minutes before the lighting comes on again.
Suppose the lighting is switched off at 11:00 because the actual radiation was above 280 W/m². If the actual
below 200 W/m² at 15.35, the lighting will not come on because the remaining lighting period is less than 30

Preventing lighting coming on and going off frequently

The lighting must be switched on and off as little as possible to reduce wear on the lamps. When the lamps
switched off, you have to wait a little while before switching them on again, at least until the lamps have cool

EXAMPLE:
The lighting comes on at 22:00 until 16:00 the following day.
In the daytime the lighting goes off when solar radiation is above 280 W/m².
The lighting may not be switched on again half an hour before the stop time.
Once the lighting has been switched off, it must stay off for at least 20 minutes.

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²	
						200	280
1	Y	16:00	Clock	00:00	0	0	
2	Y	22:00	Clock	00:00	100	-100	

lighting: minimum time on	00:30
lighting: minimum time off	00:20
delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o
below 200 W/m² for 15 minutes before the lighting comes on again.

Timed lighting, off when too much sunlight and supplementary lighting

Assimilation lighting can be switched on between a start time and a stop time. When there is a lot of sunligh
be switched off. If the radiation sum is not sufficient, supplementary lighting can be used.

EXAMPLE:
The lighting comes on at 22:00 until 16:00 the following day.
In the daytime the lighting must be off when solar radiation is above 280 W/m².
If the radiation sum has not risen above 500 J/cm² by 16.00, supplementary lighting will be used for 1 more
supplementary lighting can go off when there is a lot of sunlight.

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²		RadSum Multy-day - J/		RadS
						200	280	499	500	599
1	Y	16:00	Clock	00:00	100	-100		-1		
2	Y	17:00	Clock	00:00	0	0		0		
3	Y	22:00	Clock	00:00	100	-100		0		

delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o
below 200 W/m² for 15 minutes before the lighting comes on again.

Lighting with MeteoScope (weather forecast) and supplementary lighting

Lighting can be used when a dull day is expected (from the weather forecast).
Supplementary lighting can be used in the evening until the plant has received the desired radiation sum.

EXAMPLE:
The lighting comes on at 05:30 when dull weather is expected. After 10:00 the lighting must stay on if the ac radiation is less than 220 W/m². From 15:00 to 22:00 the lighting must be on to provide supplementary lighti sum is less than 450 J/cm².

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²		RadSum MSc - J/cm²		Rac
						280	220	0	400	0
1	Y	05:30	Clock	00:00	0	100		-100		
2	Y	10:00	Clock	00:00	0	100		0		
3	Y	15:00	Clock	00:00	0	100		0		
4	Y	22:00	Clock	00:00	0	0		0		

delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o below 200 W/m² for 15 minutes before the lighting comes on again.

Less lighting following a number of bright days

Following a number of bright days the lighting can be switched on at a lower radiation level than following a days.

EXAMPLE:
The lighting program must be enabled between 05:30 and 22:00.
Following a dull period, the lamps must come on when the actual solar radiation is below 220 W/m² and go (actual solar radiation is above 280 W/m².
Following a bright period, the lamps must come on when the actual radiation is below 100 W/m² and go off v radiation is above 160 W/m².

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value	Radiation - W/m²		Radiation - W/m²		RadSu
						160	100	280	220	1499
1	Y	05:30	Clock	00:00	0	100		100		
2	Y	22:00	Clock	00:00	0	0		0		

delay time: on because of radiation	00:15
delay time: off because of radiation	00:10

Control Climate, Lighting, General

selection influence radiation sum lighting	sum over several days
24 hours: start time	23:00
24 hours: type of start time	clock
multi-day average: start day	-3
multi-day average: stop day	-1

In this example the actual solar radiation must be above 280 W/m² for 10 minutes before the lighting goes o below 200 W/m² for 15 minutes before the lighting comes on again. The sum over several days is calculatec and the 2 days before. This is calculated each day at 23:00.
If you also want to include the expected radiation sum for today, you will need the weather forecast (MeteoS The start day and stop day can then be set as follows:

multi-day average: start day	-2

multi-day average: stop day	0

Blocking lighting (type of extra off-hours) with several TE units

The lighting can be blocked via a uni-switch. If, for example, the lighting is supplied by 2 TE units, then part
can be switched off if one of the TE units breaks down.

EXAMPLE:
The lighting supplied via block 1 has to go off if TE unit 1 breaks down.
The breakdown detection is connected to uni-switch 1.
The lighting supplied via block 2 has to go off if TE unit 2 breaks down.
The breakdown detection is connected to uni-switch 2.

Assimilation lighting: 1

uni-influence, 100 = off: connected uni-switch	uni-switch TE 1

Assimilation lighting: 2

uni-influence, 100 = off: connected uni-switch	uni-switch TE 2

Control General, Uni-switch TE 1 and Uni-switch TE 2

type of uni-influence	uni-measurement
measurement 1/2: type of measurement	detection

Lighting off during peak-rate hours

A uni-influence can be used to respond to off-peak/peak-rate hours and weekend rates.

EXAMPLE:
The lighting goes off on workdays between 07:00 and 09:00.

uni-influence, 100 = off: connected uni-switch	1

Control General, Uni-switch: 1

uni-switch: type of switch	week switch
type of uni-influence	actuation

Control General, Uni-switch, Week switch: 1

lighting: Vip on (100=on ; 0=off) -

		Start time	Relative t	Change	Value
1	Y	07:00	Clock	00:00	100
2	Y	09:00	Clock	00:00	0

period 1: days active	Monday to Friday

Lighting off during peak-rate hours, indicated by signal

A uni-influence can be used to respond to off-peak/peak-rate hours and weekend rates. Some utility compar
signal for this which is automatically input by the computer.

EXAMPLE:
The lighting goes off when the signal is received.

uni-influence, 100 = off: connected uni-switch	1

Control General, Uni-switch: 1

type of uni-influence	uni-measurement

measurement 1/2: type of measurement	detection

Blocking lighting when blackout curtains not closed

The lighting can be blocked via a uni-influence if the blackout curtain is not yet closed.

EXAMPLE:
Block the lighting as long as the blackout curtain is not closed. The curtain limit switch is connected to a uni-detector.

uni-influence, 100 = off: connected uni-switch	1

Control General, Uni-switch: 1

measurement 1/2: type of measurement	detection
type of uni-influence	uni-measurement

Lighting as extra heat source

The lighting can be switched on via a uni-switch to supply extra heating to the greenhouse.

EXAMPLE:
The lighting comes on via a uni-switch when the temperature outside is colder than 5° and the wind speed is m/s.

uni-influence, 100 = on: connected uni-switch	1

Control General, Uni-switch: 1

uni-switch: type of switch	week switch
type of uni-influence	actuation

Control General, Uni-switch, Week switch: 1

period 1: influences ViP (100=on; 0=off) -

		Start time	Relative t	Change	Value	Outside temp - °C		Windspeed - m/s	
						5.0	10.0	2	6
1	Y	00:00	Sunrise	00:00	0	-100		100	

Lighting when CHP running

The lighting can be switched on via a uni-switch when the CHP is running. The CHP "on" detector is connec switch as a detector.

EXAMPLE 1:
The lighting comes on via a uni-switch when the CHP is running.

uni-influence, 100 = on: connected uni-switch	1

Control General, Uni-switch: 1

uni-switch: type of switch	week switch
measurement 1/2: type of measurement	detection
type of uni-influence	actuation

EXAMPLE 2:
The CHP is actuated if the tank is insufficiently full (CHP tank schedule). Lighting is then cheap, and the lam switched on. A uni-switch is used to achieve this. The CHP will continue to run as long as the lighting is swit lighting must therefore be switched off again if the tank becomes too full.

uni-influence, 100 = on: connected uni-switch	1

Control General, Uni-switch: 1

uni-switch: type of switch	week switch
measurement 1/2: type of measurement	detection
type of uni-influence	actuation

period 1: influences ViP (100=on; 0=off) -

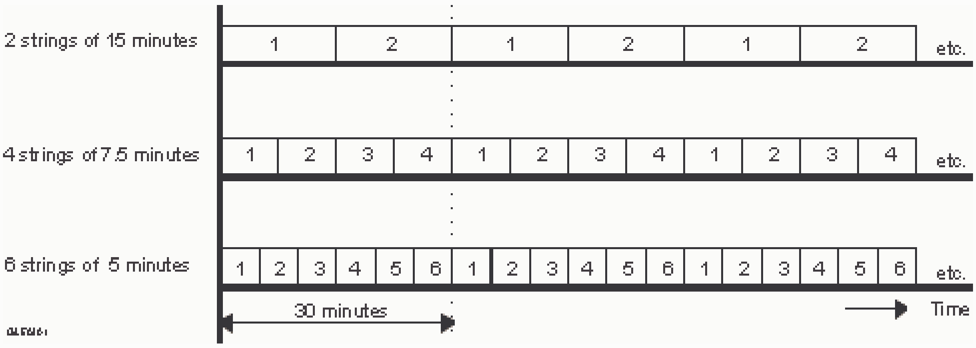
		Start time	Relative t	Change	Value	Tank temperature - °C	
						68	73
1	Y	00:00	Sunrise	00:00	0	100	

2. Cyclic lighting

Cyclic lighting is used to lengthen the period of daylight for the plant, so that plants which like a short day do
It is not necessary for the lamps to stay on continuously throughout the period of extended daylight. It is suff
be switched on at periodic intervals.

Each lighting block is divided up into a number of switching-ons or strings. These come on in turn throughou
time. When the last string is finished, the first string is started again so that the switching-ons follow a cyclic

A number of switching-ons per block of cyclic lighting can be entered when the program is purchased. A mir
maximum of 6 strings are possible.
The total time taken by a switching-on cycle is fixed at half an hour. The cycle time is divided equally over th
strings.



Lighting - Assimilation

assimilation lighting: actuations
This setting indicates what is currently happening with the lighting.

- **Block on**: the lighting is in operation

assimilation lighting: on
This setting is used for registration and indicates whether the lighting is on or off.

100 = on
0 = off

counter minimum time on
If the lighting is switched on, this counter runs until the lighting may be switched off again. This counter there
the time that the lighting is continuously switched on.

counter minimum time off

If the lighting is switched off, this counter runs until the lighting may be switched on again. This counter there
the time that the lighting is switched off continuously.

counter delay time on because of radiation
As soon as the lighting should be able to be switched on because the radiation at that time is sufficiently low
starts to run.
If the radiation rises such that the consequence of the ViP assimilation lighting computed ViP value is again
time is reset to 0.
The lighting may only actually be switched on once the delay time has elapsed.

counter delay time off because of radiation
As soon as the lighting should be able to be switched off because the radiation at that time is sufficiently hig
starts to run.
If the radiation falls again such that the consequence of the ViP assimilation lighting computed ViP value is a
delay time is reset to 0.
The lighting may only actually be switched off once the delay time has elapsed.

delay time: on because of radiation
The lighting can be switched on via the ViP setting with a current radiation influence in W/m^2. However, the
too low for at least the delay time before the lighting is actually switched on.

delay time: off because of radiation
The lighting can be switched off via the ViP setting with a current radiation influence in W/m^2. However, the
too high for at least the delay time before the lighting is actually switched off.

EXAMPLE:
The radiation must be too high or too low for at least 10 minutes before the lighting may be switched on or o

delay time: on because of radiation	00:10
delay time: off because of radiation	00:10

influence radiation sum lighting multi-day
This setting indicates on which influence the 'Radiation sum lighting multi-day' setting works.

lighting Econaut: heat of the lamps
If assimilation lighting is available, this setting can be used to specify how much heat the lamps emit per m^2
is not the same as the lamps' power consumption, but is only that proportion which is converted into heat.

EXAMPLE:
Power consumption = lamp 400 W + fitting 50 W = 450 W
Heat emitted = 450 x 75% = 338 W

lighting: minimum time on
If the ViP setting switches to an off period, the lighting only goes off if the 'lighting: minimum time on' has als
switching the lighting on for the ViP setting, it is not allowed to come on if the remaining lighting period is sho
'lighting: minimum time on'.

lighting: minimum time off
This time has to be set at a minimum to the required cooling time for the lamps before they are allowed to be
again. Furthermore, the 'lighting: minimum time off' setting can be used to ensure smooth operation in the co
The lighting may only be switched on if the 'lighting: minimum time off' has elapsed.

EXAMPLE:
The lighting has to be on for at least 30 minutes and off for 15 minutes.

lighting: minimum time on	00:30
lighting: minimum time off	00:15

lighting: time on - 24 hours
This setting is used for registration purposes and indicates how long the lighting has been on in the previous

lighting: time on actual 24 hours
This setting is used for registration and shows how long the lights are burning on the current day.

lighting: Vip on (100=on ; 0=off)
This setting is used to switch the lighting on and off. If the computed value of the ViP setting is 100, the light be on. If the computed value is 0, the lighting is allowed to be off.

Adjustable influences:

RadSum multi	J/cm^2
Radiation	W/m^2
RadSum MSc	J/cm^2
Radiation sumB	J/cm^2

status lighting via uni-influence
This setting indicates the status of the lighting if the lighting is actuated via a uni-influence.

lighting: priority
This setting indicates the priority used for switching the lighting on or off.

Combination kencode, univalue (NAME, 897843239) not defined
This setting indicates the status of the lighting.

TE: ON for this block?
Here you can specify whether the TE system has to be switched on (YES) if this lighting block is on.

TE: connected group EM
Enter the group number of the TE unit.
This setting provides the connection with the lighting block and the TE unit which can be switched on if this l on.

test: lighting on
This setting can be used to switch the lighting on in order to check which lamps have blown. The lighting is s the usual switch-on delay. The only circumstance under which the lighting cannot be switched on for testing actuators are blocked because of an alarm.
After the alarm the test can proceed. The usual switch-on delay then also applies.
If testing is set while the lighting is switched on, the normal lighting program is interrupted.
After the test the lighting program resumes.

uni-influence, 100 = off: connected uni-switch
The lighting can be switched off by means of a uni-switch.
This setting is used to connect the lighting to a uni-switch. This acts as a type of off-hours control for each li
The 'lighting: minimum time on' setting is cancelled.

uni-influence, 100 = on: connected uni-switch
The lighting can be switched on by means of a uni-switch.
This setting is used to connect the lighting to a uni-switch.
The 'lighting: minimum time on' settings are taken into account before the lighting is switched on or off. **Lig**

Cyclic

cyclic lighting: actuations
This setting indicates what is currently happening with the lighting.

- **Block on**: the lighting is in operation

cyclic lighting: start period 1
cyclic lighting: stop period 1
cyclic lighting: start period 2
cyclic lighting: stop period 2
The lighting is switched on between the start and finish times.
Two periods are possible; period 1 and period 2.
The use of 2 periods enables pre- and post-night lighting to be achieved.
A period can be switched off by making the start and finish times the same.

cyclic lighting: status
This setting indicates what is currently happening with the control system.

- **Block on**
  The lighting is on.
- **Block free clock**
  Lighting allowed between start and finish times.
- **Testing active**
  Lighting test is active.
- **Period 1**
  Period 1 is active.
- **Period 2**
  Period 2 is active.

test: lighting on
test: counter number of cycli
These settings are used to test the lighting.

cyclic lighting: start registration
The system registers how long the lighting is on every day from this time.

Lighting - External processes

CHP and TE: connected process id
Apart from the EM cluster the process ID must always be set to 1.

Lighting - General

24 hours: start time
24 hours: type of start time
The 24-hour averages are transmitted at this time.

multi-day average: radiation sum
multi-day average: start day
multi-day average: stop day
The multi-day average is calculated from the start day to the finish day, inclusive.

radiation sum day 0
radiation sum day -1
radiation sum day -2
radiation sum day -3
radiation sum day -4
radiation sum day -5
radiation sum day -6
radiation sum day -7
Day 0 indicates the anticipated radiation sum for the current day (if MeteoScope is live). Day -1 is the radiati
yesterday etc.

EXAMPLE:

The 24-hour averages have to be transmitted at 23.00 hours. Calculation of the multi-day average is based
day before yesterday and the day before that.

24 hours: start time	23:00
24 hours: type of start time	Clock
multi-day average: start day	-3
multi-day average: stop day	-1

Control Climate, Lighting, Assimilation - Service
total power off the lamps
The total power of the lamps connected to this block is set for each assimilation lighting block.

Control Climate, Lighting, General - Service
lighting: switched on power
This setting records the sum of the electrical power of all the blocks which are switched on.
This setting can also be shown in graphical form.

Control Climate, Lighting, Assimilation - Service
counter start

Control Climate, Lighting, General - Service
minimum time lamps off after no power alarm
counter lamps off after no power alarm
lighting: switch in delay
Two lighting blocks are never switched on with a shorter interval than set in 'lighting: switch in delay'.
The purpose of this is to prevent the power peak from becoming unnecessarily high.
Staggering the switching-on of the various lighting blocks is controlled via the 'counter start' setting.

If, however, the voltage to the computer (and lamps) drops for whatever reason, the system will wait for an
the power returns to allow the lamps to cool off.
Once this 'minimum time lamps off after no power alarm' has elapsed, the lighting blocks will be switched on
'lighting: switch in delay'.

off-hours lighting: detection
off-hours lighting: gross detection
This setting is for registration purposes and indicates whether the off-hours facility is active.

Roof washer

This program determines whether the climate in the greenhouse and outside are suitable for running the roo
If so, the vents will be closed while the roof washer is running.

---

alarm: alarm signal automatic set
Options:

- on outside the roof washer period
- no influence

It is possible to have the alarm signal triggered only outside the roof washer period. Some users prefer not t
roof washer is in operation overnight and develops a fault. However, they wish to be made aware of the alar
or else the vents will remain closed. To do so, select "on outside the roof waster period" in this setting.
The program now automatically enables the "roof washer fault" option in "selection measurements alarm sig
the roof washer period, and disables it again during the said period.

If the "no influence" option is selected the contents of "selection measurements alarm signal on" are not cha
alarm signal works just as you have set it.

alarm: counter washing time
This counter records the washing time per section in minutes.
If the roof washer is active for too long, an alarm can be triggered.

alarm: maximal washing time per section

If the roof washer is still not finished by this time after passing the 'roof washer: stop time', an alarm will be tı

condition release: minimum outside temperature
condition release: maximum wind speed
condition release: maximum vent position
These settings allow you to specify the outside conditions and the vent position that apply for the roof washe

The roof washer is released if:

- the outside temperature is higher than the setting
- the wind speed is lower than the setting
- the vent position is lower than the setting (assuming that the vents may be temporarily closed to wasł refers to the maximum vent position.

condition start: maximum vent position
If the vent position has actually lowered to below this level, a start command is given to the roof washer.

condition start: max deviation measurement vent position
It is possible that the vent position measurement does not move exactly to the computed position where the start. The roof washer is not released if the measurement deviation is greater than the figure set here. Furth system waits until the vent is no longer being actuated unless the vent is continuously closed with a comput 0%.

control roof washer
You can choose between Yes and No.
Specify whether the roof washer may wash the roof automatically under the stated conditions.
The weather and vent position conditions must be entered.

measurement: biggest vent position
The maximum vent position in this group is entered.

roof washer release: actuations

- **On**
  A message is transmitted to the roof washer that this group may be washed in the light of the climate conditions.

roof washer start: actuations

- **On**
  A start command is given to the roof washer to enable it to operate.

roof washer: status
This setting indicates the roof washer status.

- **Breakdown**
  The roof washer has developed a fault (finish time has passed)
- **Start**
  The roof washer can start operating.
- **Release**
  The roof washer may start operating in the light of the conditions inside and outside the house.

- **Off wind**
  The roof washer cannot operate because the wind is too strong.
- **Off vent position**
  The roof washer cannot operate because the vent positions are too high.
- **Off outside temperatur**
  The roof washer cannot operate because the outside temperature is too low.
- **Off**
  The roof washer is off.

roof washer: detection
roof washer: gross detection
Indication of whether the roof washer detector is live.
If this detector is active, the vents are closed.

- 100 = roof washer detector active
- 00 = roof washer detector inactive

roof washer: type of start time
roof washer: start time
roof washer: type of stop time
roof washer: stop time
These settings are used to specify between what times the roof washer may operate.
This is usually the afternoon and overnight.
For example, from 16.00 hours to 07.00 hours.

Soil heating

The "Soil heating" settings are used to adjust the soil heating.

---

soil Econaut: heat exchange soil
Enter the heat exchange here for 'Adjustable soil heating'.
Enter 7 here for hoses in concrete. Enter approx. 3.5 if the soil heating is in the open.
If this setting is used, set the 'soil Econaut: heat exchange pipe soil' setting to 0.

soil Econaut: heat exchange pipe soil
Enter the heat exchange here for 'Fixed soil heating'.
This is the heat exchange from the pipes in the soil to the air. If used, set the minimum soil pipe temperature
Default 10. If this setting is used, set the 'soil Econaut: heat exchange soil' to 0.

temperature: range soil control
soil pipe minimum: ViP
soil pipe maximum: ViP
The pipe temperature is limited by the minimum and maximum pipe temperatures. The temperature range is
when the maximum pipe temperature must be reached.

Adjustable influences for minimum and maximum pipe temperatures:

Radiation control	%
Snow	
Rising Agronaut	
DeviationAgronautL	
DeviationAgronautK	

EXAMPLE:
The desired soil temperature is 17°C. The pipe temperature may not be lower than 20°C nor higher than 40
The maximum pipe temperature must therefore be reached with a range of 2°C soil temperature.

temperature: range soil control	2.0
soil pipe minimum: ViP	20
soil pipe maximum: ViP	40

soil pipe: computed
This setting is for registration purposes.

soil pipe: energy demand diameter pipe
soil pipe: energy demand length pipe
Enter the diameter and the length of the soil heating circuit to enable the energy demand to be computed.

soil pipe: energy demand correction factor
This setting can be used to specify the relationship between the heat discharge of the soil pipe and a norma

- soil pipe made of PVC: correction factor = 70
- soil pipe buried in ground: correction factor = 50 **soil pipe: measurement (I/O)**
  soil temperature: measurement
  These settings are for registration purposes.

  soil pump: pipe temperature on
  soil pump: pipe temperature high speed
  The circulation pump is switched on if the computed pipe temperature is higher than 'soil pump: pipe
  The pump is switched to high-speed mode if the computed pipe temperature is higher than 'soil pump
  temperature high speed'.

  EXAMPLE 1:
  The pump is actuated at a pipe temperature of 25^{o}C.
  The system switches to high speed at 35^{o}C.

soil pump: pipe temperature on	25
soil pump: pipe temperature high speed	35

EXAMPLE 2:
The soil heating must be adjusted to a constant temperature of 20^{o}C (non-adjustable soil heating), ar
always be running.

soil pipe minimum: ViP	20
soil pipe maximum: ViP	20
soil pump: pipe temperature on	0

soil pump: status
- **Low**: 2-speed pump in low-speed mode
- **High**: 2-speed pump in high-speed mode
- **On**: pump is on
- **Off**: pump is off

soil pipe: measurement
soil pipe: correction
soil temperature: measurement
soil temperature: correction
These settings are for registration purposes.

soil temperature: ViP
The desired soil temperature.

Adjustable influences:

Radiation control	%
Radiation sum	%
Radiation sum	J/cm^2
Radiation	W/m^2
DeviationAgronautL	
DeviationAgronautK	

soil: actuation factor
The actuation factor determines the actuation time where there is a deviation from the water tempera
throttle valve actuation.
The actuation factor depends on the valve's running time.

The actuation factors for the various valves are:
- 8-minute valve: 2.5 - 4
- 4-minute valve: 1.5 - 2.5
- 2-minute valve: 0.5 - 1.5

The smaller the actuation factor, the shorter the actuation time and the smoother the control.

soil: actuation timer
The actuation timer indicates the number of seconds that the valve will still remain open or closed (frc
that the command is given) (**-** = close).

soil: actuations
This setting indicates the actuations.
- **Pump high off**
  The pump's high-speed mode is switching off.
- **Pump low off**
  The pump's low-speed mode is switching off.
- **Valve closed**
  The valve is closing.
- **Valve open**
  The valve is opening.

soil: status
This setting indicates the soil heating status.
- **Heat demand**
  There is a heat demand.
- **Heat discharge**
  Heat is being discharged (TE).
- **House regulation**
  The greenhouse temperature is too low.
- **Maximum pipe temperature**
  The computed pipe temperature is limited to its maximum.
- **Pipe temperature low**
  The measured pipe temperature is 30℃ lower than th e computed pipe temperature.
- **Transport pump**
  The transport pump is in operation.
- **Pump anti-rust**
  The pump is in operation for the anti-rust program which prevents seizure.
- **Pump high**
  The 2nd stage of the pump is in operation.
- **Pump control**
  The computed pipe temperature is higher than the temperature with the pump on; the pump is
- **Boiler protection: not open**
  The boiler temperature is lower than the protection temperature; the valves are not in operatioi
- **Boiler protection closed**
  The boiler temperature is much too low (risk of condensation in the boiler); valves are closing.

soil: connected transport EM
Enter the group number of the connected transport group to which the heat demand has to be copied

soil: connected energy manifold EM
Enter the group number of the EM manifold to which the soil heating has to copy its heat demand. S

The automatic spraying program allows you to set in advance how long the vents must stay closed du and the minimum period that the vents must stay open after spraying.
Disabling of the aspirator fan, curtain position and disabling or enabling of the recirculation fans can a spraying program.

Make sure that the hot-air boilers and the CO_2 unit are off when spraying!

---

connected aspiratorfan (01 - 15)
connected aspiratorfan (16 - 30)
connected aspiratorfan (31 - 45)
connected aspiratorfan (46 - 60)
Select all the aspirators in this climate group for the spraying program.

spraying program: status
This setting indicates the spraying program status.

- **Vents closed**
  The vents are closing.
- **Vents open**
  The vents are opening.

spraying program: released?
Set this to **Yes** to release the spraying program.

Before setting this to **Yes**, you must first set all the other settings correctly.

spraying program: once?
The spraying program can be run once or repeated daily.

spraying program: time start
The spraying program is run (if it is released) once this time has been reached.

The time that you set must not have already passed (otherwise the program will not run until th

vents closed: time
The vents remain closed for this time.

vents closed: time aspiratorfan off
The aspirator fan is off for this time. If the fan is not running, the greenhouse temperature and the RH measured properly! For this reason, the last measured RH value is retained for the control system du

If the aspirator is fitted with a CO_2 sensor, the aspirator fan must be switched off when dusting because this sensor is very sensitive to dirt and moisture.

vents closed: curtain 1 closed
vents closed: curtain 2 closed
vents closed: curtain 3 closed
vents closed: curtain 4 closed
vents closed: curtain 5 closed
vents closed: curtain 6 closed

For each curtain it is possible to set the extent to which the curtain has to be closed in percent if the v
during the spraying program.

vents closed: time fans on
Use this setting to specify how long the fans have to remain on if the vents are closed during the spra

vents open: time
After the vents have been closed for spraying, they must be opened for this time.

vents open: minimum vent position lee side
vents open: minimum vent position wind side
The minimum vent positions on the lee and wind sides if the vents have to be open during the sprayir

vents open: curtain 1 closed
vents open: curtain 2 closed
vents open: curtain 3 closed
vents open: curtain 4 closed
vents open: curtain 5 closed
vents open: curtain 6 closed
For each curtain it is possible to set the extent to which the curtain has to be closed in percent if the v
during the spraying program.

vents open: recirculation fans on
Use this setting to specify whether the fans have to be on if the vents are open during the spraying pr

Ventilation

The vents are used to provide ventilation. The vent on the (public) road is called vent 1, the other ven

The side from which the wind blows in is called the wind side, the other side is called the lee side.
If the vents on the wind side and the lee side are open by the same amount, there will be a greater ex
the wind side. That is why the vent position on the wind side is computed smaller than on the lee side

What is the best way to handle the ventilation settings in your greenhouse computer?

The ventilation temperature is the greenhouse temperature, above which extra ventilation is applied.
Outside conditions influence the amount of ventilation used.
When conditions are unfavourable (low outside temperature, a lot of wind), ventilation is used sparing
carried out in small steps and the maximum vent position is automatically reduced (this is called pre-c
When conditions are favourable, more ventilation is used. Ventilation is used before conditions in the
become too warm (this is called pre-control). Ventilation is applied in bigger steps and if it stays too w
greenhouse for a prolonged period the vents will open further and further (this is called integrated cor

If the RH gets too low in the late afternoon, there is a risk that the crop will come under stress. This ca
prevented by lowering the vent position depending on the measured RH.
If less ventilation is needed because the RH is too low, lower the vent position on the wind side first. T
regularly described in the trade journals. There are also alternative solutions, such as use of roof spri

Vent position humidity is a control, which lets a little air in depending on the outside temperature. Use
the summer months too.

Ventilation - General

spraying: time aspiratorfan group off
This setting is used to switch the aspirator fans of this climate group off during spraying.

If the fan is not running, the greenhouse temperature and the RH are not measured properly!

If the aspirator is fitted with a CO_2 sensor, ensure that the aspirator fan is switched off during d
spraying because this sensor is very sensitive to dirt and moisture.

spraying: time vent closed
This setting enables the vents to be kept closed during spraying.

spraying: time vent open after spraying
After spraying, the vents are opened for this period.

EXAMPLE 1:
Spraying is carried out for 3 hours. The vents must be closed during spraying.
The fan must be off for the first 30 minutes of spraying.
The vents must be set to the minimum vent position for 30 minutes after spraying. The minimum vent
spraying is 10.

spraying: time aspiratorfan group off	00:30
spraying: time vent closed	03:00
spraying: time vent open after spraying	00:30

Control Climate, Ventilation, Lee side

spraying: minimum vent position after spraying	10

EXAMPLE 2:
The vents must be closed for 15 minutes.

spraying: time vent closed	00:15
spraying: time vent open after spraying	00:00

P-control ventilation: influence step size
This setting is used to adjust the vent position as a function of the capacity of the vents.
The larger the number, the greater the step sizes.

- Small ventilation capacity (2 windows for ventilation): set to 100
- Normal ventilation capacity: set to 50
- Large ventilation capacity (continuous ridge ventilation): set to 25

The following ratio is specified in the control system:

P-control ventilation: influence step size	'P-range'
25	7
50	5
100	3

EXAMPLE 1:
The step size is 50% (the 'P-range' is then 5). The maximum vent position is 100%.

Theoretically 100 / 5 = 20% vent position will be set per degree of greenhouse temperature.

In practice the vent position can be opened further or less far by, for example:
- 'lee side control windinfluence: ViP' setting
- 'control: influence moderate - large ventilate' setting
- current outdoor temperature
- current radiation

EXAMPLE 2:
The step size is 100% (the 'P-range' is then 3). The maximum vent position is 100%.

Theoretically 100 / 3 = 33 % vent position will be set per degree of greenhouse temperature.

wind direction: wind in vent 1
Enter the wind directions blowing in vent 1 if a wind vane is available.
As far as the other wind directions are concerned, vent 1 will be actuated as the lee side.

uni-influence: connected uni-switch ventilation
Various ViP settings have a so-called uni-influence. The ViP setting can therefore be influenced by a
This setting enables you to connect the control unit to a uni-switch via the map.

Such a connection can be made with the following control units among others:

- greenhouse heating, for a uni-influence on the minimum pipe temperature or on the heating te work in combination with Econaut)
- ventilation, for a uni-influence on the humidity vent position or on the ventilation temperature
- assimilation lighting, for a uni-influence to switch the lighting on or off
- curtains, for a uni-influence on the energy curtain, the shading curtain or the crack in the curtai
- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

lee side priority over wind side
If you opt for NO, a uniform ventilation number is used for the lee and wind sides. The degree of vent depends on:

- whether or not a different setting has been made between lee and wind side ventilation tempe
- the moderate-ample ventilation setting
- the % wind influence setting

If you opt for YES, the desired ventilation number is used in hot weather with a larger lee-side vent po wind-side vent position. If the greenhouse temperature is too high, the lee side is gradually opened fi maximum vent position, followed by the wind side.

wind direction: wind parallel to the glasshouse ridge
Enter the wind directions here; note that uniform ventilation must be used for the lee and wind sides b the ridge. Always also decide for the wind directions on the ridge whether (Yes) or not (No) these bel

Ventilation - Leeside and Windside

control: influence moderate - large ventilate
This setting is used to ensure that slightly more ample ventilation is provided particularly in spring an

- Very moderate ventilation: set to 0
- Normal ventilation: set to 50
- Ample ventilation: set to 100

With certain crops it is desirable to open the vents wide early in the day in good, stable weather to pr possible the greenhouse temperature from rising above the ventilation temperature. In other cases m better.

Thanks to a sophisticated weather-dependent control system, it is possible to ventilate quickly and st maintaining smooth operation of the ventilation unit.
If you choose "Ventilate amply" and the weather is stable, the system quickly ventilates sufficiently th the greenhouse temperature is kept as close as possible above the ventilation line.

lee side control windinfluence: ViP
Enter a number between 0 and 100 to set the influence of the wind on the vent position.

This setting applies when the curtain is open.

- No wind influence: set to 0
- Normal wind influence: set to 50
- Large wind influence: set to 100

You can make the degree of wind influence dependent on the wind direction.

EXAMPLE 1:
Wind influence 50%.
If the wind is coming from the dry direction (SE, E or NE), then increase the wind influence.
If the wind is coming from the wet direction (SW, W or NW), then decrease the wind influence.

leeside vent position humidity windinfluence: ViP - %

		Start time	Relative t	Change	Value	Wind direction Dry	Wind direction Cold
1	Y	00:00	Sunrise	00:00	50	10	-10

The wind influence ensures that the vents are closed further, the harder the wind is blowing.
If, however, it is much too warm in the house, the greenhouse temperature will have priority ov

EXAMPLE 2:
Wind influence 100%.
The vents will be closed further, the harder the wind blows.

If the ventilation temperature in spring is set to, for example, 12℃ (cold crop) and it is 18° C in the gre
will be opened further because it is too warm in the greenhouse.

If you wish to reduce the vents to protect against the wind, a wind influence can be set using the 'lee
maximum: ViP' setting.

lee side vent position humidity: ViP
lee side vent position humidity windinfluence: ViP
The plant produces moisture by transpiration.
If the outdoor temperature is low, this moisture condenses against the roof, ducts and outside walls.
If the outdoor temperature increases, there is less condensation and moisture has to be discharged v
position.

The moisture vent position is a small vent position which operates as a minimum vent position and is
the greenhouse temperature.
You can make use of influences such as outdoor temperature and wind speed to prevent too much c

EXAMPLE 1:
Setpoint RH 80%.
If the RH becomes too high, a vent position must be set.
At 85% RH the vent position must be 5%.
If it is colder than 12℃ outside, the vent positio n must be reduced.
At an outdoor temperature of 5℃ the vent must be c ompletely closed.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Deviation RH - %		Outside temp - °C	
						0	5	12.0	5.0
1	Y	00:00	Sunrise	00:00	0.0	5.0		-5.0	

EXAMPLE 2:
Setpoint RH 80%.
If the RH becomes too high, a vent position must be set.
At 85% RH the vent position must be 5%.

If it becomes too cold in the house, the vent position must be reduced.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Deviation RH - %		Deviation heating temp	
						0	5	0.5	-0.5
1	Y	00:00	Sunrise	00:00	0.0	5.0		-5.0	

In the case of a heating temperature of, for example, 20°C, the vent position will be reduced if the gre
falls from 20.5℃ to 19.5℃.

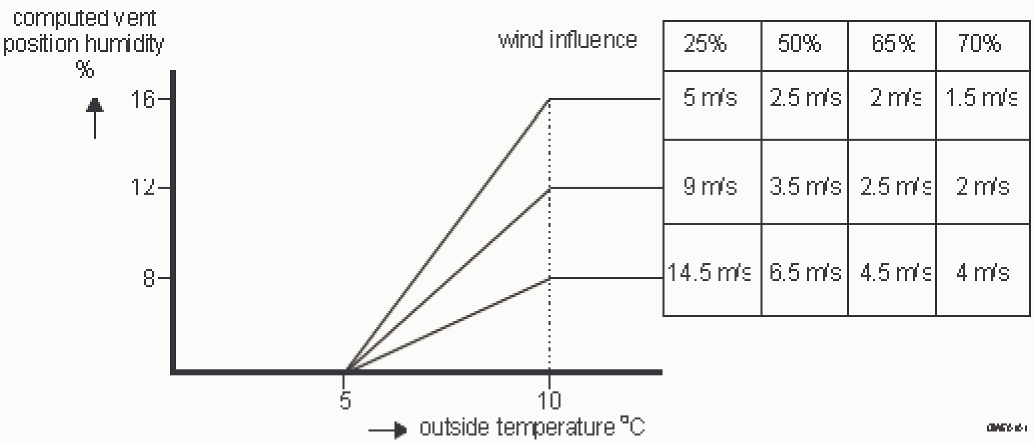
EXAMPLE 3:
If the temperature outside increases above 5℃, a v ent position may be set.
At 10℃ this vent position must be 16%.
If the wind is coming from the cold direction, this vent position must be reduced more.
If the wind is coming from the warm direction, this vent position must be reduced less.

leeside vent position humidity: ViP - %

		Start time	Relative t	Change	Value	Outside temp - °C	
						5.0	10.0
1	Y	00:00	Sunrise	00:00	0.0	16.0	

leeside vent position humidity windinfluence: ViP - %

		Start time	Relative t	Change	Value	Wind direction Warm	Wind direction Cold
1	Y	00:00	Sunrise	00:00	50	-10	10



lee side vent position limit minimum: computed
lee side vent position limit maximum: computed
lee side temperature range: computed
A higher or lower **minimum vent position limit** is computed, depending on the outside temperature.
The **maximum vent position limit** is lowered by the control system on the wind side in the event of
temperature and/or windy conditions.
The computed maximum vent position is reached when measured greenhouse temperature = ventila
temperature band.

lee side vent position minimum: ViP
The minimum vent position limit.
The minimum vent position can be increased or reduced as a function of the emission of CO_2. The C
often only measured in one group, whereas the CO_2 influence on other climate groups, particularly v
desirable.
If a CO_2 measurement group number is entered in the "Greenhouse properties" menu, the CO_2 ViP
work in groups that do not have their own sensor.

lee side vent position maximum: ViP
The maximum vent position limits.

The maximum vent position has priority over all other vent positions.

EXAMPLE 1:
It is possible for the CO_2 level to rise substantially overnight in the open. Particularly, for example, if incorporated in the soil. By now setting a minimum vent position with too high a CO_2 level, the house

leeside vent position minimum: ViP - %

		Start time	Relative t	Change	Value	CO2 - ppm	
						1000	1010
1	Y	00:00	Sunrise	00:30	0	10	

Notes:
The set influence for CO_2 begins at 1000 ppm and is at its maximum at 1010 ppm.

EXAMPLE 2:
Many nursery operators set a minimum vent position to create a more active climate in the house. T be reduced if the temperature falls or if the wind blows too hard.

leeside vent position minimum: ViP - %

		Start time	Relative t	Change	Value	Outside temp - °C		Windspeed - m/s	
						13.0	8.0	2	6
1	Y	00:00	Sunrise	00:30	10	-8		-8	
2	Y	00:00	Sunset	00:30	6	-4		-4	

EXAMPLE 3:
The maximum vent postion is at 100%. The basic RH is 80%. If the RH becomes too low, the vents If the greenhouse temperature rises, the humidity must be reduced.

leeside vent position maximum: ViP - %

		Start time	Relative t	Change	Value	Deviation RH - %		Greenhouse temp - °C	
						-10	-30	27.0	29.0
1	Y	07:00	Clock	00:30	100	-40		20	

lee side vent position maximum rain: ViP
The maximum vent position during rain.
This is not a minimum vent position.
You can make the maximum vent position in rain dependent on the wind speed.

EXAMPLE:
Maximum vent position in rain with no wind 40%.
If it is rainy and windy, reduce the maximum vent position to 10%.

leeside vent position maximum rain: ViP - %

		Start time	Relative t	Change	Value	Windspeed - m/s	
						3	6
1	Y	00:00	Sunrise	00:00	40	-30	

lee side vent position maximum curtain: ViP
This is the maximum vent position with the curtain closed.
However, 'lee side vent position maximum: ViP' has priority over the 'lee side vent position maximun

EXAMPLE:
Maximum vent position with curtain 90%.
If it is windy, reduce the maximum vent position to 50%.

leeside vent position maximum curtain: ViP - %

		Start time	Relative t	Change	Value	Windspeed - m/s	
						8	12
1	Y	00:30	Sunrise	00:30	90	-40	

vent position maximum vent position limit
The maximum vent position if the vent position limit sensor is active.

lee side: deviation measurement alarm
lee side: delay time alarm deviation measurement
If there is a greater deviation between the measured and computed vent positions than that set in **le** **alarm deviation measurement** for longer than **lee side: deviation measurement alarm**, an alarm

spraying: minimum vent position after spraying
A minimum vent position can be set temporarily after spraying.

vent position 1: actuations
This setting indicates the actuations.

- **Rapid closing**
  The use of special ventilation motors enables the vents to be closed rapidly if it starts to rain.
- **Vents closed**
  The vents are closing.
- **Vents open**
  The vents are opening.

vent position 1: measurement
vent position 1: gross measurement
vent position 1: gross measurement input 00 %
vent position 1: gross measurement input 100 %
Vent position measurement.

vent position 1: status
This setting indicates the status.

- **Wind side equal**
  Ventilate uniformly on lee and wind sides.
- **Wind on ridge**
  Ventilate uniformly on lee/wind sides with wind on the ridge.
- **Vent position limit**
  The vent position limit is active.
- **Roof washer on**
  The roof washer is active; vents closed.
- **Minimum limit vent position**
  The vent position is limited to its minimum.
- **Maximum limit vent position**
  The vent position is limited to its maximum.
- **Vent1 lee side**
  Vent1 is lee side; vent2 is wind side.
- **Storm influence**
  There is a storm; the vents are in storm position.

vent position storm
The maximum vent position in a storm with the curtain open.
A storm is defined as a wind speed higher than the 'wind speed storm' setting.
This happens irrespective of the greenhouse conditions.
This setting is designed to protect the vents.

vent position storm curtain
The maximum vent position in a storm with the curtain closed.
A storm is defined as a wind speed higher than the 'wind speed storm curtain' setting.
This happens irrespective of the greenhouse conditions.
This setting is designed to protect the vents.

If the curtain is opening or closing, a separate storm threshold 'wind speed storm curtain runn
If the wind speed is higher than this threshold, the vents close completely.

Water-uptake model

The settings under "Water-uptake model" relate to the Agronaut program (option).

Agronaut: water uptake sum
Agronaut: average leaf temperature
All the data relating directly to the plant itself are collated to provide you with even more information
information can only be seen if the relevant options are live in your *ECONOMIC* NT.

simulation water uptake active
This setting is set to "Yes" by the program if the water uptake simulation is active.

simulation: factor crop size
The crop size is recorded in this setting by the program. This is between 2 and 4 for vegetable crops

simulation: reflection soil
This setting indicates how much light is reflected by the soil. This depends on the material with whic
(white plastic = 0.40).

simulation: projected area greenhouse roof
This setting specifies the number of m^2 greenhouse roof per m^2 floor area. The figure in this setting
the slope of the greenhouse roof. The steeper the greenhouse roof, the higher the figure.

simulation: light permeability greenhouse roof
The light permeability of the greenhouse roof has to be set to simulate the water uptake. Account mu
of the dirtiness or opaqueness of the greenhouse roof.

EXAMPLE:

Clean greenhouse roof: light permeability up to 70%
Opaque greenhouse roof: light permeability 30 to 50%

simulation: loss of the water uptake
This setting is only required for tuning the water uptake with a drain pit. Enter here the water uptake
can evaporate directly from the soil. The water loss can also be caused by leakage in the watering s
a crop on rockwool.

simulation: maximum number of days without water drain pit
simulation: maximum number of days without water level tray
This setting is only required when tuning the water uptake with a level tray/drain pit. There is normall
watering at the end of cropping before the crop is cleared. For the program this is the indication that
being planted, so that the system starts with a crop size factor of 0.5. During the cropping period, ho
possible that no watering is carried out for several days in succession, especially in the winter month

simulation: projected pipe area circuit 1
This contains an area in m^2 for the pipe area (projected onto the ground) per m^2 floor area.

simulation: relative position circuit 1 relative to crop
This setting indicates the position of the circuit relative to the crop. This is important for the influence
crop.

This setting can be entered as follows:

- pipe rail system: 0.0
- growth pipe halfway up the crop: 0.5
- pipe above the crop: 1.0

simulation: projected pipe area circuit 2
This contains an area in m^2 for the pipe area (projected onto the ground) per m^2 floor area.

simulation: relative positon circuit 2 relative to crop
This setting indicates the position of the circuit relative to the crop. This is important for the influence
crop.
This setting can be entered as follows:

- pipe rail system: 0.0
- growth pipe halfway up the crop: 0.5
- pipe above the crop: 1.0

Aspirators

curtains: type of greenhouse temperature measurement
You can choose here to adjust to: average temperature, maximum temperature or minimum tempera

curtains: type of RH measurement
You can choose here to adjust to: average RH, maximum RH or minimum RH.

curtains: connected aspirator A
curtains: influence aspirator A
curtains: connected aspirator B
curtains: influence aspirator B
curtains: connected aspirator C
curtains: influence aspirator C
curtains: connected aspirator D
curtains: influence aspirator D
curtains: connected aspirator E
curtains: influence aspirator E
curtains: connected aspirator F
curtains: influence aspirator F
curtains: connected aspirator G
curtains: influence aspirator G
curtains: connected aspirator H
curtains: influence aspirator H
curtains: connected aspirator I
curtains: influence aspirator I
curtains: connected aspirator J
curtains: influence aspirator J
curtains: connected aspirator K
curtains: influence aspirator K
curtains: connected aspirator L
curtains: influence aspirator L
A maximum of 12 aspirators are possible for each climate group (aspirators A to L).
If you are working with the average temperature or average RH, an influence or a weighting factor m

EXAMPLE 1:
The nursery consists of 2 bays.
Each bay (group) has a separate heating control and ventilation control.
The curtain has 1 control system and extends over both bays.

