Hoogendoorn Economic

Towards total climate control
with version 12.21

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GROWTH MANAGEMENT

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FOREWORD

The Research & Development, Customer Service and Marketing departments have tried to make the best possible selection from a long list of customer wishes and ideas for a new Economic program version last year, addressing the following three aspects in depth:

1. Further improvements to user-friendliness and clarity;
2. The incorporation of semi-closed growing in the shape of Hoogendoorn's Aircokas concept, which has already generated a great deal of interest;
3. The trend to link the Economic to the Internet – albeit securely protected – to access new products and services (remote service and support).

Once the contents of our version 2009 have been explained to you on site by one of our advisers, I am convinced that you will appreciate all the new features.

W.P. of Duijn
Managing Director Hoogendoorn Growth Management

Vlaardingen, Autumn 2008

1. Contents

2. Before you start

Hoogendoorn pays the greatest possible attention to making the Economic easy to use. When installing the new version, there are as few modifications as possible that you have to enter manually. Installation is a good time to check all the settings again, and to confirm whether the Economic is still doing exactly what you want. This new Economic program version is very user-friendly, but it takes a while to become familiar with the changes.

Please thoroughly read through the items below straight after the program has been changed to avoid any unwelcome surprises.

1. As far as possible, the settings of your previous program are taken over automatically by the software. New options however are not yet activated, and you have to set them manually.
2. In case of an extension or a change in the group layout, it is advisable to check all relevant settings. Make sure that all switches (manual/automatic) are in the correct position.
3. Check that the alarm sensors are switched on again (for example OCTA alarm).
4. It is certainly necessary after a program change to make sure you check operations via "means outside the computer", e.g. using measuring beakers to check if each valve section receives the correct amount of water, or having a look whether the vents and screens are still opening and closing correctly, etc.

3. Introduction

Computer programs are subject to continuous improvement and change, and over time, minor and major adjustments are necessary. If you have taken out a maintenance contract, Hoogendoorn will install the latest version of the software on your climate computer every year, so that you can continuously benefit from all the improvements made in the software during the previous twelve months. This ensures your business always has the most up-to-date controls at its disposal.

If a Hoogendoorn Customer Service employee has recently installed Economic version 2009 on your system, he will have discussed all changes and improvements with you. We can however imagine that you may wish to read up once again on one or two things, which you can do in this folder.

- Part I describes the most important modifications in the program for each component.

- In Part II, you will find information on options available.

- In part III, you will find information about the Internet services that Hoogendoorn offers. You can use these services if you have an Internet connection.

- Part IV contains useful information for the installer or dealer.

Still lost?

If you cannot find something in this publication, you can consult the extended online-help facility. You can call this up by pressing the **F1 button on your keyboard, or clicking on button** .

Put the mouse cursor over the setting which you would like to know more about, and then press the **F1 button or click button** .

You will find advice on the controls under general help.

For further questions, Hoogendoorn's Helpdesk staff are available 24 hours a day, **under telephone number 0031 10 460 8030**. They have the most sophisticated technology available and can dial into your Economic, if required, to find out remotely what is happening.

PART I

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PROGRAM MODIFICATIONS

Hoogendoorn Economic version 12.21

4. New in your process computer

Once again, a large number of improvements have been included in our Economic version 2009. Some of these are installed as standard; other modifications or additions are optional. All modifications are the result of intensive consultation between Hoogendoorn staff and growers. With this new version, we are responding to customer requests which often arise when they expand, or introduce new growing techniques.

Hoogendoorn Economic version 12.21

5. General modifications

5.1 Improved alarms in case of gusty wind

Weather: wind speed too high

This new alarm gives you to option of receiving a notification when the wind is blowing hard. You can for instance use this alarm to evacuate the greenhouse in case of dangerously high wind speeds. You can set the relevant alarm limit in 'wind speed too high: maximum wind speed'.

Wind speed gusty wind: measurement

Setting this measurement out in a graph allows you to see the size of the wind speed peaks. The 'vent position storm' reacts to these wind speed peaks, and the new graph is therefore a handy tool to properly set your vent position storm.

In the current weather overview, 'storm: status' now clearly shows whether the storm protection is activated or not.

5.2 Economic Remote on Windows XP and Vista

Since the introduction of the Economic, Windows has seen many new version, the latest of which is Windows Vista. To be able to make optimum use of the technical options offered by the new Windows versions, Hoogendoorn will no longer be able to support Economic Remote on all previous Windows versions in the future.