Control Climate, Aspirators, Climate (Group 1)

climate: connected aspirator A	1
climate: influence aspirator A	100
climate: connected aspirator B	0
climate: influence aspirator B	0

Control Climate, Aspirators, Heating (Group 1)

heating: connected aspirator A	1
heating: influence aspirator A	100
heating: connected aspirator B	0
heating: influence aspirator B	0

Control Climate, Aspirators, Ventilation (Group 1)

ventilation: connected aspirator A	1
ventilation: influence aspirator A	100
ventilation: connected aspirator B	0
ventilation: influence aspirator B	0

Control Climate, Aspirators, Curtains (Group 1)

curtains: connected aspirator A	1
curtains: influence aspirator A	100
curtains: connected aspirator B	2
curtains: influence aspirator B	100

Control Climate, Aspirators, Climate (Group 2)

climate: connected aspirator A	2
climate: influence aspirator A	100
climate: connected aspirator B	0
climate: influence aspirator B	0

Control Climate, Aspirators, Heating (Group 2)

heating: connected aspirator A	2
heating: influence aspirator A	100
heating: connected aspirator B	0
heating: influence aspirator B	0

Control Climate, Aspirators, Ventilation (Group 2)

ventilation: connected aspirator A	2
ventilation: influence aspirator A	100
ventilation: connected aspirator B	0
ventilation: influence aspirator B	0

Control Climate, Aspirators, Curtains (Group 2)

curtains: connected aspirator A	0
curtains: influence aspirator A	0
curtains: connected aspirator B	0
curtains: influence aspirator B	0

EXAMPLE 2:
The nursery consists of 4 bays.
Bay 1 (group 1) is a large bay with an extra aspirator for measuring the temperature and RH in the c

Control Climate, Aspirators, Climate

climate: connected aspirator A	1
climate: influence aspirator A	100
climate: connected aspirator B	2
climate: influence aspirator B	0

Control Climate, Aspirators, Heating

heating: connected aspirator A	1
heating: influence aspirator A	75
heating: connected aspirator B	2
heating: influence aspirator B	25

Control Climate, Aspirators, Ventilation

ventilation: connected aspirator A	1
ventilation: influence aspirator A	75
ventilation: connected aspirator B	2
ventilation: influence aspirator B	25

greenhouse temperature curtains: measurement
RH curtains: measurement
HD curtains: measurement
AH curtains: measurement
dewpoint curtains: measurement
Measurements of the greenhouse climate conditions.

curtains: status measurements
This setting indicates the status of the measurements:

- **aspirator fan off**

- **connected aspirator?**
  No aspirator number has been entered, or the aspirator number is wrong.
- **RH measurement error**
  The wet bulb is dry (bottle empty or sock blocked).

4. Control Water

Crop sections

The watering program is a universal program which is used for all kinds of watering such as sprinkling with sprayers, dripping on a substrate, ebb & flood control on floors or tables etc.

Crop sections form the basis for the watering procedure.
A crop section is a particular part of the crop that requires separate treatment. This can be a small part such as with cut flowers or pot plants, but can also be a large part, for example half a house of peppers.

A crop section always has to coincide with one or more entire valve sections.
A valve cannot, therefore, be used by 2 or more crop sections. If a crop section encompasses several valve sections, these valves must belong to the same water pump.

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radiation: counter sum start
This counter records the radiation sum. At each start the value of the 'radiation sum start: ViP' setting is deducted from the radiation sum counter.

The radiation sum counter is set to zero when:

- a crop section is initiated
- the counter sum start time has passed

Agronaut: counter sum start
This counter records the uptake sum. At each start the actual water supply in l/m^2 is deducted from the uptake sum counter.

The uptake sum counter is set to zero when:

- a crop section is initiated

Agronaut: uptake deviation start
This setting is used to specify at what deviation between the measured water uptake and the maximum water uptake the roof-sprinkler valves are started.

Agronaut: selection level trays
You can enter one or more level trays in this setting.
The roof sprinklers are started if too high a water uptake is measured for one of the input level trays.

alarm: deviation EC control
alarm: deviation EC monitor
alarm: deviation EC recirculation
These settings are used to specify the deviation between the measured and set EC at which an alarm is triggered.
An alarm is triggered if the EC control system or monitor rises above 6 mS/cm.
An alarm is also triggered if the EC control or monitor measurement deviates by more than 0.5 EC/cm. A fixed delay time of 2.5 minutes applies for this.

alarm: deviation pH control
alarm: deviation pH monitor
These settings are used to specify the deviation between the measured and set pH at which an alarm is triggered.

use ViP-settings recipe
If you use a recipe, you can choose whether the crop section settings or the recipe settings are used for it. This applies to the choice of fertiliser, EC, pH and EC recirculation.

computed value: phase 2 fertilizer
computed value: phase 2 EC

computed value: phase 2 pH
computed value: EC recirculation
The calculated values of the crop section or of the recipe depending on the 'use ViP-settings recipe' setting.

control flowalarm
The options in this setting are:

Continue at minimum flow	Watering continues **with the next valve** if the flow is too low
Continue at maximum flow	Watering continues **with the next valve** if the flow is too high

control EC alarm
The options in this setting are:

Continue at EC high	Watering continues **with the next valve with clean water** if the EC is too high
Continue at EC low	Watering continues **with the next valve** if the EC is too low

control maximum supply level valve?
The default setting is "No".
If a level tray is connected to the crop section at which the valve may stop, this setting has no effect whatever.
The setting works for both level valves and ebb & flow valves.

You can choose from:

No	If no level tray is connected to the crop section, the valve stops after the **minimum** time/quantity.
Yes	If no level tray is connected to the crop section, the valve stops after the **maximum** time/quantity.

control pH alarm
The options in this setting are:

Continue in event of pH alarm	Watering continues **with the next valve** if the pH is too high or too low • with acid supply: stop supply if pH is too low • with alkali supply: stop supply if pH is too high

pH control off: pH alarm on
In this setting you can specify that an alarm is triggered in the event of a pH deviation despite the fact that the pH control is off or in the event that you have no pH control but do have a measurement device for registration purposes.

control time/litres
In this setting you can choose from:

Time	Water is supplied to each valve based on time
cc/plant	Water is supplied to each valve based on cc
Litres/m^2	Water is supplied to each valve based on litres per m^2
Volume in m^3	Water is supplied to each valve based on m^3

control time/litres flush
In this setting you can choose from:

Time	Water is supplied to each flushing valve based on time
cc/plant	Water is supplied to each flushing valve based on cc/plant
Litres/m^2	Water is supplied to each flushing valve based on litres per m^2
Volume in m^3	Water is supplied to each flushing valve based on m^3

flush for phase 1
flush for phase 2
flush for phase 3
Under the 'control time/litres flush' setting you can specify how long or how much to flush.
The system is adjusted to the set EC and pH of the phase which comes after flushing.

EXAMPLE 1:
Flushing has to be carried out for 2 ½ minutes before each phase.

control time/litres flush	Time
flush for phase 1	2.30
flush for phase 2	2.30
flush for phase 3	2.30

EXAMPLE 2:
100 litres have to be flushed before each phase.

control time/litres flush	Volume in m3
flush for phase 1	0.10
flush for phase 2	0.10
flush for phase 3	0.10

counter interval / delay time
This counter records the interval after a watering cycle has started. The counter counts up.
Once the counter reaches the set interval, the interval is complete, and the delay time begins.
The counter counts up to the interval + delay time.

counter cycles
This setting records the number of watering cycles applied each day.

crop section connection automatic reset
If this setting is set to **No**, the (already connected) valves remain connected to the crop section after a cycle (used, for example, for dripping onto a substrate).

It sometimes happens, however, that you connect a number of valves to a crop section and that you wish this connection to apply for 1 cycle (used, for example, for sprinkling).
After the cycle the valves have to be disconnected from the crop section. In that case you choose **Yes** in this setting.

crop section registration: automatic add
The area and/or the number of drippers for all the connected valves can be automatically added.
If you do not opt for automatic adding, you can enter the area and/or number of drippers yourself.

registration: area crop section
The area of the crop section with reference to registration of the water supply in l/m^2.

registration: drippers crop section in tens
The number of drippers in the crop section with reference to registration of the water supply in cc/plant.

crop section: connected climate group Agronaut
In this setting you enter the number of the climate group in which the Agronaut program is active.

crop section: connected level tray
crop section: connected external contact
crop section: connected wait contact
In these settings you can enter the number of the level tray, external contact or wait contact, respectively.
One wait contact is possible for each crop section and pump.
One level valve is possible for each crop section. A level valve may only be connected to one crop section.

crop section: connected registration group watering
Use this setting to enter the group in which the data from the crop section (l/m^2, m^3, EC, pH etc.) must be registered.

crop section: connected recipe
This setting is used to connect the crop section to a recipe.

This opens up a wide variety of options (such as repeated starting with particular start conditions).

registration water supply of flushing valves?
This setting is used to include the water supply of the flushing valves in the registration.

crop section: connected registration group flushing valves
If you have opted for separate registration, it is possible via this setting to register the water supply of the flushing valves in a separate registration group. **crop section: last cycle**
crop section: last cycle
These settings contain the data on the last watering cycle, in which Monday is day 01, Tuesday day 02 etc.

crop section: last cycle reason of start
This setting shows the reason for the start of the last cycle.

crop section: number grouping phase sequence
The default setting here is 1.
The valves are taken in sequence for each phase.
For example, with rain valves: firstly pre-supply with all the valves, then supply with all and then after-supply with all.

You may, however, wish to complete the 3 phases in a number of crop sections first and then move on to another amount of crop sections etc. In that case you assign the same group number to the crop sections that you wish to group together.

crop section: status
This setting indicates the crop section status.
The various options are:

- **Phase 1 (2,3) waiting**
  The crop section is waiting until another crop section is finished.
- **Phase 1 (2,3) active**
  The crop section is actually active.
- **Stop alarm**
  The pump has stopped because of an alarm while this crop section was active.
- **Alarm after-supply**
  If watering stops because of an alarm and the alarm situation is not cancelled within 15 minutes (adjustable by Service), after-supply with clean water is automatically initiated.
- **Wait cycle**
  The crop section is on, and the system is currently waiting until a start condition becomes active.
- **Wait**
  This message can appear directly after start-up; the crop section will start within a few seconds. The message can also be displayed if the crop section has been switched on but is to start at a later time.

ebb & flow: phase 2 supply maximum
This setting is only used if an ebb & flow valve is active.
The ebb & flow valve can respond to a stop signal from an external contact between the minimum and maximum supply settings.
The maximum supply setting always has precedence.

ebb & flow: maximum wait time
If the level in the storage tank is too low, the system must wait before raising the next table or floor.
The maximum waiting time can be entered here. Waiting is cancelled as soon as the level in the storage tank is high enough.

EC control: EC value phase 2
EC control: EC value phase 3
You can enter the EC setpoint in these settings.
If watering stops because of an alarm (apart from an external alarm), and the alarm situation is not cancelled within 15 minutes (adjustable by Service), after-supply with clean water is automatically initiated (even if supply during after-supply is set).

pH control: pH value
You can enter the pH setpoint in this setting.

recirculation: EC value
You can enter the EC setpoint for the recirculation control system in this setting.

EC control: type of control
You can choose one or more options in this setting:

Phase 3 EC supply	EC supply control with phase 3 active
Phase 2 EC supply	EC supply control with phase 2 active
Phase 3 EC recirculation	Recirculation control with phase 3 active
Phase 2 EC recirculation	Recirculation control with phase 2 active
Phase 1 EC recirculation	Recirculation control with phase 1 active

fertilizer phase 2: number selection
mesttype of phase 3: number selection
Different fertiliser types can be used for phases 2 and 3.
An option can be chosen for each phase in these settings.

method sorting watering valves
This can be used to choose how to sort the valves into an order when dealing with them.
The following choices are possible:

Optimised	A priority order is laid down for the valves. This order is: flushing valve, level valve and then the other valves. This order always applies within a group of valves with the same fertiliser type and the same EC. The sort order between different ECs goes from high to low EC. Only valves from the same matrix block are actuated at the same time.
Numerical order	The valves are dealt with in ascending valve number order.

phase 1: number of watering cycles rain valves
phase 2: number of watering cycles rain valves
phase 3: number of watering cycles rain valves
pause time between watering cycles
It is not always ideal to apply large quantities of water in one go. It is better to split the cycle into several small cycles at short intervals. It is possible to divide a cycle for each phase into several smaller watering cycles, possibly with a pause between them.
For each phase the total set water supply is evenly distributed over the number of set watering cycles.

The following rules apply to this new function:

- If the number of watering cycles is set to "0" or "1", this means 1 cycle in both cases.
- The flushing valves are always operated in the first watering cycle.
- The phase 2 of level, slave, and ebb & flow valves is always run in 1 watering cycle.
- The pause also applies if only 1 watering cycle is set, i.e. it then functions as a pause between the phases.

pH control: type of control
You can choose one or more options in this setting:

Phase 3 pH active	pH supply control with phase 3 active
Phase 2 pH active	pH supply control with phase 2 active

pH control: acid/alkali supply
In this setting you can choose from:

Supply alkali	Alkali is supplied

Supply acid	Acid is supplied

phase 1: pre-supply
This setting is used if a rain valve or roof-sprinkler valve is active.
Under the 'control time/litres' setting, you can specifiy how long or how much is applied in the pre-supply phase using Time, cc/plant, Litres/m^2 or Volume per m^3.

EXAMPLE 1:

control time/litres	phase 1: pre-supply
Time	3.30 means: 3 minutes 30 seconds
cc/plant	30.00 means: 30 cc/plant
Litres/m^2	5.50 means: 5.5 litres/m^2
Volume in m^3	10.00 means: 10 m^3 per valve

EXAMPLE 2:
Pre-supply has to continue for 3 ½ minutes.
Then supply for 10 minutes and after-supply for 2 ½ minutes.

control time/litres	Time
phase 1: pre-supply	3.30
phase 2: supply	10.00
phase 3: after-supply	2.30

EXAMPLE 3:
Water must be applied at 75 cc per plant.

control time/litres	cc/plant
phase 1: pre-supply	0.00
phase 2: supply	75.00
phase 3: after-supply	0.00

EXAMPLE 4:
Pre-supply must consist of 1 ½ litres per m^2.
Then 5 ½ litres per m^2 supply and 1 ½ litres per m^2 after-supply.

control time/litres	Litres/m2
phase 1: pre-supply	1.50
phase 2: supply	5.50
phase 3: after-supply	1.50

EXAMPLE 5:
Water must be applied at 300 litres per valve.

control time/litres	Volume in m3
phase 1: pre-supply	0.00
phase 2: supply	0.30
phase 3: after-supply	0.00

phase 2: supply
This setting is used if a rain valve or roof-sprinkler valve is active.
Under the 'control time/litres' setting, you can specifiy how long or how much is applied in the supply phase using Time, cc/plant, Litres/m^2 or Volume per m^3. This setting applies as the minimum supply setting for a level valve or ebb & flow valve.

EXAMPLE 1:

control time/litres	**phase 2: supply**
Time	3.30 means: 3 minutes 30 seconds
cc/plant	30.00 means: 30 cc/plant
Litres/m^2	5.50 means: 5.5 litres/m^2
Volume in m^3	10.00 means: 10 m^3 per valve

EXAMPLE 2:
Pre-supply has to continue for 3 ½ minutes.
Then supply for 10 minutes and after-supply for 2 ½ minutes.

control time/litres	Time
phase 1: pre-supply	3.30
phase 2: supply	10.00
phase 3: after-supply	2.30

EXAMPLE 3:
Water must be applied at 75 cc per plant.

control time/litres	cc/plant
phase 1: pre-supply	0.00
phase 2: supply	75.00
phase 3: after-supply	0.00

EXAMPLE 4:
Pre-supply must consist of 1 ½ litres per m^2.
Then 5 ½ litres per m^2 supply and 1 ½ litres per m^2 after-supply.

control time/litres	Litres/m2
phase 1: pre-supply	1.50
phase 2: supply	5.50
phase 3: after-supply	1.50

EXAMPLE 5:
Water must be applied at 300 litres per valve.

control time/litres	Volume in m3
phase 1: pre-supply	0.00
phase 2: supply	0.30
phase 3: after-supply	0.00

phase 3: after-supply
This setting is only used if a rain valve is active.
Under the 'control time/litres' setting, you can specifiy how long or how much is applied in the after-supply phase using Time, cc/plant, Litres/m^2 or Volume per m^3.

EXAMPLE 1:

control time/litres	**phase 3: after-supply**
Time	3.30 means: 3 minutes 30 seconds
cc/plant	30.00 means: 30 cc/plant
Litres/m^2	5.50 means: 5.5 litres/m^2

Volume in m^3	10.00 means: 10 m^3 per valve

EXAMPLE 2:
Pre-supply has to continue for 3 ½ minutes.
Then supply for 10 minutes and after-supply for 2 ½ minutes.

control time/litres	Time
phase 1: pre-supply	3.30
phase 2: supply	10.00
phase 3: after-supply	2.30

EXAMPLE 3:
Water must be applied at 75 cc per plant.

control time/litres	cc/plant
phase 1: pre-supply	0.00
phase 2: supply	75.00
phase 3: after-supply	0.00

EXAMPLE 4:
Pre-supply must consist of 1 ½ litres per m^2.
Then 5 ½ litres per m^2 supply and 1 ½ litres per m^2 after-supply.

control time/litres	Litres/m2
phase 1: pre-supply	1.50
phase 2: supply	5.50
phase 3: after-supply	1.50

EXAMPLE 5:
Water must be applied at 300 litres per valve.

control time/litres	Volume in m3
phase 1: pre-supply	0.00
phase 2: supply	0.30
phase 3: after-supply	0.00

registration watering: type of start time
registration watering: start time
The above settings can be used in association with registration in reports and graphs to specify when registration must begin.

reset radiation counter at start time?
The default setting is **Yes**.

The 'radiation: counter sum start' setting in the crop section is used to count the total amount of radiation. This counter has the set radiation sum deducted when a cycle starts.

You can choose from:

No	At the 'radiation: start time' the 'reset radiation counter at start time?Reset radiation counter at start time?' setting is **not** set to 0. This can be used if a watering cycle has to be initiated only once daily (or even less frequently) in response to radiation.
Yes	At the 'radiation: start time' the 'radiation: counter sum startRadiation: counter sum start' setting **is** set to 0.

start later: start time
This enables you to specify watering cycles during the morning for later initiation in the afternoon and evening.
In the 'watering crop section: on/off' setting you must choose **On: start time**.

temperature control: water temperature
This setting can be used to enter the setpoint temperature for the water temperature control system.
You can disable the control system by setting the setpoint to zero.

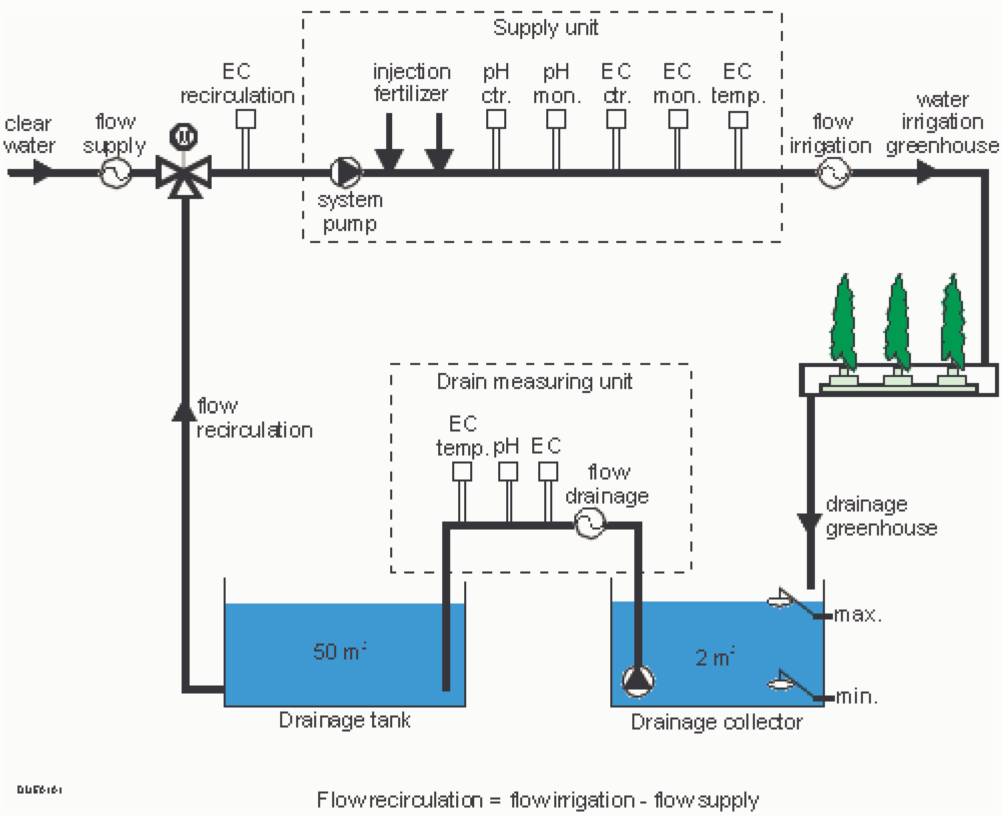
valves simultaneous: maximum number
This setting is used to specify the maximum number of valves that may be opened simultaneously.
Only valves with the same time or number of litres are opened simultaneously. The following settings must also then be correctly set:

Control Water, Supply unit, Pump
valves simultaneous maximum number: ViP

Control Water, Valves
more valves allowed simultaneously watering crop section: on/off
A crop section can be switched on or off.
The options in this setting are:

On: recipe	Watering will take place in accordance with a recipe.
On: start time	Watering will start at a later time (not to be used in combination with a recipe).
On: manual start	To be used to start a crop section without a recipe. If you are using a recipe, this option enables an interim manual start to be initiated.
Off today	The crop section is switched off for the rest of the day. To be used to stop a daily-repeated recipe on the current day and then to have it continue the following day.
Off	The crop section is switched off; interrupts a cycle in operation.

Draining



The drainage water is collected in a drain pit.
Once the drain pit is full or once an adjustable maximum interval has elapsed, the drainage water is pumped to the drainage tank via a drain unit.
Emptying is stopped by means of a minimum contact or once an adjustable maximum time has elapsed.

Drainage - Drain measuring unit

drain unit flow: measurement
Measurement of flow.

EC drain: measurement (no temperature compensation)
EC drain: correction
Measurement of drainage EC and correction.

drain unit EC temperature: measurement
drain unit EC temperature: correction
Measurement and correction for temperature compensation of the EC measurement.

drain unit pH: measurement
drain unit pH: correction
Measurement of drainage pH and correction.

flow drainwater: gross measurement
flow drainwater: correction
Measurement of flow.

drain unit: connected drain pit active
In this setting the registration program records the number of the drain pit which is engaged in emptying.

drain unit: time emptying
In this setting the registration program records the elapsed emptying time.

drainpump: release / stop
You can choose from:

Start drain pump	This option releases the drain pump (or valve). Important: the drain pit must also be released!
Stop drain pump	The drain pump (or valve) can be stopped with this option.

drainpump: status
This setting indicates the drain pump status. One or more of the following options can occur:

- **Measurement interval**
- **Pump mode**
- **Measuring active**
- **Measurement delay time**
- **Pump active**
- **Pump off**

drainwater: type of water sensor
You can choose between: **flow sensor** and **litre counter**.
The default setting is flow sensor.

pulse drainwater: number of litres/pulse
This setting is not applicable in the case of a flow sensor.
Enter the number of litres corresponding to one pulse of the litre counter including the GL board's divide factor.

pulse drainwater: interval time 0-measurement
This setting is not applicable in the case of a flow sensor.
A duration which is greater than the time between 2 pulses must be entered in this setting. After this time, the derived flow (litres/min) is set to 0 in the reports.
If too low a value is set, the flow alarm can be triggered.

flow drainwater: gaugin factor diameter
This setting is not applicable in the case of a litre counter.
The flow sensor emits a measurement signal which corresponds to the number of revolutions of the paddle wheel in the sensor. This measurement signal is converted by the computer into a quantity of water, as a function of the diameter of the pipe in which the flow sensor is installed.

Drainage - Drain pit

drain pit emptying: number of starts
This setting shows the number of times that a drain pit is emptied daily.

emptying drain pit: elapsed delay time
Once the delay time has elapsed, the drain pit is emptied for the last time.
The drain pit is then only emptied again if the level contact indicates this. If a new cycle is started, the delay time starts from the beginning again.

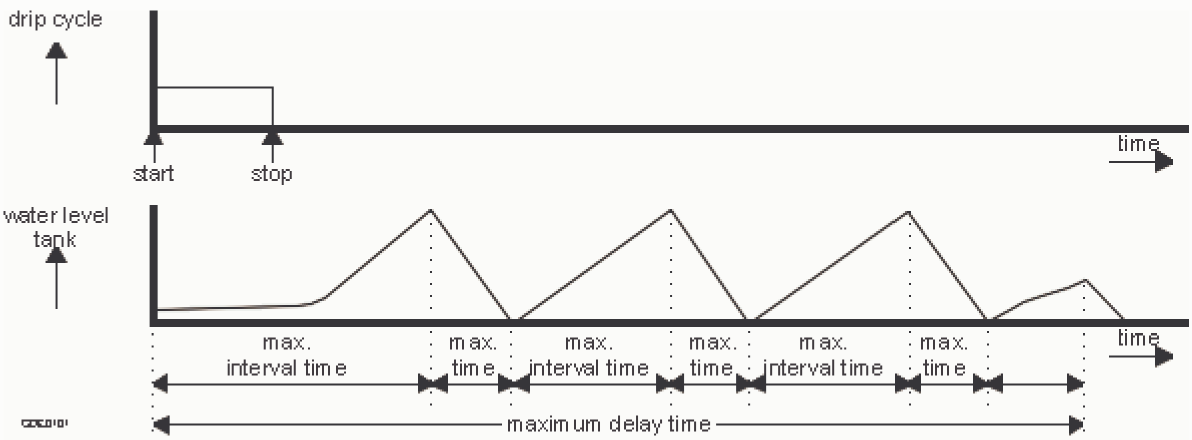
drain pit emptying: elapsed interval
Whenever the interval has elapsed, the drain pit is emptied.
The interval is a safety feature for occasions where the level contact is not working or is not connected. The interval does not continue counting if the delay time has elapsed.

emptying: maximum time
Emptying stops via a minimum contact as soon as the pit is empty or once the maximum time has elapsed.
If there is no minimum contact, emptying always lasts for the set maximum time.

drain pit emptying: maximum interval
After a dripping cycle has been launched, emptying is started via a maximum contact as soon as the pit is full or if the maximum interval has elapsed.
If no maximum contact is present, the system always waits for the maximum interval before emptying starts.

emptying: maximum delay time
Once a dripping cycle has been launched, the pit is emptied a number of times. Emptying stops once the maximum delay time has elapsed. The pit is then emptied one more time because it can still be partly full.

EXAMPLE:



drain pit start contact: detection
drain pit stopcontact: detection
drain pit start contact: gross detection
drain pit stopcontact: gross detection

The start and stop contact of the drain pit.

Start contact

- 100 = not active
- 00 = active

Stop contact

- 100 = active
- 00 = not active

start-/stop contact: type of control
You can choose from:

Start contact	Emptying starts if the maximum contact is active.
Stop contact	Emptying stops if the minimum contact is active.

drain pit: connected registration watering
Use this setting to enter the group in which the data from the drain pit (l/m^2, m^3, EC, pH etc.) must be registered.

drain pit: connection (nr actuation)
Each drain pit has its own actuator.
These actuators are located behind each other in the Dsat. The numbering goes from 1 to max. 16. If there is a second drain unit, the numbering of the drain pits which belong to the second unit starts from 1 again. This numbering may not be changed.

drain pit: release / stop
You can choose from:

Start drain pit	This option releases the drain pit for emptying. Important: the drain unit must also be released!
Stop drain pit	Emptying can be stopped with this option.

drain pit: status
This setting indicates the drain pit status.
One or more of the following options can occur:

- **Discharge active**
- **Interval active**
- **Pump blocked**
- **Drain pit on**
- **Delay time active**
- **Pumping active**
- **Pumping allowed**

emptying: last reason of start
This setting shows the reason for the last start.
One of the following options can occur:

- **start at level contact**
- **delay time**
- **interval**

emptying: last stop reason
This setting shows the reason for the last stop.
One of the following options can occur:

- **manual**
- **stop at level contact**
- **time**

measure: delay time
When the system starts emptying, it takes a little time before the drainage water reaches the drain unit. A delay time can be used to delay measurement of the EC and pH because these measurements are not reliable at this stage.

measure: time delay phase
The water which is still flowing is still registered during this phase which starts after the emptying procedure, but pumping does not continue.

registration: area valves in use
registration: area valves total
The total house area for this drain pit.

start-/stop contact: position
This setting shows the position of the start/stop contact.

- **Stop level reached**
- **Start level reached**

External contacts

The settings under "External contacts" can be used by a service technician to adjust external contacts, start contacts, stop contacts and wait contacts.

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external contact: control
This setting indicates the control status. One or more of the following options can occur:

- **Wait contact**
- **Stop contact**
- **Start contact**

external contact: positon
This setting indicates the position of the external contact.
One or more of the following options can occur:

- **Wait contact active**
- **Stop level**
- **Start level**

external wait contact: detection
external wait contact: gross detection
external start contact: detection
external start contact: gross detection
external stop contact: detection
external stop contact: gross detection
The measurements of the wait, start and stop contacts.

Level tray

Hoogendoorn's level tray is a unique tool for providing the water supply and drainage supply in a substrate system.
The water supply and drainage supply are not set using large metering rods, but simply and accurately via the keyboard of your computer. This means that there is no difficulty in making several level trays the same.

control drain: maximum recover
The drainage control is not active before the 'Drainage cycle start time'.
The discharge valve only opens if the level rises above the discharge level (this is the stop level + control: discharge valve deviation).
A drainage backlog is usually built up in this period (before 'Drainage cycle start time') which may then be recovered again.
This backlog may not be recovered in one go, but with a defined maximum per cycle, i.e. as specified in this setting.
100 cc is a reasonable figure. **drain counter: contents spoon**
Enter the contents of the spoon in the drain counter (normally 5 cc) in this setting.

Defining the drain counter 'contents spoon'.

There are two types of drain counter: the drain counter with a round funnel (type S) and its predecessor, the rectangular grey box without a round funnel. The description below applies to both types.

The **spoon contents** setting differs for each drain counter. The exact horizontal position is also a factor in this setting.
Every time a drain counter is (re)positioned, the content must be defined and entered.
Procedure:
1. Choose 6 cc as the initial value for the type S drain counter and 5 cc for its predecessor.
2. Place an empty measuring jug under the drain counter outlet.
3. Compare the drainage collected in the measuring jug with the drainage volume shown by the computer.

4. $$\text{New spoon contents} = \frac{\text{drainage measuring jug}}{\text{drainage computer}} \times \text{old spoon contents.}$$

The greater the measured drainage volume, the smaller the error. The drainage should preferably be measured for an entire day.
A constant and correct drainage flow is important in properly determining the spoon contents. For this reason always use the actual drainage from the relevant level tray. Simulating draining in a different way (e.g. via a bottle of water) gives an incorrect picture.

Note:

The drainage flow rate can influence the drainage measurement. The flow rate is generally 2 to 2.5 cc/sec. The drain counter can cope with this without difficulty.
Depending on the use of the tray (crop, number of plants, water level) and of the type of tray (4-metre, extra-wide tray), the flow rate can be higher.
At a flow rate of approx. 3.5 cc/sec it is possible for the first type of drain counter to be unable to count this. The spoon stays at the bottom. This can be overcome by changing the pivot point of the spoon and thus the **contents spoon** setting. Lest you gain the wrong impression, this seldom happens. The type S drain counter can measure a greater flow rate as standard.
(The flow rate can be determined by collecting the drainage for 60 sec, for example, then measuring the volume and dividing this by 60.)

greenhouse area level tray
Enter the greenhouse area of the level tray in this setting.
This setting is used to calculate the water uptake.

EXAMPLE:
There are 2.4 plants per m^2.
The level tray contains 4 plants and is 2 metres long.

House area = 4 / 2.4 = 1.7 m^2

level tray alarm: minimum water level
In this setting you can specify that an alarm is triggered if the water level falls below the set minimum level.

This setting is a backup protective system but certainly not a replacement for the alarm for the minimum alarm contact on the level tray.

level tray alarm: maximum water level
In this setting you can specify that an alarm is triggered if the water level rises above the set maximum level.

level tray alarm: delay time minimum level
You can enter a delay time in this setting. This delay time is taken into account if repeated watering is set with the level tray as the start condition. If the water level remains below the set minimum after the delay time has elapsed (calculated from the start time), an alarm is triggered.

level tray control start level: ViP
level tray control stop level: ViP
Enter the start and stop levels in these settings.

Using the 'Radiation W/m^2' influence it is possible to make the setpoint for the start and/or stop level on the level control a function of the absolute radiation.
Using the 'Radiation sum J/cm^2' influence it is possible to continue for longer at a higher level, for example, on a sunny day.

level tray drain: ViP
Enter the desired drainage percentage in this setting.

level tray: active draining
In this setting you can input whether active drainage is required if less is drained than the set figure.

It is important that the right type of discharge valve be used in order to achieve a good level or drainage measurement with a level tray. This depends on the format of the level tray and the number of plants / drainage quantity. Please therefore read the explanation in:
Two types of discharge valve

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level tray discharge valve: hysteresis
Set to approx. 3%.
The discharge valve actuation starts above the level: stop level + discharge valve deviation.
The discharge valve actuation stops below the level: stop level + discharge valve deviation - discharge valve hysteresis.

level tray discharge valve: number of days discharge valve open
level tray discharge valve: counter days discharge valve open
The discharge valve has to be opened periodically to allow the level tray to drain.

level tray discharge valve: time open
level tray discharge valve: interval actuation
These settings specify the length of the actuation pulse and the interval between pulses, respectively, during control of the drainage process (in combination with the drain counter).
Set the time open to 1 second.
Set the actuation interval to 3 - 5 seconds.

level tray discharge valve: counter time open
level tray discharge valve: counter interval
The relevant counters.

level tray control: deviation discharge valve
This setting determines the water level above which the discharge valve is kept continuously open.
If the setting is too low, this means that more drainage can occur than is desired.
If the setting is too high, this means that the level can increase to the maximum alarm level.
The value must be set between 5 and 20.

Two types of level tray discharge valve

4 mm discharge valve:
- A bore of 4 mm diameter.
- Identifiable by a circle with a line through it and the figure 4 engraved in the plastic.
- Usable on standard 2-metre tray without V-system cultivation.
- Hoogendoorn order number 642371

6 mm discharge valve:

- A bore of 6 mm diameter. The ring must be removed from the bore.
- Identifiable by a circle with a line through it and the figure 6 engraved in the plastic.
- Usable on 4-metre tray, wide tray (roses) and a level tray for V-system cultivation.
- Hoogendoorn order number 642372

Four-metre trays supplied from early 1993 are fitted with a 6 mm discharge valve as standard. All level trays supplied prior to this have a 4 mm discharge valve. Depending on the supply date, tray format and cultivation system it may therefore be necessary for the 4 mm valve in existing trays to be replaced by a 6 mm valve.

A 6 mm discharge valve may only be fitted to level trays **with** a drain counter.

A 6 mm valve has a greater drainage flow rate compared with a 4 mm valve. Flow rate of 4 mm valve: 2 to 2.5 cc/sec, flow rate of 6 mm valve: 3 to 3.5 cc/sec.
If the flow rate is greater than approx. 3.5 cc/sec this can cause problems for an old type of drain counter. The spoon then stays at the bottom.

If a new discharge valve is fitted to existing level trays, the drain counter's **spoon contents** setting must be redefined.

No purpose is achieved by removing the bore ring of a 4 mm valve.

level tray control: switch off correction
The 'level tray water uptake: correction' setting ensures that the computed water uptake matches the measured water uptake (supply - drainage).
If the correction mechanism cannot work (e.g. because there is no drain counter), this setting can be used to switch off the adjustment of the 'level tray water uptake: correction' setting.

level tray drain counter: detection
level tray drain counter: gross detection
Solely for drainage measurement with a separate drain counter.

level tray last dripping cycle: supply
Number of cc water applied during the last cycle.

level tray this day: supply
Number of cc water applied on the current day.

level tray drain: computed daily total
level tray drain: computed dripping cycle
Drainage figures computed by the drainage control system.

level tray water level: measurement
measurement water level: gross measurement
measurement water level: 00 input
measurement water level: 100 input
The level measurement is adjusted as if it were a vent position measurement, i.e. with a 00 input and a 100

input.
The ratio between the number of mm water column and the number of mV is linear. The measurement voltage and the computer measurement are given in the table below.

Situation	In %	mV	Gauge values
Empty gutter	0	1016+/-40	1016+/-40
Full gutter	100	1800+/-40	1800+/-40

Adjusting the procedure:

- Remove all the water.
- Read the gross measurement off at the **gross measurement** setting.
- Enter the **00 input**.
- Bring the water up to the edge.
- Read the gross measurement off at the **gross measurement** setting.
- Enter the **100 input**.

level tray water supply: dripping speed
If you have a flow sensor, this setting shows the dripping speed for each dripper.

If you have no flow sensor, you must input this setting yourself as follows:
- Place the level tray drippers in a measuring beaker.
- Set a 2-minute cycle.
- Divide the quantity collected (in cc) by 2.
- Input the result of this as the dripping speed.

level tray water supply: number of drippers level tray
Enter the number of drippers on the level tray in this setting.
This setting is used to compute the water supply to the level tray in cc/cycle and cc/day.

level tray water uptake: correction
Enter the figure 100 in this setting at the start of cultivation.
This correction is automatically adapted as more roots grow into the drainage channel.

level tray: length level tray
The length of the level tray must be entered here.

level tray: selection measurements alarm signal on
The options in this setting are:

Drain counter	The alarm signal is initiated if no drainage has been counted by the drain counter (some time after the discharge valve has been opened)
Minimum water level	The alarm signal is initiated if the level in the level tray is below the set minimum level
Maximum water level	The alarm signal is initiated if the level in the level tray is above the set maximum level

level tray: number(s) alarm signal
You can use this setting to specify which alarm signals must be initiated in the event of an alarm (option).

level tray: postion reached
The level tray position.

water supply: correction level tray
A correction factor can be entered in this setting if the actual level tray water supply differs from the registered supply.
You can use this in the following situations:

- You have only replaced the drippers on the level tray (not recommended). The level tray drippers deliver more water in relative terms as a result.
- The drippers on the level tray "empty" after a cycle. The level tray drippers deliver less water in relative terms as a result.

Do not use this setting to correct a faulty flow sensor measurement!

EXAMPLE:
Water supply in the level tray report: 553 cc
Actual take-up : 608 cc

Correction factor: 608 / 553 x 100% = 110%

Recipes

If repeated starting is required, in which account has to be taken of various start conditions (in short, giving extended options), a recipe can be used.
A recipe can be used by crop sections of different water pumps at the same time.

Agronaut drain: ViP
Enter the desired drainage percentage in this setting. If a level tray is also started, make this setting the same as the drainage setting of the level tray.

drain: start time
You can enter a time in this setting. After this time extra cycles are run specially for drainage if the set drainage percentage is not reached.

Agronaut: start relative to
Agronaut: start time
Agronaut: stop relative to
Agronaut: stop time
Agronaut sum start: ViP
Agronaut threshold start: ViP
These settings enable you to set the period in which water may be applied based on the water uptake sum.
If the measured water uptake sum is higher than the 'Agronaut sum start: ViP' setting, and the currently measured water uptake is higher than the 'Agronaut threshold start: ViP' setting, the system may start during the delay time.

cycles: number
You can enter the **maximum** number of cycles in this setting (in the case of repeated watering).
It is, therefore, possible for <u>fewer</u> cycles to be initiated, but not <u>more</u>.

Take care, therefore, to ensure that this setting is not too low in the summer!

interval: ViP
delay time: ViP
The interval and delay time can be used to set the watering schedule for a 24-hour period.
When a cycle is initiated, it begins with the interval. This is followed by the delay time. A cycle can start during the delay time if a start condition is met.
Repeated watering will always wait for the delay time after **Start time**. The interval followed by the delay time is always inserted between the following cycles.

EXAMPLE:
Minimum number of cycles on a very dark day: 10
Maximum number of cycles on a very dark day: 20
The watering period lasts 10 hours (= 600 minutes).

During a very dark day the interval and the delay time will be inserted between the cycles, i.e.:
Interval + delay time = 600 / 10 = 60 minutes

During a very sunny day only the interval will be inserted between the cycles, i.e.:
Interval = 600 / 20 = 30 minutes
The delay time is then also 30 minutes.

You can use this example to estimate the approximate settings for the interval and delay time. With experience you will be able to change the settings yourself as you see fit.

EC control EC value: ViP
recirculation EC value: ViP
pH control: pH value
fertilizer phase 2: number selection
Depending on the 'use ViP-settings recipe' setting, the above settings will be used or the relevant settings will be entered for the crop section.

EXAMPLE:
The recirculation control system has to adjust the water to an EC of 0.8 mS/cm. If the drainage water level in the tank is higher than 80%, more drainage water has to be added. The pre-control system then has to adjust the water to 1.0 mS/cm.

recirculation EC value: ViP - EC

		Start time	Relative t	Change	Value	Level drain tank - %	
						80	90
1	Y	00:00	Sunrise	00:30	0.8	0.2	

external contact: start relative to
external contact: start time
external contact: stop relative to
external contact: stop time
These settings enable you to set the period in which water may be applied based on an external contact.

level tray: start relative to
level tray: start time
level tray: stop relative to
level tray: stop time
These settings enable you to set the period in which water may be applied based on a level tray.

unit phase 2 supply maximum
This setting specifies how the **control time/litres** setting is set in the crop section.
- **No unit** means: this recipe is not in use.
- **More units** means: there are crop sections connected to different units.

level valve phase 2 supply maximum: ViP
This setting is only used if a level valve is active.
The following apply, depending on the 'unit phase 2 supply maximum' setting:

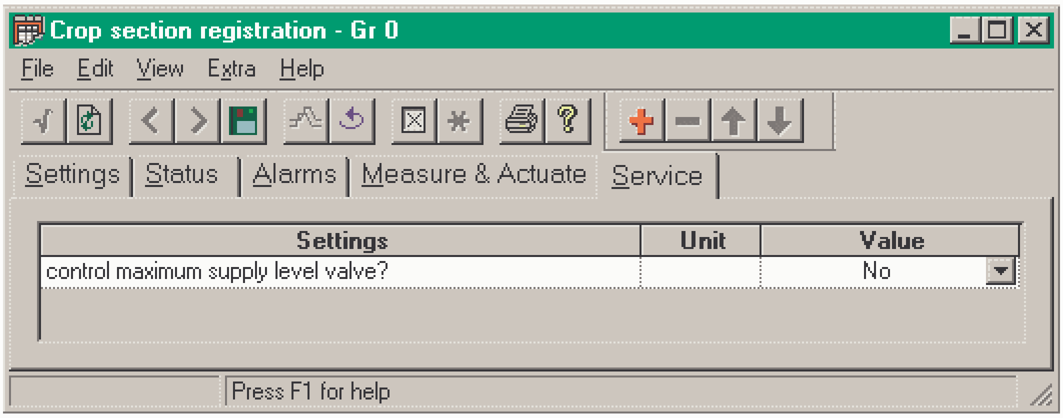
unit phase 2 supply maximum	**level valve phase 2 supply maximum: ViP**
Time	3.30 means: 3 minutes 30 seconds
cc/plant	30.00 means: 30 cc/plant
Litres/m^2	5.50 means: 5.5 litres/m^2
Volume in m^3	10.00 means: 10 m^3 per valve

The level valve can respond to a stop signal from the level tray between the minimum (crop section setting: phase 2 supply) and the maximum supply setting. The maximum supply setting always has precedence.

Variable dripping time without level tray

If no level tray is present, regulation is still possible with a variable dripping time. Make the following settings to achieve this.
Control is now always carried out in accordance with the **level valve: phase 2 supply maximum** setting. The advantage is that the cycle can be influenced by the influences in this ViP setting.

1. Set **maximum supply control level valve** to **Yes**. This is a Service level setting.



2. Set the *first valve* as the **level valve** (instead of the rain valve).

type of valve		level valve

3. Set the *other valves* as **slave valves** (instead of the rain valve).

type of valve		slave valve

4. The dripping time (min:sec) or dripping volume (cc) can now be set in **level valve: phase 2 supply maximum**.

level valve phase 2 supply maximum: ViP -

		Start time	Relative t	Change	Value	Drain pit - %		Radiation - W/m²	
						50	40	600	800
1	Y	00:00	Sunrise	00:30	100.00	20.00		20.00	
2	Y	00:00	Sunset	00:30	100.00	0.00		0.00	

In this example the dripping volume is 100 cc. If the drainage percentage in the drain pit is too low, or if the radiation is too high, the dripping volume is increased by 20 cc.

If the crop section setting **control time/litres** is set in **cc/plant, litres/m2** or **volume in m3** it is possible that watering will **not** be stopped by the maximum supply setting in the event of a *defective flow sensor*. For this reason always set the flow alarm as precisely as possible!

Set as above when dripping does not take place; i.e. in the morning before watering begins or in the afternoon once watering has finished.

radiation: start relative to
radiation: start time
radiation: stop relative to
radiation: stop time

radiation sum start: ViP
radiation threshold start: ViP
These settings enable you to set the period in which water may be applied based on the radiation sum.
If the measured radiation sum is higher than the 'radiation sum start: ViP' setting, and the currently measured radiation is higher than the 'radiation threshold start: ViP' setting, the system may start during the delay time.

start 1: time
start 1: minimum daily sum radiation
start 1: minimum daily sum water uptake
start 2: time
start 2: minimum daily sum radiation
start 2: minimum daily sum water uptake
start 3: time
start 3: minimum daily sum radiation
start 3: minimum daily sum water uptake
start 4: time
start 4: minimum daily sum radiation
start 4: minimum daily sum water uptake
You can use these settings to specify any extra cycles.
The cycle is initiated if the time has passed AND the radiation sum AND the water uptake sum are higher than the minimum sum.