From Economic version 10, we have therefore undertaken the following changes:

- This version of Economic Remote can no longer be installed on Windows 95, Windows 98, Windows ME and Windows NT.

6. Climate Management

6.1 Vent delay open after restriction

You can now easily prevent temperature and RH falling too quickly subsequent to a restricted vent. You can delay the quick opening of vents so that the climate adjusts gradually, and there are no shocks for the plants.

Vents can now be opened with a delay after they have been closed due to a restriction. Some examples for such restrictions are: rain, frost, storm, roof wash and heating. After a restriction no longer exists, vents should, if possible, be actuated to a large vent position. This can lead to an undesirable drop in RH and temperature. To prevent this, you can set a number of steps, and the time period between steps, for opening the vents.

The most common restrictions are: rain, frost, storm, roof wash and heating, vent position restriction due to alarm.

New settings:
lee side open after restriction: number of steps
wind side open after restriction: number of steps
and
lee side open after restriction: interim period
wind side open after restriction: interim period

Example:

Vents are restricted due to a 'lee side vent position maximum rain: ViP' of 10%. After the rain has stopped, the new vent position required is 70%. The 'lee side open after restriction: number of steps' is set to 4, with a 'lee side open after restriction: interim period' of 2 minutes. The first 3 steps should be calculated relatively low, and with circumstances remaining the same, the last step should be the largest.
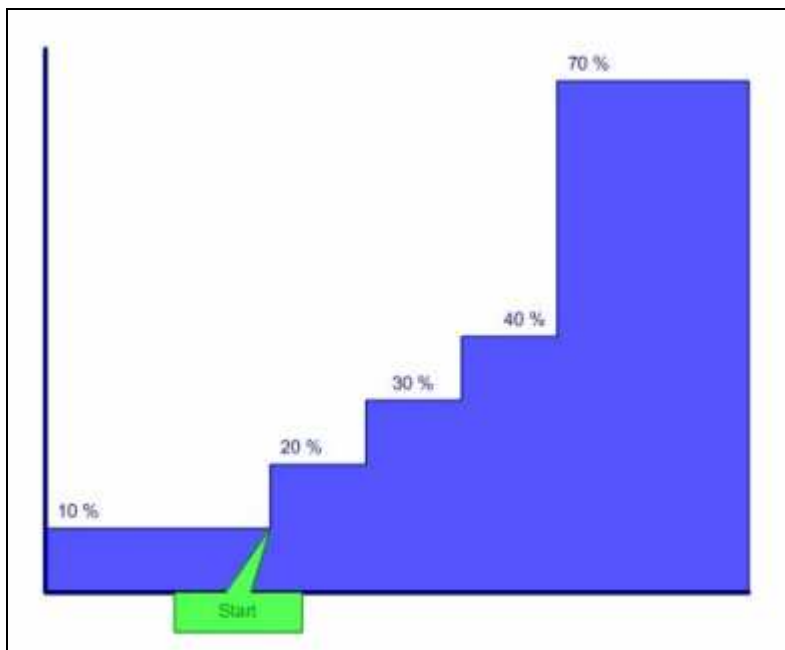
Illustration 1 - Delayed opening of vents

6.2 Moderate or wide vent

6.2.1 Moderate vent

At the request of several growers, we now offer the option to vent more moderately.

Vent lee/wind side influence moderate - wide: ViP
By setting this ViP lower, venting is done more evenly. In this Economic version, the setting range has been expanded. You can now also set negative values. If you set the ViP more negatively, this results in more cautious venting.

Depending on weather circumstances, vent position weather and vent position I-action from a certain value in 'moderate - wide vent' setting should reach 0. With cold weather and/or a lot of wind, this point is reached more quickly than with warm weather without wind. With a value of -100%. vent position weather and vent position I-action are always 0, even with warm weather.

If you adjust the value of the 'moderate - wide vent' ViP, you will see the effect of this adjustment within one minute in report 'Lee / wind side calculated'.

With 'moderate - wide vent' set to -101%, vent position weather and vent position I-action are 0%, and the delayed maximum vent position is also switched off. The control for the greenhouse temperature then acts exclusively as a P-regulator. Using the ViP influences or the P-range ViP, the range can be adjusted to weather circumstances. The only time P regulation is not recommended is in combination with the automatic P-range.

6.2.2 Wide vent

Another group of growers wanted to be able to vent even more widely. They asked whether the P-range ViP could be set even smaller.

Lee/wind side P/range: ViP
From now on, you can set this ViP for lee side and wind side to 1.0 °C. A small P-range makes for much less balanced venting. For venting widely, it is better to not only regulate based on the P range. Using 'vent position weather' and 'vent position I-action' in combination achieves the required outcome much more quickly when there is warm weather or a lot of radiation, while there is less risk of vents opening and shutting continuously.

Tip: If you experience problems because the wind side vent does not want to open completely, check first that the delayed maximum vent position is not the culprit. In chapter "Delayed maximum vent position" you can find more information about the delayed maximum vent position and how you can switch off the weather-dependent restriction.

The following table provides the new setting options in an overview:

Value	Description
101	Wide open vent + weather-dependent maximum vent position are NOT considered in calculations
100	Wide open vent + weather-dependent maximum vent position ARE considered in calculations
-100	Vent position weather and I-action are 0, so that a P-range only + weather-dependent maximum vent position ARE considered in calculations
-101	Vent position weather and I-action are 0, so that a P-range only + weather-dependent maximum vent position are NOT considered in calculations

Table showing the meaning of 'lee/wind side influence moderate - wide vent: ViP'

6.3 More insight into the workings of the ventilation regulation

lee/wind side total range: delayed
lee/wind side total range: undelayed
These new registration settings can be shown in a graph. They provide a better insight into the behaviour of the ventilation regulation. Its meaning is also explained further, based on a few figures, below.

The total range is within the P-range.
- The P-range is the greenhouse temperature difference at which the calculated vent position P-action reaches 100%.
  The total range is the greenhouse temperature difference at which the total calculated vent position reaches 100%.

But there are a number of important differences.
- In contrast to the P-range, the total range also partly takes into account 'vent position humid', 'vent position I-action' and 'vent position weather'.
- The P in P-range stands for proportional: the vent position P-action is proportional to the greenhouse temperature difference. The total range is not proportional: the calculated total vent position is not proportional to the greenhouse temperature difference.
- The total range can be smaller than the P-range, but not larger.
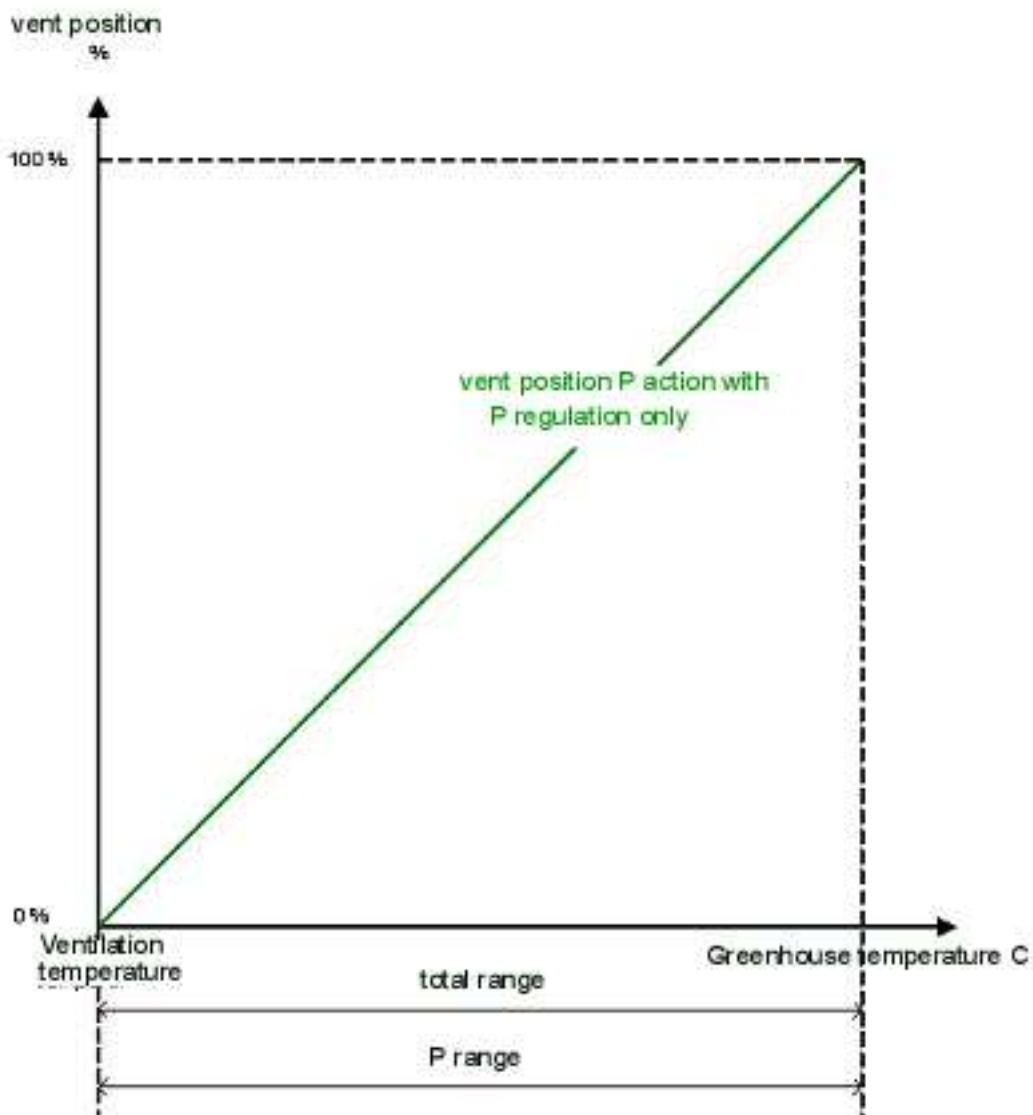
Illustration 2 - P-range with P-regulation only