EXAMPLE 1:
An extra cycle is required at 22.00 hours.

start 1: time	22:00
start 1: minimum daily sum radiation	0
start 1: minimum daily sum water uptake	0.00

EXAMPLE 2:
An extra cycle is required at 22.00 hours if the radiation sum on that day is higher than 1000 J/cm^2.

start 1: time	22:00
start 1: minimum daily sum radiation	1000
start 1: minimum daily sum water uptake	0.00

EXAMPLE 3:
An extra cycle is required at 22.00 hours if the radiation sum on that day is higher than 1000 J/cm^2 and the water uptake sum is higher than 0.8 l/m^2.

start 1: time	22:00
start 1: minimum daily sum radiation	1000
start 1: minimum daily sum water uptake	0.80

type of start recipe
In this setting you can choose from:

Repeating daily	Watering will be repeated every day between **Start time** and **Stop time**
Continuous	Taking due account of the **Interval** and the **Delay time**, watering will take place continuously
Start immediately	Watering will start immediately

time: start relative to
time: start time
time: stop relative to
time: stop time

These settings enable you to set the period in which water may be applied based on time.

type of start recipe
You can choose one or more options in this setting:

Start time 4	After this time the system may start for a radiation or water uptake sum
Start time 3	After this time the system may start for a radiation or water uptake sum
Start time 2	After this time the system may start for a radiation or water uptake sum
Start time 1	After this time the system may start for a radiation or water uptake sum
Stop contact	The system may stop at an external contact between the start and finish time
Start contact	The system may start at an external contact between the start and finish time
Stop level tray	The system may stop at a level tray between the start and finish time
Start level tray	The system may start at a level tray between the start and finish time
Drain	After the start time the system may start drainage
Water uptake sum	The system may start on the basis of the water uptake sum between the start and finish time
Radiation	The system may start on the basis of the radiation sum between the start and finish time
Time	The system may start on the basis of the time between the start and finish time

Registration

The settings under "Registration" can be used by a service technician to adjust the flow sensors and pulse sensors.

sensor 1: type of water sensor
You can choose between a **flow sensor** and a **litre counter**. The default setting is flow sensor.

pulse sensor 1: number of litres/pulse
Enter the number of litres corresponding to one pulse of the litre counter including the GL board's divide factor.
This setting is not applicable if you opted for a flow sensor.

pulse sensor 1: interval time 0-measurement
A duration which is longer than the time between 2 pulses must be entered in this setting. After this time, the derived flow (litres/min) is set to 0 in the reports.
If too low a value is set, the flow alarm can be triggered. This setting is not applicable if you opted for a flow sensor.

flow sensor 1: gauging factor diameter
This setting does not have to be entered if you opted for a litre counter.

sensor 2: type of water sensor
You can choose between a **flow sensor** and a **litre counter**. The default setting is flow sensor.

pulse sensor 2: number of litres/pulse
Enter the number of litres corresponding to one pulse of the litre counter including the GL board's divide factor.
This setting is not applicable if you opted for a flow sensor.

pulse sensor 2: interval time 0-measurement
A duration which is longer than the time between 2 pulses must be entered in this setting. After this time, the derived flow (litres/min) is set to 0 in the reports.
If too low a value is set, the flow alarm can be triggered. This setting is not applicable if you opted for a flow sensor.

flow sensor 2: gauging factor diameter
This setting does not have to be entered if you opted for a litre counter.

sensor 1: gross measurement
sensor 1: correction
sensor 2: gross measurement
sensor 2: correction
The gross measurement and correction for the flow measurement of sensors 1 and 2.

sensor 1: measurement flow
sensor 2: measurement flow
The flow measurement for sensors 1 and 2.

sensor 1: registration
sensor 2: registration
These are computed values. A quantity in m^3 is derived from the flow rate in l/m. This figure is shown in these settings and in overviews for sensors 1 and 2.

Valves

It is possible to specify what each sort of valve is, e.g. rain valve, level valve, slave valve, ebb & flow va roof-sprinkler valve or flushing valve.

The valves are sub-divided into sections. The valves within the 1st section are numbered from 1 to 255 next 255 valves are in the 2nd section and are numbered from 1001 to 1255. This is followed by 2001 t 2255 etc.

---

valves 0: status
One of the following options can occur:
- **Error present**
- **Alarm stopped**
- **Flow too low**
- **Flow too high**
- **Flood time**
- **Phase 3 active**
- **Phase 2 active**
- **Phase 1 active**

% water supply relative to crop section phase 1
% water supply relative to crop section phase 2
% water supply relative to crop section phase 3
These settings enable you to set the percentage of the water supply relative to the crop section. Normally these settings would be 100%.

valves 0: connected crop section
Enter the number of the crop section to which the valve belongs.

valve connected to crop section
In this setting you can specify whether the valve has to be connected to a crop section.
If the 'crop section connection automatic reset' setting is set to **Yes**, the crop section connection is cancelled (set to **No**) as soon as a cycle has been applied.

EXAMPLE 1 (method 1):
In this example the number of litres per m^2 is entered for the crop section.
As far as the valves are concerned, a percentage figure is used to specify how much water has to be applied.

Control Water, Crop sections

control time/litres	Litres/m^2

phase 1: pre-supply	1.00
phase 2: supply	5.00
phase 3: after-supply	0.50

Control Water, Valves, Valves 1, 2 and 3

% water supply relative to crop section phase 1	100.0
% water supply relative to crop section phase 2	100.0
% water supply relative to crop section phase 3	100.0

Control Water, Valves, Valves 4 and 5

% water supply relative to crop section phase 1	90.0
% water supply relative to crop section phase 2	90.0
% water supply relative to crop section phase 3	100.0

Valves 1, 2 and 3 will pre-supply 1 litre/m^2, supply 5 litres/m^2 and after-supply 0.5 litres/m^2.
Valves 4 and 5 receive 10% less water during phases 1 and 2.

EXAMPLE 2 (method 2):
In this example the number of litres per m^2 is entered for the valves.
The percentage figures for the valve settings therefore represent the number of litres per m^2.
100 litres per m^2 is entered for the crop section.

Control Water, Crop sections

control time/litres	Litres/m^2
phase 1: pre-supply	100.00
phase 2: supply	100.00
phase 3: after-supply	100.00

Control Water, Valves, Valves 1, 2 and 3

% water supply relative to crop section phase 1	1.0
% water supply relative to crop section phase 2	5.0
% water supply relative to crop section phase 3	0.5

Control Water, Valves, Valves 4 and 5

% water supply relative to crop section phase 1	0.9
% water supply relative to crop section phase 2	4.5
% water supply relative to crop section phase 3	0.5

Valves 1, 2 and 3 will pre-supply 1 litre/m^2, supply 5 litres/m^2 and after-supply 0.5 litres/m^2.
Valves 4 and 5 receive 10% less water during phases 1 and 2.

alarm: average flow
alarm: maximum deviation flow
In these settings you can specify the average flow and the maximum deviation before an alarm is triggered.

Control Water, Valves - Measure and Actuate
measurement: average flow
This setting shows the computed average flow.
The average flow will never be computed at lower than 60 l/min, even if the actual flow is lower.

EXAMPLE:
An alarm must be triggered if the flow is 20% too high or too low when measured.

Proceed as follows:

- the flow from the last cycle is shown in the setting:

Control Water, Valves - Measure and Actuate
measurement: average flow

- enter this value in the **alarm: average flow** setting

- set the **alarm: maximum deviation flow** setting to 20%

area valve section
Input the area of the valve section in this setting.
This setting is used to control the water supply in l/m^2 and for registration if the crop section setting 'crop section registration: automatic add' is set to Yes.

water supply: number of drippers valve section
Enter the number of drippers for the valve section in this setting.
This setting is used for registering and controlling the water supply in cc/plant.
connection valve (cardnr, relaisnr)
connection drain valve (cardnr, relaisnr)
Enter the card number and relay number in this setting as per the connection documentation.

counter watering cycles phase 1 and 2
counter watering cycles phase 3
These settings record how many watering cycles there have been.

ebb & flow: connected contact/level measurement
Enter the number of an external contact in this setting.
Raising is stopped as soon as the level on the floor or table is high enough.

ebb & flow: flood time
The flood time can be entered in this setting.

ebb & flow: counter flood time
This setting records the elapsed flood time.

measurement: average flow
This setting shows the computed average flow.
The average flow will never be computed at lower than 60 l/min, even if the actual flow is lower.

Control Water, Valves - Alarms
alarm: average flow
alarm: maximum deviation flow
In these settings you can specify the average flow and the maximum deviation before an alarm is triggered.

EXAMPLE:
An alarm must be triggered if the flow is 20% too high or too low when measured.

Proceed as follows:
- the flow from the last cycle is shown in:
measurement: average flow

- enter this value in:
Control Water, Valves - Alarms
alarm: average flow

- set:
Control Water, Valves - Alarms
alarm: maximum deviation flow to 20%

more valves allowed simultaneously
This setting enables you to specify whether more valves may be opened simultaneously. Only valves with the same time or number of litres are opened simultaneously.

The following settings must also then be correctly set:

Control Water, Supply unit, Pump
valves simultaneous maximum number: ViP

Control Water, Crop sections
valves simultaneous: maximum number

type of valve
In this setting you can choose from:

Rain valve	You can choose this valve in the case of sprinkler valves and dripper valves.
Level valve	You can choose this valve if the valve section includes a level tray; you must then designate the other valves as slave valves. The following setting is then used by the program: Control Water, Recipes **level valve phase 2 supply maximum: ViP** If a level valve has to be switched off because, for example, the level tray is not working properly, or in the case of very young plants that are not yet on the level tray, it is not possible to start with the level tray. In such cases you are recommended to change the level valve and slave valves temporarily into rain valves.
Slave valve	You can choose this valve if the valve has to follow the level valve. The level tray determines the water supply. With the slave valves you can use the **% water supply relative to crop section phase 2** setting to specify the water supply of the slave valves as a percentage of the level valve.
Ebb & flow valve	You can choose this valve if the valve is an ebb & flow valve. The following settings are then used by the program: **ebb & flow: connected contact/level measurement** **ebb & flow: flood time** **ebb & flow: counter flood time** Control Water, Crop sections **ebb & flow: phase 2 supply maximum** **ebb & flow: maximum wait time**
Roof sprinkler	You can choose this valve if the valve is a roof-sprinkler valve.
Flushing valve	You can choose this valve if the valve is a flushing valve. The following settings are then used by the program: Control Water, Crop sections **control time/litres flush** **flush for phase 1** **flush for phase 2** **flush for phase 3**

water supply
These settings accurately show the water supply by this valve for the current day.

valves 0: connected drain pit
This setting contains the number of the drain pit to which the valve section discharges its drainage water.

valves 0: connected pump
Enter the pump number to which the valve belongs in this setting.

water supply

water supply - actual 24 hours
These settings record the water supply for each day.

EC control

The settings under "EC control" can be used by a service technician to adjust the EC control system. The Help information below is intended to back up Support.

1. EC control
2. Supply unit with modulating valve
3. Supply unit with on-off pumps
4. Switching off pre-control
5. Suction pipe

A special converter board, to which 2 EC sensors can be connected as standard, is used for measuring the EC.
The sensor circuit is completely metallically isolated from the rest of the EC converter board. The output signal is 0 - 5 V in the range 00 - 12.5 mS.
Control is based on actuating a modulating fertiliser feed valve in combination with a protection valve (to prevent leakage).
In OFF mode the control valve is closed, and the protection valve is not energised.
When it is operational, the protection valve is energised. A pulse pump, injection pump or open/closed valve can also be used as a feed valve. The type of valve must be set when commissioning the system.

1. EC control settings

The EC control controls the EC with the aid of a percentage valve position. This valve position is the sum of a pre-control and a PI control. The pre-control valve position takes account of variations in:

- EC setpoint
- flow rate
- EC recirculation measurement (or EC-on measurement)

All other variations are the responsibility of the PI control. The most important factor, for which the pre-control must be adjusted by the PI control is the changing of the A/B fertiliser tanks.

2. Supply unit with modulating valve

The valve position is achieved by computing an actuation time from the valve position and the running time. Before the pump starts, the valve is actuated to the correct position so that it is properly positioned once the pump starts. The position of the modulating valve does not change during preliminary flushing. The valve is kept continuously closed on completion of the cycle.

It is important to avoid any interruption to the closing or opening actuations in OFF mode if under
EC control: control type you have selected **'standard EC'**.

3. Supply unit with on-off pumps

The valve position is achieved with a fixed pulse length of 1 second and a variable pause time. A valve position of 25%, for example, is achieved by means of a 1-second pulse and a 3-second pause. (20% is 1-sec. actuation and 4-sec. pause etc). If a pump is used, this must be connected to the OPEN actuation.

4. Switching off pre-control

This control is intended for intelligent supply units with a modulating control (e.g. Sentec liquid fertiliser supply systems). The valve position is achieved by computing an actuation time from the valve position and the running time. The valve is NOT actuated to the correct position before the pump starts because the supply system handles this itself. The position of the modulating valve does not change during preliminary flushing. The valve is kept continuously closed on completion of the cycle. If the pre-control is not used, you can choose from a P-control, an I-control or a combination of the two.

5. Suction pipe

Suction pipes use a modulating valve control. The special feature of this type of supply unit is that more fertiliser is supplied by the unit itself as the flow rate increases without increasing the valve position (internal flow compensation). In a suction pipe control, therefore, the **valve position** is not affected by variation in the flow.

If the control is not working properly, please first consult the section on "Product specifications, EC control".

EC at 100% valve position
This setting indicates how high the EC will become if the valve is actuated to 100%.
The higher the EC, the more concentrated the fertiliser solution.

EC minimum valve position per 100 l/min
EC maximum valve position per 100 l/min
EC computed minimum valve position
EC computed maximum valve position

The EC control works by computing a valve position between 0% and 100%:
0% valve position means that there is zero supply, 100% valve position means that there is continuous or maximum supply. The EC control always works within the limits of the minimum and maximum valve positions.
The default values are 0% for the minimum valve position and 100% for the maximum valve position. These figures do not require adjustment for an EC control which is working properly.
Under **minimum and maximum valve position** settings it is possible to read off and, if necessary, adjust the valve positions for the EC control.
The I-action adapts faster if the valve position is forced in one direction by the maximum or minimum, so that the valve position pre-control will quickly be between the minimum and maximum.

Important: In the event that the pre-control is switched off, the minimum valve position can also be computed as a negative figure via the *P + I control* option under the *type of control* setting (e.g. in a system with a Sentec liquid fertiliser supply system)

The adjustable minimum and maximum valve positions can be determined by reading off the valve position during supply. Do not set the limits too tight, e.g. minimum to 10% and maximum to 90%. If there are no problems, the default minimum and maximum values of 0 and 100% can remain in use. Should there be a problem, it is usually connected with the minimum valve position rather than the

maximum.
The minimum valve position can be set to a high figure **temporarily** to rectify a malfunction in the EC control.

Testing the watering unit
A continuous supply can be achieved by temporarily setting the minimum and maximum positions to the same figure. This enables the system to be tested for malfunctions.

Valve position and flow rate
The minimum and maximum valve positions are flow-dependent. This means that there is a different limit for valves with a different take-up.
Example: set 5% as the minimum and if the flow rate is 400 litres/min, then the computed valve position is 4 times 5% = 20%. If you have a flow rate of 750 litres/min in a subsequent valve, there is a minimum valve position of 7.5 times 5% = 37.5%.
This applies to all fertiliser choices for the same pump.

EC control: actuations
EC control 2nd protection valve: actuations
The actuations of the various valves.

EC control adjust PI-action: interval
EC control adjust PI-action: maximum actuation pulse
The EC I- and P-actions are adjusted each time the set interval has elapsed.
If you set the maximum actuation pulse lower than the interval, this will ensure a pause before a new valve position is calculated. The required length of the pause depends on the dead time in the system.
With a maximum actuation pulse greater than or equal to the interval, the length of the actuation pulse is not limited.
The interval is cancelled if the I-action is adapted for the flow variation.

EXAMPLE:

EC control adjust PI-action: interval	11
EC control adjust PI-action: maximum actuation pulse	5

A new P- and I-action is calculated every 11 seconds.
There is a minimum pause of 11 - 5 = 6 seconds in which no actuation is performed and the response of the new EC measurement is awaited.

EC control: type of valve
Set the type of supply valve here.

EC control: type of control
Here you must specify the type of EC control being used.
'Standard EC' is the normal EC control with pre-control. If 'Standard EC' is not chosen, you must enter the 'EC PI-control: control factor EC supply' setting.

EC control: measurement valve position
EC control: computed valve position total
EC control: valve position pre-control
EC control: P-action
EC control: I-action
These settings are input by the computer.

EC in: measurement (no temp comp)
EC in: correction
EC control: measurement (no temp comp)
EC control: correction
EC monitor: measurement (no temp comp)
EC monitor: correction
EC measurements with the relevant corrections.

pump EC temperature: measurement

pump EC temperature: correction
Temperature measurement for the purpose of temperature compensation.

EC control: EC IN measurement fixed
If there is no EC measurement of the clean water (EC recirculation or EC feed), the EC value which is entered in this setting is used.
If there is an EC feed or EC recirculation measurement, this setting does not have to be entered.

EC control: volume sand filter
If the sand filter is located between the mixing valve of the EC recirculation and the injection point of the control, the gross volume of the sand filter must be entered here.
The changes in the EC recirculation measurement are then delayed and buffered by the sand filter. The program calculates the EC recirculation value that could be measured downstream of the sand filter.

EC control: minimum length actuation pulse
This setting is only important for an on/off control.
The normal length of an actuation pulse is 1 second, but some pumps only supply fertiliser if the pulse l is at least 2 or 3 seconds.

EC control: running time modulating valve
If supply unit with a modulating valve is present, the running time can be entered here.
If the system is fitted with frequency-controlled pumps, the GU board is often used. The 'actuation spee be set on the GU board by means of a block of microswitches.
The running time must be set to the same time.

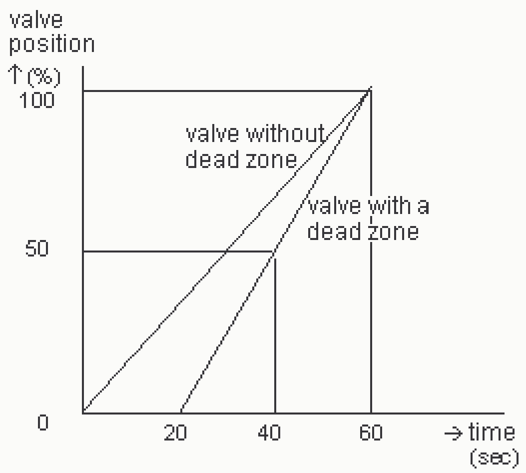
EC control: type of valve
Set the type of supply valve here.

EC control: type of control
Here you must specify the type of EC control being used. 'Standard EC' is the normal EC control with p control. If 'Standard EC' is not chosen, you must enter the 'EC control: PI valve position pre-control' set

EC control: actuation timer
This counter counts the actuation time of the EC valve or pump.

EC modulating valve: dead zone
EC modulating valve: counter dead zone
Some modulating valves first have to be opened for some time before the valve actually lets liquid flow through it. This is the dead zone.
Enter the duration of the dead zone in seconds in this setting.

EXAMPLE:
A modulating valve with a running time of 1 minute and a dead zone of 20 seconds, see figure.



EC control: running time modulating valve	01:00
EC modulating valve: dead zone	00:20

The effective running time is 60 -20 = 40 seconds.

Valve types which are known to have a dead zone:
- Brinkman EC valve with "blue cap"
- Almost all diaphragm valves

Tip: To ensure that systems incorporating a modulating valve with a dead zone work properly, *P+I* control is sometimes set in the **EC control type** setting. After entering the dead time the *standard control* can often be reset.

EC PI-control: control factor EC supply
This setting is only used if you did not choose 'Standard EC' control.
This setting indicates how strongly the P-action and I-action respond to a deviation in the EC measurement.

EXAMPLE:

PI-valve position pre-control (%)	5.0	1.0	5.0	5.0	10.0
EC deviation (mS/cm)	0.2	0.2	0.2	0.2	0.2
Mixing tank volume (litres)	600	600	0	600	600
Flow (litres/min)	500	500	500	200	500
P-action (%)	6.0	1.2	0	6.0	12.0
I-action (%)	0.5	0.1	0.5	0.2	1.0

pH control

The settings under "pH control" can be used by a service technician to adjust the pH control system. The Help information below is intended to back up Support.

1. Supply unit with modulating valve
2. Supply unit with on-off pumps
3. Switching off pre-control
4. Suction pipe
5. Installation

When commissioning the system you have to select a control with on-off pumps, a modulating valve or a suction pipe.
The pH control controls the pH with the aid of a percentage valve position. This valve position is the sum of a pre-control and a PI control. The pre-control must be responsible for the major part of the valve position, while the PI control must regulate the pre-control and then carry on making minor adjustments.
The pre-control valve position takes account of variations in the flow rate. All other variations are the responsibility of the PI control. The most important factors for which the pre-control must be adjusted by the PI control are:

- changing/diluting the acid/alkali tanks.
- changing the setpoint
- amending the type of water (rain or mains water)

1. Supply unit with modulating valve

The valve position is achieved by computing an actuation time from the valve position and the running time. The pH is not regulated during preliminary flushing. The valve is kept continuously closed on completion of the cycle.

It is important to avoid any interruption to the closing or opening actuations in OFF mode if under
pH control: control type you have selected **'standard pH'**.

2. Supply unit with on-off pumps

The valve position is achieved with a fixed pulse length of 1 second and a variable pause time. A valve position of 2%, for example, is achieved by means of a 1-second pulse and a 49-second pause. (5% is 1-sec. actuation and 19-sec. pause etc).

3. Switching off pre-control

This control is intended for intelligent supply units with a modulating control (e.g. Sentec liquid fertiliser supply systems). The valve position is achieved by computing an actuation time from the valve position and the running time. The valve is NOT actuated to the correct position before the pump starts because the supply system handles this itself. The position of the modulating valve does not change during preliminary flushing. The valve is kept continuously closed on completion of the cycle. If the pre-control is not used, you can choose from a P-control, an I-control or a combination of the two.

4. Suction pipe

An important feature of a suction pipe unit is that the fertiliser and also the acid/alkali are entrained by the flow. This means that more acid/alkali is automatically entrained as the flow rate increases (internal flow compensation).
In a suction pipe control, therefore, the valve position is not affected by variation in the flow.
In practice the pH control is suitable for adjusting small fluctuations up to approx. 1.0 pH. Remember that the pH is a logarithmic quantity. A fluctuation of 1 pH represents a change in acidity by a factor of 10, and 2 pH by a factor of 100.

5. Installation

The pH control regulates the measured pH value at the control sensor.
For each program it is possible to choose whether control is achieved by the addition of acid or base. This avoids the addition of acid and base alternately. Control can be carried out with a monitoring sensor (extra alarm). The control setpoint can be adjusted for each crop section/recipe and therefore applies to all valves.

The pH sensor used is a disposable type because the reference liquid runs out in the long term. Its service life is normally about 1 year.
In addition, the sensor has to be monitored (recalibrated) regularly with the aid of gauge solutions of pH7 and pH4.

A special converter board which comes in 2 versions, i.e. with 1 or 2 measurement channels, is required for the pH measurement. A pH converter board can easily be installed in the EC converter box and draws its supply voltage directly from the EC converter board, i.e. +15V.
The sensor circuit is completely metallically isolated from the rest of the pH converter board. The output signal is 0 - 5 V in the range 00 -12.5 pH.

If the control is not working properly, please first consult the section on "Product specifications, pH control".

pH valve position pre-control: slope
pH valve position pre-control: offset
EC valve position pre-control flow independent
pH valve position pre-control flow independent
These settings are used to determine the pre-control valve position of the pH control system.

pH control: maximum valve position per 100 l/min
pH control: minimum valve position per 100 l/min
pH computed minimum valve position
pH computed maximum valve position

The pH control works by computing a valve position between 0% and 100%:
0% valve position means that there is zero supply, 100% valve position means that there is continuous or maximum supply. The pH control always works within the limits of the minimum and maximum valve positions.
The default values are 0% for the minimum valve position and 100% for the maximum valve position. These figures do not require adjustment for a pH control which is working properly.
Under **minimum and maximum valve position** settings it is possible to read off and, if necessary, adjust the valve positions for the pH control.
The I-action adapts faster if the valve position is forced in one direction by the maximum or minimum, so that the valve position pre-control will quickly be between the minimum and maximum.
The maximum limit must particularly ensure that the pH control (especially for units with a mixing tank) quickly comes to rest again if the acid or alkali tank was empty.

Important: In the event that the pre-control is switched off, the minimum valve position can also be computed as a negative figure via the *P + I control* option under the *type of control* setting (e.g. in a system with a Sentec liquid fertiliser supply system)

The adjustable minimum and maximum valve positions can be determined by reading off the valve position during supply. Do not set the limits too tight, e.g. minimum to 10% and maximum to 90%. If there are no problems, the default minimum and maximum values of 0 and 100% can remain in use. Should there be a problem, it is usually connected with the minimum valve position rather than the maximum.
The minimum valve position can be set to a high figure **temporarily** to rectify a malfunction in the pHcontrol.

Testing the watering unit
A continuous supply can be achieved by temporarily setting the minimum and maximum positions to the same figure. This enables the system to be tested for malfunctions.

Valve position and flow rate
The minimum and maximum valve positions are flow-dependent. This means that there is a different limit for valves with a different take-up.
Example: set 5% as the minimum and if the flow rate is 400 litres/min, then the computed valve position is 4 times 5% = 20%. If you have a flow rate of 750 litres/min in a subsequent valve, there is a minimum valve position of 7.5 times 5% = 37.5%.
This applies to all fertiliser choices for the same pump.

Recommendation
Recommended value with a mixing tank: 30-50%
Without mixing tank: 100%

pH control adjust PI-action: interval
pH control adjust PI-action: maximum actuation pulse
The pH I- and P-actions are adjusted each time the set interval has elapsed.
If you set the maximum actuation pulse lower than the interval, this will ensure a pause before a new valve position is calculated. The required length of the pause depends on the dead time in the system.
With a maximum actuation pulse greater than or equal to the interval, the length of the actuation pulse is not limited.
The interval is cancelled if the I-action is adapted for the flow variation.

EXAMPLE:

pH control adjust PI-action: interval	11
pH control adjust PI-action: maximum actuation pulse	5

A new P- and I-action is calculated every 11 seconds.
There is a minimum pause of 11 - 5 = 6 seconds in which no actuation is performed and the response of the new pH measurement is awaited.

pH control: type of valve
You must specify here how control takes place.
The type of pH valve can be set here:

- ***suction pipe***
- ***modulating***
- ***on / off***

pH control: type of control
Here you must specify the type of pH control being used.
'Standard pH' is the normal pH control with pre-control.
If 'Standard pH' is not chosen, you must enter the 'pH PI-control: control factor alkali supply' and/or 'pH PI-control: control factor acid supply' settings.

pH control: actuations
Actuation of the pH control system.

pH control: measurement valve position
pH control: computed valve position total
pH control: valve position pre-control
pH control: P-action
pH control: I-action
These settings are input by the computer.

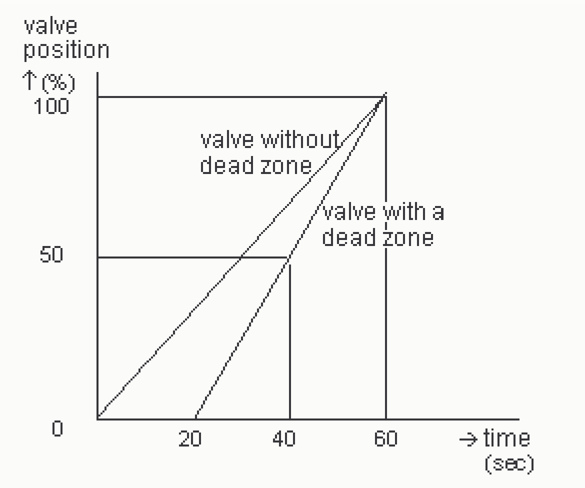
pH control: maximum deviation EC I-action
The pH control system only works if the EC deviation is no greater than specified here.

pH control: minimum length actuation pulse
This setting is only important for an on-off control. The normal length of an actuation pulse is 1 second, but some pumps only supply fertiliser if the pulse length is at least 2 or 3 seconds.

pH control: running time modulating valve
If a supply unit with a modulating valve is present, the running time can be entered here. If the system is fitted with frequency-controlled pumps, the GU board is often used. The 'actuation speed' can be set on the GU board by means of a block of microswitches.
The running time must be set to the same time.

pH modulating valve: dead zone
pH modulating valve: counter dead zone
Some modulating valves first have to be opened for some time before the valve actually lets liquid flow through it. This is the dead zone.
Enter the duration of the dead zone in seconds in this setting.

EXAMPLE:
A modulating valve with a running time of 1 minute and a dead zone of 20 seconds, see figure.



pH modulating valve: dead zone	01:00
pH modulating valve: counter dead zone	00:20

The effective running time is 60 -20 = 40 seconds.

Tip: To ensure that systems incorporating a modulating valve with a dead zone work properly, *P+I* control is sometimes set in the **pH control type** setting. After entering the dead time the *standard control* can often be reset.

pH PI-control: control factor alkali supply
pH PI-control: control factor acid supply
These settings are only used if you did not choose 'Standard pH' control.
These settings indicate how strongly the P-action and I-action respond to a deviation in the pH measurement.

EXAMPLE:

Supply	Acid	Acid	Acid	Acid	Alk.	Alk.	Alk.	Alk.
Tank vol. (litres)	600	600	0	600	600	600	0	600
Flow (litres/min)	500	500	500	200	500	500	500	200
pH deviation	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PI acid (alk.)	5.00	1.00	5.00	5.00	5.00	1.00	5.00	5.00
P-action (%)	10.2	2.0	0	10.2	32.4	6.5	0	32.4
I-action (%/step)	0.85	0.17	0.85	0.34	2.70	0.54	2.70	1.08

pump pH control: measurement
pump pH control: correction
pump pH monitor: measurement
pump pH monitor: correction
pH measurements with the relevant corrections.

Pump

Watering can be stopped in the event of an alarm situation, e.g. if the EC is too low.
Once the alarm situation has been cancelled, the settings under "Pump" can be used to resume watering.

If you wish to pause watering temporarily, e.g. when topping up the fertiliser tanks, a pause can be set in the settings under "Pump".

---

actuation pump: pre-run time
Enter the pre-run time here.
During pre-running the water pump starts to run but the valves remain closed. This is used to bring the

pipes up to pressure.

actuation pump: run-on time
The crop sections that are released are completed one after another.
As soon as one crop section is finished, the next one is started.
Once all the released crop sections have been completed, the pump continues running for the time set to keep the system pressurised.

alarm: delay time EC, pH, EC-temperature
You can set a delay time for the alarm using this setting.
This means that an alarm is not triggered immediately but only once the delay time has elapsed as follows:

- *double the delay time when starting the pump up*
- *set delay time during operation*
- *fast alarm in the event of a pH measurement above 10*
- *fast alarm in the event of an EC measurement above 6*

alarm: delay time flowalarm
You can set a delay time for the alarm using this setting.
If the flow is too low or too high, the flow alarm is triggered once this delay time has elapsed.

alarm: minimum flow computed
alarm: maximum flow computed
The computed flow alarm limits based on the current number of valves that are active simultaneously.
These flow alarm limits are calculated on the basis of the following settings:
- alarm: average flow
- alarm: maximum deviation flow
- flow change at 2 valves simultaneous
- flow change at 3 valves simultaneous
- flow change at 4 valves simultaneous

The alarm limits are computed by adding the 'alarm: average flow' settings of the various valves that are active and then deducting the set flow change percentage from them.
The highest 'alarm: maximum deviation flow' value of all the active valves is now used to calculate the alarm limits.

alarm: minimum water temperature EC
alarm: maximum water temperature EC
Enter the minimum and maximum water temperatures using these settings.
If the water temperature is lower than the minimum water temperature or higher than the maximum, an alarm is triggered.

clean water: type of water sensor
You can choose between: ***flow sensor*** *and* ***litre counter****.*
The default setting is flow sensor.

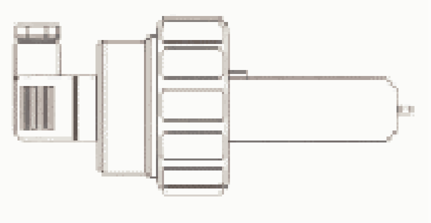
pulse clean water: number of litres/pulse
This setting is not applicable in the case of a flow sensor.
Enter the number of litres corresponding to one pulse of the litre counter including the divide factor of the GL board.

pulse clean water: interval time 0-measurement
This setting is not applicable in the case of a flow sensor.
A duration which is greater than the time between 2 pulses must be entered in this setting. After this time, the derived flow (litres/min) is set to 0 in the reports.
If too low a value is set, the flow alarm can be triggered.

flow clean water: gauge factor diameter
This setting is not applicable in the case of a litre counter.
The flow sensor emits a measurement signal which corresponds to the number of revolutions of the paddle wheel in the sensor. This measurement signal is converted by the computer into a quantity of water, as a function of the diameter of the pipe in which the flow sensor is installed.

flow clean water: counter litre

This setting shows how many m^3 water have passed the flow sensor.



Determining the gauge factor for the pipe diameter

There are two types of flow sensors that can be connected to the ECONOMIC NT. The procedure for determining the gauge factor is different for these two types.

1. *Georg Fisher type GF15*
2. *Bürkert type 8020*

1. Georg Fisher type GF15

Type GF15 flow sensors have their own sensor-specific gauge value (Fs). This value is shown on the flow sensor: this is the Fs value. This gauge value is used to determine the ***gauge factor diameter*** *setting.*
Proceed as follows to determine the ***gauge factor diameter*** *(also known as the T50 value):*

$$\text{gauge factor} = \frac{(\text{D internal})^2}{(\text{D internal average})^2} \times \text{gauge factor old} \times \text{Fs}$$

gauge factor	=	computer setting
D internal	=	measured internal diameter of PN16 pipe
D internal average	=	average internal diameter of PN16 pipe, see table below
gauge factor old	=	factor as per table below
Fs	=	sensor-dependent gauge value

D external [mm]	**D internal average [mm]**	**minimum flow indication [m^3/h]**	**maximum flow indication [m^3/h]**	**gauge factor old [litre/min]**
25	20.9			46.0
32	26.8	approx. 0.7	approx. 8	72.3
40	33.6	approx. 1	approx. 15	131.4
50	42.1	approx. 2	approx. 25	215.7
63	53.0	approx. 3	approx. 44	375.9
75	63.2	approx. 6	approx. 76	639.2
90	75.9	approx. 8	approx. 107	895.1
110	92.7	approx. 13	approx. 165	1375.9
140	118.1			2190.09

EXAMPLE:
The flow sensor is mounted in a PN16 pipe with an external diameter of 90 mm.
Fs = 1.0333.
What is the gauge factor that has to be entered in the computer ?

Measure the internal diameter. Let us assume that this is 79 [mm].
The ***gauge factor old*** *is 895.1 for an internal diameter of 75.9 mm.*

$$\text{gauge factor} = \frac{(79)^2}{(75.9)^2} \times 895.1 \times 1.0333 = 1002$$

*Therefore, enter 1002 for the **gauge factor diameter** computer setting.*

---

2. Bürkert type 8020

*Unlike the Georg Fisher flow sensor type, the Bürkert type 8020 flow sensor has no sensor-specific gauge factor (Fs). The gauge factors from the table below can therefore be entered in the **gauge factor diameter** service setting without further correction.*

The fittings (T-piece or saddle piece) of the Georg Fisher and Bürkert flow sensors are not interchangeable. The T-piece / saddle piece type 1501 is used for the Bürkert flow sensor.

External diameter [mm] (T-piece)	**D internal diameter [mm] (saddle)**	**gauge factor [litre/min]**
32		64.38
40		104.90
50		170.36
63		294.70
	75	410.96
	90	657.90
	110	1060.07
	160	1666.67
	225	3891.05

EC alarm: absolute maximum EC
The value set here is the absolute maximum EC measurement to which the system must quickly respond with an alarm, irrespective of the setpoint and alarm deviation.

counter: EC alarm
counter: EC recirculation alarm
counter: pH alarm
counter: external alarm
counter: flow alarm
Counter for the delay time before the alarm is triggered.

EC control recirculation on?
This setting is used to turn recirculation on or off. ***EC recirculation: actuation factor***
EC recirculation: actuation timer
The controller's actuation factor is related to the running time of the modulating valve or diaphragm regulator in the injection pump. The shorter the running time, the shorter the actuation pulses have to be.

EXAMPLE:
Actuation factor = 5
Deviation from setpoint = 0.4 EC

Actuation timer = actuation factor x deviation = 5 x 0.4 = 2 seconds

A 2-second actuation is then performed in every period.

EC recirculation: actuations

Actuations of the EC recirculation valve.

EC recirculation: measurement (no temperature compensation)
EC recirculation: correction
EC temperature recirculation: measurement
EC temperature recirculation: correction
The recirculation control system is responsible for mixing 2 water currents with different EC values by means of a modulating valve control system.
The control system is the same as the standard EC control system with a modulating valve.

EC recirculation: interval
EC recirculation: interval counter
A pulsating actuation is carried out in the event of any deviation. The actuation time is variable. The actuation interval can be input in the above setting. The value specified here must take account of the inertia of the control system.

The inertia of a system is the time between actuation of the EC pump and the response of the measurement device. The greater the inertia, the longer the interval. The default value for this interval is 8 seconds. An actuation pulse is then emitted every 8 seconds, if necessary.

EC/pH control: flow measurement fixed
If there is no flow measurement, the value set here is used as the flow measurement. The EC and pH control systems do not then respond quickly to variations in flow.
If there is a flow measurement, this setting does not have to be entered.

EC/pH control: volume mixing tank
For supply units with a modulating valve (and without a mixing tank) this setting must be set to approx. 20 to 30 litres.
In the case of supply units with on/off pumps (and with a mixing tank) the actual water volume available must be entered in this setting (i.e. not the mixing tank's maximum volume).

If a pump is being used, this must be connected to the OPEN actuator (CLOSED has no meaning).

external alarm: type of alarm
In this setting you can choose from:
- *Continue in event of alarm: if an external alarm is active, watering continues*

If you specify that watering must stop in the event of an external alarm, it can be continued (after the alarm has been cancelled) by setting the 'pump: stop / continue' setting to 'Let pump continue'.

The external alarm can be used for:
- *an overheating alarm for the water pump*
- *breakdown in the watering unit*
- *level monitoring*

external alarm: delay time
The alarm is not triggered immediately. An adjustable delay time applies after the water pump starts. The delay time is halved during operation.

external alarm: detection
external alarm: gross detection
If external alarm present:
reading = 100
contact = closed
voltage measured across contact = 0 V

If no external alarm:
reading = 0
contact = open
voltage measured across contact = 5 V

flow change at 2 valves simultaneous
flow change at 3 valves simultaneous
flow change at 4 valves simultaneous
The settings for the flow alarm on the valves are entered for the situation where 1 valve receives water at any one time.
If 2 or more valves receive water simultaneously, the flow is usually not 2, 3 or 4 times as high; instead there is a reduction in flow because of a pressure loss.
The magnitude of the pressure reduction can be set here.

EXAMPLE:
All valves deliver (if actuated separately) a flow rate of 300 l/min.
If 2 valves are actuated simultaneously, the flow rate proves to be 510 l/min.

*The flow change is then: (510-600)/600 * 100% = -15%*

If 3 valves are actuated simultaneously, the flow rate proves to be 675 l/min.

*The flow change is then: (675-900)/900 * 100% = -25%*

pump water temperature: measurement
pump water temperature: correction
Measurement of the water temperature.

flow water supply: gross measurement
flow water supply: correction
flow clean water: gross measurement
flow clean water: correction
Measurement of the water supplied to the house and the incoming water.

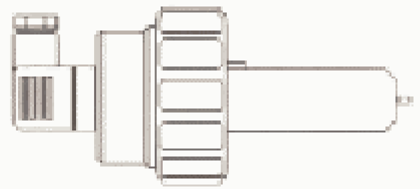
water supply: type of water sensor
You can choose between: ***flow sensor*** *and* ***litre counter****.*
The default setting is flow sensor.

pulse water supply: number of litres/pulse
This setting is not applicable in the case of a flow sensor.
Enter the number of litres corresponding to one pulse of the litre counter including the GL board's divide factor.

pulse water supply: interval time 0-measurement
This setting is not applicable in the case of a flow sensor.
A duration which is greater than the time between 2 pulses must be entered in this setting. After this time, the derived flow (litres/min) is set to 0 in the reports.
If too low a value is set, the flow alarm can be triggered.

flow water supply: gauge factor diameter
This setting is not applicable in the case of a litre counter.
The flow sensor emits a measurement signal which corresponds to the number of revolutions of the paddle wheel in the sensor. This measurement signal is converted by the computer into a quantity of water, as a function of the diameter of the pipe in which the flow sensor is installed.

flow water supply: counter litre
This setting shows how many m^3 water have passed the flow sensor.



Determining the gauge factor for the pipe diameter

There are two types of flow sensor that can be connected to the ECONOMIC NT. The procedure for determining the gauge factor is different for these two types.

1. *Georg Fisher type GF15*
2. *Bürkert type 8020*

---

1. Georg Fisher type GF15

Type GF15 flow sensors have their own sensor-specific gauge value (Fs). This value is shown on the flow sensor: this is the Fs value. This gauge value is used to determine the ***gauge factor diameter*** *setting.*
Proceed as follows to determine the ***gauge factor diameter*** *(also known as the T50 value):*

$$\text{gauge factor} = \frac{(\text{D internal})^2}{(\text{D internal average})^2} \times \text{gauge factor old} \times \text{Fs}$$

gauge factor	=	computer setting
D internal	=	measured internal diameter of PN16 pipe
D internal average	=	average internal diameter of PN16 pipe, see table below
gauge factor old	=	factor as per table below
Fs	=	sensor-dependent gauge value

D external [mm]	D internal average [mm]	minimum flow indication [m^3/h]	maximum flow indication [m^3/h]	gauge factor old [litre/min]
25	20.9			46.0
32	26.8	approx. 0.7	approx. 8	72.3
40	33.6	approx. 1	approx. 15	131.4
50	42.1	approx. 2	approx. 25	215.7
63	53.0	approx. 3	approx. 44	375.9
75	63.2	approx. 6	approx. 76	639.2
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110	92.7	approx. 13	approx. 165	1375.9
140	118.1			2190.09

EXAMPLE:
The flow sensor is mounted in a PN16 pipe with an external diameter of 90 mm.
Fs = 1.0333.
What is the gauge factor that has to be entered in the computer ?

Measure the internal diameter. Let us assume that this is 79 [mm].
The ***gauge factor old*** *is 895.1 for an internal diameter of 75.9 mm.*

$$\text{gauge factor} = \frac{(79)^2}{(75.9)^2} \times 895.1 \times 1.0333 = 1002$$

Therefore, enter 1002 for the ***gauge factor diameter*** *computer setting.*

---

2. Bürkert type 8020

Unlike the Georg Fisher flow sensor type, the Bürkert type 8020 flow sensor has no sensor-specific *gauge factor (Fs). The gauge factors from the table below can therefore be entered in the **gauge factor diameter** service setting without further correction.*

The fittings (T-piece or saddle piece) of the Georg Fisher and Bürkert flow sensors are not interchangeable. The T-piece / saddle piece type 1501 is used for the Bürkert flow sensor.

External diameter [mm] (T-piece)	**D internal diameter [mm] (saddle)**	**gauge factor [litre/min]**
32		64.38
40		104.90
50		170.36
63		294.70
	75	410.96
	90	657.90
	110	1060.07
	160	1666.67
	225	3891.05

level contact ebb & flow: detection
level contact ebb & flow: gross detection
The detector indicates whether there is sufficient water in the storage tank to raise a subsequent table.
If the reading is 100: sufficient level; therefore continue
If the reading is 0: insufficient level; therefore wait

The system waits at a maximum for the 'ebb & flow: maximum wait time' to see whether the reading reaches 100.

temperature control watering.

The water temperature can be controlled during sprinkling. The setpoint is adjustable for each crop section and therefore applies to all valves.

Two types of control are possible:

- *One control which is based on a pulse/pause control for a modulating valve.*
  The valve is kept continuously closed if the watering pump is off.
- *One control which provides continuous actuation for an on/off system. No actuation occurs if the watering pump is off.*

Any circulation pump for the heat exchanger can be connected in parallel with the watering pump.

temperature control watering / cooling: type of control
You can choose from:

On/off	Provides continuous actuation
Modulating	Provides pulsating actuation

modulating: heating actuation factor
modulating: heating actuation timer
The actuation factor and the actuation timer. Mixing valves with short running times are frequently installed. The actuation factor must then be small (0.5 - 1).

on/off: deviation heating on
on/off: deviation cooling on
Cooling or heating comes on if the water temperature deviates from the setpoint by more than the set deviations.

on/off: heating / cooling hysteresis

- ***cooling*** *off at: setpoint + deviation - hysteresis*
- ***heating*** *off at: setpoint + deviation + hysteresis*

pump: stop / continue
In this setting you can choose from:

Set pump to pause	Watering is paused until midnight
Let pump continue	Watering continues from the same point where the water pump was stopped for an alarm or pause
Status: pause active between watering cycles	This text is displayed if the pump is paused between watering cycles

pause time
pump: remaining pause time
These settings are used to specify a pause. Once the pause time has elapsed, watering starts at the same point where the watering pump was stopped before the pause.

pause time before automatic after-supply
If phase 3 (after-supply) is set, and the pump is stopped for an EC alarm, then phase 3 (without supply) is run after the pause time set here.

pump: flow
pump: flow clean
These settings indicate the measured flow.

pump: number(s) alarm signal
You can use this setting to specify which alarm signals must be initiated in the event of an alarm (option).

pump: status
This setting indicates the pump status:

- ***EC valve actuated***
- ***Pre-running***
- ***Flushing because of alarm***
- ***Phase 1, 2 or 3 active***
- ***Pause***
- ***Flow high or low***
- ***pH high or low***
- ***EC temp. alarm***
- ***EC high or low***
- ***External alarm***

rapid adjustment at alarm
The EC and pH control systems can be disrupted by a sudden and major disturbance in the supply unit.
For example, if the control valves have to be moved to their outermost position during emptying of the fertiliser tanks and then the tanks have to be refilled.
Another example is if a much higher EC is used for drip-filling the mats at the start of cultivation than was previously the case.