In this Illustration, the total range and the P-range are the same size. This is because 'vent position humid', 'vent position weather' and 'vent position I-action' are 0%. The vent position then is wholly determined by the vent position P-action. In other words: venting is done with the P-regulation only. P-regulation only happens with winter weather, when small vent positions are sufficient to prevent too much heat escaping. See chapter 'Vent more moderately" for the forced setting of a P-regulation only.
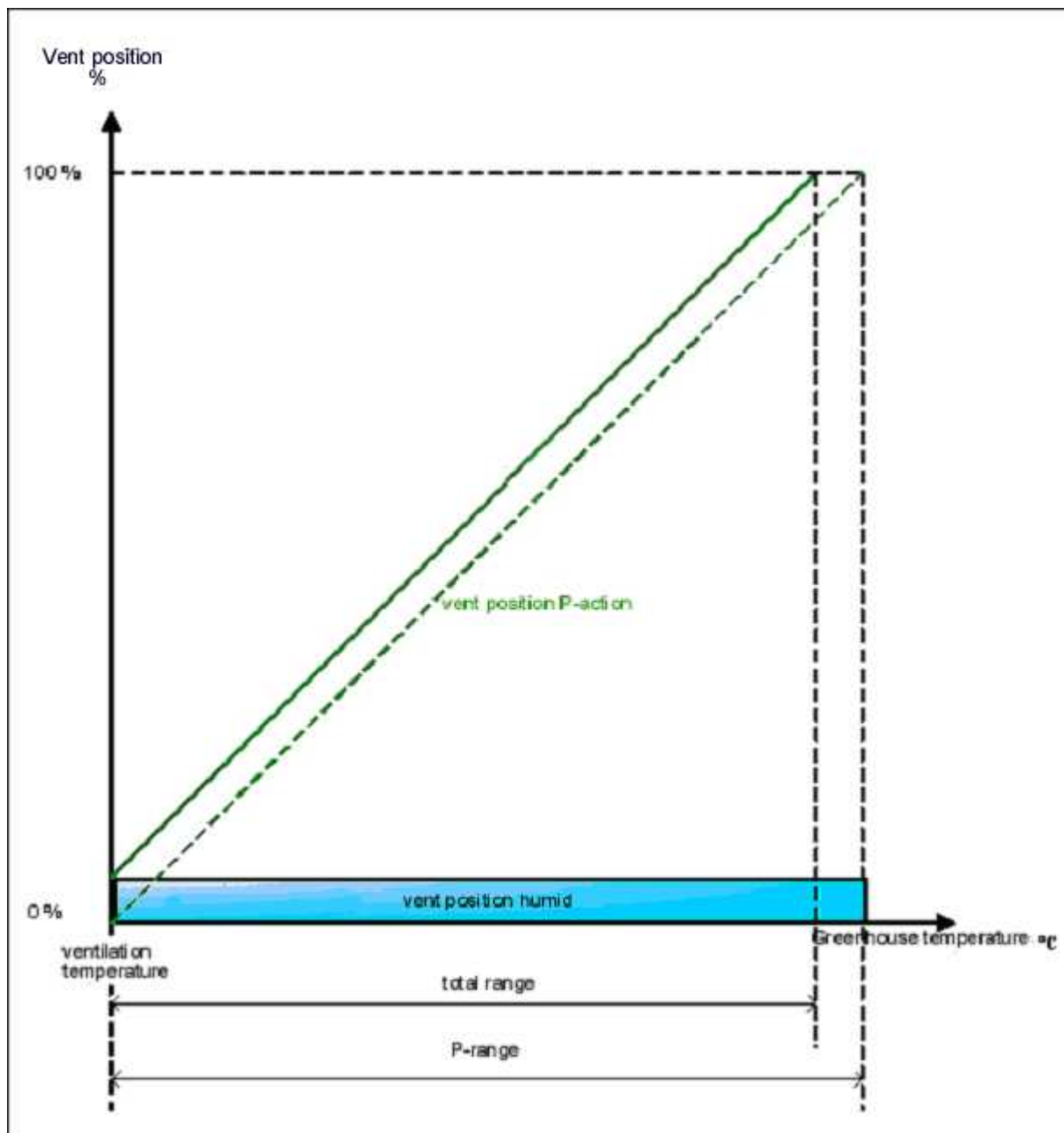
Illustration 3 - P-regulation + vent position humid

In the illustration, the total range is now smaller than the P-range. The 'vent position humid' ensures that a 100% vent position is achieved with a lower greenhouse temperature than whenever no 'vent position humid' has to be guaranteed.

The 'vent position humid' is independent of the greenhouse temperature and runs horizontally.

The 'vent position P-action' is proportional to the greenhouse temperature and runs diagonally up in Illustration 2 and Illustration 3.

The total vent position in Illustration 3 is the same as the sum of 'vent position humid' and 'vent position P-action'. This situation can for instance arise on a cold, humid spring day.
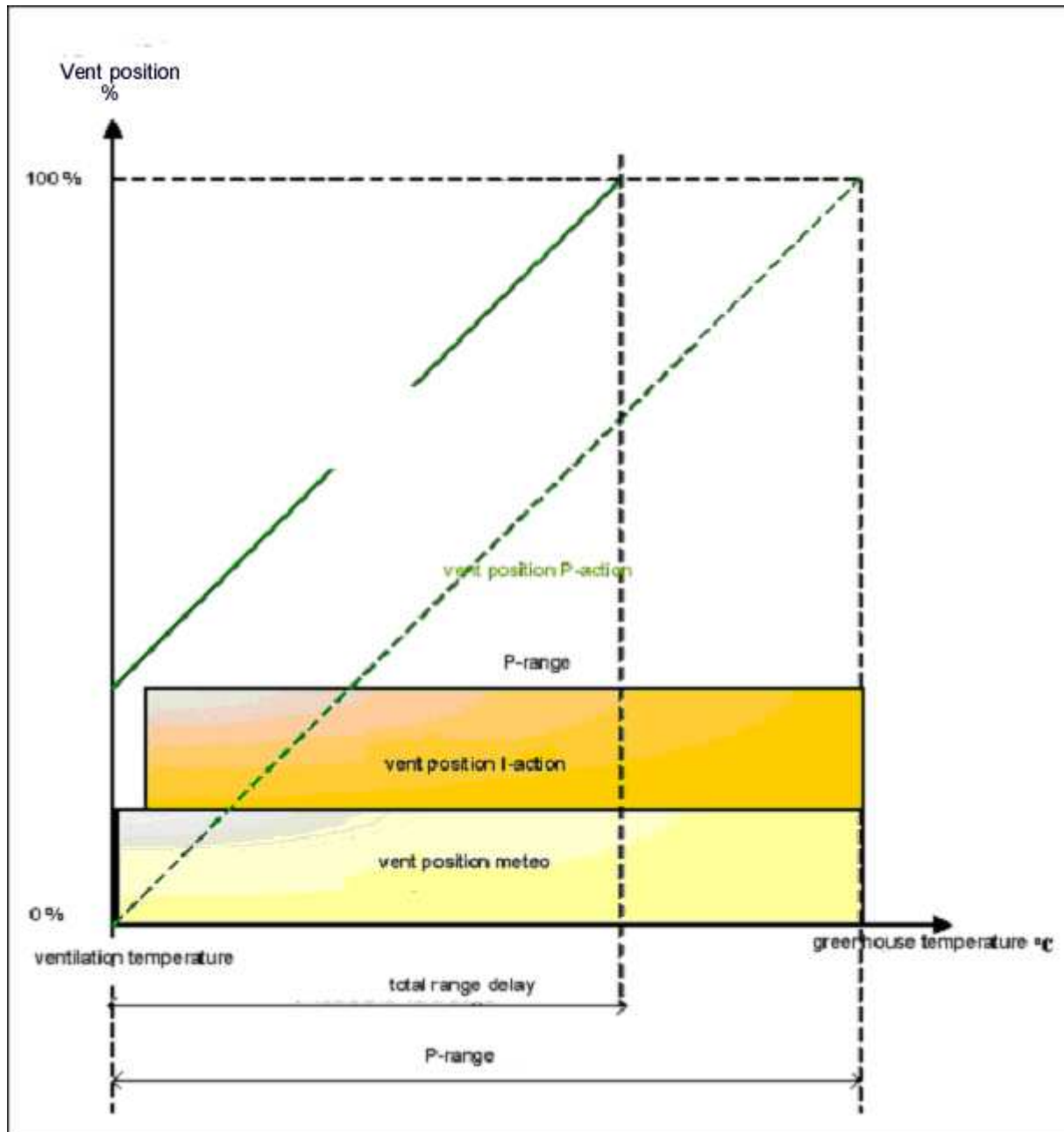
Illustration 4 - P-regulation + vent position weather + vent position I-action