The control system simply needs time to adjust to this new situation. It can then occur, depending among other things on the system properties, that an alarm is triggered one or more times. Particularly if relatively short cycles are being used.
The 'rapid adjustment at alarm' setting enables the control system to be returned rapidly to proper operation.

In the event of problems, it is recommended that you first ensure that the EC level is as required and then rapidly adjust the pH.

recirculation level breaktank: measurement
recirculation level breaktank: gross measurement
recirculation level breaktank: 00 input
recirculation level breaktank: 100 input
One measurement is possible for each water pump with regard to the ViP influence 'Drainage water level'.
This measurement is adjusted as if it were a vent position measurement.

selection pre-run time
Pre-running of the pump often interferes with the EC and pH control systems. It is usually also not necessary for every cycle; once before the first cycle is often sufficient.

You can choose from:

Each cycle	Pre-running at the start of each crop section, even if the pump was already active
At pump start	Pre-running each time the pump starts
Once daily	Pre-running once daily

status pre-run time
This setting indicates whether the pump will pre-run once daily, before each cycle, or each time before the pump starts.

valve actuations in matrix
If this is set to 'Yes', the valves are always actuated via the matrix system.
That means that there must be a valve actuation AND a block actuation in the matrix box for each actual valve actuation.

If this is set to 'No', the valves are still actuated via the matrix system if the item 'Pump without matrix' is not live.

The valves are only not actuated via the matrix system if this is set to 'No' AND the item 'Pump without matrix' is live.
A maximum of 48 actuations are then possible, with valve 1 being the first valve actuation and valve 48 being block actuation 32.

valves simultaneous maximum number: ViP
This ViP setting is used to specify the maximum number of valves which can be opened simultaneously at various times during the day.
For example, in the early morning and in the afternoon 1 valve may be open at any one time, while in the middle of the day 2 valves may be open simultaneously.
Only valves with the same time or number of litres are opened simultaneously.

The following settings must also then be correctly set:

Control Water, Valves
more valves allowed simultaneously

Control Water, Crop sections
valves simultaneous: maximum number

watering controls switch back to old version
This can be used, if necessary, to switch off various control system components.
The options enable program modules to be disabled in the event of unexpected problems in the program. These disabling options should never be used unless advised in advance to do so by Hoogendoorn. They may also only be used for the concrete problem for which this is permitted. The content of this setting and its effect vary for each program series.

5. Energy management

Energy Management

Energy Management's major trump card can be summed up in one word: *flexibility*.
This applies to:

1. Priorities in energy or CO_2 controls
2. Configuration
3. Emergencies

1. Flexible priorities

You can freely determine and change as you see fit the order in which boilers and CHPs may supply energy. You can set the order for supplying CO_2 just as freely. The total quantity of energy and/or CO_2 produced is matched to the total demand.

2. Flexible configuration

- There is no distinction between the main and standby boilers.
- A number of boilers may be filled for CO_2 or for a tank store for each tank control.
- Well matched control of several CO_2 sets on 1 boiler.
- With CHP tank control the user also automatically has the opportunity to control CHPs in response to energy demand.
- Account is also taken of the energy or CO_2 supplied by energy or CO_2 producers controlled independently of the computer. For example, the system will not start a boiler unnecessarily if the utility company has switched a CHP on which is delivering a sufficient supply.
  Required condition: the external supply must be measured via detectors.
- All group connections, e.g. from the circuits to the transport, are entered on-site.
  This highly flexible design permits even more complex systems to be automated without having to resort to the use of dummy tanks, extra CO_2 controls, switchgear cabinets or other means. As a result, it is easier for you, the user, to retain a clear overview of the system.

3. Emergency control

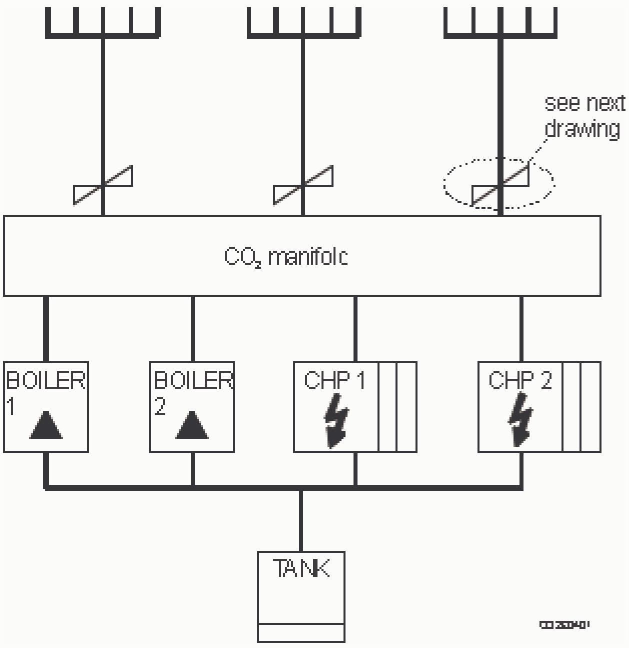
If an energy or CO_2 producer fails or does not start automatically, the next boiler or CHP is switched on. Detectors report whether a producer is running, has broken down or is switched off.

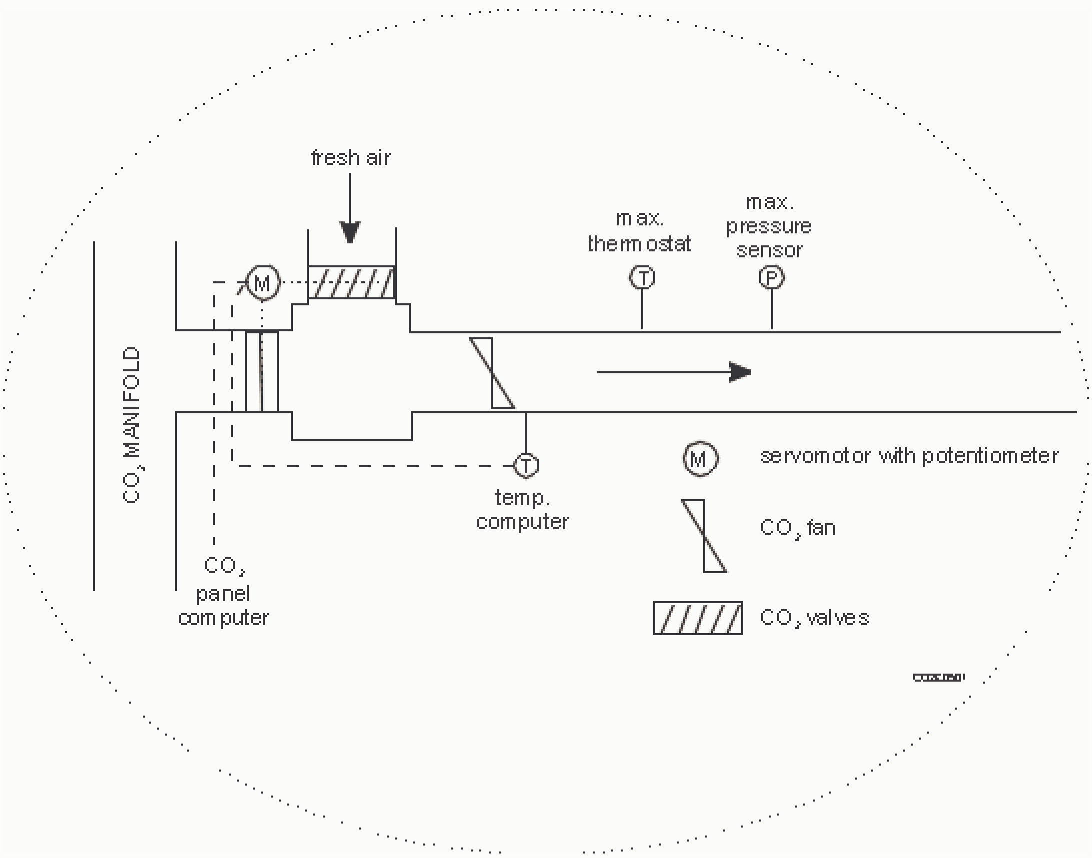
Starting point for Energy Management

The total CO_2 demand and the total energy demand are central to the control system. They are computed for each CO_2 or energy manifold.
The CO_2 produced by various CHPs and/or boilers is fed into a joint air receiver (manifold). From there, main distribution pipes lead to various parts of the nursery. A valve located upstream of the CO_2 fan at the start of the distribution pipes enables the quantity of CO_2 transported to be reduced by adding outside air.
Regulating the CO_2 volume with these CO_2 valves has two functions:

- Regulating the mutual ratio of CO_2 discharge by the various distribution pipes.
- Avoiding a situation where too much CO_2 is discharged if the volume of CO_2 produced is too high.

In addition to regulating the CO_2 volume, the CO_2 valves also add outside air if the feed gases are too hot. There are also CO_2 valves for adding outside air which are not mounted on a central air receiver but directly downstream of the CHP feed line. Whether the program can also be used for these must be checked in advance if the event of such an application being required.





An energy manifold is the junction for the energy produced by the various boilers and CHPs which jointly supply energy to the same section of the nursery. The relevant tank is also associated with an energy manifold.
You can set a priority for each of the producers. This ensures that precisely the right number of producers are started to meet the CO_2 demand or energy demand.
The preferred option for energy supply is from the tank. When building up a tank store for energy, production has to be greater than the nursery's energy demand. Here too you can set priorities.

There can be different connections for CO_2 and for energy.
For example, Boiler 1 and CHP 1 supply CO_2 to the left section of the nursery, while Boiler 2 and CHP 2 supply CO_2 to the right.
All the boilers and CHPs supply energy to the same manifold and tank. This is not a problem for Energy

Management. Although there are 2 CO_2 manifolds, there is only 1 tank control with 1 CO_2 tank schedule.

Installation requirements

The air receiver is termed a manifold in the CO_2 program. This manifold must remain at an approximately constant pressure. This can be be ensured by means of feeding extra outside air if the CO_2 fans extract more than the volume of flue gas produced. If, on the other hand, more flue gases are produced than the CO_2 fans in combination with the CO_2 valves discharge, the excess must be discharged via a chimney.
Pressure is NOT controlled by the Hoogendoorn computer but rather is the responsibility of the installer. In a classic boiler installation (without CO_2 manifold) this is done by having the flue gases extracted into the chimney by the CO_2 fan. More air is automatically entrained in the event of low flue gas production. And if too much flue gas is produced, this is discharged to the atmosphere via the chimney. This method is used for boilers. With CHPs the flue gases are not discharged directly out of the chimney because they have to pass through a flue-gas scrubber before continuing to the manifold.
The installer must also provide a safety feature to protect against suction from the manifold if the feed valves to the manifold are closed and the CO_2 fans are running with the CO_2 valve open.

The CO_2 distribution pipe must be protected independently of the computer against excessive temperature and pressure. This protection takes the form of a maximum thermostat and a maximum pressure sensor where the fan is switched off if the threshold is exceeded. The Hoogendoorn temperature monitor with the aid of the CO_2 valves regulates the system to a temperature level below the maximum thermostat setting.

A valve position feedback device is installed for the Hoogendoorn CO_2 valve control system. The air temperature is measured with a type of water temperature measurement device because temperatures in excess of 40℃ are regulated.

The Hoogendoorn control system is based on the assumption that the CO_2 fans deliver a fixed supply rate. The capacities of the fans may vary from each other. The control system has a setting to allow it to take account of this.

The main distribution pipe transports the CO_2 to a distribution system that feeds the CO_2 to various climate groups.

Alarms

energy control: return to old version
This can be used, if necessary, to switch off various control system components in the event of problems with the program.

These disabling options should never be used unless advised in advance to do so by Hoogendoorn. They may also only be used for the concrete problem for which this is permitted.
The content of this setting and its effect vary for each program series.

energy: group connections: selection alarm signal on
An alarm is triggered if the connections with energy management group numbers are incorrectly set, for example if a connection is made to a non-existing tank.
It is not possible, of course, to filter out all possible error situations because these can be wrong for the given installation but represent a meaningful combination for the program configuration.

Options:

Heat discharge: group connection wrong	Alarm signal on if the group connection for heat discharge is wrongly set.
CO2 manifold: group connection wrong	Alarm signal on if the group connection for the CO2 manifold is wrongly set.
Energy manifold: group connection wrong	Alarm signal on if the group connection for the energy manifold is wrongly set.
CO2 valve: group connection wrong	Alarm signal on if the group connection for the CO2 valve is wrongly set.

CHP/TE: group connection wrong	Alarm signal on if the group connection for the CHP or TE is wrongly set.
HDS: group connection wrong	Alarm signal on if the group connection for HDS is wrongly set.
Boiler: group connection wrong	Alarm signal on if the group connection for the boiler is wrongly set.

energy: number(s) alarmsignal
You can use this setting to specify which alarm signals must be initiated in the event of an alarm (option).

energy: selection measurements alarmsignal on
Options:

Boiler temperature too low	Alarm signal on if the boiler temperature is too low.
Operating station: no communication	Alarm signal on if there is no communication with the operating station.
CO2 boiler: breakdown	Alarm signal on if CO_2 boiler has broken down.
Boiler: will not start	Alarm signal on if boiler will not start.
Boiler: off	Alarm signal on if boiler is off.
Boiler: breakdown	Alarm signal on if boiler has broken down.
CHP CO2: will not start	Alarm signal on if CHP for CO_2 will not start.
CHP CO2: off	Alarm signal on if CHP for CO_2 is off.
CHP CO2: breakdown	Alarm signal on if CHP for CO_2 has broken down.
CHP energy: will not start	Alarm signal on if CHP for energy will not start.
CHP energy: off	Alarm signal on if CHP for energy is off.
CHP/TE: breakdown	Alarm signal on if CHP or TE has broken down.

Explanatory note:

- The breakdown alarms are triggered as soon as a breakdown message is detected, irrespective of whether the CHP or boiler in question would have to be actuated for the control system. An alarm is therefore also triggered in the event of a breakdown if the CHP is actuated by the utility company.
- If a CHP or boiler is not operated for a long period (e.g. not yet connected), it is useful to remove it temporarily from the priority list. An alarm is then not triggered in the event that it is detected to be off.

Boiler

add next priority: capacity
The next boiler or CHP is switched on, in accordance with the priorities set, when the boiler has reached the percentage of the maximum power set here.

boiler low speed: detection
boiler low speed: gross detection
boiler high speed: detection
boiler high speed: gross detection
boiler off: detection
boiler off: gross detection
boiler failure: detection
boiler failure: gross detection
CO2 failure: detection
CO2 failure: gross detection

The detection systems with the relevant gross detections.

boiler on: maximum starting time
boiler: timer on
The counter records the time that the boiler is actuated and may run for up to 24 hours. If the low-speed detector is not measured after the counter has reached its maximum starting time, the 'Will not start' message is activated.

boiler temperature CO2 threshold: minimum pipe
If the boiler temperature is higher than the threshold and there is a CO2 MUST situation, a minimum pipe temperature is set.
This ensures that CO_2 supply can be continued for longer.

boiler temperature deviation heat demand: ViP
The temperature is adjusted to the highest pipe temperature demand plus the set deviation.

boiler temperature minimum: ViP
boiler temperature maximum heat demand: ViP
The thresholds for the computed boiler temperature.

Take care to ensure that the minimum boiler temperature is not adjusted too low as a function of the available light.

boiler temperature: computed
The boiler temperature is computed on the basis of the highest pipe temperature demand (by a heating circuit or a transport group) plus a user-defined 'boiler temperature deviation heat demand: ViP' setting.

boiler temperature: max CO2 and tank store
This is the maximum boiler temperature if the boiler is started up by the CO_2 program.

boiler temperature: measurement
Boiler temperature measurement system.

A boiler valve can close off the feed of boiler water to the manifold.
There are two different functional applications:

1. boiler closing valve on the main boiler
2. standby valve on the standby boilers

The boiler valves are controlled such that there is always one valve open if the tank closing valve is closed so that no negative pressure occurs at the manifold. This does not mean, however, that this can be guaranteed under all circumstances. An external protection device (independent of the computer) against negative pressure at the manifold is needed if powerful pumps are acting on the manifold.

Boiler closing valve on the main boiler
If the boiler in question is the main boiler, the boiler valve is controlled as the boiler closing valve.
The manifold control has determined which boiler is the main boiler on the basis of the priorities set. One boiler is always the main boiler. If there is no tank control, the boiler closing valve is continuously open. This is also the case, therefore, if there are CHPs or TEs running to supply heat. If the pumps are drawing more on the manifold than the CHPs are delivering, water will therefore be caused to flow through the boiler.

Standby valve on the standby boilers
Priorities for the standby valve control:

- Not opening or closing for boiler protection
- Open because of CO_2 demand, tank store and subsequent filling (blocking)
- Energy demand control: the valve gradually opens further with increasing energy demand
- Closed

boiler valve: running time

The boiler valve's running time.

boiler valve: open during tank emptying
If the boiler valve has to be open during tank emptying (boiler emptying), set this to 'Yes'.

boiler valve: computed position
The computed position of the boiler valve.

boiler valve: actuation timer
The actuation timer of the boiler valve.

boiler valve: actuations
This setting indicates the boiler valve actuation system.

- Valve open
- Valve closed

boiler: actuations
This setting indicates the boiler actuation systems.

- Boiler on
- Modulation open
- Modulation closed
- High on

boiler: connected energy manifold
Use this setting to refer to the relevant energy manifold.

boiler: connected CO2 manifold
Use this setting to refer to the CO_2 manifold.

boiler: energy capacity
Enter the boiler power in this setting.

If the boiler power is not immediately available, it can be determined as follows:

Method 1: The number of kcal/h is known.

1 kcal = 4.18 kJ
1 kW = 1 kJ/s
thus 1 kcal/h = 4.18 / 3600 kW
or 1,000,000 kcal/h = 1.161 kW

Method 2: The maximum fuel consumption and efficiency are known.

power = fuel energy content x efficiency

Groningen natural gas, for example, has a maximum energy content of 35.17 MJ/m^3. Boiler efficiency is 90% at most. Maximum consumption is A m^3/h.
Energy consumption = A x 35.17 x 0.90 MJ/h = A x 35.17 x 0.90 MJ / 3600 s = A x 9.77 x 0.90 kW

add next priority: capacity
The next boiler or CHP is switched on, in accordance with the priorities set, when the boiler has reached the percentage of the maximum power set here.

You are recommended not to set this setting higher than 75%. The default value is 70%. The boiler valve of the next boiler opens over a range of 20%.

control burner: computed actuation action boiler temp.

This is the computed actuation action because of a heat demand.

control burner: actuation timer
This actuation timer is updated with the computed actuation action every 20 seconds. The actuation timer indicates what the actuator is actually doing (- = close).

control: P-action per degree low
control: P-action per degree high
The modulating burner control system consists of a P-action and an I-action.
The P-action operates with the above settings, within both the low-speed and the high-speed control ranges.

EXAMPLE 1:
If the measured boiler temperature suddenly falls from 80℃ to 79℃, a one-off actuation action of +8 seconds is computed.
In the event of a rise from 79℃ to 80℃ the actuat ion action is -8 seconds.

control: P-action per degree low	8
boiler temperature: computed	80

EXAMPLE 2:
If the measured boiler temperature suddenly rises from 80℃ to 81℃, a one-off actuation action of - 6 seconds is computed.

control: P-action per degree high	6
boiler temperature: computed	80

control: I-action actuation
The I-controller gives an actuation pulse if the boiler temperature deviates for an extended period.

control: I-action interval time
control: I-action interval counter
The modulating burner control system consists of a P-action and an I-action.
The I-action operates with the above settings, within both the low-speed and the high-speed control ranges.
The I-action is not performed if the measured boiler temperature deviates from the computed boiler temperature by less than 1℃.

EXAMPLE:
With a measured boiler temperature of 79℃ an actua tion action of +1 second is computed every 90 seconds.
With a measured boiler temperature of 81℃ an actua tion action of -1 second is computed every 90 seconds.

control: I-action actuation	00:01
control: I-action interval time	01:30
boiler temperature: computed	80
boiler temperature: measurement	78

detections: ignore because of failure
A defect in the detectors that cannot be immediately remedied can seriously disrupt the control system. For that reason it is also possible for the service technician to ignore the detectors temporarily.
The control system then assumes that the boiler is actually operating the actuators. The emergency control system is, of course, then switched off, and the detector problem must be resolved as soon as possible.

In the event of conflicts between the detectors, for example both an on and an off control are monitored simultaneously, the system does not show both messages, but operates a priority sequence:

- Detector off
- Detector fault
- Detector CO2 fault
- Will not start (= detector on is too slow)
- Burner on

The 'CO2 fault' detector can operate in combination with the lower priorities; energy supply is possible.
If the 'Burner on' detector is on, it also indicates whether the boiler is operating in high-speed or low-speed mode.
The 'High speed' detector is only accepted if the 'Low speed'' detector is also being measured.

heat discharge: delay time boiler on
heat discharge: delay time counter
These settings are used to prevent the boiler being switched on when not wanted during heat discharge, in response to the boiler temperature.
For safety reasons, the boiler is prevented from being switched on and the counter runs only if the following conditions are met:

- at least 1 connected heating circuit is in the process of discharging heat
- no connected heating circuit is in the process of firing
- the boiler is off
- the boiler temperature is too low

In all other situations the counter is set to zero, and the boiler is not prevented from operating.
Once the delay time has elapsed, the boiler is enabled again.
Boilers for CO_2 production are not prevented from operating.

high speed: deviation boiler high off
high speed: counter interval low/high
The boiler switches from high to low speed if the boiler temperature is higher than the computed temperature plus the set deviation. The 'high speed: minimum time on/off' setting is always observed, before which the 'high speed: counter interval low/high' setting is used.

high speed: control range
This setting determines the control range of the modulating burner control system at high speed.
Above this control range the modulation is continuously closed. Below this control range it is continuously open.
The LOW SPEED modulating actuator is again constantly actuated.

EXAMPLE:
If the boiler is running at high speed, and the measured boiler temperature is lower than 75℃, the bu rner is actuated such that it is continuously open. The modulating burner control system operates in the range between 75℃ and 80℃.

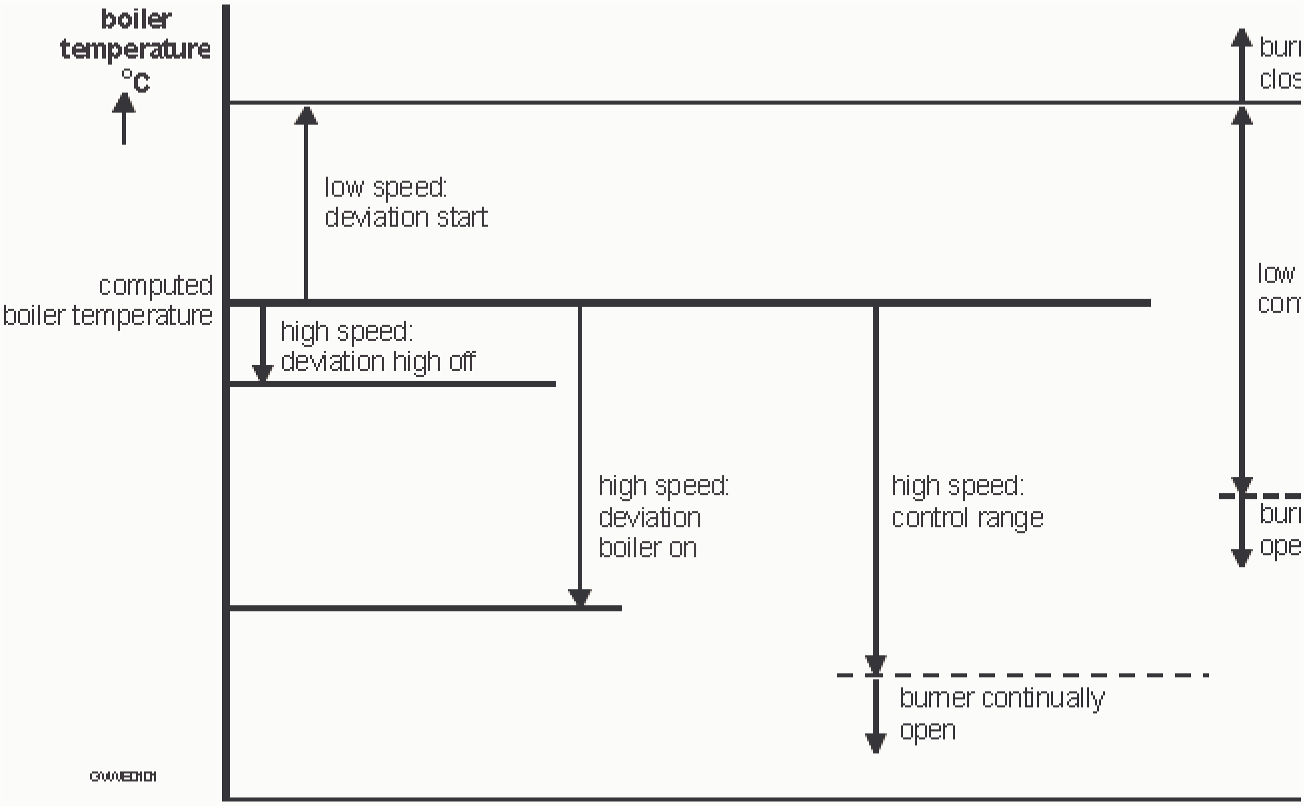
high speed: control range	5
boiler temperature: computed	80

high speed: deviation boiler on
If the burner is fitted with a high-speed control, it is switched to high speed if the boiler temperature is too low by the set deviation. It switches back to low speed once the boiler temperature has risen to the computed boiler temperature.

high speed: minimum time on/off
There is a minimum time before switching to a different speed. The burner must be operated in the relevant mode for at least this time before it is switched over.

EXAMPLE:
The boiler is switched to high speed when the boiler temperature falls below 75°C and is switched back to low speed once the boiler temperature rises above 80℃.

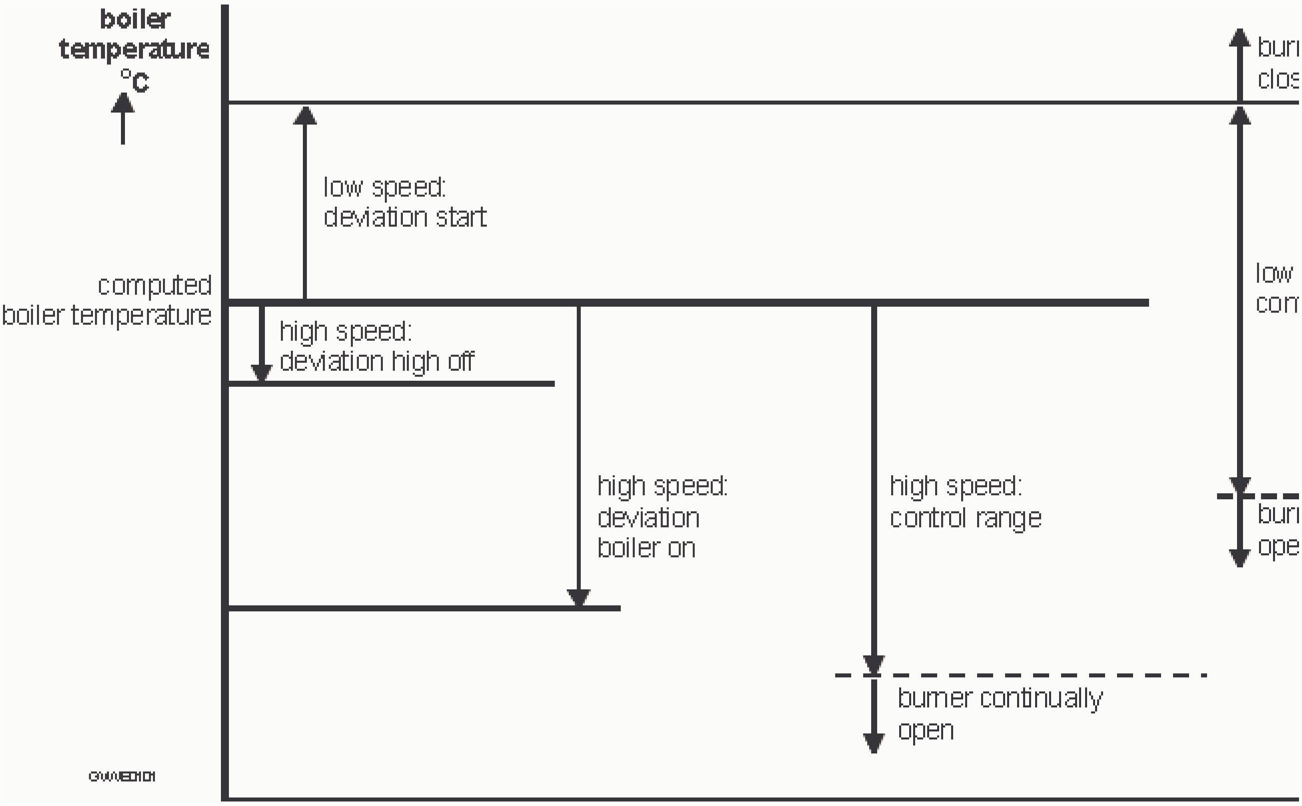
high speed: deviation boiler on	-5
boiler temperature: computed	80



low speed: deviation start
low speed: control range
These settings determine the control range of the modulating burner control system.

EXAMPLE:
If the measured boiler temperature is greater than 82℃, the burner is kept permanently closed. If the measured boiler temperature is lower than 77°C, the burner is kept permanently open. The modulating burner control system operates in the range between 77℃ a nd 82℃.

low speed: deviation start	2
low speed: control range	5
boiler temperature: computed	80



low speed: deviation boiler off
low speed: deviation boiler on
The boiler is switched off if the boiler temperature is higher than the computed temperature plus the set deviation.
The boiler is switched back on when the boiler temperature is lower than the computed temperature plus the set deviation.

low speed: counter on/off
When the boiler is switched on, it remains on for at least this time.

EXAMPLE:
The boiler is switched off when the boiler temperature increases beyond 88°C and is switched back on when the boiler temperature falls below 83°C.

low speed: deviation boiler off	8
low speed: deviation boiler on	3
boiler temperature: computed	80

maximum boiler temperature CO2: deviation on
This setting is used to specify at what deviation below the 'boiler temperature: max CO2 and tank store' setting the boiler may be switched on again if it has been switched off as a result of this maximum.

minimum boiler temperature
Alarm limit for the minimum boiler temperature.
Do not set this alarm limit too low. The boiler temperature is measured at the top of the boiler; it is usually colder at the bottom of the boiler!

protection: boiler temperature
protection: boiler temperature
The boiler protection serves to prevent the boiler temperature from falling too low in the event of a sudden high heat demand.
The boiler protection comes into operation if the measured boiler temperature is lower than the set 'protection: boiler temperature'.
If the deviation is not greater than the 'protection: boiler temperature' setting, the initial step is for the mixing

valves not to be opened or closed any further. If the deviation is greater than the range, the mixing valves are closed in stages. In a standby boiler the boiler protection influences the actuation of the standby valve.

EXAMPLE:
The valves are not actuated further if the boiler temperature is lower than 65℃ and are closed if the boiler temperature is lower than 61℃.

protection: boiler temperature	65
protection: boiler temperature	4

status boiler control
This setting indicates the boiler status.

- To low
- High/low starting position
- On; heat
- To off
- To high
- High; CO2 or store
- High; heat
- Delay on
- On; CO2 or store
- Maximum temperature; CO2
- Off: emergency power
- Limit on max. capacity

status boiler: input
This setting indicates the boiler status.

- CO2 demand
- CO2 high speed
- CO2 minimum burner
- Store min. burner
- Main boiler
- Heat demand
- Tank store

status boiler: output
This setting indicates the boiler status.

- Boiler protection:closed
- Boiler protection:not open
- Minimum pipe temp. CO2
- Fault CO2
- Detector high
- Detector low
- Burner on
- Will not start
- Detector fault
- Detector off
- Incorrectly connected

switch over: reset period high/low
switch over: start position control low
switch over: start position control high
These settings are used with boilers which do not switch automatically from high speed to low speed and vice versa.

If the program sees that it has to switch from high speed to low speed, the high-speed actuator is immediately de-energised, and the burner is closed for the reset period. This reset period must be set to the burner's running time at least, though it may also be set to a longer time which will result in a waiting period.
Once the reset period has elapsed, the burner is opened for the number of seconds set in 'switch over: start position control low'.
The switch from low speed to high speed follows the same procedure except that the 'switch over: start position control high' setting is used to move to the start position.

uni-influence: connected uni-switch tank
uni-influence 2: connected uni-switch tank
Various ViP settings have a so-called uni-influence. The ViP setting can therefore be influenced by a uni-switch.
This setting enables you to connect the control unit to a uni-switch via the map.

Such a connection can be made with the following control units among others:

- greenhouse heating, for a uni-influence on the minimum pipe temperature or on the heating temperature (does not work in combination with Econaut)
- ventilation, for a uni-influence on the humidity vent position or on the ventilation temperature
- assimilation lighting, for a uni-influence to switch the lighting on or off
- curtains, for a uni-influence on the energy curtain, the shading curtain or the crack in the curtain
- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

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- boiler, for a uni-influence on the maximum burner position
- tank, for a uni-influence on the tank layers store
- greenhouse climate, for a uni-influence on the other control units not mentioned above

Boiler: burner

boiler high filling: starting capacity
boiler high filling: deviation starting capacity off
boiler high filling: minimum time on/off
boiler high filling: minimum energy demand
The boiler is set to high-speed mode for CO_2 if the desired capacity is higher than the initial capacity, the minimum off time has elapsed and the energy demand is higher than the minimum energy demand.
The system reverts to low-speed mode when the desired capacity is lower by the set deviation and the minimum on time has elapsed.

boiler low: capacity 00% position
boiler low: capacity 25% position
boiler low: capacity 50% position
boiler low: capacity 75% position
boiler low: capacity 100% position
boiler high: capacity 00% position
boiler high: capacity 25% position

boiler high: capacity 50% position
boiler high: capacity 75% position
boiler high: capacity 100% position
The quantity of gas for the relevant burner position has to be entered in these settings in order to convert the burner position to the quantity of gas.

The quantity of gas for each burner position can be determined using the gas meter by, for example, having a fixed gas consumption rate for 1 minute and reading off the relevant gas quantity on the gas meter.
A burner report detailing these data can also be used.

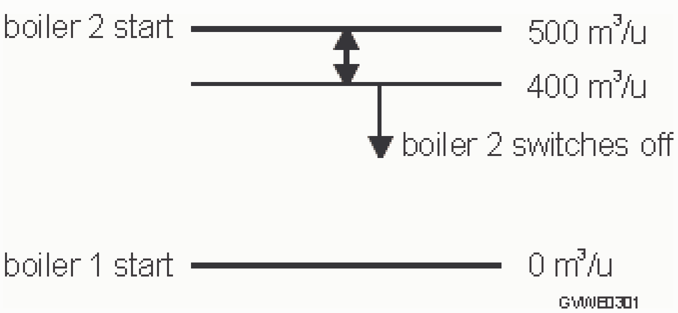
burner position: measurement
burner position: measurement (0-100)
The measured burner position between 0 and 100%.
The burner position is used to control the quantity of gas in m^3/h during filling of the tank or if the boiler has been started by the CO2 program.

burner: computed capacity
burner: measurement capacity
burner: computed position
If the measured tank temperature when filling is too low by comparison with the computed tank temperature, the burner's computed capacity will be increased. This is done with the help of a PI-control system.
The computed P-action + computed I-action together form the desired supply capacity to which the system is adjusted. The computed capacity at any given moment can deviate from this sum for various reasons:

- to maintain smooth operation in the control system
- a greater supply rate is not possible because the boiler temperature is rising too high
- the CO_2 measurement is above the minimum CO_2
- restriction as a result of minimum or maximum filling capacity

CO2: maximum capacity boiler
tank store: maximum capacity boiler
capacity: deviation switch off
The maximum capacity if the boiler is running for CO_2 production and the maximum capacity if the boiler is running to create a tank store.
Use the 'capacity: deviation switch off' setting to specify when a boiler has to be switched off again.

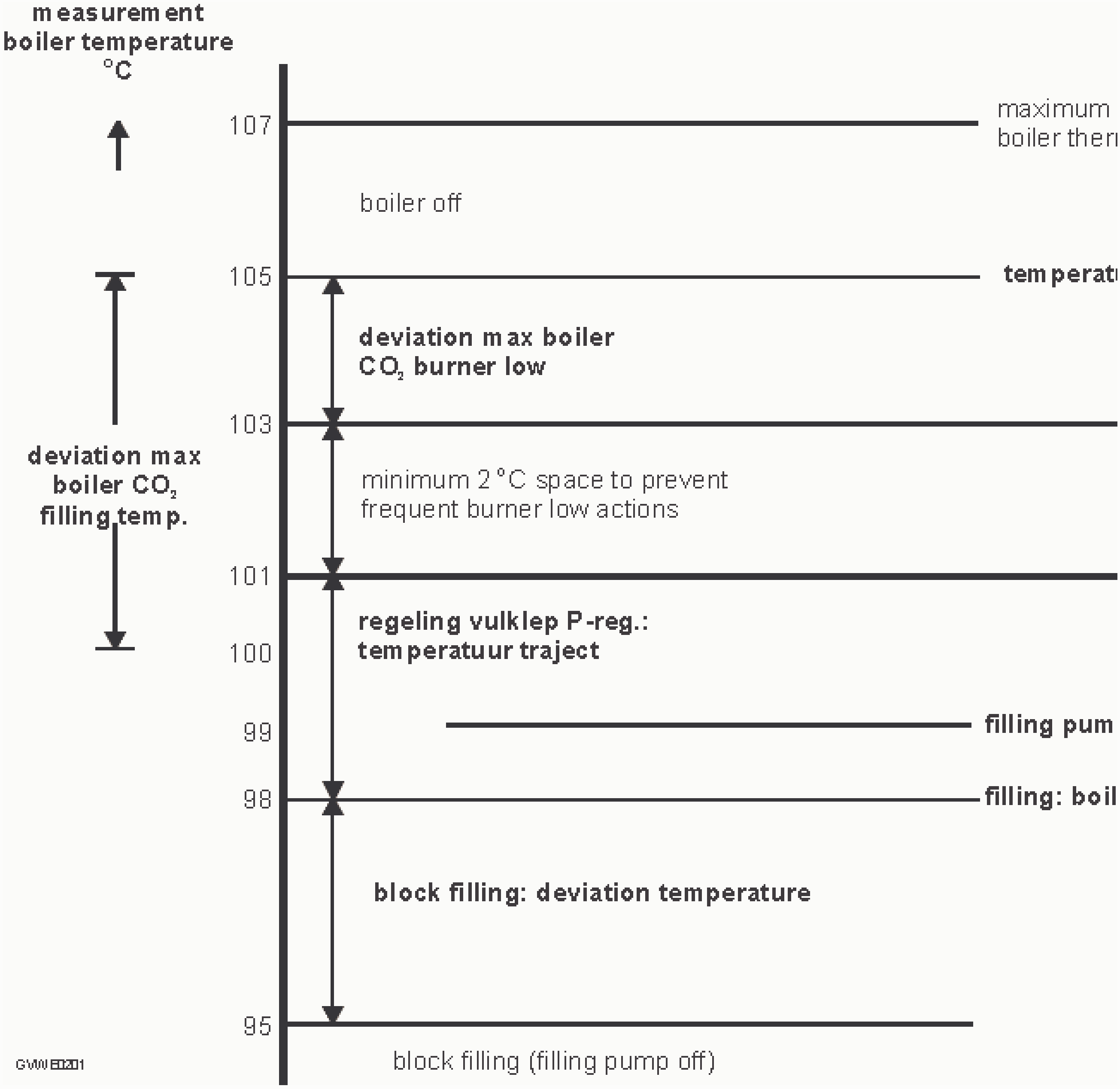
EXAMPLE:
The priorities are set such that first boiler 1 goes on and then boiler 2.
The capacity of boiler 1 is 500 m^3/h. If a higher capacity is computed, boiler 2 starts up. Switch boiler 2 off again if the computed capacity is lower than 400 m^3/hour.



CO2: maximum capacity boiler	500
capacity: deviation switch off	-100

deviation maximum boiler CO2: filling temperature
Maximum boiler temperature CO_2 multiplied by this temperature deviation (set as a negative) gives the target temperature for the boiler during filling with control based on the return temperature and/or the energy demand.

EXAMPLE:



deviation maximum boiler CO2: keep high off
If the boiler temperature rises to the maximum boiler temperature CO_2 multiplied by this temperature deviation (set as a negative value normally), the system will not switch over to high-speed mode.

deviation maximum boiler CO2: burner low
When the boiler temperature rises above this setting during tank control, the burner is adjusted to a lower output.
The boiler will therefore produce less heat, and the tank will be filled less quickly. This is done to prevent the boiler from switching off.

control burner position: actuation factor
control burner position: actuation action filling
The actuation factor determines the number of seconds of actuation per % deviation from the burner position. The smaller the actuation factor, the shorter the actuation time and the smoother the control.

The actuation action specifies the total length of the actuation pulse for the CO_2 supply and tank store (- = close).

temperature: maximum capacity boiler ViP
If the boiler is burning because of a heat demand from the greenhouse, the burner is actuated such that this

maximum capacity is not exceeded. This ViP setting has 2 periods.

Limiting the burner capacity can result in the greenhouse temperature becoming too low. Please check, therefore, whether the initial threshold of your boiler protection is properly set. It should be just below the minimum boiler temperature with a reasonably large range. Check also whether the alarm signal has been set to be triggered if the boiler temperature falls too low.

Boiler: tank filling

boiler return temperature: measurement
If a boiler return temperature measurement is available, the filling valve can be regulated on the basis of the return temperature. The boiler return temperature measurement is the temperature of the boiler's feed water. The filling valve has to be a mixing valve which routes some of the water to the tank and some back to the boiler, or the flow across the boiler must be controlled with a frequency-controlled pump (Kebus pump).

As high as possible a boiler filling temperature is maintained.
Depending on the burner position and the volume of flow across the boiler, the computed return temperature is adjusted such that the 'filling valve energy: computed filling temperature' is achieved.
If the computed return temperature is lower than the minimum return temperature or if the filling valve has to open more than 100%, the burner is set to a lower output.

Set the minimum return temperature such that the temperature at the bottom of the boiler is no lower than 70° C. This avoids excessive tensile stresses on the boiler and condensation. Consult your heating engineer, if necessary, about an appropriate setpoint.

Advantages of a control system:

- Stable and higher average filling temperature. The control system responds immediately to changes in the burner position, energy demand from the greenhouse and rising return temperature as the tank becomes full. If the tank is only filled on the basis of the measured boiler temperature, the control system only responds if the boiler temperature rises or falls.
- Protection of the boiler by preventing water that is too cold flowing into the boiler.
- More efficient use of the filling pump's high/low actuator.
- Suitable for frequency-controlled pump and open tank system (Kebus system).

control filling valve: type of control
You can choose between a boiler temperature P-control or control on the basis of an energy calculation.

control filling valve: running time valve
The valve's exact running time has to be specified here.

control filling valve: actuation timer
This setting indicates how long the valve is opened or closed.

control filling valve: opened
The computed % position of the filling valve.

control filling valve: boiler temperature start
Filling begins at this set boiler temperature.

filling pump high: minimum boiler temperature on
filling pump high: minimum time on
filling pump high: deviation temperature high off
filling pump high: counter time on
The filling pump is set to high speed if the boiler temperature exceeds the set temperature.
The filling pump is switched back to low speed once the boiler temperature falls by the deviation.

A minimum running time can be set to ensure smooth operation.

filling valve energy: computed filling temperature
filling valve energy: computed pre-control
filling valve energy: computed P-action
filling valve energy: computed I-action
filling valve energy: boiler return temperature: computed
These values are computed by the program.

filling valve energy: P-factor
filling valve energy: I-factor
filling valve energy: interval I-action
filling valve energy: counter interval I-action
The P- and I-factors are in ℃ (delta-T over the boiler) per ℃ boiler temperature deviation. The I-action may only be adjusted once the interval has elapsed. The P- and I-controls have to remain subordinate to the pre-control.
The I-control may not be switched off.

filling valve energy: actuation factor filling valve
Every 20 seconds the valve is displaced for the set number of seconds per ℃ boiler return temperature deviation. Do not set this factor too high (recommended setting 0.7 - 1.5) so that the valve is more likely to operate smoothly. Adjustment is easier with the pumps on the manifold temporarily switched off and a fixed supply capacity with a high average. A residual deviation of a few ℃ (max. 5) between the computed and measured return temperatures is not a problem, provided the valve is in equilibrium.

filling valve energy: pre-control low
filling valve energy: pre-control high
The pre-control (with a filling pump) low and high settings are adaptively adjusted by the program. They represent the number of ℃ (delta-T over the boiler) that are required per 100 m^3/h gas whose heat content has to be fed to the tank.
The size of these factors depends mainly on the filling pump capacity, hence there is a separate factor for the filling pump at low or at high speed. On commissioning, the boiler temperature can fluctuate on first filling because these factors are still active in the setup process. The program automatically detects that the boiler temperature is varying too quickly and then responds with rapid adjustment of the factors in question.
If you wish, the fitter can speed up the setup procedure provided the measured boiler return temperature does not deviate too much from the computed return temperature. Increase the factor if the boiler temperature is too high, reduce it if the temperature falls.

filling valve P-control: temperature range
The filling valve is actuated in accordance with a boiler temperature P-control.
If the boiler temperature is higher than the filling temperature by this range, the filling valve will be fully open.

filling valve P-control: computed P-factor
The computed P-factor = seconds of actuation per degree of deviation.

filling valve P-control: maximum actuation pulse open
The maximum valve adjustment % per minute. This is done to ensure smooth operation when the boiler temperature is showing a marked rise.

tank filling valve / filling pump: actuations

- **Filling pump**
  Filling pump on (is used in the case of a control system with a filling valve)
- **Open**
  Valve opening (is used with frequency-controlled filling pump)
- **Closed**
  Valve closing (is used with frequency-controlled filling pump)

tank filling pump high speed: actuations

- **High**
  Filling pump running at high speed

tank filling: minimum return temperature boiler
As high as possible a boiler temperature is maintained. If the boiler temperature is higher or lower than the "target temperature tank filling", the computed return temperature is adjusted.