In the Illustration, the 'vent position weather' and the' vent position I-action' ensure that the total range is much smaller than the P-range. 100% vent position is achieved at a much lower greenhouse temperature than without 'vent position weather' and 'vent position I-action'. The 'vent position weather' is determined by the weather circumstances. You can influence the size of these part vent position as well, with the ViPs 'influence moderate - wide vent' and '% wind influence'. The' vent position weather' is independent of the greenhouse temperature and runs horizontally.

The 'vent position I-action' increases in steps towards the maximum I-action, as long as it is warm in the greenhouse. The maximum I-action depends on the weather, the influence 'moderate - wide vent' set and possible excess heat in the greenhouse, or a minimum pipe. The size of the vent position I-action is independent of the current greenhouse temperature and runs horizontally.

The vent position P-action is proportional to the greenhouse temperature and runs diagonally upwards. The total vent position is the same as the sum of vent position weather, vent position I-action and vent position P-action (Vent position humid is 0%).

This situation can for instance arise with mild weather.

As long as heat stays in the greenhouse, the I-action is to increase until the maximum I-action is achieved. When calculating the total range undelayed (not shown in the Illustration), the maximum I-action is used for the calculated I-action. The total range delayed shows when the total range should be set to 'off', in case it stays too warm in the greenhouse structure.

lee/wind side P-range: uncorrected
lee/wind side P-range: calculated
These settings were previously called "lee/wind side P-range: calculated" and "lee/wind side P-range: regulation" respectively. The new names state more clearly that the first setting provides an interim calculation, while the second one shows the actual P-range.

The P-range can be shown in a graph from now on.

6.4 Delayed maximum vent position

lee/wind side calculated delayed maximum vent position
The continued retention of a delayed maximum vent position was also possible in previous Economic versions. For safety reasons, the maximum vent position was restricted dependent on the weather. With very bad weather, the delayed maximum vent position ensures that the vent cannot open any further than 45% at the wind side. No weather-dependent automatic restriction is applied to the lee side.

A new option is that the delayed maximum vent position can now be shown in a graph or in a report.

Also new: you can switch off the automatic weather-dependent restriction by using influence 'moderate - wide vent' ViP and setting it to 101%.

6.5 More screen options with additional influences

Uni-influence

The ViP-settings for the screens have been provided with another uni-influence.

This gives you wider options for setting up your screens. For example, you can now use both an IR camera and a pyrgeometer to regulate your screens.

'Uni-influence 2' has been added to all settings for the screens which had an uni-influence, i.e.:

- **screen: ViP outside temperature close**
- **screen: ViP screen position**
- **screen: ViP gap**
- **shade screen: ViP radiation close**
- **shade screen: ViP radiation difference open**

6.6 Alarm options expanded with CO2 regulation

CO2 regulation: CO2 too low
CO2 too low: difference calculated CO2
CO2 too low: switch-off time
The new alarm 'CO2 regulation: CO2 too low' notifies you straight away if there are problems with the installation and the CO2 level is not achieved. You do have to set the alarm yourself first though, depending on your own specific situation, using 'CO2 too low: difference calculated CO2'.

CO2 too low: minimum CO2
CO2 too high: maximum CO2
This absolute alarm threshold sends out an immediate alarm for the most common problems with your CO2 meter, because defects such as a broken wire usually lead to a 0-measurement or an extremely high measurement.

CO2 too high: difference maximum CO2 ViP
This setting used to be called 'difference maximum CO2 dosing unit'. The new name is more consistent with other setting names.