CHP / TE

add next priority: capacity
The next boiler or CHP is switched on, in accordance with the priorities set, when the CHP has reached the percentage of the maximum power set here.

capacity CHP
Use this setting to specify the power of the CHP.

If the CHP power is not immediately available, it can be determined as follows:

Method 1: The number of kcal/h is known.

1 kcal = 4.18 kJ
1 kW = 1 kJ/s
thus 1 kcal/h = 4.18 / 3600 kW
or 1,000,000 kcal/h = 1.161 kW

Method 2: The maximum fuel consumption and efficiency are known.

power = fuel energy content x efficiency

Groningen natural gas, for example, has a maximum energy content of 35.17 MJ/m^3. Boiler efficiency is 90% at most. Maximum consumption is A m^3/h.
Energy consumption = A x 35.17 x 0.90 MJ/h = A x 35.17 x 0.90 MJ / 3600 s = A x 9.77 x 0.90 kW

add next priority: capacity
The next boiler or CHP is switched on, in accordance with the priorities set, when the CHP has reached the percentage of the maximum power set here.

Make this setting lower than 100% for configurations with a tank. This ensures that enough heat can always be produced for filling the tank.
Make this setting 100% or higher for configurations without a tank. This ensures that there is always sufficient cold return water for cooling the CHP.

capacity CO2 supply
Enter the supply capacity here.

CHP/TE on: detection (100=active)
CHP/TE on: gross detection
CHP/TE off: detection (100=active)
CHP/TE off: gross detection
CHP/TE failure: detection (100=active)
CHP/TE failure: gross detection
CHP CO2 on: detection (100=active)
CHP CO2 on: gross detection
CHP CO2 off: detection (100=active)
CHP CO2 off: gross detection
CHP CO2 failure: detection (100=active)
CHP CO2 failure: gross detection
CHP peak: detection (100=active)
CHP peak: gross detection
The detection systems with the relevant gross detections.

CHP CO2: actuation
This setting indicates the CHP actuation system.

- CHP CO2 on

CHP on : maximum starting time
CHP CO2: maximum starting time
CHP CO2: extended time on
CHP CO2: actuation CO2 during extended time on
If the CO_2 demand drops, the CHP on actuation remains in operation during the run after time. This is because it is undesirable for CHPs to be frequently switched on and off. However, the CO_2 demand can fluctuate greatly.

CHP: actuation
This setting indicates the CHP actuation system.

- CHP on

CHP: connected energy manifold
Use this setting to refer to the relevant energy manifold.

CHP: connected CO2 manifold
Use this setting to refer to the CO_2 manifold.

CHP: status
The status of a CHP:

- **Peak period**
  CHP is on in response to the current peak
- **CHP on tank**
  CHP is on in response to filling the tank
- **CHP on heat demand**
  CHP is on in response to the heat demand

counter minimum time CHP off
counter minimum time CHP on
counter time CHP actuation on
counter time CHP CO2 actuation
counter CO2 extended time on
These settings record how long the CHP is **on** or **off**, respectively.

detections: ignore because of failure
Use this setting to specify whether the detector systems have to be ignored because of a fault.

lightning: computed electric capacity
This setting records the required electrical capacity.

minimum time CHP on
minimum time CHP off
These settings are used to specify the minimum and maximum on and off times of the CHP.

status CHP: control
This setting indicates the CHP status.

- Lighting
- End emptying
- CO2 demand
- CHP on peak
- CO2 run after time
- Minimum time off
- Minimum time on
- Heat demand

- Tank filling

status CHP: input
This setting indicates the CHP status.

- Lighting
- End emptying
- CO2 demand
- Heat demand
- Tank filling

status CHP: output
This setting indicates the CHP status.

- CO2 detection on
- Fault CO2
- CO2 not on
- CO2 detector off
- Minimum time off
- CHP on
- Will not start
- Detector fault
- Detector off
- Incorrectly connected

CO2 manifold

CO2 manifold: connected energy manifold
This setting enables you to refer to the energy manifold that has to discharge the heat generated during CO_2 production.
It also indicates the relevant tank to the program.

computed CO2 demand
This setting computes the total CO_2 demand if there is more than one CO_2 fan connected to the CO_2 manifold.

computed CO2 production
This setting computes the total CO_2 produced.

priority CO2: boiler 1
priority CO2: boiler 2
priority CO2: boiler 3
priority CO2: boiler 4
priority CO2: boiler 5
priority CO2: boiler 6
priority CO2: boiler 7
priority CO2: boiler 8
priority CO2: boiler 9
priority CO2: CHP 1
priority CO2: CHP 2
priority CO2: CHP 3
priority CO2: CHP 4
priority CO2: CHP 5
priority CO2: CHP 6
priority CO2: CHP 7
priority CO2: CHP 8
priority CO2: CHP 9
priority CO2: CHP 10
priority CO2: CHP 11

priority CO2: CHP 12
priority CO2: CHP 13
priority CO2: CHP 14
priority CO2: CHP 15
priority CO2: CHP 16
priority CO2: CHP 17
priority CO2: CHP 18
priority CO2: CHP 19
priority CO2: CHP 20
These settings are used to enter the priority of the boilers and CHPs for CO_2 production.
The number of boilers and/or CHPs used depends on the CO_2 demand and/or the space in the tank.
If the detectors are connected and a boiler or CHP has broken down, the boiler or CHP with the next priority will automatically be switched on.

CO2 unit: modulation

CO2 modulation: connected CO2 manifold
Use this setting to refer to the CO_2 manifold to which the CO_2 unit is connected.

extra actuation CO2 unit
This setting provides extra actuation options in addition to the CO2 unit actuation for CO2 in general with climate controls.

- **fan on**: the supply unit is in operation
- **CO2 MUST**: this actuator is active during CO2 MUST

The fan on actuator in the CO2 unit: EM modulation can be used, among other occasions, whenever EM is located on a different control station from the climate control, and connection to the I/O of this control station has precedence. The CO2 MUST actuation is a new feature from version 7 onwards. **supply: status central supply**
This setting indicates the central supply status.

- **Unit OFF**
  The CO_2 fan is operated at full power, and the CO_2 valves are closed.
- **Rapidly higher**
- **Low supply**
- **Higher supply**
- **ALLOWED to supply**
- **MUST supply**

supply: maximum capacity
This setting is intended for limiting the computed CO_2 demand of a CO_2 general group when the fan capacity forms a limiting factor for CO_2 discharge. Usually, however, the fan capacity is chosen generously such that this is not the case. In such cases this setting is usually allowed to have a very high value and will not influence the control system.
Other maximum limits, for example the set maximum capacity in the Tank menu, then form the limiting factor in any increase. It is useful if the above setting does not have to be set to the actual value because this requires quite a lot of queries to the installer. Usually only the capacity in terms of power consumption is known.

In the case of CO_2 valves the above is still applicable. However, the setting is also used to determine the mutual ratio between the CO_2 fan capacity of the various CO_2 general groups. If a very high setting is set instead of the actual value, the same figure must be used for all groups if the fans have the same capacity as each other. If this is not the case, the maximum capacity must be set to such a value that it indicates the mutual ratio between the fans.

Before the computed valve position is assigned to the various groups according to their ratio with the group with the highest demand set to 100%, the desired capacity is corrected for the fan capacity of that group. The maximum CO_2 capacity of the first group on the manifold is taken as the reference.

The group with the highest demand is determined using this corrected CO_2 demand. This group's valve is then reset to 100%. The other valves are adjusted according to the ratio of their corrected CO_2 demand to the corrected CO_2 demand of the group with the valve at 100%.

supply: P-factor
If the tank temperature is too low, a P-action is computed as a function of the P-factor and the temperature deviation.

supply: step-size I-action
The step size of the I-action is a setting in percent, i.e. the setting is almost independent of the system's supply capacity.

supply: minimum interval I-action
supply: counter interval I-action
The minimum interval before an I-action is carried out with the relevant counter.

supply: computed P-action
supply: computed I-action
supply: computed capacity
If the measured tank temperature is too low compared with the computed tank temperature, the computed capacity is increased. This is done with the help of a PI-control system.
Computed P-action + computed I-action results in the desired supply capacity.
The value actually computed can vary because:

- the control system is not allowed to fluctuate too greatly
- the CO_2 measurement is above the minimum CO_2
- the capacity is limited by the minimum or maximum filling capacity

CO2 unit: valve

CO2 valve: actuation factor
CO2 valve: maximum actuation pulse open
CO2 valve: actuation counter
A new actuation timer is computed every 20 seconds:

actuation timer = (computed position - measured position) x actuation factor

The opening rate can be limited to prevent the temperature from rising so fast that the computer's temperature protection comes into action too late. The actuation timer is limited to the maximum actuation pulse open every 20 seconds.

CO2 valve: minimum position
CO2 valve: maximum position
The computed valve position is limited between the minimum and maximum.
The default settings for these are 0 and 100%, respectively.
Their purpose is to force the valve easily into a particular position when testing actuators or in the event of emergencies.

It is not wise to set the maximum position lower to prevent an excessive temperature, should it appear that the temperature protection always comes into action at a 100% position.
The proportional control of the other valves does not take account of this maximum position. What can (though does not have to with a good control system) is to reduce the 100% CO_2 valve position and reduce the 75%, 50% and 25% valve positions proportionally.

If there is a dummy stroke on the 00% side of the valve the error occurring is smaller, should the minimum position be used to compensate for this. Here too, the most precise method is to increase the 0% valve position and the 25%, 50% and 75% valve positions proportionally.

CO2 valve: position at 00 % CO2
CO2 valve: position at 25 % CO2
CO2 valve: position at 50 % CO2
CO2 valve: position at 75 % CO2

CO2 valve: position at 100 % CO2
CO2 valve: computed position % CO2
CO2 valve: computed position
The computed valve positions are shown in 'CO2 valve: computed position % CO2'.
A further correction is then made for a possible non-linear decrease in CO_2 discharge compared with the decreasing valve position.
This is done with the aid of the 0%, 25%, 50%, 75% and 100% valve positions which represent the valve positions for a particular desired CO_2 percentage. Intermediate values are interpolated.

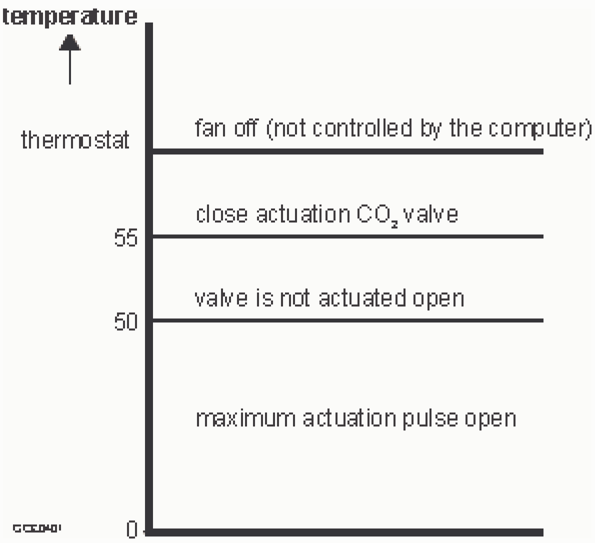
CO2 valve: measurement valve position
CO2 valve: measurement valve position (0-100)
CO2 valve: measurement temperature
CO2 valve: actuations
The valve position and temperature measurement devices together with the CO_2 valve actuator.

CO2 valve: status
This setting indicates the status of the CO_2valve.

- **Temperature protection**
  The computed valve position is limited if necessary. It may then be that the computed valve position is below the minimum. The temperature protection is intended to prevent damage to the CO_2 ducts and therefore has highest priority.

CO2 valve: temperature limit: no opening valve
CO2 valve: temperature limit: closing valve
The system monitors every second whether the temperature is rising too high.
If the temperature rises above 'CO2 valve: temperature limit: no opening valve', the temperature protection comes into action then and the valve is no longer opened.
If the temperature rises above 'CO2 valve: temperature limit: closing valve', the valve is closed.

EXAMPLE:
No longer open the valve at 50℃, close the valve a t 55℃.



Emergency power

emergency power EM start: detection
emergency power EM start: gross detection
emergency power EM release: detection
emergency power EM release: gross detection
The emergency power program ensures that major power consumers are not actuated during a power failure if the generator set is running.

'emergency power EM start: detection' must be activated immediately the mains voltage fails. All actuators are switched off (if this has not already happened because of the power failure), and the controls are set to the right starting conditions for control during emergency power. This detector has to remain active as long as there is no power from the electricity mains.

'emergency power EM release: detection' is the signal that the generator set is running properly.
Actuators are only switched on in phases, if allowed, from 1 minute later. The emergency power program remains active as long as both detectors measure 100.

emergency power EM: meteo influences >100 = warm: ViP
emergency power EM: actual meteo influence (1=warm 2=cold 4=off)
You can choose to leave the boiler running and the pad and fan switched off or vice versa, depending on the weather conditions.
The 'emergency power EM: meteo influences >100 = warm: ViP' setting enables you to specify what is warm and what is cold by means of the outside temperature, radiation and wind ViP influences. A computed value of greater than or equal to 100 means "warm". Warm and cold must be understood as relative terms. In the summer you can adjust the setting such that "warm" refers to very hot weather and "cold" to moderate weather.

As soon as the emergency power program is activated, the instantaneous emergency power influence is entered under 'emergency power EM: actual meteo influence (1=warm 2=cold 4=off)'. This is then not changed again during the ongoing emergency power cycle, even if the weather conditions change.
You can change the setting yourself. Should you find that the 'emergency power EM: meteo influences >100 = warm: ViP' setting was not properly adjusted, you can still switch to the "warm" or "cold" situation by changing the 'emergency power EM: actual meteo influence (1=warm 2=cold 4=off)' setting.

Energy management, Boiler, Boiler - Settings
boiler temperature minimum: ViP
boiler temperature maximum heat demand: ViP
The resulting "warm" or "cold" influence is used as a ViP influence in the boiler control settings, e.g. the maximum boiler temperature.

Control Climate, Cooling, Cooling - Settings
cooling: stages emergency power warm weather
cooling: stages emergency power cold weather

Control climate, Cooling, Cooling humidification - Settings
humidification: stages emergency power warm
humidification: stages emergency power cold

Control climate, Cooling, Cooling dehumidification - Settings
dehumidification: stages emergency power warm
dehumidification: stages emergency power cold

In the case of universal cooling, you can specify for each group whether the stages may be switched on and how many stages may be switched on. It is therefore possible to opt to leave the pad and fan switched off completely, running at half power or running absolutely freely. **emergency power EM: delay time start**
emergency power EM: delay time stop
emergency power EM: counter delay time start
emergency power EM: counter delay time stop
'emergency power EM: delay time start' ensures that the program is not activated unnecessarily in the event of an occasional faulty measurement by the 'Begin emergency power' detector.
'emergency power EM: counter delay time start' is principally a counter for the delay time before starting. As soon as the emergency power program has started, the counter is set to a negative setting and remains so at least until the 'Release' message is given. Afterwards, this counter shows the time that the delay start of the actuations has been active.
If the mains power tends to fail again after coming on for a short time, the emergency power program can be kept active for a time after the mains power returns via 'emergency power EM: delay time stop'. This ensures smooth operation of the actuators. This delay time can also be used to filter out a one-off failure to measure by the emergency power detectors.

emergency power EM?
This setting indicates whether emergency power is enabled.

Control General, Weather station - Alarms
alarm 1: selection alarm signal on

emergency power EM: alarmsignal automatic on after stop
If the emergency power option is selected in the 'alarm 1: selection alarm signal on' setting, the alarm signal will be triggered if the emergency power program is active.
As soon as you notice that the alarm signal is on for an emergency power situation, you can deselect the emergency power option in the 'alarm 1: selection alarm signal on' setting, so that the alarm signal is available for another new alarm.

If 'emergency power EM: alarmsignal automatic on after stop' is set to 'Yes', the emergency power option will be automatically reselected once the mains power has been restored.

Energy manifold

energy demand: maximum increasing
energy demand: maximum decreasing
The energy demand can vary greatly. For this reason the computed energy demand is delayed.
These settings are used to specify the delay. The maximum increase must be set at a sufficiently high level.

EXAMPLE:

energy demand: maximum increasing	100
energy demand: maximum decreasing	50

energy demand: correction
energy demand: correction factor
The computed energy demand can be adjusted to obtain the best possible energy demand in kW.
Such adjustment must be carried out at a time of constant temperature demand.

The computed energy demand can be adjusted to correspond as closely as possible to the actual energy demand in kW. This correction must be carried out at a time where there is a stable burning situation and the instantaneous energy consumption can be calculated.
For example, when the boiler has been burning for some time and the CHP units are off. The energy consumption can then be calculated using the boiler efficiency and the instantaneous gas consumption (which can be read off at the gas meter). The energy content of 1 m^3 natural gas is 35.17 MJ. Let us assume that A m^3/h natural gas is being burned, and the boiler efficiency is 90%.

The energy consumption = A x 35.17 x 0.90 MJ/h. This has to be converted into kW (= kJ/s).
The calculation is then: energy consumption = A x 9.77 x 0.90 kW.

Enter this end result under 'energy demand: correction'. The program then automatically adjusts the 'energy demand: correction factor' setting. The set correction is then reset to 0 as an indication that the program has processed the set value.
If a CHP unit is running, its thermal power in kW also has to be included in the correction. Particular attention is needed in the case of variable-power CHP units. The CHP unit must be at its normal operating temperature.

energy demand: computed without delay
energy demand: computed delayed
The energy demand is computed from the energy demand of the connected heating circuits.

computed temperature heat demand (highest tube)
The computed energy demand.

energy manifold: connected tank
This setting enables you to refer to the tank.

energy manifold: connected transport heat storage
This setting enables you to refer to the heat storage transport.

feed temperature: deviation heat demand
feed temperature; computed delayed
The emptying valve is adjusted to the manifold feed temperature.
The temperature is computed from the heat demand plus the set deviation.
If there is insufficient heat in the tank, a boiler or CHP is switched on.

priority energy: boiler 1
priority energy: boiler 2
priority energy: boiler 3
priority energy: boiler 4
priority energy: boiler 5
priority energy: boiler 6
priority energy: boiler 7
priority energy: boiler 8
priority energy: boiler 9
priority energy: CHP 1
priority energy: CHP 2
priority energy: CHP 3
priority energy: CHP 4
priority energy: CHP 5
priority energy: CHP 6
priority energy: CHP 7
priority energy: CHP 8
priority energy: CHP 9
priority energy: CHP 10
priority energy: CHP 11
priority energy: CHP 12
priority energy: CHP 13
priority energy: CHP 14
priority energy: CHP 15
priority energy: CHP 16
priority energy: CHP 17
priority energy: CHP 18
priority energy: CHP 19
priority energy: CHP 20
These settings are used to enter the priority of the boilers and CHPs for energy production.
The number of boilers and/or CHPs used depends on the energy demand and/or the space in the tank.
If the detectors are connected and a boiler or CHP has broken down, the boiler or CHP with the next priority will automatically be switched on.

The program also responds to energy demand while the tank is being filled. In combination with CO_2 supply, CHPs and/or boilers will be started as a function of the highest requirement: CO_2 or energy demand. In combination with filling for tank layers with a CHP, more CHPs may be enabled for filling the tank than for meeting the energy requirement.

As many energy producers are enabled in accordance with the computed priorities as required to meet the computed energy demand. The power of each boiler and each CHP must therefore be specified.

The system does not wait until the energy demand is equal to the produced power before the next priority is enabled; this is done sooner. If the highest priority running is a CHP, a next priority is switched on when the energy demanded from the CHP represents a user-defined percentage of its total power (default 70%).

Special case: CHPs without a tank.
Since the CHPs cannot modulate, a CHP may only be enabled if the energy demand is higher than production by the CHP. If not, the CHP is shut down because it will become too hot. In order to be able to meet the appropriate energy demand, therefore, the main boiler is always enabled in the case of a CHP without a tank. Furthermore, the power for switching on the next priority must be set to greater than 100%.

This is allowed to enable the same priority to be allocated to several energy producers. However, this is not recommended in ordinary installations.

The energy control system takes into account a CHP which produces energy outside the energy control system (because of minimum time CHP on, because of a peak, because of lighting, via switching on by the

utility company etc.).
If, for example, one CHP is sufficient to meet the energy demand and CHP priority 3 is running, CHP priority 1 will not be enabled for energy demand.

feed temperature energy manifold: measurement
return temperature energy manifold: measurement
The feed and return temperatures of the manifold.

Heat discharge

cooling water temperature: measurement
Cooling water temperature measurement system for controlling heat discharge or the switching valve.

status heat discharge
This setting indicates the status of the heat discharge program.

cooling: deviation average tank temperature on
cooling: deviation average tank temperature off
The heat discharge program can be operated based on your choice from the following options:

1. Cooling water temperature
2. A selected tank sensor
3. The difference between the measured average tank temperature and the computed tank temperature according to tank schedule CO_2 or CHP

This selection is made using the "switching valve: selection sensor" setting.
If you select the third option, the deviation in the "deviation average tank temperature on" and "deviation average tank temperature off" settings can be set in ℃ between the measured average tank temperature and the computed tank temperature where the heat discharge program is started or stopped.

heat discharge: connected energy manifold
Use this setting to refer to the energy manifold.

heat discharge: select temperature sensor
switching valve: measurement selected sensor
If the tank is full, heat can be discharged.

switching valve: select temperature sensor
Use this setting to specify from which sensor onwards heat discharge is to begin.

heat discharge only if CHP on
This setting enables you to specify that the switching valve may only open if the CHP is also on.

switching valve: continue till previous tank sensor
You can opt to keep the switching valve continuously open until the next sensor is reached.

switching valve: threshold water temperature cooling

Switching valve: temperature range
This is used to switch over from the condensor to the tank with the aid of the switching valve on the tank sensor.

If the return water from the house has a very high temperature, there is the risk of the TE failing because it cannot discharge its heat. The switching valve allows colder water, for example from the tank, to be added to the return water so that this is prevented.
The cooling water temperature threshold indicates from what cooling water temperature water is added. The switching valve is adjusted in accordance with a cooling water temperature P-control system. If the cooling water temperature is higher than the threshold by this range, the switching valve will be fully open.

switching valve: running time valve
The valve's exact running time has to be specified here.

switching valve: computed P-factor
The computed P-factor = seconds of actuation per degree of deviation. This setting is entered by the computer.

switching valve: actuation timer
This setting indicates how long the valve is opened (positive) or closed (negative).

switching valve: maximum actuation pulse open
The maximum valve displacement % every 20 seconds. This is done to ensure smooth operation even when the cooling water temperature is showing a marked rise.

switching valve: opened
The position of the switching valve.

switching valve: actuation

- **Open**
  Switching valve open
- **Closed**
  Switching valve closed

Service

EM: sample graph?
EM setting: number data-block
EM setting: function block
EM setting: number section
EM setting: type number (1-8)
EM setting: number setting
service: value EM graph sample
These settings can be used by a Hoogendoorn service technician to set extra graph curves and thus to follow controls.

Tank: general

actuation 1: phase active
actuation 2: phase active
These settings are enabled when the selected phase is enabled.
These actuations can be used in order, for example, to empty the tank even further if this reaches the **Tank emptying block** phase.
This phase must then be selected.

Several phases can be chosen at the same time:

Off	Active if the tank control is off
Boiler filling	Active if the tank is being filled by the boiler
Filling block	Active if filling is blocked because the boiler temperature is too low
Emptying	Active if the tank is being emptied
Emptying block	Active if emptying of the tank is blocked because of a higher manifold return temperature compared with the tank feed

automatic adjusting tank schedule CO2
Use this setting to ensure that the start temperature of (peak period) "average tank temperature CO2: ViP" is automatically adjusted to the actually measured average temperature + 5℃. This will mean that the CO_2 supply will always start at the beginning of the period, and adjustment is no longer necessary.
During the night the computed CO_2 tank temperature goes to 30℃, as a result of whic h the tank can be completely emptied.

If the transition from the day period to the night period is set astronomically, this time is also

automatically adjusted. In this way the tank schedule remains on course during the season and during the evening you always arrive at the final value at the right time.
If the transition is set according to the clock, it is not automatically adjusted.

average tank temperature CO2: ViP
peak period: average tank temperature CO2: ViP
This is used to specify the schedule for filling the tank during CO2 MUST (during and outside a peak period). If the tank temperature is too low, the computed burner position will be increased. This is done by means of the **minimum and maximum capacity** settings for the burner. As a result, more CO_2 is produced. The heat released is stored in the tank. It is possible in this way to fill the tank completely every day so that the maximum amount of CO_2 is produced.
The whole tank is used and will gradually be filled over the whole day.

tank layers CO2: ViP
peak period: tank layers CO2: ViP
In this setting you can specify UP TO which tank layer the system may fill for tank layers (during and outside a peak period).

CO2: minimum capacity: ViP
CO2: maximum capacity: ViP
This is used to specify the amount of gas per hour for filling the tank in accordance with the tank schedule. These are the limits of the burner position during CO_2 control. If the tank temperature is sufficiently low, the burner position will be increased from the minimum capacity.

emptying: minimum time emptying block
emptying: counter time emptying block
To ensure smooth operation, a minimum time for this phase can be set here.

emptying: position emptying valve emptying block
During the emptying phase the emptying valve may not be adjusted back to 0% before switching to Emptying block.
In many systems this creates too great a vacuum. The Emptying block phase begins as soon as the emptying valve has been closed to the % value set here.
The most commonly used value is 10%.

feed temperature tank: measurement (I/O)
tank temperature 1: measurement (I/O)
tank temperature 2: measurement (I/O)
tank temperature 3: measurement (I/O)
tank temperature 4: measurement (I/O)
tank temperature 5: measurement (I/O)
tank temperature 6: measurement (I/O)
tank temperature 7: measurement (I/O)
tank temperature 8: measurement (I/O)
tank temperature 9: measurement (I/O)
The feed temperature and tank temperature measurement devices.

peak period: type of control
Options:

Average temp CHP
Average temp CO2
Tank layers boiler
Tank layers CHP
Tank layers CO2

period emptying allowed (>= 100: emptying allowed): ViP
The emptying phase is only allowed if this setting is >= 100. If this is not the case, the system opts to block emptying rather than allow the emptying phase.
Under normal circumstances the default value for this interval is always 100. The setting is intended for emergencies such as a temporary solution until the cause of unwanted emptying can be tackled. Another possible application is in situations where part of the tank control, e.g. filling with CHPs, takes place independently of the Hoogendoorn computer. The uni-influence can be used to take an external signal into

account.
If the system is not allowed to empty, the tank has only limited usefulness in preventing unwanted peaks in gas consumption. It is therefore always wise to trace and tackle the cause of unwanted emptying or switching on and off. Possible causes: minimum time CHP off set too short, poorly adjusted PI with a boiler tank store, incorrect measurement of the manifold return temperature.

phase off: filling pump
phase off: filling valve
phase off: emptying valve
phase off: boiler closing valve
phase off: tank closing valve
phase tank filling block: filling pump
phase tank filling block: filling valve
phase tank filling: emptying valve
phase tank filling: boiler closing valve
phase tank filling: tank closing valve
phase tank emptying: filling pump
phase tank emptying: filling valve
phase tank emptying block: emptying valve
phase tank emptying: boiler closing valve
phase tank emptying: tank closing valve
These settings are used to specify the position of the valves and pump for each phase. Use the drawings and associated phase definitions provided by Hoogendoorn for this purpose.
Because phase definitions can be set, the control system can be adapted to the local situation.

status tank boiler
status tank CHP
These settings indicate the tank status for the boiler and CHP.

tank control on
This setting is used to switch the tank control system on or off.

tank filling: selection tank temperature sensors
tank emptying: selection tank temperature sensors
Select the temperature sensors which are located in the tank.
The average tank temperature is determined using the selected sensors.

tank filled: CHP off
Use this setting to specify that the CHP must be switched off when the tank is full.

tank filling block: deviation temperature
tank filling: minimum time
tank filling: delay time switch over emptying
Minimum time for filling the tank if the boiler temperature exceeds the filling temperature.
To prevent frequent switching on and off, the system will also wait before switching to "Emptying"; for example if the CO_2 demand falls.
If the boiler temperature falls below the filling temperature multiplied by the temperature deviation (set as a negative value normally), filling will be blocked.

type of control
Options:

Average temp CHP
Average temp CO2
Tank layers boiler
Tank layers CHP
Tank layers CO2

Tank: valves

average tank temperature store CHP: ViP
peak period: average tank temperature store CHP: ViP

This is used to specify the schedule for filling of the tank by the CHP.
If the tank temperature is too low, the computed burner position will be increased. This is done by means of the **Minimum and maximum capacity** settings for the burner.

tank layers store CHP: ViP
tank layers store boiler: ViP
peak period: tank layers store CHP: ViP
peak period: tank layers store boiler: ViP
The tank is filled by the CHP or boiler in accordance with a tank schedule. This tank schedule operates on the basis of the average tank temperature.
In addition, there is a tank schedule with which it is possible to set how many tank layers have to remain filled to maintain a store.

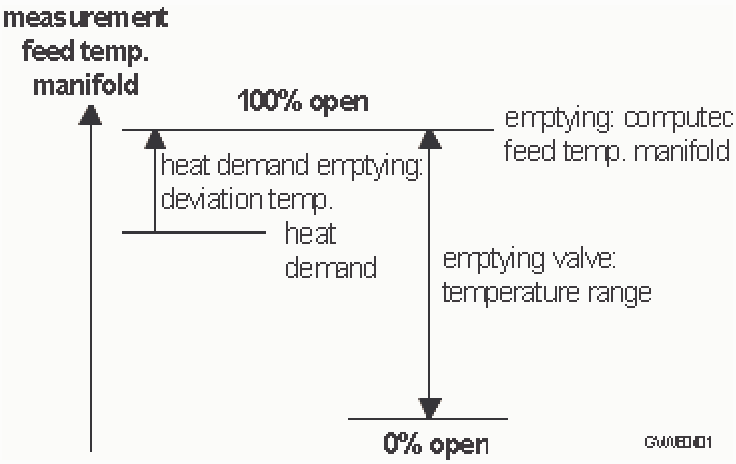
The CHP will be started up, if allowed by the tank schedule, based on the average tank temperature OR, if allowed by the tank schedule, based on tank layers.

In the "Tank layers store" setting you can set UP TO which tank layer the system may fill for a tank store. The system waits with filling until the CHP can fill a complete tank layer. If the tank layer store is set, for example, to 3, the CHP is only started if sensor 2 is cold. Filling proceeds continuously until sensor 3 is hot and always at least for the "Minimum time CHP on".

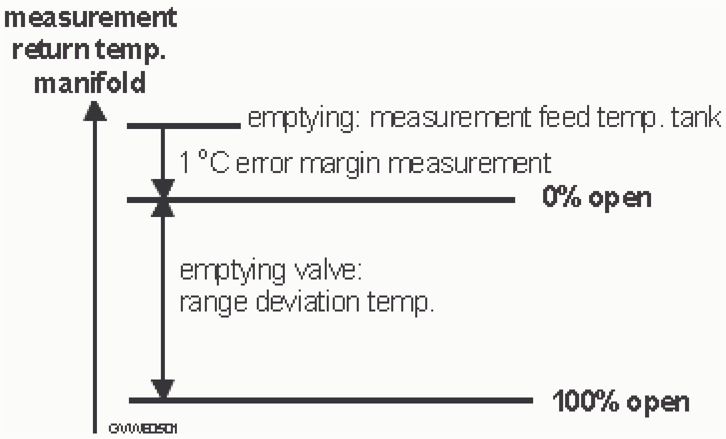
If there is a small filling overcapacity, the boiler can maintain a chosen tank sensor at the desired temperature thanks to the modulating burner position. Filling and emptying then remain in equilibrium.

CHP on: energy demand release tank closing valve
When the CHP filling phase of the tank control is active, this is always in combination with a boiler tank control phase.
The valves operate in accordance with the tank filling and emptying control system for the boiler phases.
There is one exception: the tank closing valve is always opened if the energy demand is lower than set here.

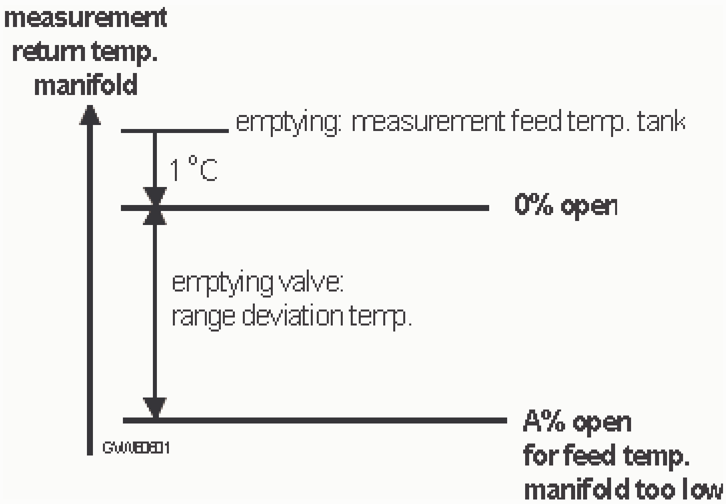
emptying valve: range feed temperature manifold
The emptying valve is actuated in accordance with a feed temperature P-control.
If the measured manifold feed temperature is lower than the computed manifold feed temperature by the range, the emptying valve will be fully closed (i.e. set fully to boiler water).



emptying valve: range deviation temperature
This setting is used to add boiler water from an early stage.
If the manifold return temperature is lower than the tank feed temperature by less than the set range, the emptying valve will already be closed via a P-control (more boiler water).



In practice, the emptying valve will often have to be reversed both because of too low a feed temperature and because the return temperature comes within the temperature deviation range. The ultimate computed emptying valve position is obtained as follows: firstly compute position A and then distribute the valve proportionally between position A and the 0% position over the temperature deviation range.



emptying valve: running time valve
The valve's exact running time has to be specified here.

emptying valve: computed P-factor
The computed P-factor = seconds of actuation per degree of deviation.

emptying valve: actuation counter
The computer indicates how long the valve is opened (positive) or closed (negative).

emptying valve: maximum pulse close
The maximum % valve displacement per minute. This is to prevent the boiler temperature from falling too quickly.

emptying valve: opened
The computed emptying valve %.

end emptying: actuation pulse boiler valve
end emptying: actuations to activate
end emptying: time maintain actuations
end emptying: counter maintain actuations
In the End emptying phase the boiler closing valve is closed with an actuation pulse. Extra actuation systems can also be operated during a user-defined period.

peak period: months

peak period: days
These settings are used to select the months and days when a peak period is active.

EXAMPLE:

The peak period is active in the months of November to March, on weekdays from Monday to Friday.

These choices must then be selected.

tank emptying valve: actuations

- **Open**: valve is opening
- **Closed**: valve is closing

tank closing valve: actuation

- **Open**: valve is opening
- **Closed**: valve is closing

tank phase 1 / 2: actuations

- **actuation 2 phase**: actuation 2 active
- **actuation 1 phase**: actuation 1 active

tank store boiler: minimum capacity: ViP
tank store boiler: maximum capacity: ViP
This is used to limit the amount of gas per hour for filling the tank in accordance with the tank store.

tank store boiler: P-factor
If the tank temperature is too low, a P-action in m^3/h is computed in accordance with the set P-factor and the tank temperature deviation.
The P-factor is set in % per ℃ and not in m^3 per hour so that the setting is less dependent on the installation.

tank store boiler: step size I-action
tank store boiler: interval time burner adaptation
tank store boiler: interval counter adaptation
The I-action step size can be set in % so that the value to be set is less dependent on the installation's supply capacity.
The step size and interval can also often then be left set to the default. Always use long intervals. The burner position is then more stable.

tank store boiler: computed P-action
tank store boiler: computed I-action
tank store boiler: computed capacity
If the measured tank temperature when filling is too low by comparison with the computed tank temperature, the burner's computed capacity will be increased. This is done with the help of a PI-control system.
The computed P-action + computed I-action + pre-control together form the desired supply capacity to which the system is adjusted.
The pre-control is computed on the basis of the energy demand.

Transport

energy demand: maximum decrease
transport: computed energy demand
The energy demand can vary greatly. For this reason the computed energy demand is updated with a delay.
The above setting can be used to specify the delays for the decrease.

temperature: deviation highest pipe: ViP
The transport pipe is adjusted to the highest water temperature demanded by the connected heating circuit, plus this setting (buffer).

EXAMPLE:
Increase the buffer, the higher the energy demand.

temperature: deviation highest pipe: ViP - °C

		Start time	Relative t	Change	Value	Energy demand	
						900	1000
1	Y	00:00	Sunrise	00:30	5	5	
2	N						

The energy demand influence here is that of the circuits at the rear (i.e. not the total energy demand).

transport pipe: minimum
transport pipe: maximum
The transport pipe temperature thresholds.

transport pump high speed: pipe temperature deviation
The transport pump is actuated if one of the groups demands heat.
The pump is switched to high-speed mode if the deviation between the feed and return temperatures is greater than this setting for approx. 15 minutes.

transport pipe feed: measurement
transport pipe return: measurement
A return temperature is needed to control the pump's high-/low- speed mode.

transport pump low/high speed: dead zone
transport pump low/high speed: delay time
The dead zone is the change in the deviation between the feed and return temperatures, within which the control system does not act.
The delay time is the time that the deviation in the feed and return temperatures must be present before the system switches over.

transport speed control: actuation factor
transport speed control: actuation timer
The actuation factor is used to specify the actuation time per ℃ for the frequency controller.

The actuation timer shows the actuation time (positive = higher; negative = lower).

transport pump: anti rust
This setting is used to specify whether the transport pump has to be actuated for the anti-rust progam which prevents seizure.
If the transport pump has not run in the preceding 24 hours, it is actuated in the morning for 2 minutes.

transport speed control: actuations

- **Lower speed**
  Speed control: speed-decrease actuator active
- **Higher speed**
  Speed control: speed-increase actuator active

transport: actuation factor
The actuation factor determines the actuation time where there is a deviation from the water temperature for the mixing valve actuation. The actuation factor depends on the valve's running time.

The actuation factors for the various valves are:

- 8-minute valve: 2.5 - 4
- 4-minute valve: 1.5 - 2.5
- 2-minute valve: 0.5 - 1.5

The smaller the actuation factor, the shorter the actuation time and the smoother the control.

transport: actuation timer
The actuation timer indicates the number of seconds that the valve will still remain open or closed (from the moment that the command is given) (**-** = close).

transport: actuations

- **Pump high off**
  Pump high-speed mode switching off
- **Pump low off**
  Pump low-speed mode switching off
- **Valve closed**
  Close actuation active
- **Valve open**
  Open actuation active

transport: connected energy manifold
transport: connected transport
Use this setting to connect the transport to the relevant energy manifold and possibly to a subsequent transport system.

transport: heat discharge actuation pulse protection
The actuation pulse when the protection is enabled.

transport: influence heat discharge
This setting is used to specify whether the transport pipe also has to discharge the heat from the TE system.

- **Yes**
  Discharge: i.e. mixing valve is opened further if protection is actuated.
- **No**
  Do not discharge: i.e. mixing valve does not respond to the TE.
  You should also opt for No in the case of heat discharge because of a full tank.

transport: status

- **Heat demand**
  There is a heat demand.
- **Heat discharge**
  Heat has to be discharged.
- **TE protection on**
  TE protection is active.
- **Transport pump**
  A different transport pump is possibly on.
- **Pump anti-rust**
  Pump is running in connection with anti-rust program.
- **Pump high**
  Pump must run at high speed.
- **Pump control**
  Pump is on in connection with control.
- **Boiler protection: not open**
  Boiler protection: valve not open
- **Boiler protection: closed**
  Boiler protection: valve closed

6. Service manual

General

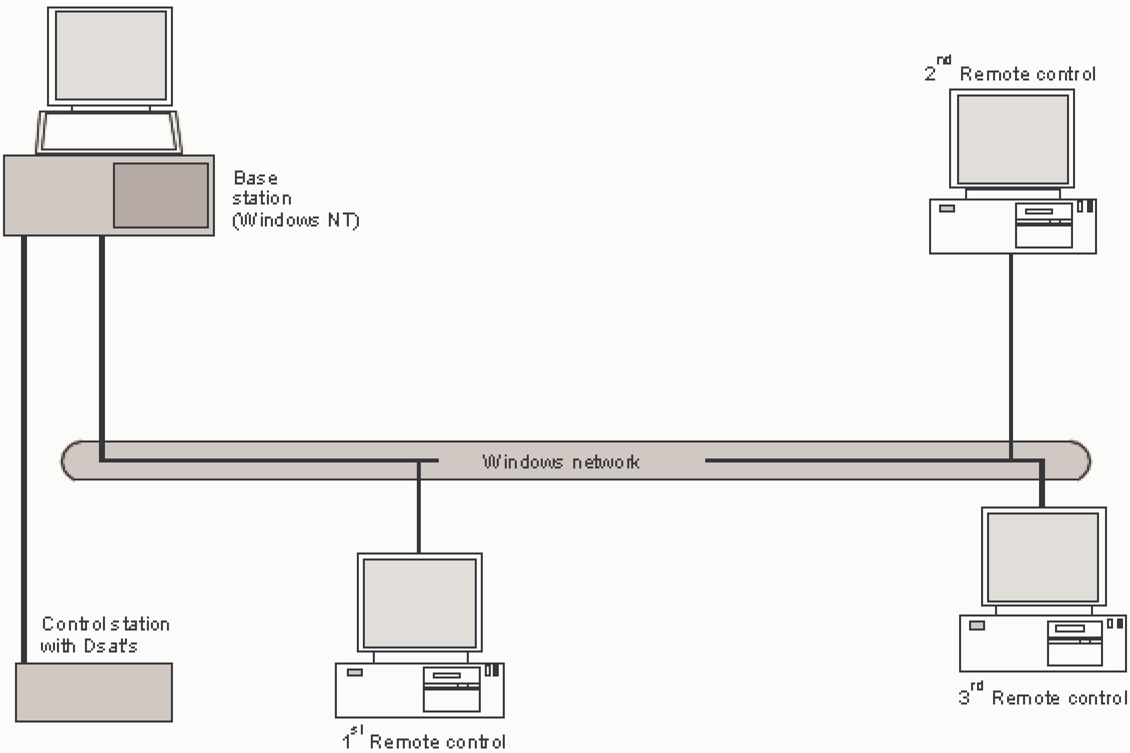
This section contains a general description of:
- Networks
- Virus protection
- Modem initialisation string

ECONOMIC NT network

Please refer also to the *ECONOMIC* NT Service Manual.

---

1. Network properties



Notes:

- The maximum length of the network cable is 185 metres. This distance can be increased to 925 metres by means of repeaters.
- The network can incorporate a maximum of 10 PCs.
- There is a network card installed in the base station and in each remote control PC.

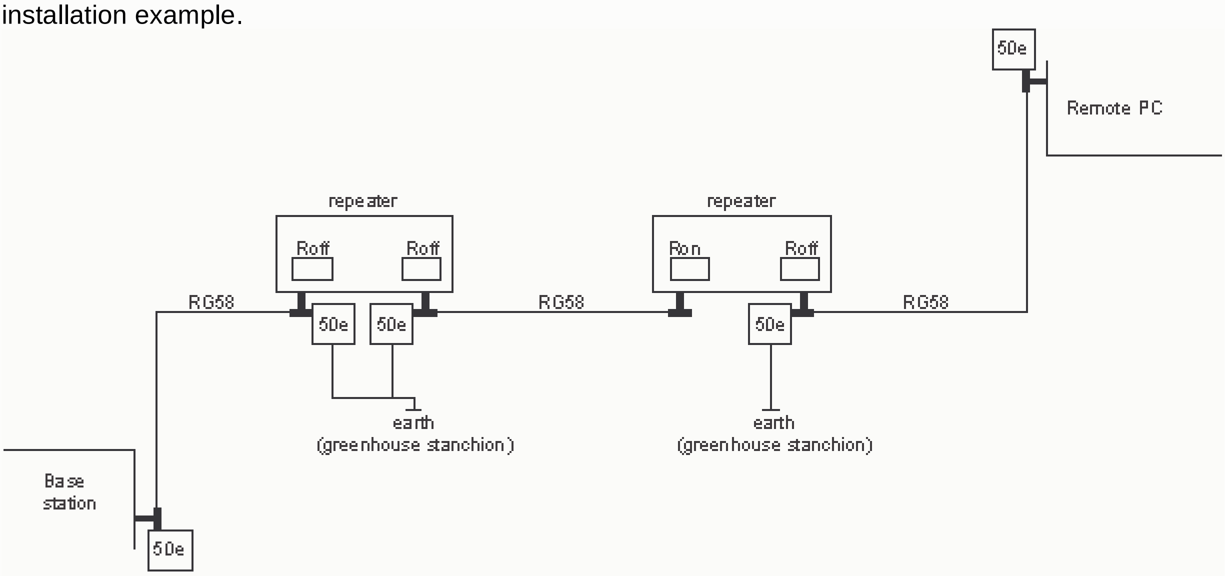
ECONOMIC NT network properties:

- PCs running the Windows95, Windows NT Workstation or Portos operating systems can be connected to a network.
- Principle: Peer-to-peer and not server-based.
- Thin coax cable of type RG58 C/U 50 ohms (no UTP, twisted pair cable)
- Network cable cannot be installed in star design.
- Maximum distance is 925 metres with 4 repeaters installed.
- Network protocol TCP/IP; this is the same protocol as used on the Internet.

2. Connecting repeaters

A repeater amplifies the network signal, enabling the length of the network to be increased. 185 metres coax possible per repeater. A maximum of 4 repeaters are possible in one network.

The position of the terminating resistors and earth is explained in more detail with reference to a network installation example.



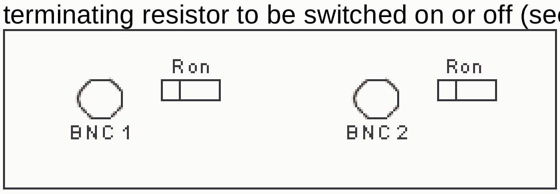
Example of network with repeaters

2.1 Terminating resistor

Each segment in a network must have a terminating resistor at each end. "Segment" here refers to the cable between two repeaters or between a repeater and a network card (base station or remote PC). The maximum length of a segment is 185 m.

The terminating resistors in the network can come in two types: resistor in the repeater or resistor in the terminating connector.

Setting the terminating resistor on the repeater:
There are 2 coax connectors (BNC) on top of the repeater. The Ron microswitch enables the 50 ohm terminating resistor to be switched on or off (see drawing).



View of repeater from above

If the terminating resistor in the terminating connector (50e) is used, the terminating resistor in the repeater does not have to be used (Roff position). Please refer to the drawing above showing the network installation example for further information.

2.2 Earth

The system is earthed via a special terminating connector (T-piece) with a length of earthing cable attached to it. There is also a terminating resistor (50e) in the terminating connector.
The connector is connected by means of a T-piece to BNC 1 or BNC 2 on the repeater. Attach the earthing cable to a greenhouse stanchion and not to the earth connection.

The RG58 coax cable must be earthed at one point per segment.
Please refer to the drawing above showing the network installation example for further information.

Checking for viruses

A virus is a program that influences the functioning of PCs in an undesirable manner. Depending on the type of virus, this can have far-reaching consequences.

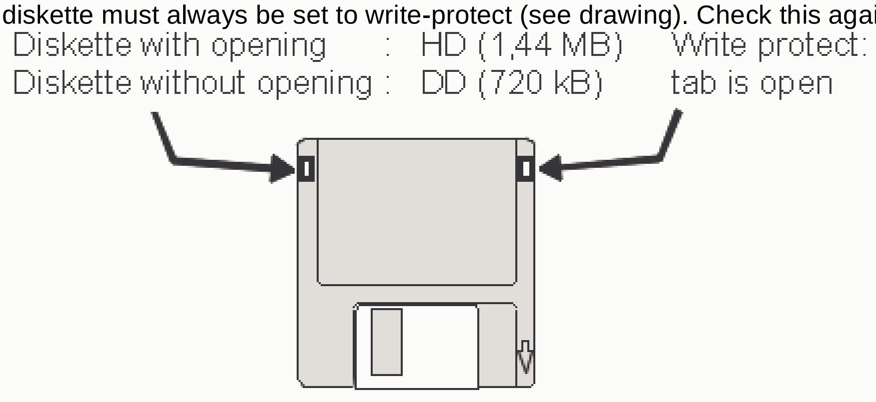
A virus is installed on a PC without the user being aware of it. This happens via a diskette or via a modem connection with, for example, the Internet.

A PC can be checked for viruses with the aid of a virus detection program.

- The *ECONOMIC* NT base station has McAfee's virus detection program installed. This checks continuously for viruses. If a virus has unintentionally been installed on the base station, the user's attention is immediately and clearly drawn to it.
- If the detection program is not installed on a PC, the 'VP detection' service diskette can be used. This is a diskette with auto-start.

Using the VP detection diskette:

- The VP detection diskette must always be set to write-protect (see drawing). Check this again before using the diskette.



3½" diskette

- Close the program (go to Start, Exit).
- Switch the PC off (de-energise).
- Place the VP diskette in the disk drive.
- Switch the PC on. The PC is now booted from the VP detection diskette. The virus check is then run automatically. Re-booting the PC by means of Ctrl + Alt + Del is not adequate for a virus check!
- Watch the virus check carefully.

A virus has been found, what happens next:

- Contact Hoogendoorn Service. The action to be taken will be discussed jointly.
- Try to remove the virus using the VP clean program.
- Try to trace the source.
- Dispose of any diskettes suspected of being infected with the virus.

Resolving the problem yourself is normally the preferred option. When it comes to viruses, however, there are other aspects which make it desirable to discuss this with Hoogendoorn Service. These include:

- Has the user had problems with similar viruses on other PCs at this time?
- The action to be taken is often radical.
- The action to be taken depends on various circumstances and cannot therefore be summarised in a procedure.

Modem initialisation strings

1. Initialisation strings

The table below shows initialisation strings for modems supplied or used with the ECONOMIC.

Modems	**Baud rate (between PC and modem)**	**Initialisation string**	**Add for ISDN** (see explanation below)	**Chip set** (for information only)
Wisecom ISA 33K6	57600	ATX3+MS=11,1,300,33600	(N/A)	Rockwell/Conexant
Wisecom ISA 56K	115200	ATX3+MS=11,1,300,33600	(N/A)	Rockwell/Conexant
Wisecom PCI 56K	115200	ATX3+MS=11,1,300,33600	(N/A)	Rockwell/Conexant
Quatron 14K4 to 56K external	115200	ATZX3	+MS=11,1,300,33600	Rockwell/Conexant??
Wisecom 56K external (flat model)	115200	AT&FX3"H0%C0	(N/A)	Cirrus Logic
Wisecom 56K external (upright model)	115200	ATZX3	(N/A)	Rockwell/Conexant
US Robotics 56K external	115200	ATZX3	(N/A)	Rockwell/Conexant
E-Tech 56K external	115200	ATZX3S0=0	(N/A)	Rockwell/Conexant

Brief explanation of initialisation strings:

ATZ	Attends to retrieving settings from memory
ATX3	Attends to not waiting for dial tone
ATS0=0	Ensures that modem does not automatically go into auto answer mode
AT+MS=x	Attends to the modulation selection (minimum and maximum line speed). This setting is not normally used, but in combination with some ISDN modems it may be necessary to limit the initial line speed.

2. Method of adjustment

To adjust the modem's initialisation string follow the steps below.

Action	Done
Saving (image or tape)	
Start the **Installation of components** from the ECE CD and select **Standard ISA modem**	
Click on the **Properties** button in the **Properties for modems** window	
Enter the **Maximum speed** according to the values from the table above	
Click on the **Connection** tab	
Click on the **Advanced** button	
Complete the **Extra settings** field (this is the init string) according to the table above	
Click on **OK**	
Click on **OK**	
Click on **Close**	
Now ignore the rest of the instructions in the DOS box, since it is not a normal modem that is being installed. Instead press **Enter** three times	
The PC will be restarted	
Check that the modem works	

Creating an image

A disk image can be created as follows:

1. Boot the PC using an appropriate diskette.
2. Start Power Quest Disk Image and choose Create Image.

It is recommended for the above that the boot diskette which can be created using the **Drive Image** package should be used.

Close

Installation

This section contains a number of checklists and phased plans for:

- Phased installation plans
- Control station maintenance
- Control station replacement
- Replacement of HP tapestreamer by ORB drive

Step-by-step installation plans

Select the action for which you require more information:

1. Base station and control station
    - Installation as new

Base station and control station

Hardware
A base station can only be installed on hardware supplied by Hoogendoorn.

Partitioning of hard disk
The hard disk of a base station is always partitioned into two.
The first partition, the C disk, is provided with NTFS, the second with FAT.
The *ECONOMIC* software is on the C disk. The second partition can be used for temporary data storage.
Whenever an image is created, this is always stored in the second partition.

In the case of updates settings in the user folders are adjusted to the new version; however, no settings are added to existing user definitions.

Installation as new

This Help page describes the steps which have to be followed in order to install an *ECONOMIC* NT.

Requirements

- The ECE CD of the required version
- A configuration diskette with user data

This action is never carried out "in the field". All systems supplied come correctly partitioned and with pre-installed software.

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Action	Completed
Partitioning	
Formatting	

Installation of Spare Image	
Installation of ECE CD	
Installation of modules	
Set correct IP address (only on ERS-2)	
Load control station as new	
Update map (from version 4.1 onwards)	
Control station setup	
MeteoScope setup	
Econaut setup	

Partitioning hard disk

A hard disk is partitioned as follows:

1. Boot the PC using an MS-DOS diskette.
2. Start Fdisk.exe.

The following diskette can be used for the above: **Windows NT installation diskette** version 2.2.8 or higher

Formatting hard disk

A hard disk is formatted as follows:

1. Boot the PC using an MS-DOS diskette.
2. Start Format via the DOS prompt.

The following diskette can be used for the above: **Windows NT installation diskette** version 2.2.8 or higher

Installation of ECE CD

Software can be installed from the ECE CD as follows:

1. Run SETUP.EXE on the CD via Windows Explorer or choose "Settings, Configuration screen, Software" from the "Start" menu and then press "Install".
2. Choose "Base station" in the installation program. The correct version is selected via the configuration diskette.

Installation of modules

Various modules can be installed on the base station via the SETUP on the ECE CD. The following modules can currently be installed:

1. Network card
2. Modem
3. Service packs

Inputting IP address

Devices (computers) in a network must all have a unique address. They can communicate with each other via this address.
IP addresses are used as the address system. These consist of a number divided into four parts.

ECONOMIC computers have an IP address in the following range: 172.18.0.0 to 172.18.255.255.
An ERS-2 can have
1. a standard IP address
2. a configuration-specific IP address

Standard IP address
ERS-2 stations are supplied when new with a standard IP address.

Configuration-specific IP address
A normally functioning ERS-2 control station has an IP address that is derived from the configuration number. The base station knows this number and can therefore contact the ERS-2 station.

A standard IP address can be converted to a configuration-specific address via Start, Programs, ECONOMIC, Control stations, **Control station IP address**.
This option is only available for **"Serv"** and **"Deal"** users.

Control station maintenance

There are various installation and updating procedures for an ERS-1/ERS-2a and ERS-2 control station:

ERS-1 and ERS-2a:

- Log on under "Serv" or "Deal" account.
- Go to "Service level".
- Close the background system.
- Start **Control system maintenance** in the **Extra** menu of the *ECONOMIC* Explorer.

ERS-2:

- Log on under "Serv" or "Deal" account.
- Choose **Control station maintenance** via Start, Programs, ECONOMIC, Service, Control stations

Update map

A special option has been added to Start, ECONOMIC from version 4.1 onwards: **Update map**. This option can be found under Start, Programs, ECONOMIC, Service
Accessing this option will update the map to the new configuration: old groups are removed, new ones are added.

This option is only available for **"Serv"** and **"Deal"** users.

Update base station

When the base station is updated, the existing installation is replaced by a newer version. The steps below must be followed.

In certain cases steps other than those outlined below are required; check in the above page to see whether this is applicable.

Requirements

- The ECE CD of the required version
- A configuration diskette with user data

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Action	Completed
Backup (image or tape)	
Installation of ECE CD	
Update control station	
Update map (from version 4.1 onwards)	
Maintain data acquisition files	
Check list of I/O connections (ERS-2)	
Create image of drive C:	

Generate list of I/O connections

Choose **Control station maintenance** via Start, Programs, ECONOMIC, Control stations

Then choose **"Generate list of I/O connections"**

This option is only available for **"Serv"** and **"Deal"** users.

Close

Update of version 3 (or lower) to version 4 (or higher)

In an update the existing software is replaced by a newer version.

Special action is required if the current version is version 3 or lower and the new version is version 4 or higher.

The steps below must be followed.

Requirements

- The ECE CD of the required version
- A configuration diskette with user data

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Preparations

Action	Completed
Print Econaut reports to check after update	
Note the following settings for each Econaut group: *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	
Note MeteoScope data: user name, password, telephone number (0 for outside line?)	
Dump datablocks	
Backup (image or tape)	

Conversion

Installation of ECE CD	
Update control station	
(Re)Start background (if necessary)	
Update map	
Maintain data acquisition files	
Check list of I/O connections	
Synchronise alarms	
Convert Econaut greenhouse properties	

Check and set

Check settings and reports	
MeteoScope subscription: enter user name and password	
MeteoScope subscription: upload immediately	
Econaut: check greenhouse properties	
Econaut: set *Switch off Econaut* to No	
Econaut: enter *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	
Create image of drive C:	

Installation of service packs and drivers

1. Check versions
2. Installation / update procedure in steps
3. Network installation
4. Modem installation

For the installation of Windows NT Service Pack 4 and supplementary drivers, version 2.5.x or higher of the *ECONOMIC* NT software must be installed on the base station.
An ECE CD version 2.5.x or higher is required.

Log on as **Serv** or as **Deal**.

First check whether the modules below are already installed.

1. Check versions

Windows NT Service Pack 4

You can check whether Windows Service Pack 4 and drivers are already installed as follows:
The blue screen which appears when booting the *ECONOMIC* base station shows which Service Pack is installed.

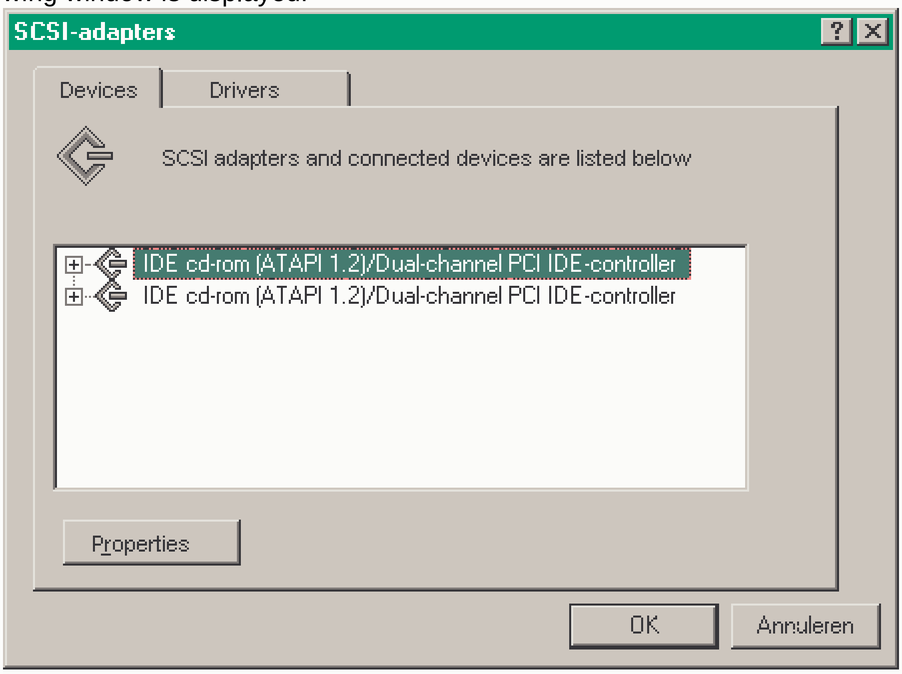
Internet Explorer version 4 Service Pack 1

- Start Internet Explorer from the desktop.
- Click **Next**.
- Select the third option "I already have a ..." with the mouse.
- Click **Next**.
- Click **Finish**.
- Cancel the error message by clicking **OK**.
- Choose the Help tab in the Internet Explorer window.
- Choose **Info**

. The window that now appears shows the versions of Internet Explorer and Service Pack.

IDE driver

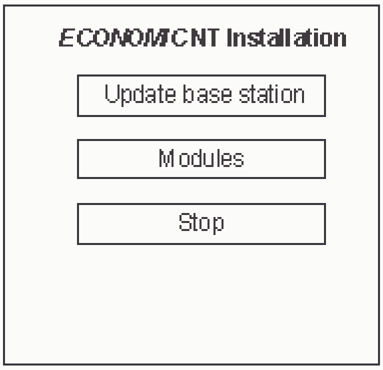
- Go to the Windows configuration screen.
- Choose SCSI adapters.
- The following window is displayed:



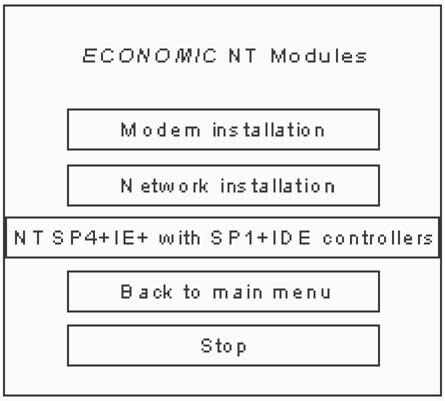
- If the same devices appear in the SCSI adapters window as in the above window, the IDE drivers are installed.

2. Installation / update procedure in steps

These modules are installed via Setup.exe in the root of the ECE CD. The following window appears after Setup.exe is run; choose **Modules**.



After you have chosen Modules, the following window appears:

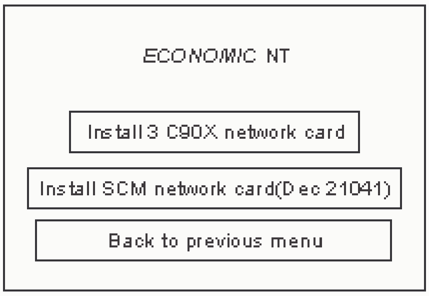


There are a number of steps for each module. You should, therefore, follow the instructions on the screen. The base station will be restarted a number of times during installation of the modules.

3. Network installation

An *ECONOMIC* base station which forms part of a network is fitted with a network card and the appropriate drivers. Installing the network drivers on the *ECONOMIC* base station is explained. The ECE-CD with the latest program version is required to install or update the network drivers. Version 2.5.x as a minimum must already be installed on the base station. The network card must be installed before the drivers can be installed.

Go to ***ECONOMIC* NT Modules** and choose **Network installation**.
The following window is displayed:



Choose the correct network card and follow the further instructions on the screen.

4. Modem installation

One type of modem can be installed via the Modules installation:
Rockwell HCF 56K Data Fax PCI modem

Version ECE 2.5.x as a minimum must already be installed on the base station.
The modem card must be installed before the modem drivers can be installed.

Remote control

PC requirements

To install an *ECONOMIC* remote control or Demo on a PC, the PC should satisfy the next minimal specification (see also the README.TXT file on the ECE CD) :

- at least Pentium
- at least 16MB RAM
- at least 200MB free harddisk space
- modem or ethernet connection

- W95 with SP1 (versie 4.00.950a) or OSR2 (version 4.00.950b)
- W98 (if used with a modem a specific patch is necessary)
- Windows NT 4.0 with SP4
- Windows 2000

- Microsoft Internet Explorer 4.01 of 5.0 (no desktop-integration)
  Note: Internet Explorer 3.02 can not be used.

Types of remote control

A remote control uses eighter a **local network** or a **modem connection**.

When using a modem connection first a **Remote access connection** to the base station should be established and tested before installing the remote control.

Sequence

Installation of a remote control should always be done **after** installing or updating the basestation.

The next paragraphes descripes the **installation** and **update procedure**. It is done following the next steps:

1. preparation (if needed).
2. installation of the software.
3. creating or updating connection.

Remote control installation

The installation of a remote control is done in three steps: the first steps consists of some preperation, the second step is the installation of the software from the ECE CD and the thirth step is the creation of a connection to the base station.

A remote control can be installed on a DaCo or on a base station.

Requirements

- The ECE CD with the correct version.
- A hardware configuration according subscription (see also README.TXT file on the ECE CD).

Checklist

Tip: Print the checklists, put them on the desk where the computer is and tick the list while completing the steps.

Preparation

Action	Completed
Create a user on the base station	
Create a remote access connection on remote control This is only needed for a modem connection, not for a local network	
Test the remote access or ethernet connection	

Installation of software

Action	Completed
Start installation From CD: Setup.exe From base station: connect disk to \\ECONTxxxx\RemInst$\Setup.exe	
Select "Remote control"	
Select the correct version The version of the remote control has to be the same as that of the base station	
Follow the instructions on the display Restart the computer when requested.	

Creating new connection

Action	Completed
Start the *ECONOMIC* program	
Enter the configuration number	
Select the type of connection	
Select the telephone book entry Only for modem connections The telephonebook entry (remote access) should already have been created, see preparation.	
Test connection Open the connection and test a few setting lists, surveys and graphs	

Remote control update

The update of a remote control encloses the installation of the software from the ECE CD.

To update a remote control the preceeding steps should be followed. An update is only done on a PC where it previously has been installed already. The old connections, setting list etc. stay available after the update.

Requirements

- The ECE CD with the correct version.
- A hardware configuration according subscription (see also README.TXT file on the ECE CD).

Checklist

Tip: Print the checklists, put them on the desk where the computer is and tick the list while completing the steps.

Installation of software

Action	Completed
Start installatie From CD: Setup.exe From base station: connect disk to \\ECONTxxxx\RemInst$ and start Setup.exe	
Select "Remote control"	
Select correct version The version of the remote control has to be the same as that of the base station	
Follow the instructions on the display Reboot the PC when requested.	

Updating connection

Action	Completed
Start the *ECONOMIC* program	
Test connection Open the connection and test a few setting lists, surveys and graphs	

Conversion of ERS-1, ERS-2a or VitaCo to ERS-2

There are two types of *ECONOMIC* control station:

- ERS-1: first type
- ERS-2: latest type

The earliest versions of ERS-2 (second half of 1999) were ERS-2a systems, an early variant of ERS-2. These ERS-2a systems are all being converted to an ERS-2.

The table below shows the circumstances under which conversion to an ERS-2 control station is undertaken.

From	To	Condition
ERS-1	**ERS-2**	If the configuration can no longer run on an ERS-1, conversion to an ERS-2 is necessary. An ERS-2 control station has more processor capacity than an ERS-1.
ERS-2a	**ERS-2**	If the current version is 3.x and the new version is 4.x or higher, conversion to an ERS-2 is necessary. Version 4 or higher will not run on an ERS-2a.
VitaCo	**ERS-2**	Some of the settings and data can be transferred during the conversion from VitaCo to *ECONOMIC*.

The following sections give the step-by-step plans for the various conversions.

Conversion of control station from ERS-1 or 2A to ERS-2

Converting an ERS-1 or ERS-2a control station to ERS-2 requires the following steps to be carried out in order.

Requirements

- Datablocks UDA.SAV and NOIN.SAV from the old ERS-1 or 2A configuration
- The ECE CD with the desired version of the *ECONOMIC* NT base station (version 4.1 or higher)
- EPROMs for ERS-2
- Configuration diskette with user data

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Preparations

Action	Completed
Print reports and settings lists to check after update	
Print the adjustment settings of the uni-switches. You will need them for the 0% input and the 100% input after the update.	
Print Econaut reports to check after update	
Note the following settings for each Econaut group: *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	
Note MeteoScope data: user name, password, telephone number (0 for outside line?)	
Dump ERS-1 or ERS-2a datablocks	
Backup (image or tape)	

Conversion

Fit network card (if necessary)	
Installation of ECE CD	
Disconnect DSat loops (note numbering)	
Update ERS-2a EPROMS on control station or replace ERS-1 with ERS-2	
Connect coax connection (if necessary)	
Set correct IP address	
Load control station as new	
Conversion of datablocks	
Reload contents of control station	
Connect hardware (DSat loops)	
(Re)Start background	

Update map	
Maintain data acquisition files	
Check list of I/O connections	
Synchronise alarms	
Convert Econaut greenhouse properties	

Check and set

Check settings and reports	
Uni-switch setup	
MeteoScope subscription: enter user name and password	
MeteoScope subscription: upload immediately	
Econaut: check greenhouse properties	
Econaut: set *Switch off Econaut* to No	
Econaut: enter *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	
Create ERS-2 dump	
Create image of drive C:	

Updating ERS-2 EPROMs

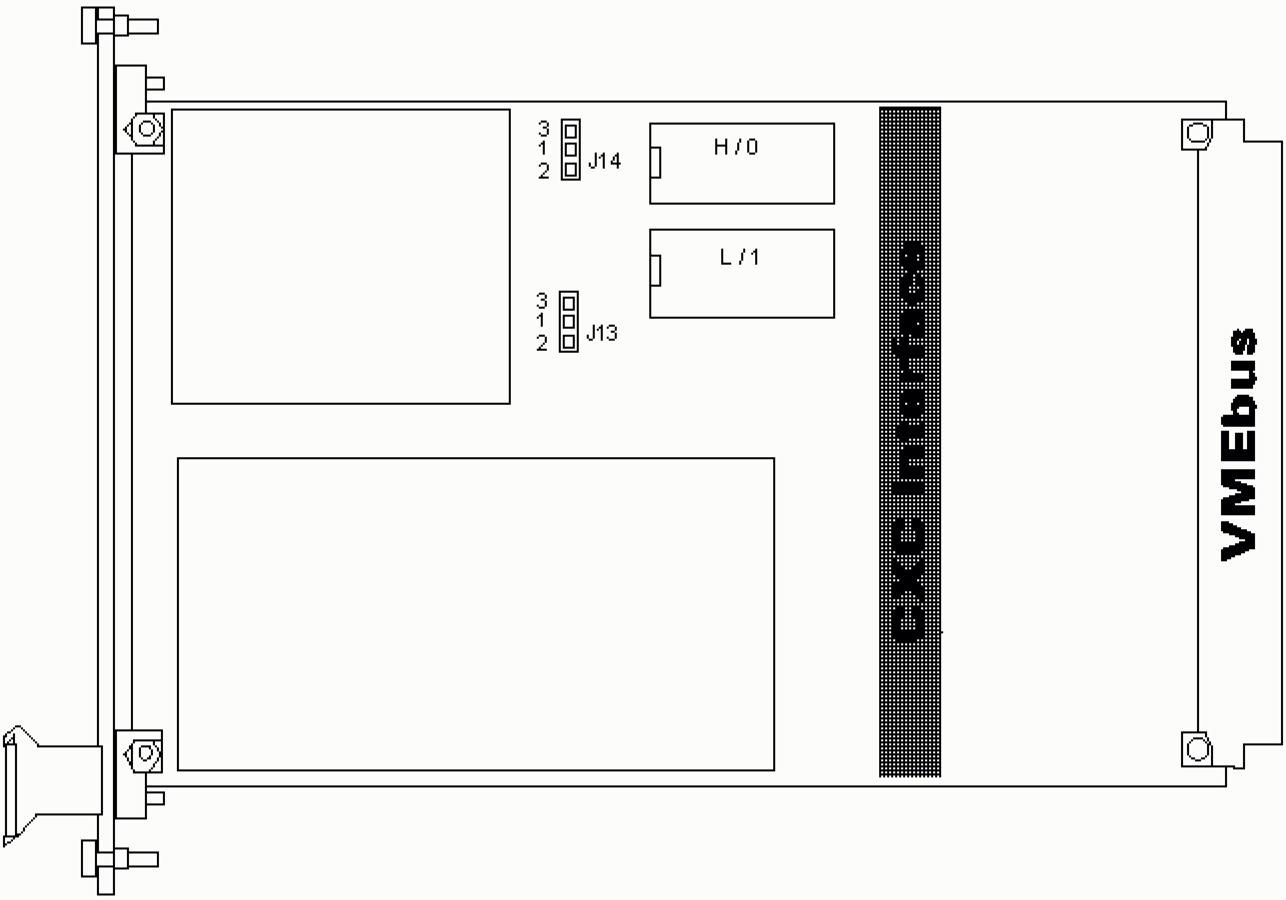
There are two types of EPROM: **27C010** and **27C040**
Type 27C040 EPROMs are always used for the ERS-2.

EPROMs are updated as follows:

- Remove the old EPROMs from the processor board (use suitable tools, not a screwdriver).
- Insert the new EPROMs (taking note of HI and LO).
- Fit the jumper: J14, connect pins 1 and 2.

Jumper location

Close



Conversion of datablocks

The existing setup and user-defined settings can be transferred when converting an ERS-1, ERS-2a or VitaCo to an ERS-2.
The old datablocks (NOIN.SAV and UDA.SAV) have to be converted to the new format for ERS-2 for this.

The conversion is accessed via Start, Programs, ECONOMIC, Control stations, **Converting control stations**.

The old datablocks can be copied from both a hard disk and a diskette.

Close

Uni-switch setup

Uni-switches: set for measurements of type window position and type level measurement the dialog as shown below

- keep minimal scale value on 0
- set maximal scale value to 100
- set minimal gross measurement to the old 0% input
- set maximal gross measurement to the old 100% input

Close

Conversion of VitaCo to ERS-2

Converting a VitaCo control station to ERS-2 requires the following steps to be carried out in order.

Requirements

- An already installed base station and ERS-2 control station
- Diskette for the conversion of history data: 'VitaCo - *ECONOMIC* NT 1.3'

VitaCo requirements

- Datablocks UDA.SAV and NOIN.SAV from the old VitaCo configuration
- Registered data (history) of the VitaCo on diskette
- The file 'Econaut.ctl' if Econaut is running on the VitaCo
- MeteoScope data

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Actions on VitaCo	**Completed**
Program maintenance - save VRS datablocks	
Spare copy - operation data	
Econaut - copy file C:\HHA\VB\ECONAUT.CTL manually to diskette. This will probably fit on the diskette with the datablocks.	
Print reports and settings lists to check after update	
Print the adjustment settings of the uni-switches. You will need them for the 0% input and the 100% input after update.	
Print Econaut reports to check after update	
Print or note the following settings for each Econaut group: *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	
MeteoScope - note data: user name, password and telephone number (0 for outside line?)	

You now have sufficient data to convert to *ECONOMIC* NT with an ERS-2 control station.

Actions on *ECONOMIC* NT	**Completed**
Save contents of control station If settings have already been changed (not normally necessary)	
Conversion of datablocks	
Reload contents of control station	
Convert data acquisition files Use diskette labelled 'VitaCo - *ECONOMIC* NT 1.3'. Start 'install.bat' and follow the instructions.	
Connect hardware (DSAT loops)	
(Re)Start background	
Check list of I/O connections	
Synchronise alarms	
Conversion of greenhouse properties	
Update map	

The conversion is now complete. You can now carry out the system check.

Check	Completed
Check settings and reports	
Uni-switch setup	
MeteoScope subscription: enter user name, password and telephone number	
MeteoScope subscription: upload immediately	
Econaut: check greenhouse properties	
Econaut: set *Switch off Econaut* to No	
Econaut: enter *Setpoint 24 hours temperature* and *Max. increase/decrease per hour*	

The conversion of VitaCo to ERS-2 is finished. Create a dump of the control station and an image of drive C.

System backup	Completed
Make dump of control station	
Create image of drive C:	

Conversion of VitaCo registration data to ECONOMIC NT

If a VitaCo system is converted to an *ECONOMIC* NT, the **Data conversion 1.3** service diskette (or higher version) can be used to convert the data (graph of weekly data). Step-by-step conversion procedure:

1. Create a backup on an empty diskette of the VitaCo Data operation via the option in the VitaCo Maintenance menu.
2. Once the *ECONOMIC* NT has been installed, log on as DEAL.
3. Stop the *ECONOMIC* background process and stop the operation.
4. Go to the Data conversion 1.3 service diskette in drive A:\ via Windows Explorer.
5. Start the conversion program via INSTALL.BAT. The program is installed on the hard disk.
6. Insert the diskette with the VitaCo DATA.
7. After the diskette has been copied, enter the configuration number (e.g. 3050).
8. Restart the foreground and background processes of the *ECONOMIC*.
9. Check the DATA by calling up graphs and period / weekly reports. The graphs still have to be created.

Conversion of greenhouse properties

The greenhouse properties, set on a VitaCo or *ECONOMIC* NT version 3.x and lower, can be transferred to the 'Greenhouse and Crop' module.
The file 'ECONAUT.CTL' is required for this.
The conversion is accessed via Start, Programs, *ECONOMIC* NT, Control stations, **Converting greenhouse properties**.

The file 'ECONAUT.CTL' can be copied from both a hard disk and a diskette.

Uni-switch setup

Uni-switches: set for measurements of type window position and type level measurement the dialog as shown below

- keep minimal scale value on 0
- set maximal scale value to 100
- set minimal gross measurement to the old 0% input
- set maximal gross measurement to the old 100% input

Replacement of HP tapestreamer with ORB drive

The replacement of an HP Colorado tapestreamer with a Castlewood ORB drive is best done as follows:

1. Deleting old backup software;
2. Switching computer off and exchanging hardware;
3. Installing software for the ORB drive;
4. Preparing disc for use;
5. Changing settings for *ECONOMIC* NT data copies.

This document describes the implementation of these steps. Full information about the use of the ORB drive can be found in the general *ECONOMIC* NT help under 'Help with data copies/backups'.

Step 1: Deleting old backup software

The first step is the deletion of the HP Colorado tapestreamer software. This can be done via the *ECONOMIC* NT installation CD (version 7.0.9 and higher). On it is a function that uninstalls the current backup software. Proceed as follows:

- Place the *ECONOMIC* NT installation CD in the CD-ROM drive and start the program 'Setup.exe'.
- Select 'Components'.
- Select 'Delete components'.
- Select 'Delete backup (DOS box and Colorado).
- After a few moments a dialogue window and a DOS window will appear. Move the windows so that you can see them both properly.
- Follow the instructions given in the DOS window.
- As soon as you have carried out all the instructions given in the DOS window, the software will be deleted and the Windows log-in screen will appear.

Now go on to the next step.

Step 2: Switching computer off and exchanging hardware

During this step the tapestreamer is physically exchanged for the ORB drive. Proceed as follows:

- Switch the computer off and open the case.
- Remove the tapestreamer.
- Check that the ORB drive master/slave setting is correct. The ORB drive will probably have to be connected as a slave to IDE2 (behind the CD-ROM drive). Adjust this setting as necessary.
- Fit the ORB drive in the computer and connect the drive.
- Start the computer and check that the BIOS recognises the ORB drive. If the ORB drive is connected to IDE2 as a slave, the following text will be displayed:
  `Detecting IDE Secondary Slave ... CASTLEWOOD ORB2-E`
  Close the case if this is the case or check the cabling and master/slave setting if the ORB drive is not detected.
- Once the computer has started up, open Windows Explorer and check that the drive is detected by Windows. The ORB drive will be displayed as 'Removable disc'. Make a note of or remember the drive letter for the ORB drive. You will need this to install the software for the ORB drive.

Now go on to the next step.

Step 3: Installing software for the ORB drive

During this step two products are installed. One is a software package supplied by Castlewood with the ORB drives. The other is an ORB tool developed by Hoogendoorn Automation. The software supplied by Castlewood contains extensive functionalities and can only be used when logged on as service. When logged on as 'Gebr1' this software is not accessible. The ORB tool developed by Hoogendoorn Automation contains only the functionalities that must be available to the user (erase disc and eject disc) and is therefore accessible when logged on as 'Gebr1'.

The installation of both products is possible from the *ECONOMIC* NT installation CD. The software supplied by Castlewood however is on the ORB disc supplied with the ORB drive. The installation procedure available on the *ECONOMIC* NT installation CD will prompt you for this disc of its own accord.

To install the software for the ORB drive proceed as follows:

- Put the *ECONOMIC* NT installation CD in the CD-ROM drive and start the program 'Setup.exe'.
- Select 'Components'.
- Select 'Installation of other devices'.
- Select 'Installation of ORB software'.
- After a few moments a DOS window will appear with instructions for installation of the software. Follow the instructions in the DOS window.
- As soon as you have completed all the instructions given in the DOS window, the software will be installed and the Windows log-in screen will appear.

Now go on to the next step.

Step 4: Preparing disc for use

Before a disc can be used with the *ECONOMIC* NT it must first be prepared for use. All the data on the disc are erased and a directory structure is created where the *ECONOMIC* NT can place the backup. This also has to be done with a disc for the client. Proceed as follows:

- Put a disc in the ORB drive (see 'General Help *ECONOMIC* NT\Help with data copies/backups' for further information).
- Erase the ORB disc in accordance with the procedure described in 'General Help *ECONOMIC* NT\Help with data copies/backups'. Ensure that the ORB disc is not selected in Windows Explorer, because the erasure of the disc will then fail.
- The disc is now ready for use.

Now go on to the next step.

Step 5: Changing settings for *ECONOMIC* NT data copies.

To make a backup with a tapestreamer first a data copy is placed on the hard disc, then this data copy is copied to tape. But with an ORB drive the data copy is placed straight onto the ORB disc and is not copied to the hard disc first. Consequently, the destination location for the data copy in the *ECONOMIC* NT must be changed.

Change the destination location for the data copy by changing the [Data copy: destination location] setting at [Control General], [Data copy backup] so that it corresponds to the correct directory on the ORB disc.

Probably only the drive letter will need changing (see 'General Help *ECONOMIC* NT\Help with data copies/backups' for further information).

The system is now ready to make backups. Do not forget to give the client an explanation of the use of the ORB drive (exchanging discs and preparing discs for use). The client will also find useful information at 'General Help *ECONOMIC* NT\Help with data copies/backups'.

Installation of demo

The installation of a demo involves two steps: the first step is to install the (remote) control, and the second step is to create the "demo connection". The latter proceeds in just the same way as creating a normal connection except that the data are now downloaded from a CD instead of the base station. The installation of modules (MeteoScope/Econaut) also follows the same pattern as for a normal remote control.

A demo can be installed on a remote control and as a second configuration on a base station. No hardware lock is required for the demo.

Requirements

- ECE CD version 3.0 or higher
- A correct hardware configuration (see README.TXT on the ECE CD)

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

Action	**Completed**
Installation of remote control	
Creation of "demo connection"	

Control station maintenance

ECONOMIC has two types of control station: **ERS-1** and **ERS-2**. Each type has its own installation procedure.

These procedures are explained in the accompanying sections.

The most important external differences between the two types of control station is that an ERS-2 has a coax connection and an ERS-1 does not.

ECONOMIC has two types of control station: **ERS-1** and **ERS-2**. The software supplied on the configuration diskette is not interchangeable.

ERS-1 control station maintenance

- What does it do...
- Procedures
  - Updating control program
  - Loading control station as new
  - Loading all modules of empty control station

What does it do...

This program enables you to update the control station software and to create a copy of the control station datablocks.
These actions may only be performed by authorised service technicians.

Starting the update procedure
Start the update procedure for an ERS-1 control station by selecting the **Control system maintenance** option.
This menu is accessed via the Extra tab, Options service - Control system maintenance item in the *ECONOMIC* Explorer.

This menu can only be started after the following 4 steps:

1. Log on as **Deal** or **Serv**
2. Select nursery (this is the user's name on the left).
3. Set access level to Service.
4. Stop the background process.

Updating control program

This procedure allows you to install new control software.

All the modules in the control station are replaced. The datablocks are uploaded and stored in the SAV folder. The datablocks are reorganised and restored. Existing settings are retained wherever possible.

The version that is to be loaded is indicated at the top of the screen. If you want a different version, this can be selected after choosing 'OK' (see Choosing different version).

Procedure:

1. Start the update procedure, see also What does it do...
2. Check the version number of the program to be loaded. A different version can be chosen, if required. When you choose **OK**, the control program on the hard disk is loaded on the control station. This program was copied from the diskette onto the hard disk while the base station was being updated.
3. Choose **Yes** when you are asked to stop the control program.
4. Copy the old and new datablocks onto a diskette when requested to do so.
5. Restart the control station once loading is complete.
6. Start the background process.
7. Set the control station clock to the correct time.

When complete, check the operation of the entire system.

Loading control station as new

This procedure enables you to replace the software in the control station.

The control station is loaded with modules and datablocks. Any software still in the control station is overwritten. If any software is left in the control station, it is **not** retained (backed up) and can, therefore, no longer be uploaded.

The version that is to be loaded is indicated at the top of the screen. If you want a different version, this can be selected after choosing 'OK' (see Choosing different version).

1. All existing control modules and datablocks in the control station are deleted. Default values are entered in the settings.
2. When complete, check the operation of the entire system.

Loading all modules of empty control station

This procedure enables you to load an (empty) control station. This option is used to replace a defective control station.

You can load from both the hard disk and a diskette; a menu with the following options is displayed:

1. Restore from HARD DISK
2. Restore from DISKETTE

If you opt for the diskette, this must contain all the necessary files, i.e.:

- **control modules**
- **noin.sav**
- **uda.sav**

The diskette can be created using the Saving entire control program procedure.

1. All existing control modules and datablocks in the control station are deleted. Default values are entered in the settings.
2. When complete, check the operation of the entire system.

Saving control station datablocks

This procedure enables you to save the data blocks from the control station on the hard disk of the operating station. The datablocks can also be copied to a diskette, if required. While the datablocks are being uploaded from the control station, the control station is out of service, i.e. it does not perform any measurement or actuation tasks.

When complete, check the operation of the entire system.

Loading control station datablocks

This procedure enables you to load datablocks on the control station. You can load from both the hard disk and a diskette; a menu with the following options is displayed:

1.Restore control DATA from HARD DISK
2.Restore control DATA from DISKETTE

If you opt for the diskette, this must contain the following files:

- **A:\NOIN.SAV**
- **A:\UDA.SAV**

1. Always use datablocks of the same version as the program running on the control station.
2. All existing datablocks in the control station are deleted. Default values are entered in the settings.
3. When complete, check the operation of the entire system.

Saving entire control program

This procedure is used to create a copy of the entire control station. This copy is saved on the hard disk and also, optionally, on a diskette. While the software is being uploaded from the control station, the control station is out of service, i.e. it does not perform any measurement or actuation tasks.

When complete, check the operation of the entire system.

Communication

This procedure enables communication with the control station with the aid of the LSP program.

This is usually used to add or remove program modules manually.
Under normal circumstances this procedure will not be necessary.

Choosing different version

After one of the procedures Updating control program or Loading control station as new has been chosen, a different version can be chosen, e.g. from a diskette.
This is done by selecting the RsMod.ini file in the folder where the control software is located.

Tips and tricks

Before performing a procedure, check the version number of the control software (top line on the screen).
If you wish to install a different version, launch the option that you want and then select the correct version.

Check the operation of the system after performing a procedure.

Before updating an existing system, you are recommended first to copy the datablocks to a diskette.

ERS-2 control station maintenance

- What does it do...
- Introduction
- Actions to be performed:
    - Update contents of control station
    - Load contents of control station as new
    - Save contents of control station
    - Reload contents of control station
    - Copy process modules to different location
    - Copy process modules from different location
    - Generate list of I/O connections
    - Show status of control station
    - Security check datablocks

What does it do...

This program enables you to perform various actions on the control station's process modules.
These actions may only be performed by authorised service technicians.
This program can only be launched on a base station.

Starting the update procedure
Start the update procedure for an ERS-2 control station by selecting the **Control station maintenance** option.
The Control station maintenance program is accessed via Start, Programs, *ECONOMIC* NT, Service, Control stations.

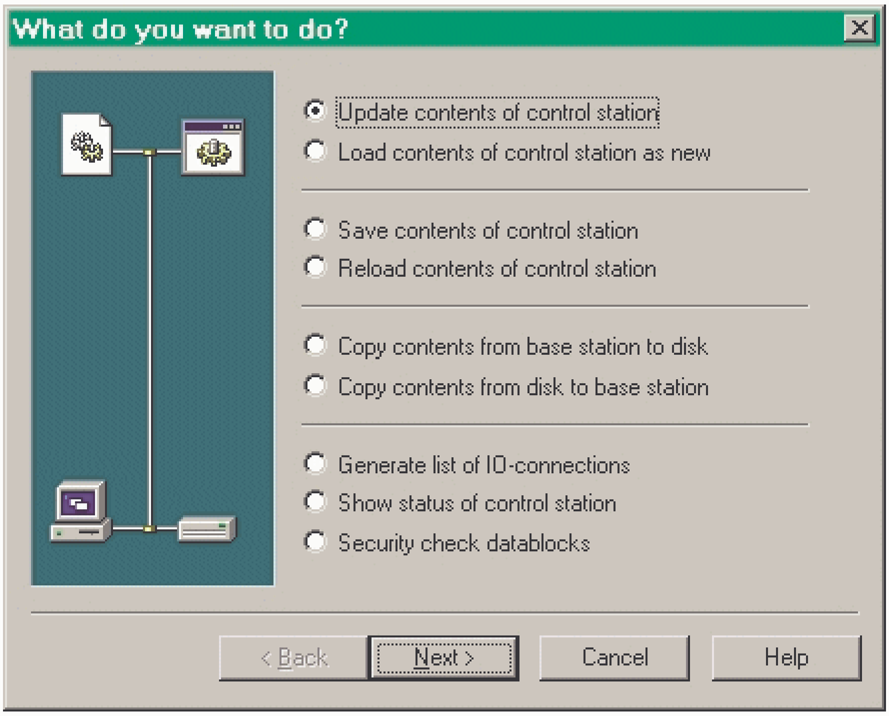
This menu can only be accessed if you are logged on as **Deal** or **Serv**.

In almost all the actions described below the control process is interrupted.

Introduction

The introduction screen is shown when the program is launched. This screen provides information on the base station.

Press **Next** to continue.



You can now select an action. After making your selection, press **Next** to continue.

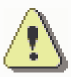
The various actions are explained in greater detail below.

The program can only establish contact with the control station if the control station's IP address is correctly input. This can be checked, if required, from Start, Programs, *ECONOMIC* NT, Service, Control stations and then the **Control station IP address** option (an explanation of this option can be found in the Help screens).

Update contents of control station

This action enables you to update the contents of a control station. The complete contents of a control station will be moved to the base station. Process data will then be reorganised. This reorganisation is necessary because the process configuration of the *ECONOMIC* NT can be changed, for example by adding extra settings or groups. New settings are set to a default value. Existing settings will not be changed.
After reorganisation all the process modules of the relevant control station are restored to the control station.

This action is necessary whenever the *ECONOMIC* NT software is updated.



1. When complete, check the operation of the entire system.
2. Check whether the control station clock is showing the right time.

Load contents of control station as new

This action enables you to replace the contents of a control station. All the settings for processes running on the relevant control station are set to default values. All the process modules of the relevant control station are then loaded on the control station.

1. All existing control modules and datablocks in the control station are deleted. Default values are

entered in the settings.
2. When complete, check the operation of the entire system.
3. Check whether the control station clock is showing the right time.

Save contents of control station

This action enables the contents of a control station to be saved to the base station.
This copy can then be copied to a diskette via the Copy process modules to different location option.

You can restore these contents to the control station later using Reload contents of control station.

When complete, check the operation of the entire system.

Reload contents of control station

This action is used to restore the contents saved on the base station to the control station.

This means that you will have restored the situation of the last time that:

- the contents of a control station were replaced
- the contents of a control station were saved
- a copy was pasted via Copy process modules from different location

This action can be carried out if, for whatever reason, you wish to replace the contents of a control station with one of the above-mentioned copies..

1. All existing control modules and datablocks in the control station are deleted. The settings will be overwritten by the restored copy.
2. When complete, check the operation of the entire system.
3. Check whether the control station clock is showing the right time.

Copy process modules to different location

This action enables you to copy the copy which you have made using Save contents of control station to a different location on the hard disk or a diskette.

This means that you can create an extra backup of the control station contents.

Copy process modules from different location

This action is used to restore a copy that you have made via Copy process modules to different location.
This copy then replaces the copy created with Save contents of control station.

You can then load this on a control station using Reload contents of control station.

Generate list of I/O connections

This action enables you, if you wish, to view the list of I/O connections and print it, if required.

Show status of control station

This action enables you to view the status of an ERS-2 control station.