6.7 CO$_2$ regulation more flexible due to extended ViPs

maximum CO2: ViP

The number of settable periods for this ViP has been extended from 2 to 6, and the following ViP-influences have been added:

- Radiation sum - %
- Wind speed - m/s
- Assim. lighting
- Vent position - %
- Uni-influence
- Uni-influence 2

With these extensions, you can set a specific difference between minimum and maximum CO2 if required. This fulfils a request we often heard from users who wanted to use this to optimise their CO2 regulations.

As ViP-influence 'vent position' has now also been included in the maximum ViP, you now have the option to switch CO2 sources (boiler, CHP, …) on and off depending on the vent position, although the vent position-dependent switching of CO2 sources is not possible in all situations, as it depends on your installation. Please ask your service engineer, who will be pleased to help.

ViP-influences Uni-influence and Uni-influence 2 are new both in 'maximum CO2: ViP' and 'minimum CO2: ViP', providing extra flexibility. You may have a requirement in connection with the switching of CO2 sources yourself, which can now be fulfilled. Please ask your service engineer, or ring the Hoogendoorn Helpdesk.

6.8 Roof washer registration

The roof washer regulation has been expanded with a new registration to be better able to check on its function. The items stated below can both be displayed as a graph.

Roof washer: status control (1=off, 2=release, 4=start)

Off	The roof washer may not be on, depending on settings and weather.
Release	The roof washer may be on, depending on settings and weather.
Start	The roof washer is active in this climate group: the roof washer is on the roof or wants to start. The Economic actuates "start" once the vents are shut.

Wash time counter current roof

Every time the roof washer starts on another roof, the wash time counter returns to 0. In a graph, the number of peaks shown corresponds to the number of roofs the roof washer has washed. The graph therefore indicates where the roof washer is.
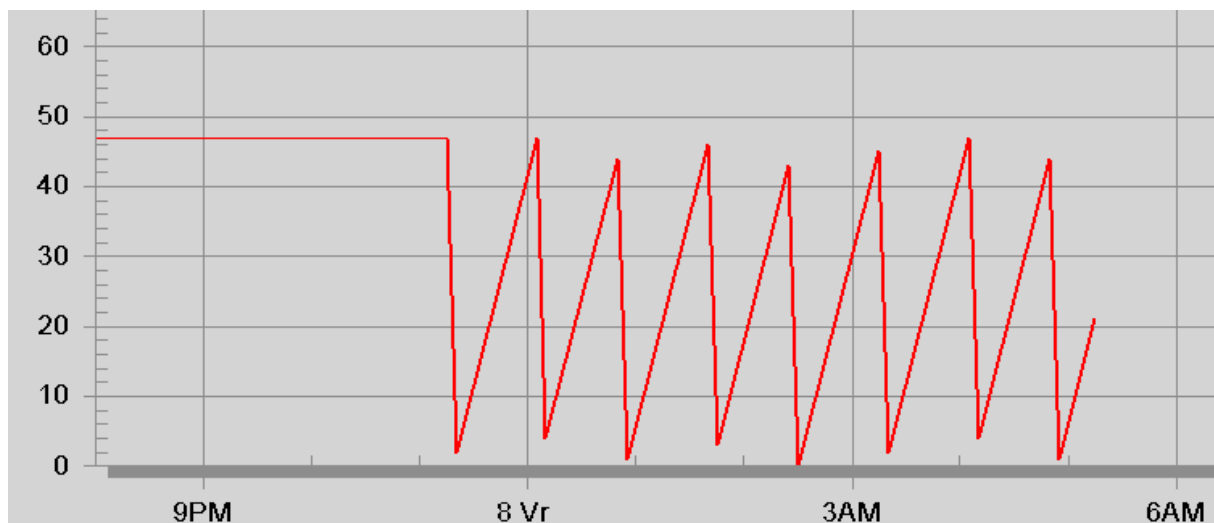
Illustration 5 - Wash time counter current roof

The above illustration shows an example of the progress of 'wash time counter current roof'. In this graph, the roof washer washed 7 roofs at 5:15 h. It has been busy with the 8th roof for 20 minutes, the roof washer is therefore probably halfway finished.

Item 'wash time counter current roof' was available in the previous program at service level and used to be called "alarm: wash time counter".

6.9 Calculation of vapour pressure deficit

To calculate VPD, an infrared camera is required to determine the plant's temperature.

Illustration 6a - Plant temperature camera

Air VPD is the difference between the actual vapour pressure in the air and the maximum vapour pressure at the current air temperature. For greenhouse climate control, it is usually the "plant" VPD which is calculated.