An ERS-2 control station has two valid statuses:

- Normal mode
- Update mode

In normal mode the status value will be 0. In "Update" status there are no control programs active. If an ERS-2 control station is not responding normally, you can check its status. If a control station is in "Update mode", it is possible to switch to "Normal mode" using the "Cancel update mode" option.

All other statuses require further investigation.

Security check datablocks

This action relates to the datablocks which are ready for reloading on the control station. Important settings are checked and possibly limited or the original value is entered.

The security check on datablocks must always be carried out before reloading automatically saved datablocks. It is also advisable to run the security check before restoring a backup created using the Save contents of control station option.

This action must be carried out after copying process modules from a different location and before reloading the contents of the control station.

Replacing a control station

If the control station is defective, it will have to be replaced temporarily by a service control station. After being repaired, the user's control station is returned and exchanged with the service control station again.

ECONOMIC NT has two types of control station: **ERS-1** and **ERS-2**.
ERS-1 and ERS-2 control stations are not interchangeable! Always install a control station of the same type, therefore, as the one being replaced.

Replacing the ERS-1 control station

If the control station has been replaced or the contents of the control station have been corrupted, the control station modules must be reloaded. The preferred option it to use a copy of the datablocks which has just been made.

The steps to follow in replacing a control station are described below.

Replacing defective control station by service control station

Preparation

- If feasible (control station program is not corrupt), save the control station datablocks. Use an empty diskette for this.
- Reset the MEM card of the service control station if this has not already been done. The RS reset service diskette is needed for this. The whole reset procedure is described in Resetting memory card.

Load program on service control station

- Choose the Empty control station load all modules options from the 'Control station maintenance' menu. A window now appears asking whether the software must be loaded from a diskette (see note below) or from the base station's hard disk. Choose the hard disk.

Explanatory note:
The current program version is loaded in this way together with the most recent datablocks. These are the datablocks that have just been created (see Preparation) or were created during the last program update or backup.

Note:
If you are restoring from a diskette, this must be a diskette to which all the software from the control station was copied using the: **Save entire control program** option from the **Control station maintenance** menu.

After-care

- Check the operation of the *ECONOMIC* NT and check/change the settings in consultation with the user. Then create a new dump of the datablocks on an empty diskette.
- Return the user's control station to Hoogendoorn for repair attaching a clear description of the problem.

Returning user's control station (replaced by service control station)

Preparation

- Save the control station datablocks.
- Reset the MEM card of the repaired control station if this has not already been done. The RS reset service diskette is needed for this. The whole reset procedure is described in Resetting memory card.

Load program on user's control station

- Choose the **Empty control station load all modules** option from the **Control station maintenance** menu. A window now appears asking whether the software must be loaded from a diskette (see note below) or from the base station's hard disk. Choose the hard disk.

Explanatory note:
The current program version is loaded in this way together with the most recent datablocks. These are the datablocks that have just been created (see Preparation).

After-care

- Check the operation of the *ECONOMIC* NT. If settings still have to be changed, a dump of the datablocks has to be created on an empty diskette.
- Reset the MEM card of the service control station if this has not already been done. The RS reset service diskette is needed for this. The whole reset procedure is described in Resetting memory card.

The service control station can then be used immediately in the event of a breakdown at another user.

Resetting control station memory card

If an ERS-1 control station on a user's site is replaced by an exchange/service control station, the memory of the memory card must be empty before the program is installed. This is because this control station may contain a program from another user. Resetting the MEM card using the 'RS reset' service diskette is explained below.

Resetting the control station memory is a radical action. It is not possible to restore the previous status without a backup.

Resetting

- Stop the *ECONOMIC* NT background progam.
- Place the 'RS reset' service diskette in the disk drive.
- Go to the MS-DOS prompt (open a DOS box for this).
- Go to the C:\ENDxxxx\SysData\SetupRS\Util folder.
- Type: **lsp -2** (-2 = COM2)
  The LSP prompt appears after the LSP explanatory screen.
- Type: **t** **[Enter]**
- Switch the control station off and then back on.
  After the question mark '?'
- Type: **lsp** **[Enter]**
- Type: **[Esc]** (the LSP prompt now appears)
- Type: **:a:** **[Enter]** (drive a: with the LSP prompt)
- Type: **l @40000 shell** **[Enter]** (l stands for load)
  The shell program is now loaded on the control station. This takes approx. 40 seconds. The LSP prompt then appears again.
- Type: **t** **[Enter]**
- Switch the control station off and then back on again. (the '$ prompt' now appears)
- Type: **tarcom -r** **[Enter]**
  The memory is reset at this moment. An error message then appears. This is because the control station is trying to start without a program being available.

Checking contents of memory

- Switch the control station off and then back on again. The question mark '?' appears.
- Type: **lsp** **[Enter]**
- Type: **[Esc]** The LSP prompt now appears again.
- Type: **i** **[Enter]**
  The contents of the memory card are now displayed. If resetting has been successful, therefore, nothing appears.
  The LSP prompt now appears again.
- Type: **q** (The DOS prompt A:\ now appears)
- Type: **C:** **[Enter]** (The DOS prompt C:\ now appears)
- Remove the service diskette from the base station.

The control station memory card is now empty. The control program can now be installed.

Replacing the ERS-2 control station

If the control station has been replaced or the contents of the control station have been corrupted, the control station modules must be reloaded. The preferred option is to use a copy of the datablocks which has just been made using **"Save contents of control station"**. If no copy is available that has just been made, it is also possible to use the automatically saved control station datablocks.

I Saving the contents of the original control station was successful
II Saving the contents of the original control station was unsuccessful

Checklist

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

I. Saving the contents of the original control station was successful

Action	Completed
Empty the exchange system with EraseCS and enter the IP address.	
Choose Reload contents of control station under Control station maintenance.	
Choose Reset contents of control station under Control station maintenance.	
Check the operation of the system. In the event of doubts about the proper operation, procedure II must also be followed, i.e. the procedure when saving the contents of the original control station was unsuccessful.	

II. Saving the contents of the original control station was unsuccessful

Action	Completed
Empty the exchange system with EraseCS and enter the IP address.	
Choose 'Copy process modules from different location' under Control station maintenance. Select the location 'C:\Endxxxx\SysData\Datablck'. Once this is finished, the program asks whether the automatically saved datablocks must be restored. Answer Yes to this question.	
Choose Security check datablocks under Control station maintenance.	
Choose Reload contents of control station under Control station maintenance.	
In the Control General - Service - Emergency start menu set "Emergency start: stop everything and restart" to Yes. This is the most effective option if the actuations are still blocked. Once the window containing the message "The action has been successfully completed" has appeared, you are recommended to set the "Emergency start: stop everything and restart" setting to Yes within one minute.	
Stopping and restarting lasts 2 minutes at most. Then check the operation of the system. Check the following, in particular: • Are the curtains really in the position indicated in the current curtain report? The curtain positions are initialised during the emergency start procedure. The actuation counter for all the curtains is entered, and the running time determines how long it will take before the correct position is reached. • Is the daily watering program running properly? Is the "Cycles counter" crop section setting, for example, perhaps set too high or too low?	

Putting into operation and adjustment

There are different factors that have a bearing on adjustment.

- Putting an *ECONOMIC* into operation
- Adjustment of different measurements
- Adjustment of ERS-2 measurements
- Grodan water content meter
- E-VOS system
- Scales
- Silo level measurement
- Tensiometer

Table of contents settings and drawings

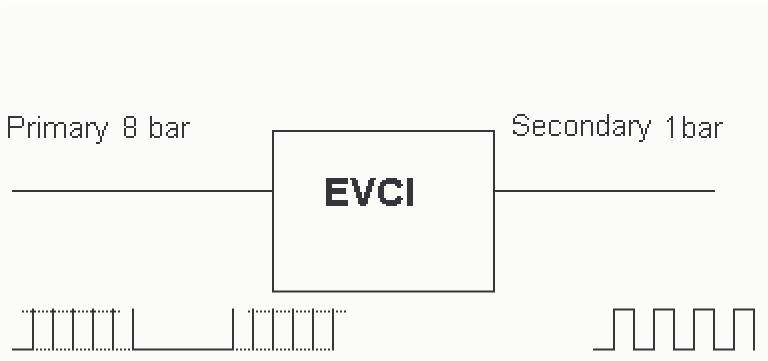
Gas registration with the *ECONOMIC*

1. What gas registration involves

1. Total consumption over a given period (m3)
2. Current gas consumption (m3/hour)
3. Calculation of an hour prediction (m3/hour)

These three quantities are presented by the *ECONOMIC* in current reports, in week or period reports and in graphs.

2. Gas measurement: primary or secondary side?



The utility company's gas meters emit pulses as a measure for the quantity of cubic metres of gas. This is done via an EVCI (Electronic Volume Conversion Instrument). Not only does this instrument measure the m3 of gas but also the pressure and the temperature of the gas. The costs of the gas are in fact paid in m3 at 1 bar and at 0 degrees Celsius.

Gas metering on the secondary side:

Most EVCIs emit one pulse per m3 of gas. On the secondary side of the gas meter (m3 of gas at 1 bar and 0 degrees Celsius) we can see a regular pulse string (for example: a consumption of 600 m3/hour: one pulse every 6 seconds).

Total consumption (1) and the development of consumption (2) are easy to determine and the calculation of an hour prediction (3) is also very possible.

Gas metering on the primary side:

On the primary side pulse strings of 8 to 9 pulses are emitted and then nothing for a time.

The development of consumption (2) and the calculation of the hour prediction (3) is not very easy in this case!

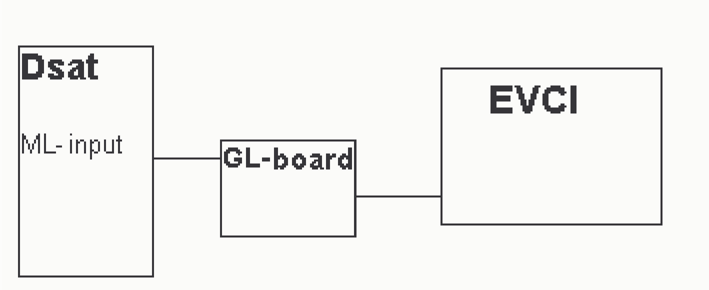
Important:

Good gas registration is only possible with a measuring signal on the secondary side of the gas meter.

Where there is only a primary connection, you are urgently recommended to call in the utility company to have the secondary connection made as well.

3. Connections

Outline drawing of connections:



The GL board provides for a separation between the Dsat and the gas meter/EVCI. A scaling factor for the pulses can also be set on the GL board.

GL board connections:
Connect the positive of the gas meter signal to terminal A3 (input) of the GL board and the negative to terminal A7
The output signal from the GL board (relay contact) is terminal A8 and A9. Connect them as a report in the Dsat.
Connect the supply voltage for the GL board (24Vdc) to terminal A1 (+) and A2 (-).
Set the scaling factor of the GL board to 1.

4. Settings

The main gas registration settings at a glance, with setting advice for a pulse meter. You can depart from these settings in some situations, so see also the help for each setting.

Uni-switch Menu - General	
type of switch	week switch
type of uni-influence	maximum hour prediction
uni-measurement: unit list 1	m3/h
uni-measurement: sum unit	m3
measurement1: type of registration	add, hour prediction
measurement1/2: measurement type	report 0-100
measurement 1/2: type of average	2 minutes
measurement1: scaling value	1.00 (this is the scaling factor of the GL board)
measurement1: process as pulse count	Yes
pulse counter: maximum waiting time pulse	05:00 [mm:ss]
add: time unit pulse counter	per hour
add: scaling value addition	1,000
measurement1: measured value low pulse	0.0
measurement1: measured value high pulse	100.0

Uni-switch menu - Energy monitoring	
minimum history time	00:30 [hh:mm]
addition: consumption x 1,000,000	(*)
addition: consumption x 1,000	(*)
addition: consumption x 1	(*)

(*): The initial value (read off gas meter) can be entered in these three settings. Then the count of the total addition can be read off here.

Commissioning an *ECONOMIC* NT

A checklist provides a structured overview of all the activities involved in commissioning an *ECONOMIC* NT system. An *ECONOMIC* NT can be commissioned once the computer has been installed and the peripherals and sensors have been connected.
Commissioning an *ECONOMIC* NT system consists essentially of checking the installation, adjusting the measurement devices, setting the control systems and instructing the user.
The purpose of this checklist is twofold. On the one hand, it is a guide that is used to check off the activities when completed. This prevents items from being forgotten, particularly if a project is commissioned by various service technicians. Secondly, the checklist records which actions have been carried out and which have not. This avoids any misunderstandings at a later date.

Tip: Print the checklists, place them on the desk next to the computer and check the items off after carrying out the actions.

The list of actions is based on the most comprehensive *ECONOMIC* NT system. A selection can, of course, be made for a particular project.

Explaining the operation of the programs is best done using the '1st, 2nd and 3rd visit *ECONOMIC* NT operating instructions' checklist. This is included in the *ECONOMIC* NT manual.

1. Installation checklist

Installation	Installation instructions	Mains voltage	Connections	Test	OK / Not applicable
1. Base station	O	..... volt ac	O	O	O OK
2. Control station	O	..... volt ac	O	O	O OK
3. Printer	O	..... volt ac	O	O	O OK / O n/a
4. Monitor	O	..... volt ac	O	O	O OK
5. Remote control	O	..... volt ac	O	O	O OK / O n/a
6. DSATs:					
DSAT 1.1	O	..... volt ac	O	O	O OK
DSAT 1.2	O	..... volt ac	O	O	O OK / O n/a
DSAT 1.3	O	..... volt ac	O	O	O OK / O n/a
DSAT 1.4	O	..... volt ac	O	O	O OK / O n/a
DSAT 1.5	O	..... volt ac	O	O	O OK / O n/a
DSAT 1.6	O	..... volt ac	O	O	O OK / O n/a
DSAT 1.7	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.1	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.2	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.3	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.4	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.5	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.6	O	..... volt ac	O	O	O OK / O n/a
DSAT 2.7	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.1	O	..... volt ac	O	O	O OK / O n/a

DSAT 3.2	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.3	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.4	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.5	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.6	O	..... volt ac	O	O	O OK / O n/a
DSAT 3.7	O	..... volt ac	O	O	O OK / O n/a
7. Alarm circuit:					
Alarm loop			O	O	O OK
Alarm box			O	O	O OK
Hooter			O	O	O OK
Ext. alarms			O	O	O OK
Telephone alarm indicator			O	O	O OK / O n/a

2. Control General checklist

Control General	**Installation instructions and connections**	**Adjust measurement devices**	**Check actuators**	**Set control systems**	**OK / Not applicable**
1 Weather station:					
Outside temperature	O	O			O OK
Wind speed	O	O			O OK
Wind direction	O	O			O OK
Radiation / light sensor	O	O			O OK
Rain sensor	O	O			O OK
2. DSAT alarms (measuring and actuation equipment)			O	O	O OK
3. Clock and astronomy				O	O OK
4. Uni-switches:					
Uni 1	O	O	O	O	O OK / O n/a
Uni 2	O	O	O	O	O OK / O n/a
Uni 3	O	O	O	O	O OK / O n/a
Uni 4	O	O	O	O	O OK / O n/a

3. Control Climate checklist

Control Climate	**Installation instructions**	**Adjust**	**Check**	**Set**	**OK /**	

group no.	and connections	measurement devices	actuators	control systems	Not applicable	Notes
1. Greenhouse climate						
Aspirator	O				O OK / O n/a	
Temp. sensor		O			O OK / O n/a	
Min. alarm thermost.	O		O		O OK / O n/a	
Fan			O		O OK / O n/a	
Settings				O	O OK / O n/a	
2. Heating						
Water sensors in circuits 1, 2, 3	O	O				
Valves in circuits 1, 2, 3	O		O		O OK / O n/a	
Settings:					O OK / O n/a	
General				O	O OK / O n/a	
Circuit 1		O	O	O	O OK / O n/a	
Circuit 2		O	O	O	O OK / O n/a	
Circuit 3		O	O	O	O OK / O n/a	
Hot air			O	O	O OK / O n/a	
Soil		O	O	O	O OK / O n/a	
3. Ventilation						
Vent position sensors for vents 1, 2	O	O			O OK / O n/a	
Vent motor actuation	O		O		O OK / O n/a	
Settings:						
General				O	O OK / O n/a	
Recirculation			O		O OK / O n/a	
Roof washer		O	O	O	O OK / O n/a	
4. CO_2						
Sensor	O	O			O OK / O n/a	
Selector	O	O			O OK / O n/a	
Settings:						
General				O	O OK / O n/a	

Supply unit			O	O	O OK / O n/a	
Extra control			O	O	O OK / O n/a	
5. Curtain						
Curtain motors 1, 2	O		O		O OK / O n/a	
Settings				O	O OK / O n/a	
6. Lighting						
Actuations	O		O		O OK / O n/a	
Settings				O	O OK / O n/a	
7. Humidification						
Actuators	O		O	O	O OK / O n/a	
Settings				O	O OK / O n/a	
8. Alarms						
Settings				O	O OK / O n/a	

4. Control Water checklist

Control Water no.	**Installation instructions and connections**	**Adjust measurement devices**	**Check actuators**	**Set control systems**	**OK / Not applicable**	**Notes**
Supply unit						
EC control:						
Measurement devices	O	O			O OK / O n/a	
Actuators			O	O	O OK / O n/a	
pH control:						
Measurement devices	O	O			O OK / O n/a	
Actuators			O	O	O OK / O n/a	
Pump	O	O	O	O	O OK / O n/a	
Draining						
Drainage measurement unit:						
EC	O	O			O OK / O n/a	
pH	O	O			O OK / O n/a	
Flow	O	O			O OK / O n/a	

Drain pit		O		O	O OK / O n/a	
Valves			O	O	O OK / O n/a	
Level control						
Level tray	O	O	O		O OK / O n/a	
Drain counter	O	O			O OK / O n/a	
Settings				O	O OK / O n/a	
Crop section registration				O	O OK / O n/a	
External contact	O	O			O OK / O n/a	
Alarm settings				O		

5. Control Energy checklist

Control Energy no.	**Installation instructions and connections**	**Adjust measurement devices**	**Check actuators**	**Set control systems**	**OK / Not applicable**	**Notes**
Boiler						
Water sensor	O	O			O OK / O n/a	
BBK	O		O		O OK / O n/a	
Settings:						
Boiler in general					O OK / O n/a	
Boiler		O	O	O	O OK / O n/a	
Standby valve			O	O	O OK / O n/a	
Tank						
Water sensors	O	O			O OK / O n/a	
EBC	O		O		O OK / O n/a	
Settings:						
Tank phase				O	O OK / O n/a	
Tank measurement devices				O	O OK / O n/a	
Boiler plan				O	O OK / O n/a	
CHP plan				O	O OK / O n/a	
Filling and emptying valves				O	O OK / O n/a	

Transport						
Water sensors	O	O			O OK / O n/a	
Valve and measurement devices	O	O	O	O	O OK / O n/a	
TE						
Measuring/actuation equipment	O	O	O		O OK / O n/a	
Settings				O	O OK / O n/a	
CHP					O OK / O n/a	
EBC	O	O	O		O OK / O n/a	
Settings				O	O OK / O n/a	

Energy connections	**Installation instructions and connections**	**Adjust measurement devices**	**Check actuators**	**Set control systems**	**OK / Not applicable**	**Notes**
Boiler				O	O OK / O n/a	
Circuit 1				O	O OK / O n/a	
Circuit 2				O	O OK / O n/a	
Circuit 3				O	O OK / O n/a	
Transport				O	O OK / O n/a	
Tank				O	O OK / O n/a	
CHP				O	O OK / O n/a	

The Energy connections are included in both the *Control Energy* and *Control Climate* folders. Check the Energy connections via the **Energy connections** report in the *Control Energy* folder.

Adjusting measurement devices

1. Aspirator temperature sensors
    1. Calibration resistor
    2. Calibration thermometer
    3. Stabilisation block
2. Outside temperature sensor
3. Water sensor
4. Feedback device
5. Voltmeter
6. Adjustment with calibration resistor in the DSAT

Once you have chosen the access level Service, the service settings with which the measurement devices are set up are displayed.
All the measurement devices must be adjusted during commissioning of an *ECONOMIC* NT. This

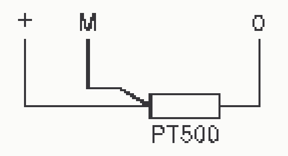
adjustment takes place by means of a correction. The correction is the value by which the measurement device has to be adjusted to obtain the correct measurement.

Example of working with corrections:
The *ECONOMIC* NT measures a greenhouse temperature of 20.1℃. The reference (calibration resistor or calibration thermometer) gives a temperature of 20.5℃. The greenhouse temperature is thus shown too low by 0.4℃. +0.4℃ must be entered in the correction.

1. Aspirator temperature sensors

The temperature sensors in the aspirator (wet and dry bulb) are of type PT500. This is a resistance measurement device. The resistance is 500 ohms at 0℃. PT means positive temperature correction. The resistance therefore increases (approx. 2 ohms per degree) as the temperature rises. At 20℃, for example, the resistance will be approx. 540 ohms.

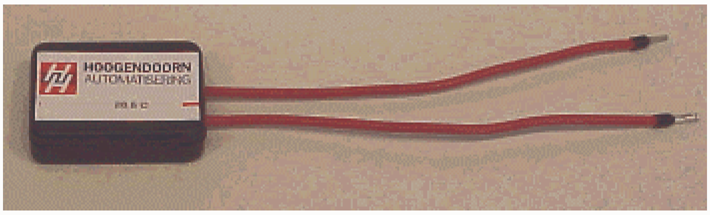
The PT500 sensor is connected as follows:



There are several methods for adjusting the temperature sensors of an aspirator. Three methods are explained here. The first method, with a calibration resistor, is the most practical and therefore the best one to use. The two other methods, with a calibration thermometer and with a stabilisation block, can be used as a double-check and in special cases.

Three general comments in advance:
- Proper adjustment is only possible if the DSAT has already been energised for a few hours (electronics at operating temperature).
- The temperature in the greenhouse may not vary by too much from the normally prevailing temperature during the adjustment process. Example: the aspirators in an empty greenhouse at 5℃ where it is normally 20℃ cannot be correctly adjusted.
- Check in advance whether the aspirator filter is clean. Replace the filter if necessary. A soiled filter gives too high a reading.

1.1 Calibration resistor



Procedure:
1. Set the actuators of the vents, curtains and such like to manual mode. (During adjustment, the measurement is 20.5℃. This might not match the actual temperature at that moment.) Be advised to switch off the aspirator fan during adjustment.
2. Connect the calibration resistor (20.5℃) instead of the greenhouse temperature sensor in the aspirator. Remove the sock from the wet bulb sensor.
3. Read off the temperature measurement on the monitor.
4. Enter the greenhouse temperature correction so that the *ECONOMIC* NT displays the same as the temperature shown by the 20.5℃ calibration resistor.

5. Remove the calibration resistor from the aspirator and reconnect the temperature sensor.
6. Enter the wet bulb temperature correction so that this is the same as the measured greenhouse temperature.
7. Place the sock back on the wet bulb sensor.

This method requires relatively little time (approx. 5 minutes per aspirator) and can be used at any time (sun, wind, heating have no effect). A practical procedure derived from this method (connect the calibration resistor in the DSAT) is described in the section entitled Adjustment with calibration resistor in the Dsat.

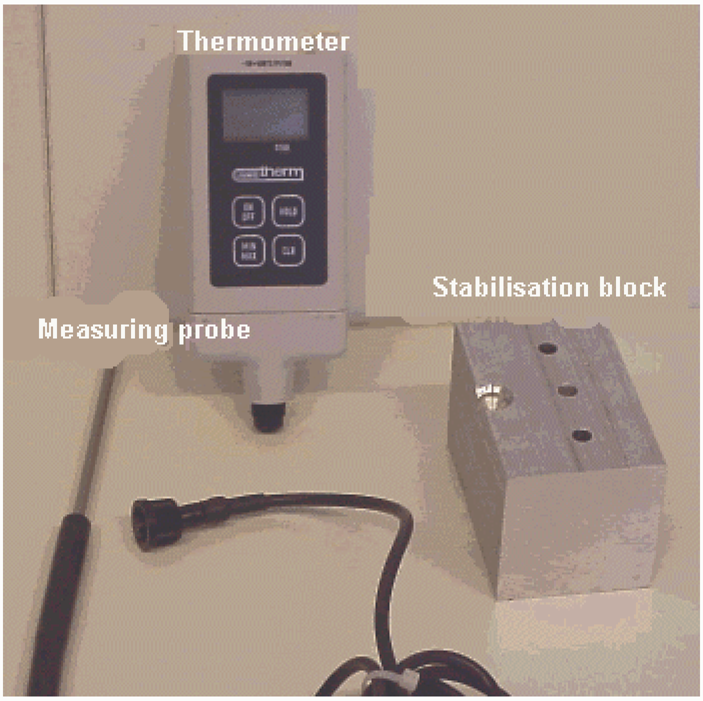
1.2 Calibration thermometer

Procedure:

1. Place the calibration thermometer in the aspirator. Remove the sock from the wet bulb sensor.
2. After approx. 15 minutes read off the temperature on the calibration thermometer.
3. Read off the temperature measurements on the monitor.
4. Enter the appropriate corrections so that the *ECONOMIC* NT displays the same as the thermometer.
   The climate must not vary between steps 2 and 4 in this method. Proper adjustment is not possible in sunny, windy weather.

This method requires a relatively long period (approx. 20 minutes per aspirator). The calibration thermometer has to be recalibrated annually.

1.3. Stabilisation block



Procedure:

1. Place the stabilisation block in the aspirator over the dry and wet bulb sensors.
2. Check the reading of the block thermometer for one minute, for example. The temperature must not vary (*).
3. Read off the temperature measurements on the monitor.
4. Enter the appropriate corrections so that they are the same as the temperature shown by the block.
5. Remove the block from the aspirator.

(*) Place the stabilisation block in the greenhouse at the start of the service visit. The block temperature may not vary by more than 1℃ from that of the greenhouse.

Once the block is at ambient temperature, it requires approx. 5 minutes per aspirator. The method can be used in changeable climatic conditions (sun, wind, heating have no effect). The block thermometer has to be recalibrated annually.

2. Outside temperature sensor

Like the aspirator sensors, the outside temperature sensor is of type PT500. The calibration resistor adjustment method is the best to use. The outside temperature sensor is connected in the same way as the aspirator temperature sensors

Note:
Proper adjustment is only possible if the DSAT has already been energised for a few hours (electronics at operating temperature).

Procedure:

1. Set the actuators of the vents, curtains and such like to manual mode. (During adjustment, the measurement is 20.5℃. This might not match the actual outside temperature at that moment.)
2. Connect the calibration resistor to the outside temperature sensor terminals in the junction box at the bottom of the weather-station mast. Connecting in the weather sensor box in the mast is better, but this is often very impractical.
3. Read off the outside temperature measurement on the monitor.
4. Enter the outside temperature correction so that the *ECONOMIC* NT displays the same as the temperature shown by the 20.5℃ calibration resistor.
5. Remove the calibration resistor and reconnect the temperature sensor.

3. Water sensor

A water sensor is a temperature sensor of type PT500. Pipe, boiler and tank temperatures are measured using water sensors. The calibration resistor adjustment method is the best to use. The calibration resistor for water sensors has a value of 60.4℃. The water sensor is connected the same way as the aspirator temperature sensors.

Note:
Proper adjustment is only possible if the DSAT has already been energised for a few hours (electronics at operating temperature).

Procedure:

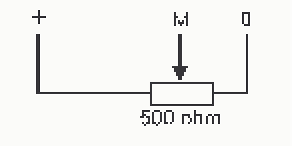
1. Set the actuators of the boiler, mixing valve and such like to manual mode. (During adjustment, the measurement is 60.4℃. This might not match the actual temperature at that moment.)
2. Connect the calibration resistor (60.4℃) in place of the water sensor.
3. Read off the temperature measurement on the monitor.
4. Enter the water temperature correction so that the *ECONOMIC* NT displays the same as the temperature shown by the 60.4℃ calibration resistor.
5. Remove the calibration resistor and reconnect the water sensor.

NB:

You are strongly advised against adjustment with an installed readable pipe thermometer as the reference. This deviates by definition.

4. Feedback devices

A feedback device is an adjustable 500 ohm resistor. Examples of feedback devices are: vent position, CO2 selector (via resistance circuit). A feedback device is connected as follows:



Vent position detector adjustment procedure:
1. Close the vents.
2. Read off the gross measurement in the *ECONOMIC* NT.
3. Enter the gross measurement under 'Gross measurement 0%'.
4. Open the vents.
5. Read off the gross measurement in the *ECONOMIC* NT.
6. Enter the gross measurement under 'Gross measurement 100%'.

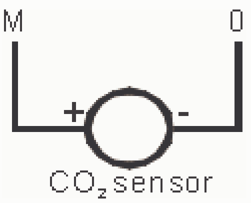
Adjusting the vent position in winter
The vents may not be open 100%, otherwise it will become too cold in the greenhouse. The input 100% must therefore be estimated. In spring or summer the input 100% must be accurately adjusted.

Setting vents to standby position
When adjusting the 'Gross measurement 0%' of a fitted vent position feedback device, you are advised to set the vents to standby position (cables taut, vents not quite opening).

5. Voltmeter

Examples of parameters for which a voltmeter is used are: EC (0-4 V), pH (0-4 V), CO2 (0-100 mV), RH (0-4 V) etc.

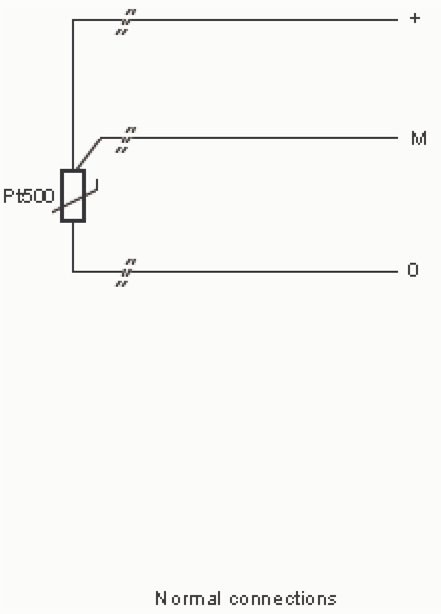
A voltmeter is connected as follows:

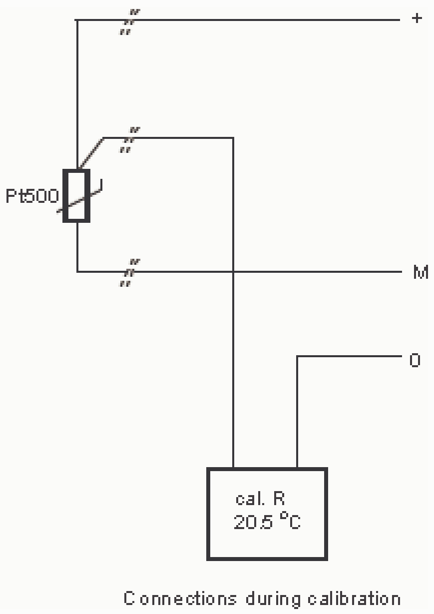


Adjustment of the various sensors with a voltage output is explained in the Service Help screens for the relevant settings.

6. Adjustment with calibration resistor in the DSAT

The temperature sensors (aspirator, water and outside temperature sensors) can be adjusted using a calibration resistor. This is described above. A practical variant on this method is to make the adjustment with the calibration resistor in the DSAT in place of the PT500 sensor.





Procedure:
1. Disconnect the wire from the M terminal in the DSAT and connect it to the calibration resistor.
2. Move the wire from the 0 terminal to the M terminal.
3. Connect the second terminal of the calibration resistor to the 0 terminal.
4. Determine the correction; please refer to the section on "Adjustment with calibration resistor' for details.
5. Once the adjustment is finished, reconnect the terminals as standard.

If this adjustment method is used, any deviation in the PT500 is not corrected.

ERS-2 setup

1. General

A measurement signal is converted to a net measurement by means of settings from the setup screen. This screen is used for all sensors, detectors and feedback devices. There is, therefore, a large number of setup options. The required values of the various settings are known for almost all measurement devices. These values are automatically entered when the system is loaded as new. Only one or two settings are needed for setup. The table below lists the meanings of the various settings.
For general information on the setup or adjustment of measurement devices please refer to **Adjusting Measurement Devices** in the ***ECONOMIC* NT Service Manual**
.

I/O gross measurement	This value is uploaded by the DSAT.
I/O net measurement	End result, after leaving the setup screen a copy of I/O net measurement is shown.

I/O correction I/O minimum scaling value I/O maximum scaling value I/O minimum gross measurement I/O maximum gross measurement	These settings are used in converting an I/O gross measurement to an I/O net measurement.
I/O already adjusted?	This is an aid when commissioning an *ECONOMIC* NT. After the measurement device has been adjusted, this setting must be set manually to Yes. When a list of I/O connections is generated, the setting is included, and the system shows which measurement devices have or have not been adjusted.
I/O linearisation table type	This setting is used for sensors which do not emit a linear measurement signal.
I/O measurement type or subtype	The DSAT uses the measurement type in calculating the I/O gross measurement
I/O loop number I/O loop type I/O unit number I/O unit type I/O card number I/O card type I/O channel number I/O channel type	Data on connection of the measurement device.

2. Measurement devices

Almost all measurement devices must be adjusted by the **I/O correction**. The exceptions are described in chapters 3-7. **I/O correction** is the value by which the **I/O net measurement** must be adjusted to obtain the correct measurement.

Example of working with **I/O correction**:
An **I/O net measurement** of 20.1 is shown in the setup screen of a greenhouse temperature. **I/O correction** stands at 1.1. The reference (calibration resistor or thermometer) gives a temperature of 20.5℃. The greenhouse temperature is thus shown to o low by 0.4℃. **I/O correction** must be increased by 0.4, and a figure of 1.5 must be entered. **I/O already adjusted?** then has to be set to **Yes**.

Changing other settings apart from **I/O correction** results in incorrect measurements in a standard sensor. The required values for the other settings of all the measurement devices are specified in default values.

3. Feedback devices

The devices used to measure vent positions, curtain positions, burner positions and levels are all feedback devices. They have to be adjusted using **I/O minimum gross measurement** and **I/O maximum gross measurement**. **I/O correction** must remain set to zero.

Example of working with **I/O minimum gross measurement** and **I/O maximum gross measurement**.

13. Close the vents fully.
14. Read off **I/O gross measurement** and enter this value under **I/O minimum gross measurement**.

15. Open the vents fully.
16. Read off **I/O gross measurement** and enter this value under **I/O maximum gross measurement**.
17. Set **I/O already adjusted?** to **Yes**.

Changing other settings apart from **I/O minimum gross measurement** and **I/O maximum gross measurement** results in incorrect measurements in a standard sensor. The required values for the other settings of all the measurement devices are specified in default values.

4. Detectors

I/O net measurement can only have the value 0 or 1 for detectors. A detector can be forced into a particular position by entering 1 or -1 under **I/O correction**. During normal operation **I/O correction** is always set to 0.
Once the functioning of a detector has been checked when the system is switched on, **I/O already adjusted?** then has to be set to **Yes**.

5. RH or wet bulb temperature measurements

When loading as new, the system does not know whether the RH is being measured with a wet bulb temperature or an electronic RH measurement device. The setpoints in the setup screen assume a wet bulb temperature measurement device. If an electronic RH measurement device is used, the settings must be corrected manually. The setpoints are given in the table below.

	Wet bulb temperature	**Electronic RH**
I/O minimum scaling value	-40.0	0.0
I/O maximum scaling value	40.0	100.0
I/O minimum gross measurement	0	0
I/O maximum gross measurement	8000	1000
I/O linearisation table type	No linearisation	No linearisation
I/O measurement type or subtype	Pt500-1 space 0-8000: 40℃ (60 sec)	Electronic RH 0-1000 100% (60 sec)

The wet bulb temperature and electronic RH are both adjusted by the **I/O correction**, see Measurement devices.

The text **60 sec** after the measurement type means that the DSAT uploads the average measurement during the preceding 60 seconds. Any other average, e.g. **1 sec**, causes a jerky measurement signal and adversely affects the control system.

6. Uni-switch measurement

When loading as new, the system does not know what type of measurement is downloaded via x: unscaled net measurement without delay. The settings in the setup screen must be corrected manually. Firstly, determine the measurement type using the default values section and then complete the settings specified below.

I/O minimum scaling value
I/O maximum scaling value
I/O minimum gross measurement
I/O maximum gross measurement
I/O measurement type or subtype

Measurement x: unscaled net measurement without delay is adjusted by the **I/O correction**, see Measurement devices.

The Service tab of the Uni-switch General menu contains the settings **Measurement type** and **Average type**. . The setpoints for these must correspond to the **I/O measurement type** or **Subtype** from the setup screen. If you opt for a time of longer than 1 minute under **Average time**, a measurement type with a maximum average of 60 seconds must be selected in the setup screen.

7. Sensors from other suppliers

7.1. Priva NTC

If a Priva NTC is used for a particular temperature measurement device instead of a Pt500, the settings from the setup screen must be manually corrected. The setpoints are specified in the table below.

The Priva NTC is adjusted by the **I/O correction**, see Measurement devices.

I/O minimum scaling value	0
I/O maximum scaling value	0
I/O minimum gross measurement	0
I/O maximum gross measurement	5000
I/O linearisation table type	Priva NTC linearisation
I/O measurement type or subtype	Voltage 5 V 0-5000: 5 V (xx sec)

The text **xx sec** after the measurement type indicates over how many seconds the measurement signal is averaged by the DSAT. This time is a function of the measurement type, see default values. Any other average adversely affects the control system.

7.2. Other

In principle, any sensor with a linear measurement signal can be connected to the *ECONOMIC* NT. The following procedure is used to set it up:

18. Determine the measurement type and enter this under **I/O measurement type** or **Subtype**.
19. Select two calibration points which are not too close to each other.
20. Feed the measurement signal from the low calibration point to the DSAT.
21. Enter the known measurement under **I/O minimum scaling value**.
22. Read off **I/O gross measurement** and enter this value under **I/O minimum gross measurement**.

23. Feed the measurement signal from the high calibration point to the DSAT.
24. Enter the known measurement under **I/O maximum scaling value**.
25. Read off **I/O gross measurement** and enter this value under **I/O maximum gross measurement**
26. Set **I/O already adjusted?** to **Yes**.

This procedure is similar to that for setting up a feedback device. The calibration points have a known measurement for the 0% vent position and the 100% vent position when adjusting a vent position.

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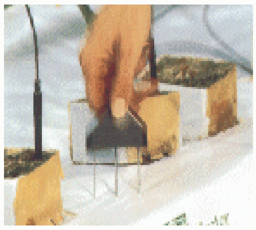
8. Default values

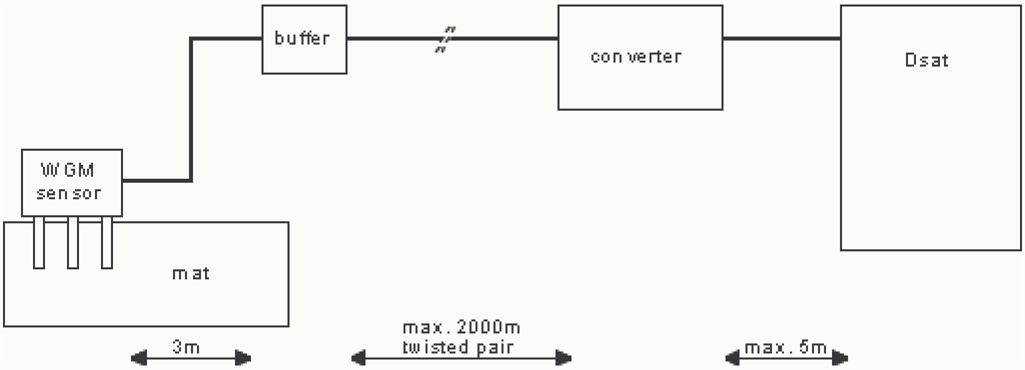
Grodan Water Content Meter and HOOGENDOORN ECONOMIC

A water content meter can be used to measure the water content, the EC and the temperature in a rockwool mat. By connecting the water content meter to the ECONOMIC the three measurements can be registered in a graph and watering can be started

according to the water content measurement.
A level measurement is started up in the ECONOMIC for the water content measurement. A uni-switch is used for the EC and temperature measurements.



1. Connection



Buffer

- The buffer makes it possible for the measuring signal to be fed over a long distance.

Converter

- Two important functions of the converter: conversion of the measuring signal from digital to analogue and provision of DC isolation of the output signals.
- The supply voltage for the interface is 10 - 28 Volt dc/ac (10 W). Green LEDs show that the supply voltage is OK.
- A red flashing LED signifies an alarm situation.
- The output signal can be set variably using dip switches:
  0 - 5 Vdc, 0 - 10 Vdc, 0 - 20 mA or 4 - 24 mA. A measuring signal of 0 - 5 V is chosen for all three measurements for connection in the Dsat.
- The type of rockwool mat can be set using three dip switches. This setting is important for a good measurement.

Dsat

- The three measurements are read in as voltage measurement 0 - 5 V. Connection to the terminals 0 and M.

2. Installation

In consultation with the client place the water content meter sensor in a representative position in the greenhouse. The casing of the sensor and buffer is splash-waterproof. Bear this in mind when installing.

3. Adjustment and verification of the measurements

A 'calibration block' is supplied with the water content meter. This is a plastic block that fits exactly round the three measuring pins of the sensor.

3.1 Water content measurement

The water content measurement is started up as a level measurement in the ECONOMIC.
0 - 5 Volt (measuring signal) -> 0 - 100% (measurement)

Adjustment of measurement:
1. Do not place the sensor in a mat:
   measuring signal = 0 Volt -> gross measurement = 0 points
2. Place the calibration block around the sensor:
   measuring signal = 5 Volt -> gross measurement = approx. 5,000 points

3.2 EC measurement

The EC measurement is started up as a uni-switch in the ECONOMIC.
0 - 5 Volt (measuring signal) -> 0 - 10 mS/cm. The measurement is temperature corrected.

Uni-switch service settings:

measurement type	voltage 5 Volt
measurement type average	60 seconds
scaling value	2

Measurement verification:
1. Do not place the sensor in a mat:
   measuring signal = 0 Volt -> measurement scaled delayed = 0
2. Place the calibration block around the sensor:
   measuring signal = ca.1,5 Volt -> measurement scaled delayed = approx. 3 mS

3.3 Temperature measurement

The temperature measurement is started up as a uni-switch in the ECONOMIC.
0 - 5 Volt (measuring signal) -> 0 - 50 ℃

Uni-switch service settings:

measurement type	voltage 5 Volt
measurement type average	60 seconds
scaling value	0.1

Measurement verification:
1. Do not place the sensor in a mat:
   measuring signal = 0 Volt -> measurement scaled delayed = 0
2. Place the calibration block around the sensor:
   measuring signal = approx. 1.8 Volt -> measurement scaled delayed = approx. 18 ℃

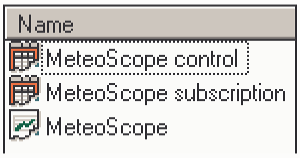
Retrieval of weather forecast by MeteoScope

1. What does it do...

It is possible to change settings that concern the retrieval of the weather forecast by MeteoScope via the settings list '*MeteoScope subscription*'. There are **three** possibilities to retrieve the weather forecast, which are:

1. via the BBS of Meteo Consult
2. via the local area network
3. via the FTP server of Meteo Consult

The settings list '*MeteoScope subscription*' can be found in the file list '*MeteoScope*' of the '*ECONOMIC Explorer*':

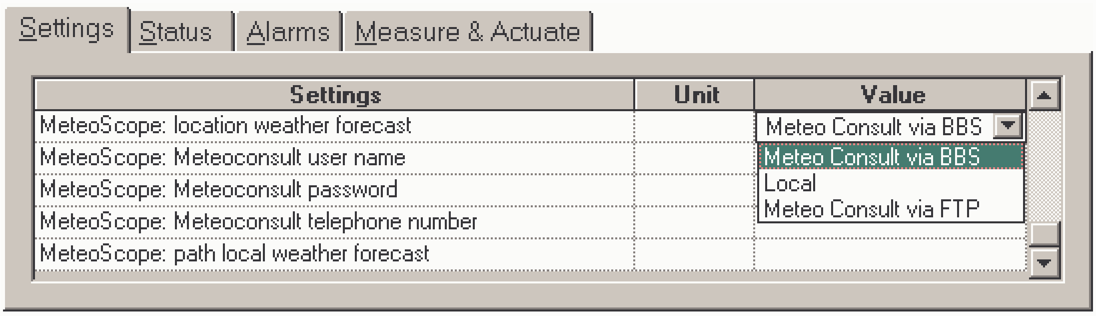


Consult the help of the individual settings for more information

2. Help with MeteoScope weather forecast via the BBS of Meteo Consult

The MeteoScope makes a direct modem connection to the BBS of Meteo Consult with this way of retrieving. After the connection is established the weather forecast will be retrieved from this BBS.

2.1. Settings tab

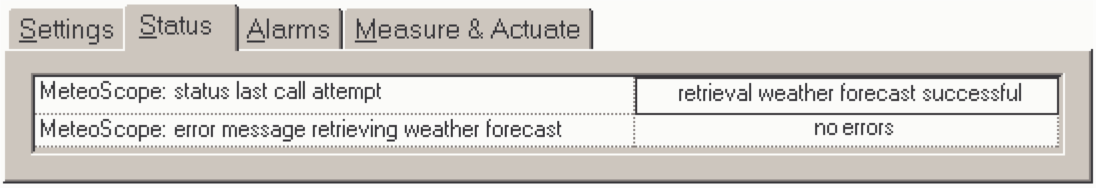


On the tab *Settings* there is a selection named '*MeteoScope: location weather forecast*' where you can choose on what way the weather forecast must be retrieved. Set this to '*Meteo Consult via BBS*' to retrieve the weather forecast from the BBS of Meteo Consult.

The phone number of the BBS of Meteo Consult must be filled in at the setting '*MeteoScope: Meteoconsult telephone number*', possibly provided with prefix zeros to dial via a possibly present home exchange. Also the by Meteo Consult provided user name and password must be filled in at '*MeteoScope: Meteoconsult user name*' and '*MeteoScope: Meteoconsult password*'.

The setting '*MeteoScope: path local weather forecast*' will **not** be used while retrieving the weather forecast via BBS.

2.2. Status tab



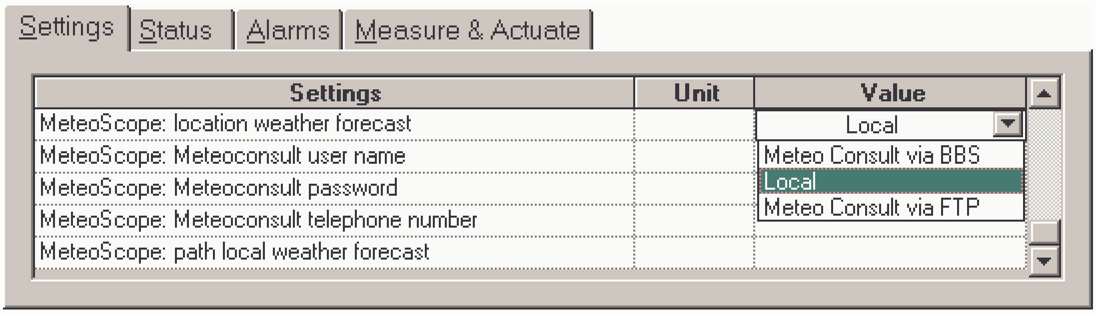
The status '*MeteoScope: status last call attempt*' for retrieving the weather forecast via BBS can contain the following texts:

- no weather forecast retrieved yet
  only if there has never been a retrieval of the weather forecast this status will be shown
- retrieval weather forecast successful
  the weather forecast was downloaded and processed successfully during the last try
- retrieval weather forecast not successful
  MeteoScope was unable to retrieve the weather forecast. This will only show when the MeteoScope was unable to retrieve the weather forecast during all the retries.
- processing weather forecast failed
  the weather forecast was downloaded successfully, but not correctly processed by the MeteoScope. When this error keeps occurring it is advisable to contact your dealer

3. Help with MeteoScope weather forecast on the local area network

With this way of retrieving the weather forecast there will be **no** direct connection to Meteo Consult from the computer on which MeteoScope runs, but the weather forecast file will be retrieved through the local area network from an other computer.

3.1. Settings tab

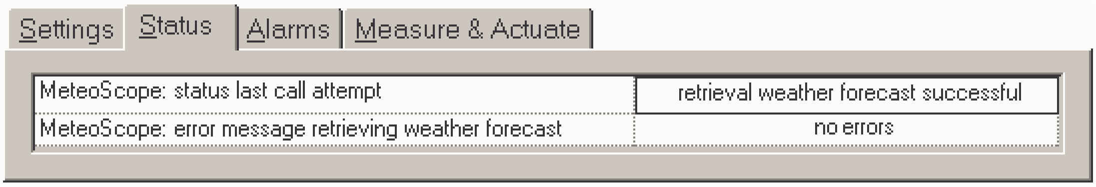


On the tab *Settings* there is a selection named '*MeteoScope: location weather forecast*' where you can choose on what way the weather forecast shall be retrieved. Set this to 'Local' to retrieve the weather forecast from an other computer in the local area network.

The network path of the other computer must be filled in at the setting '*MeteoScope: path local weather forecast*', for example *\\SERVER\SHARE*.

The settings '*MeteoScope: Meteoconsult telephone number*', '*MeteoScope: Meteoconsult user name*' and '*MeteoScope: Meteoconsult password*' will **not** be used while retrieving the weather forecast via the local area network.

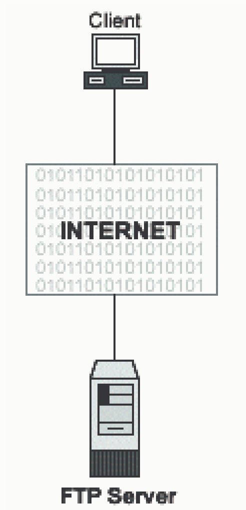
3.2. Status tab



The status '*MeteoScope: status last call attempt*' for retrieving the weather forecast via the local area network can contain the following texts:

- <u>no weather forecast retrieved yet</u>
  only if there has never been a retrieval of the weather forecast this status will be shown
- <u>retrieval weather forecast successful</u>
  the weather forecast was downloaded and processed successfully during the last try
- <u>retrieval weather forecast not successful</u>
  MeteoScope was unable to retrieve the weather forecast. This will only show when the MeteoScope was unable to retrieve it during all the retries.
- <u>processing weather forecast failed</u>
  the weather forecast was downloaded successfully, but not correctly processed by the MeteoScope. When this error keeps occurring it is advisable to contact your dealer

4. Help with MeteoScope weather forecast via the FTP server of Meteo Consult



Besides the possibility of retrieving the weather forecast by dialing to Meteo Consult (via the BBS) it is also possible to retrieve the weather forecast via Internet from Meteo Consult.

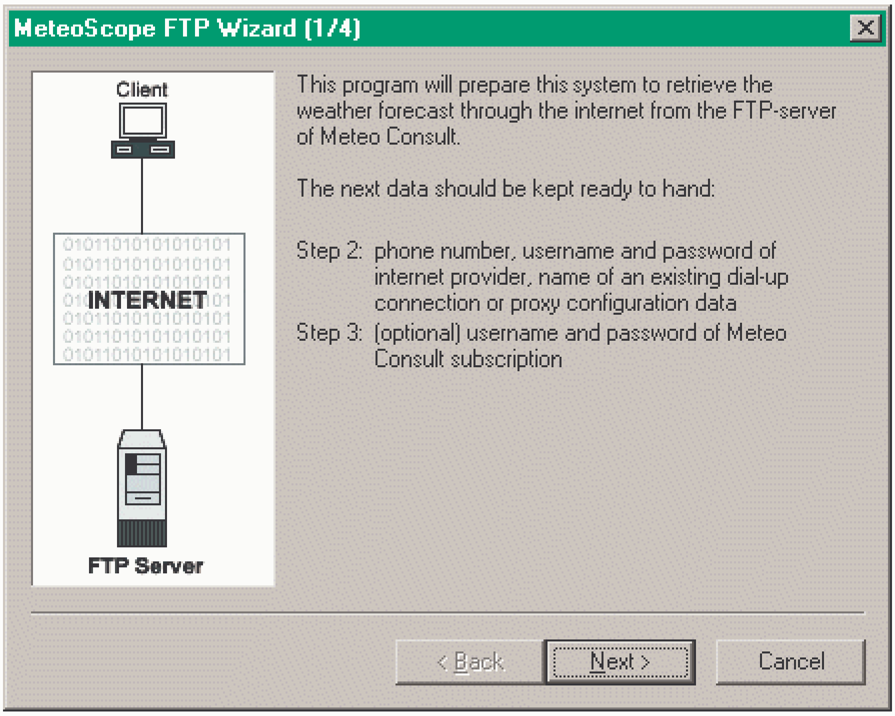
With this possibility there won't be connected directly to the server of Meteo Consult (via the BBS), but a connection is established with an Internet Service Provider. As soon as the Internet connection is established the server of Meteo Consult is contacted through the Internet by means of the FTP protocol.

4.1. Configure retrieving weather forecast via FTP

The system needs to be configured first before you are able to retrieve the weather forecast via FTP. There is a wizard available that gives you the opportunity to configure all settings needed for this way of retrieving the weather forecast. This wizard is available when MeteoScope supports the downloading of the weather forecast via FTP.

The wizard can be started by clicking the **Start**-button of Windows and choosing the following menus: **Programs** » **ECONOMIC NT** » **Wizard MeteoScope weather forecast via FTP**.

The FTP wizard will be started, <u>Step 1</u> appears:

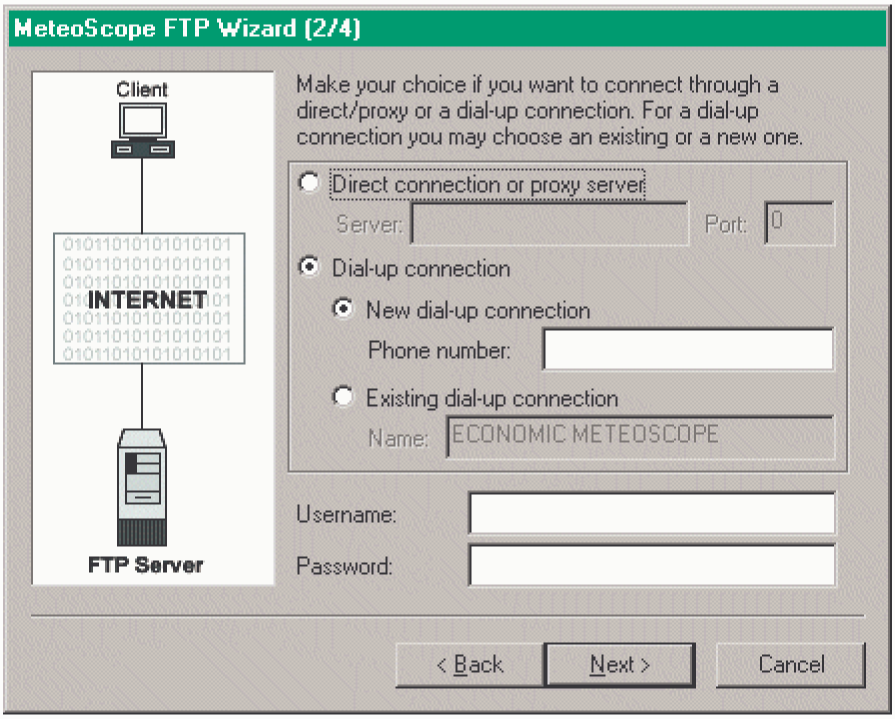


The wizard indicates that at least one of the following sets of data should be kept ready to hand:

1. phone number, username and password of the Internet Service Provider
2. name of an existing dial-up account (this also includes the username and password of the Internet Service Provider)
3. address of proxy server and proxy port

Optionally the username and password of Meteo Consult can be filled in at Step 3.

Click the **Next** button to proceed, Step 2 will appear:



There are 4 ways of connecting to the Internet:

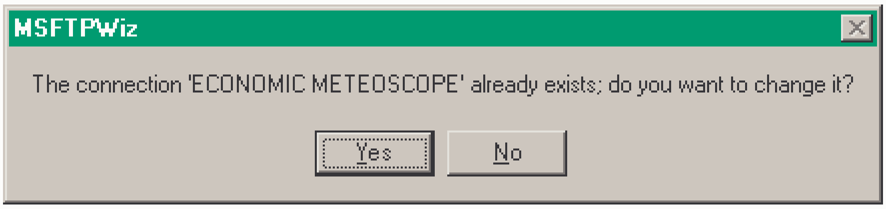
1. If the Internet is accessible by means of a direct Internet connection (i.e. through a cable modem that doesn't requires to dial-in) you select **Direct connection or proxy server** and don't fill out the **Proxy server**. The **Port** can be set to 0.
2. If the Internet is accessible by means of a proxy server you select **Direct connection or proxy**

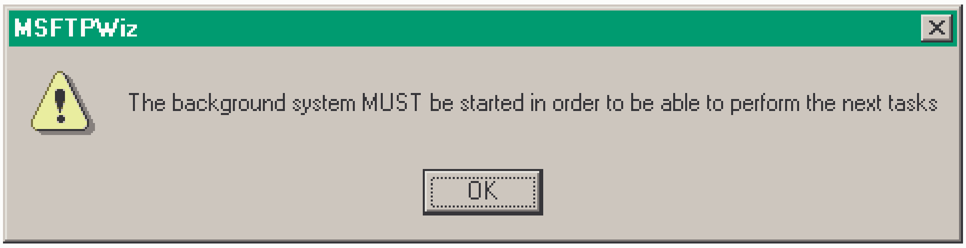
server and fill out the data of the proxy server at **Server** and **Port** (if you want to use the default port, you can enter 0). It might be necessary to fill out the **Username** and **Password** at the bottom edit boxes.

3. When you want the wizard to create a new dial-up connection for you, you choose **Dial-up connection** and hereafter **New dial-up connection** when these aren't already selected. At the edit box besides **Phone number** you fill out the phone number of the Internet Service Provider (possibly provided with prefix zeros to dial via a possibly present home exchange) and the **Username** and **Password** at the bottom edit boxes.
4. If you want to use an already existing dial-up connection from your system, you choose **Dial-up connection** and hereafter **Existing dial-up connection** when these aren't already selected. At the edit box besides **Name** you fill out the name of the already existing dial-up connection and the **Username** and **Password** of this connection at the bottom edit boxes.

When everything is set up you may click **Next** to proceed with the wizard.

It is possible that you see one of the following reports before Step 3 appears:

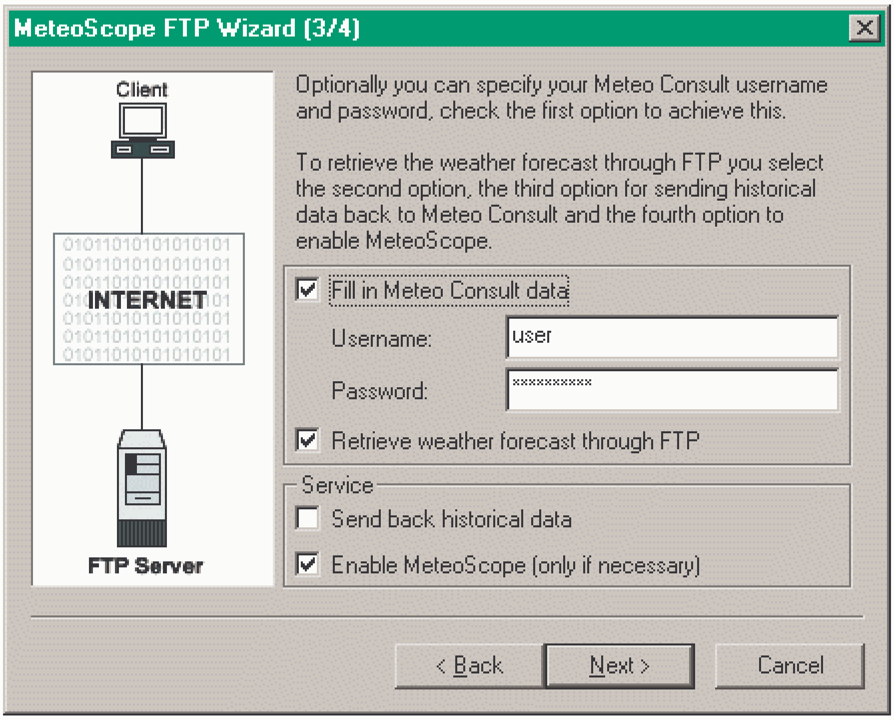
1. 

When this report appears there is already an existing dial-up connection with this name, if you choose **Yes** the phone number and all other options are overwritten by the settings of the wizard, if you choose **No** the current settings will be unchanged.
2. 

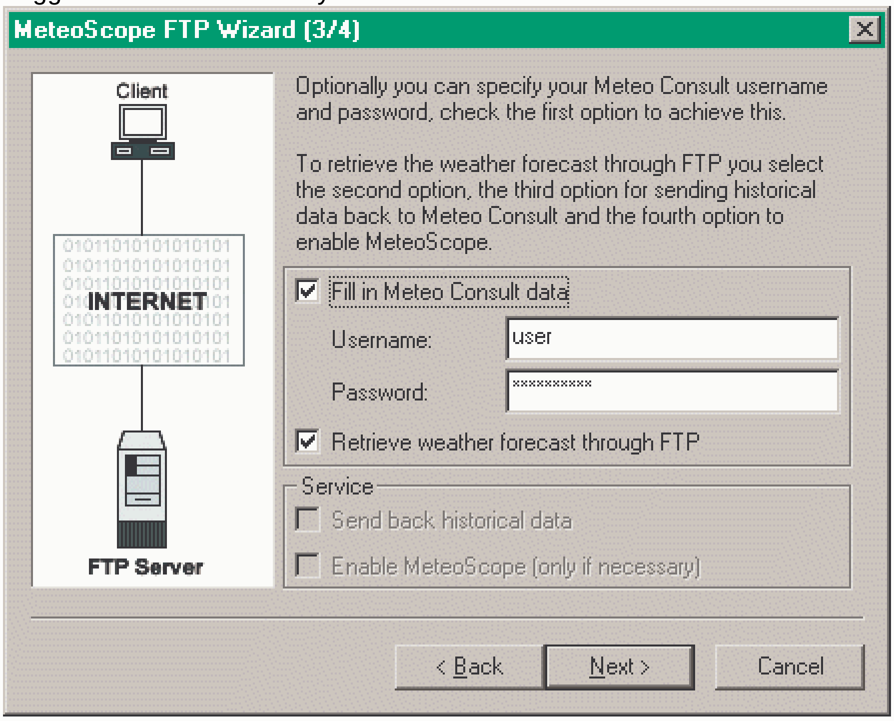
This report indicates that the background system isn't running at the moment; you won't be able to configure the settings in Step 3. It will be possible to finish the wizard because the settings at Step 3 are optional.

Step 3 will appear:

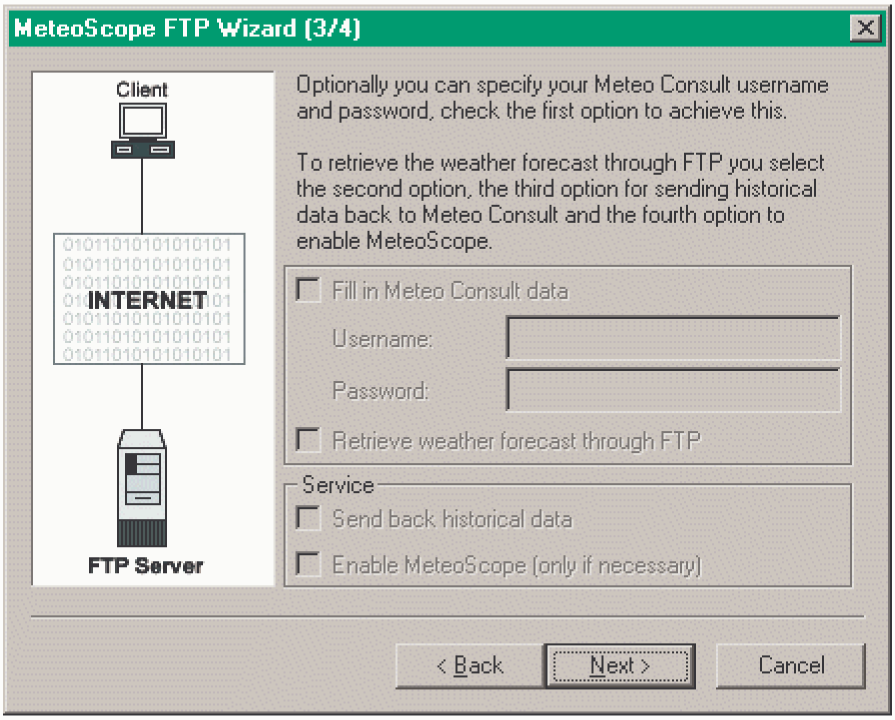
- Logged in as administrator on the system:



- Logged in as user on the system:



or when the background system isn't running Step 3 will look like this:



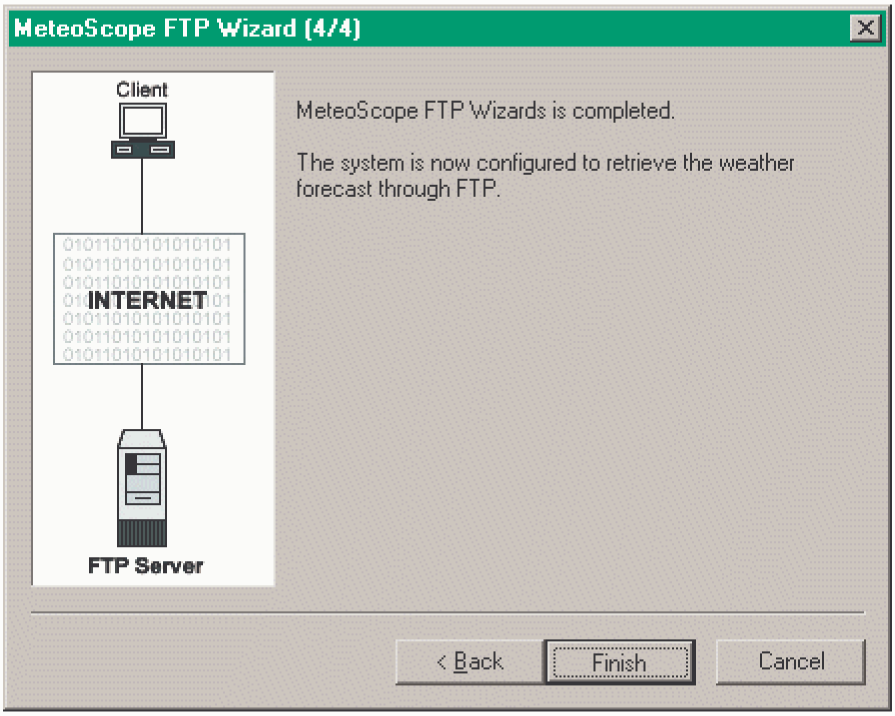
When the background system is running it is for all users possible to set the following options at Step 3:

- Fill in Meteo Consult data: when this option is checked the filled in **Username** and **Password** will be saved as the username and password in MeteoScope
- Retrieve weather forecast through FTP: when this option is checked the way of retrieving the weather forecast is set to '*via FTP*'

and the following options are only accessible for administrators on the system (these options are on the ECONOMIC only accessible at the Service level):

- Send back historical data: besides that the weather forecast is retrieved the saved historical data of the past 24 hours will be collected and send back to Meteo Consult so they could use this for analyses
- Enable MeteoScope: '*MeteoScope: switch off*' will be set to '*No*' when this option is checked.

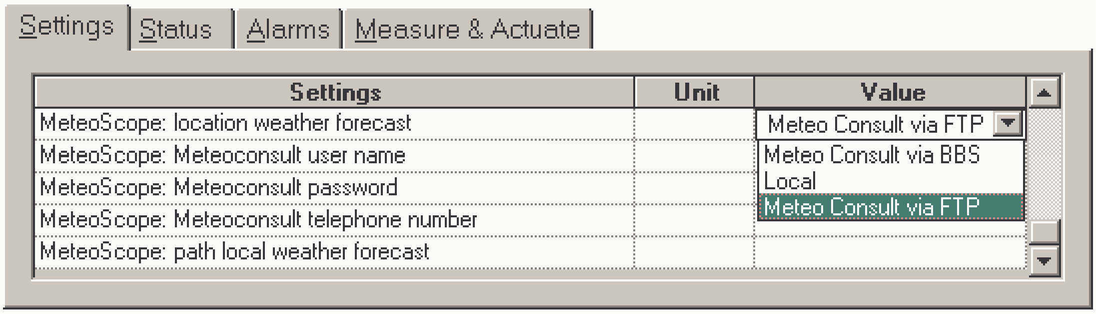
When you click the **Next** button Step 4 will appear:



The wizard is now completed, if you click on **Finish** the wizard will be closed.

4.2. FTP settings in 'MeteoScope subscription'

4.2.1. Settings tab



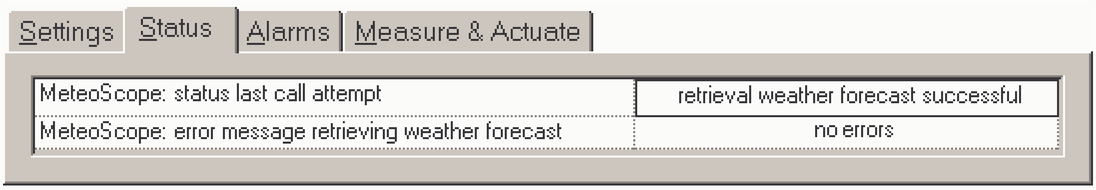
To manually configure the way of retrieving the weather forecast there is the selection '*MeteoScope: location weather forecast*' available at which the retrieving via FTP can be checked. It's also possible to check that the weather forecast should be retrieved via the BBS of Meteo Consult or via the local area network when available.

The username and password should also be provided at '*MeteoScope: Meteoconsult user name*' and '*MeteoScope: Meteoconsult password*' while retrieving the weather forecast via FTP.

Mind out the use of upper and lower case while filling in the by Meteo Consult distributed username and password

The settings '*MeteoScope: Meteoconsult telephone number*' and '*MeteoScope: path local weather forecast*' will **not** be used while retrieving the weather forecast via FTP.

4.2.2. Status tab



The status '*MeteoScope: status last call attempt*' for retrieving the weather forecast via FTP can contain the following texts:

- no weather forecast retrieved yet
  only if there has never been a retrieval of the weather forecast this status will be shown
- retrieving weather forecast
  MeteoScope is currently downloading the weather forecast; all of the following actions belong to this status: the possible collection of historical data, the retrieval of the weather forecast or waiting for a new retry because of a failure while downloading during the last try
- retrieval weather forecast successful
  the weather forecast was downloaded and processed successfully during the last try
- retrieval weather forecast not successful
  MeteoScope was unable to retrieve the weather forecast. This will only show when the MeteoScope was unable to retrieve it during all the retries.

- processing weather forecast failed
  the weather forecast was downloaded successfully, but not correctly processed by the MeteoScope. When this error keeps occurring it is advisable to contact your dealer

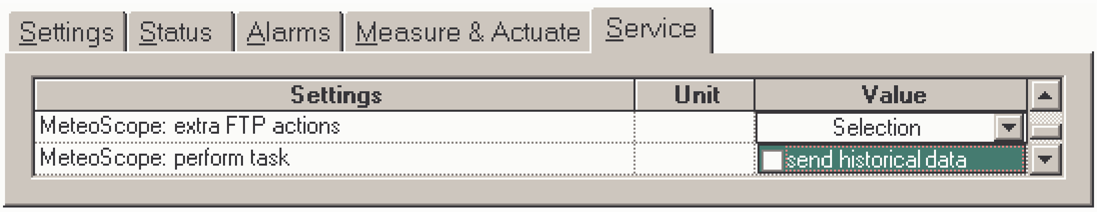
When the weather forecast will be downloaded via FTP, it is possible to see a detailed error message at the status '*MeteoScope: error message retrieving weather forecast*'. When the weather forecast is downloaded successfully the status '*no errors*' will be shown.

The other (error) messages at '*MeteoScope: error message retrieving weather forecast*' might be one of the following:

message	***description*; possible cause**
No connection with Internet: dialup failed and no proxy	*the Internet connection could not be established*; a (temporary) malfunction with the modem, an incorrect username or password for the Internet Service Provider, an incorrect telephone number, an incorrect proxy server or an incorrect proxy port
Initialization or connecting to FTP server failed	*the FTP-server could not be contacted*; an incorrect server name, FTP-server (temporary) not reachable, an incorrect username or password for the FTP-server
Downloading of remote file failed	*unable to retrieve the file from the remote server*; file does not exist on the remote server, no access rights to retrieve the file from the server
Uploading of local file failed	*unable to write the file to the remote server*; local file does not exist, no rights to write the file to the remote server
Unable to delete file	*unable to delete local or remote file*; file does not exist, no rights to delete the file
One of the DLLs is not registered	*unable to locate a DLL*; EcoInet.dll not registered, contact your dealer to register this DLL
Receiving weather forecast failed	*an unknown failure*; none of the above problems is the cause, check the FTP_tee.log for more information and contact your dealer

4.2.3. Service tab

This tab is only accessible under the Service level



Above-mentioned figure gives a selection with extra FTP actions (at the setting '*MeteoScope: extra FTP actions*') that can be switched on or off:

- send historical data: with this action the historical data of the past 24 hours is collected and send back to Meteo Consult while downloading the next weather forecast

Automating E-VOS

This description is based on HOOGENDOORN ECONOMIC version 6 or 7.

1. Introduction

Velzo currently employs the Velzo E-VOS principle for working with an existing installation according to the VOS principle. New installations are also being built in this way. How can we best automate a Velzo E-VOS?

2. Experience

We have now acquired experience with the E-VOS. We can exercise control in two ways:

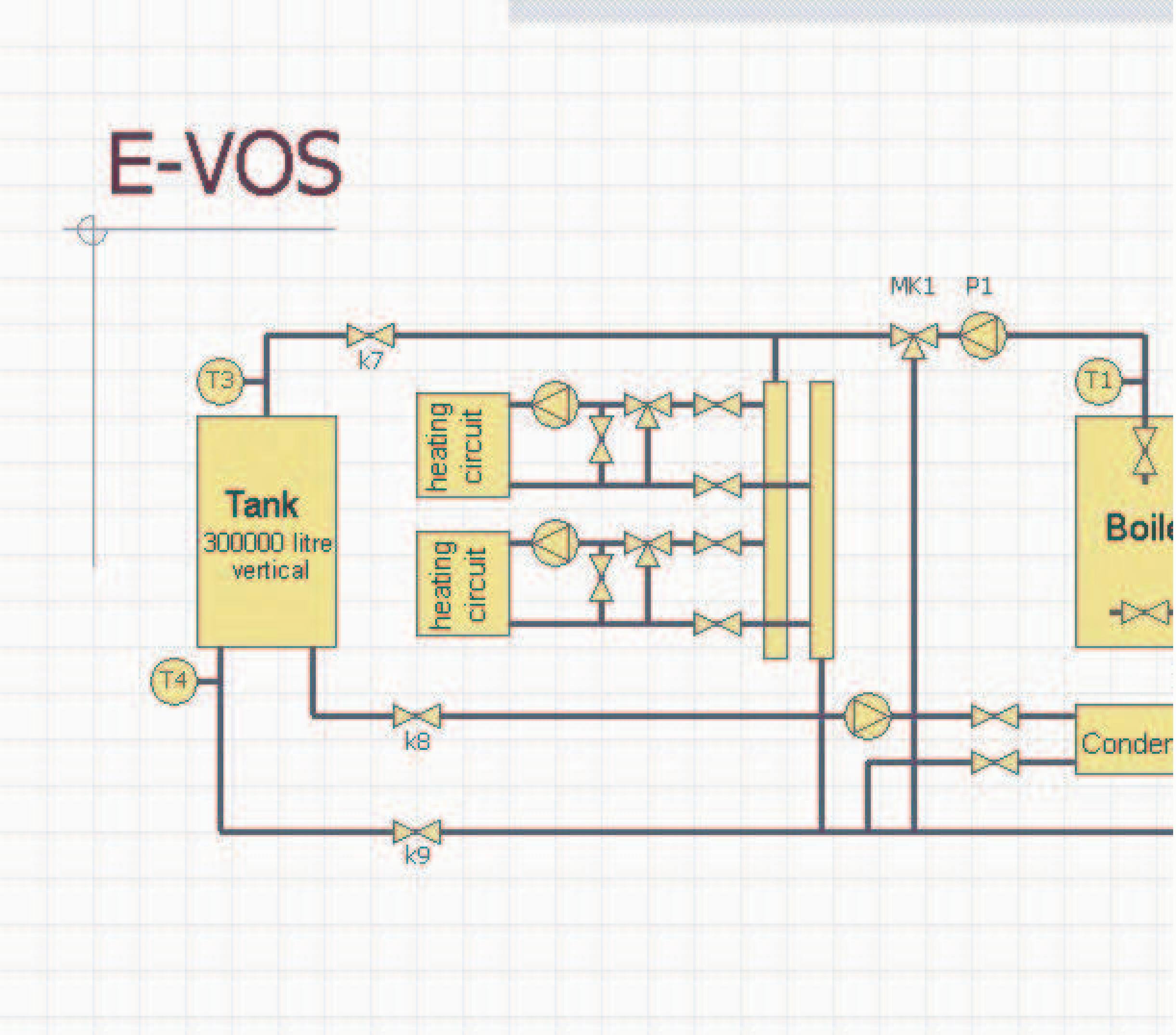
- We can exercise control by using the valve as a filling valve, in which case the frequency-controlled pump has to deliver sufficient flow to cool the boiler. If so desired we can then work with a summer and winter position.
- We can control the valve with a uni-switch according to boiler temperature (the valve is allowed to open as soon as the boiler temperature is high enough) and the frequency-controlled pump as a filling valve.

Control with a valve and a frequency-controlled pump is actually doubling up. So a clear choice must be made to keep one of the two controls as constant as possible. Using both controls at the same time will **never** work.
Hoogendoorn Automation itself prefers the first option because controlling a valve is smoother.

3. How to start up

The diagram below shows a mixing valve MK1. It is controlled as a filling valve and can be controlled on the basis of T2 (return temperature monitoring).
Pump P1 with frequency controller is started up with a uni-switch (control loop with one measurement). The frequency controller gives an output of 0-20 mA. This signal can be converted to 0-100% or 0-50 Hz via the uni-measurement. If so desired use a GU board.

4. Diagram



5. How to control

A glance at the diagram shows us that there is an open connection between the tank and the distribution header. This means that you must ensure that at least one layer always remains filled.
It is therefore a good idea to control primarily according to tank layers that are filled with a limited burner position.
We can also work with the CO2 filling curve. There does not need to be any counteraction. It can even work very well in tandem and in this way you effect a KEBUS control.

As we have seen, valve MK1 is controlled as a filling valve on the basis of boiler return temperature (energy control). The frequency-controlled pump is switched on by the filling pump ON actuation and then the uni-switch controls the speed according to the set value. It must in any event be high enough to ensure sufficient flow/recirculation across the boiler (possibly influence of outside temperature in order to effect a summer and winter position).

It is important **NOT** to control the quantity of buffer layers and the burner position on the basis of the energy number. After all, this is by definition chasing the facts. It is far better to make use of influences such as outside temperature and wind speed. These are influences that say something about the energy requirement for the day in question, but that do not fluctuate too rapidly.

6. Settings

tank layers store boiler: ViP -

		Start time	Relative t	Change	Value	Outside temp - °C		Wind speed - m/s	
						15.0	5.0	4.0	10.0
1	Y	-02:30	Sunrise	00:00	2	4		4	

tank store boiler: maximum capacity: ViP - m³/h

		Start time	Relative t	Change	Value	Outside temp - °C		Wind speed - m/s	
						15.0	5.0	4.0	12.0
1	Y	00:00	Clock	00:00	200	100		100	

uni-switch: setpoint -

		Start time	Relative t	Change	Value	Outside temp - °C		Wind speed - m/s	
						15.0	5.0	4.0	10.0
1	Y	00:00	Sunrise	00:00	25.0	25.0		25.0	

average tank temperature CO2: ViP - °C

		Start time	Relative t	Change	Value
1	Y	07:00	Clock	09:00	100
2	Y	00:00	Sunset	00:00	40

Silo level measurement and HOOGENDOORN ECONOMIC

1. Installation guidelines

For the purpose of the ViP-influence 'drain water level' a silo level measurement can be installed. The level in a drain silo is measured with a level sensor. The measuring principle is based on a pressure measurement. The sensor is placed at the bottom of the silo. The water in the silo causes a pressure that varies with the height of the water column. A thin film of water means low pressure; a full silo means higher pressure. The pressure sensor sits in a tubular rubber casing approx. 10 cm in length and 4 cm across. The silo level meter is connected by way of a converter box.

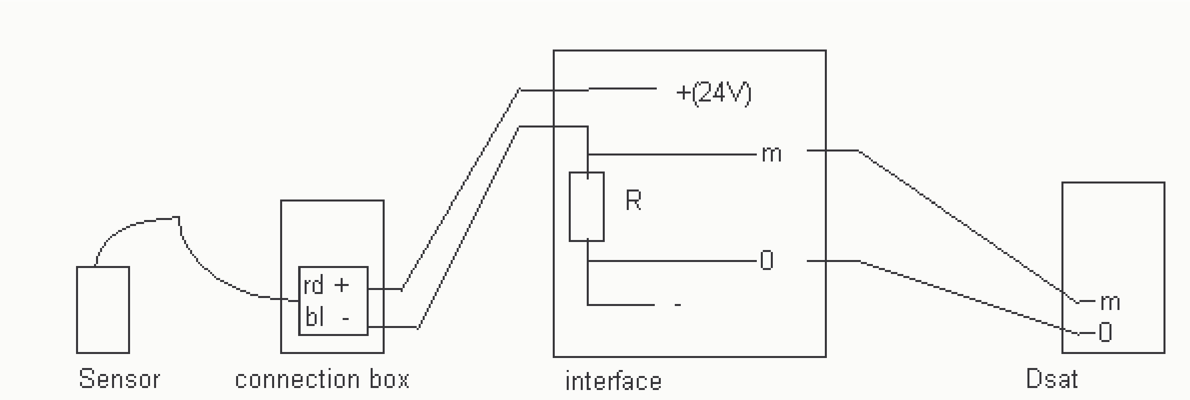
- Mount the sensor on or in a PVC pipe. Place it vertically in the silo. The sensor must hang directly (approx. 5 cm) above the floor of the silo. Fix the top of the PVC pipe to the edge of the silo. The sensor is consequently easy to remove from the water for service provision.
- To lengthen the sensor cable use a junction box. For installation indoors use a splash-waterproof junction box, for outdoors a waterproof junction box.
- The sensor is equipped with a hose for air pressure compensation. Do not immerse or seal this hose.
- The 24 V supply from the converter box may not be used for other purposes. This is to prevent influencing of the silo level measurement.

2. Connection

The connecting cable for the sensor is 5 metres long. The sensor emits a measuring signal of 4-20 mA -> 0-1 bar -> 0-10 metres water column. The supply voltage is 24 Vdc. The conversion of the measuring signal to a voltage, the 24 Vdc supply and the connection of the sensor are effected in an adapted DVV box (converter box).

- The 24 Vdc supply voltage is supplied by an adapted DVV with DC connection.
- The 4-20 mA measuring signal is converted via a 39E2 resistor into a measuring voltage suitable for the ECONOMIC. This resistor is placed in the adapted DVV.
- Set the strap on the HA board in the Dsat (type of measurement) to standard.

Overview of connections:



For verification, see the table below. It contains some measured values.

3. Adjustment

The adjustment of the silo level measurement is similar to the adjustment of a vent position sensor or here too determining a 0% and a 100% side.

0-100% -> 0-5000 points -> 0-1V -> empty-full

Table with example measured values

Measuring current[mA]	*Measuring voltage[mV]*	*Points[n]*	*Height[m]*
4	approx. 160	approx. 760	0
8	approx. 310	approx. 1550	2.5
12	approx. 470	approx. 2340	5
16	approx. 630	approx. 3130	7.5
20	approx. 790	approx. 3910	10

Determine the 0% side by removing the sensor from the silo.

For the 100% side the sensor must be installed in the silo. If the silo is full, the gross measurement can be read off and entered. If the silo is part full, measure the height of the level and convert this to the 100% level.

Tensiometers and HOOGENDOORN ECONOMIC

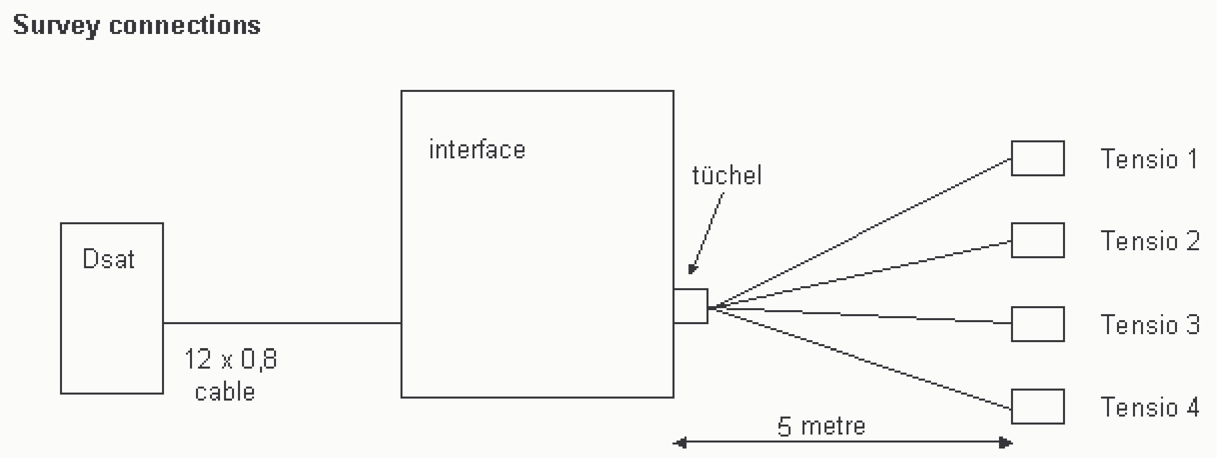
1. Connection
2. Installation guidelines
3. Adjusting tensiometers

Tensiometers can give greater insight into the humidity of the soil, making it possible to be more efficient with water and fertilisers. A tensiometer consists of a hollow pipe, filled with water with a porous stone at the end. The meter is placed in the soil. The degree of exchange of water from the tensiometer with the soil is a measure of the humidity of the soil. Three or four tensiometers are placed at different depths in the soil at one spot in the greenhouse. The tensiometers are connected via a converter box.

1. Connection

Three or four tensiometers are placed in one spot at different depths in the soil. The tensiometer emits a measuring current of 4-20 mA, corresponding to a pressure difference of 0-1000 hPa. Wet soil -> measuring signal is 4 mA; the drier the soil, the higher the measuring current. The supply voltage of the tensiometers is 24 Vdc. The conversion of the measuring signal to a voltage suitable for the Dsat, the 24Vdc supply and the connection of the tensiometers is provided in a converter box (adapted DVV box).

- The 4-20 mA measuring signal is converted into a measuring voltage suitable for the Dsat via a 221 Ohm resistor. These resistors are placed in the converter box.
- The 24Vdc supply voltage is provided by an adapted DVV with DC connection.
- Four tensiometers can be connected per converter box.
- Set HA board straps of the Uni-switch measurements to standard (voltage measurement).
- The tensiometers are connected to a connector, so that the sensors are easy to remove. Topping up the sensors or tilling the soil is consequently very easy.



Solder the four tensiometers to the connector for the converter box:

- tensio1-white = connector pin 1, tensio1-brown = connector pin 2
- tensio2-white = connector pin 3, tensio2-brown = connector pin 4
- tensio3-white = connector pin 5, tensio3-brown = connector pin 6
- tensio4-white = connector pin 7, tensio4-brown = connector pin 8

2. Installation guidelines

- In consultation with the client place tensiometers in a place in the greenhouse that is

representative for the whole crop section.
- Place tensiometers in one spot at four different depths (for example, 10, 20, 35 and 50 cm). Bury the cable from the tensiometers sufficiently deep. Clearly mark the exact position of the tensiometers with a stake or something similar, to prevent damage by a milling machine for example.
- Secure converter box to greenhouse leg, no more than 4 metres cable distance away from the tensiometers (cable length of tensiometers is 5 metres).
- Cover the converter box with a plastic sheet, to protect from rainwater.
- Cable between converter box and Dsat 12 x 0.8 wall cable; 8 cores for the four tensio measurements and the other 4 cores in Dsat to earth.
- The 24 V supply from the converter box may not be used for any other purposes. This is to prevent influencing of the tensio measuring signal.
- Number the four tensiometers 1 to 4 on the cable above the soil (tensiometer no. 4 is placed deepest).
- The tensiometer contains boiled demineralised water. If the measurement is greater than approx. 500 hPa, this water will have to be replenished. This will be necessary once every six months / full year (depending on how dry the soil is).

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3. Adjusting tensiometers

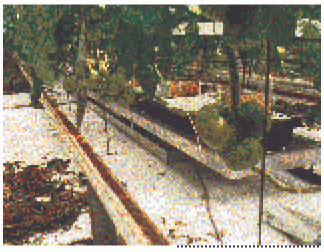
For four tensiometers four Uni-switches with measurement will be needed. The setting and adjustment of the measurement is the same for all four. The four measurements in a single long-term graph gives the most information about the humidity of the soil.

Setting program
- Control general: Uni-switch, General, Service tab
  measurement type: level measurement
  measurement type average : 60 seconds
  scaling value: 1.00
- Graphs:
  uni-switch: 1, 2, 3, 4
  Title of graph for instance: tensio 10, 20, 35, 50 (0 = wet, 500 = dry)
  Instantaneous graph (5-minute samples) and long-term graphs (day and night averages)

Adjustment

Measured values: 0-1000 hPa -> 0-100 % -> 0-5000 points -> 0-5 Volt -> wet-dry
1. Place tensiometer in tray with water, 5 cm under water.
2. read out *gross measurement*
3. enter *measurement* 0% with gross measurement
4. Calculate 100% side: 4420 + (0% side - 884)
   Example: 0% side = 905; 100% side = 4420 + (905 - 884) = 4441
5. Enter *measurement 100% side*
6. Verification of measurement: take tensiometer out of the water and rub dry with a cloth. The measurement must now slowly rise.

Scales and HOOGENDOORN ECONOMIC



The weight of a substrate mat with its plants is measured with scales. The measuring signal can be connected to an ECONOMIC as a level tray measurement or as a uni-switch (measurement type level measurement). Registration in a graph and starting of watering are then possible. In the case of a uni-switch starting is possible by way of an external start contact to which the actuation of the uni-switch is connected. If the scales are connected to a uni-switch and there is a level tray present, starting is possible by way of both measurements. For example, the scales at night and the level tray by day. The scales of the SUBSTRA type are described.

1. Installation guidelines

- Determine the maximum plant weight to be measured by approximation. New scales are adjusted as standard to a maximum weight of 50 kg. If this weight is greater, then the scales will have to be readjusted. See the guide attached to the scales.
- Place the scales on a platform so that the junction box and the electronics do not come into contact with the drain water.

2. Connection

The scales have a 24 Volt supply. The interface board of the scales emits a measuring signal of 4 - 20 mA. Using a 221 Ohm resistor a measuring voltage of approx. 1 - approx. 5 Volt is made from this, suitable for the type level measurement.

Interface board terminal strip:

27. 24 Volt supply:
    terminal 2 (gnd) and terminal 1 (+24V)
28. Measuring signal 4-20 mA:
    terminal 3 (gnd) and terminal 4 (Iout)
29. Scales signals (load cell):
    terminal 7 (SIG -, white) and terminal 8 (SIG +, green)

    terminal 9 (EX -, black) and terminal 6 (EX +, red)

3. Type measurement

The type measurement (jumper HA board) for the scales measurement: type standard.