Plant VPD is the difference in vapour pressure between the air in the plant (in the cavities behind the stomata) and the greenhouse air. The greenhouse air vapour pressure is determined by the temperature and RH of the

Illustration 6b - An overview of VPD

greenhouse air. The vapour pressure in the plant is determined by the plant temperature. For calculation purposes, it is assumed that the air in the plant has an RH of 100%.

The plant VPD is a measure for the evaporation capacity of the plant. The actual evaporation however also depends on other factors, amongst others the status of the stomata and the availability of water in the substrate.

7. Aircomatic

7.1 Improved misting with Aircomatic

From this version onwards, you can directly adjust the pulse length and interim period pulse to changing radiation. With radiation decreasing rapidly, you can quickly adjust the pulse length or interim period pulse, so that misting is restricted immediately.

From this version onwards, influence 'radiation W/m2' is based on 'radiation: undelayed' in the following items:
unit: temperature: pulse length: ViP
unit: temperature: interim period pulse: ViP

Until now, all ViPs in the Aircomatic used an influence called 'radiation W/m2' based on 'radiation: delayed climate'. For the pulse length and the interim period pulse, we found that an immediate reaction to changes in the radiation fits in better when trying to achieve the required climate, so the influence for these ViPs has been adjusted. The other ViPs for Aircomatic still use 'radiation: Delayed climate', and you can adjust the increase and decrease speed yourself via the Weather setting.

8. Water management

8.1 Set irrigation easily with crop section on/off

The setting method for the irrigation of the crop section is now clearer and simpler:

irrigation crop section: on/off
This setting has been deleted. Its contents were directly erased after setting, so this setting didn't show whether a crop section was actually on for a recipe, and if a manual start had been set properly. The setting has been replaced with several new settings in **crop section**:

Repeat irrigation based on recipe
- **off**
- **off today, but with start times**
- **off today, no start times**
- **on**

irrigation cycle start
- **start time crop section**
- **manual start**
- **manual start direct**
- **no extra start**

stop irrigation cycle
- **yes/no**

Only 1 selection can be made per setting.

Advantages:
- Much clearer, as contents are not erased so quickly. Examples:
  - 'On' for repeated irrigation based on recipe is only erased if you set another selection.
  - The selection of a manual start is only changed at the end of the irrigation cycle. When the cycle is complete, the setting automatically goes to 'no extra start'.
- You can see the reason why a crop section was last started, in the existing setting **crop section: start reason for last irrigation cycle.** Registrations have been added in these settings.

- 'On for start time crop section' can now be combined with 'on for recipe'. This was not possible in the old program. 'Start time crop section' now is also clearly connected to the start time for the crop section itself, and not to the start times for the recipe.
- The option 'off today' can now be combined with' manual start', allowing you to now set the repeat irrigation for the rest of the day to stop for a crop section, and to then possibly give one or more manual starts afterwards.
- When you don't want to irrigate again today by recipe, but would still like to provide a number of fixed starts, this is possible using setting **off today, but with start times**. Then water is still given at the start times in the recipe, as long as they have been selected.
- You can set a crop section completed to start in the morning of the next day, while irrigation by recipe is set to off. After setting the start conditions, you also set 'off today'. This option always automatically switches the next day to 'on'.
- You can immediately stop a running irrigation cycle quite easily now. The repeat irrigation by recipe is no longer automatically switched off.
  Setting 'stop irrigation cycle' is set to 'no' as default. By setting it to 'yes', a running irrigation cycle stops. Then the setting is automatically reset to 'no'.

8.2 Irrigation: improved alarms

If you want to irrigate a crop section, it is important that you connect valves first and only then start an irrigation cycle for the crop section, and not the other way around.
Whenever a crop section was started in older Economic versions and no valve was connected, the crop section was automatically reset to off. This is annoying if you forget to connect valves every now and then.
From Economic 12.20 onwards, the crop section is not set to off if there are no valves connected, but you are notified with an alarm:
water: crop section: no valve connected

8.3 Registration of last irrigation cycle also in phase 1 and 3

Report 'Last valve irrigation cycle' gives you an overview of how long it was since a valve has had water at a glance. This report is a handy tool for determining which valves still have to have water.
The registration of the last irrigation cycle has been optimised. Until today, the last cycle was only registered with irrigation in phase 2. From this version onwards, the irrigation cycle is also registered if you only irrigate in phase 1 and/or 3.

8.4 More accurate dosing in irrigation cycle in unit of cc/m²

With irrigation, it is important to be able to provide precisely the required quantity of water. For dosing in units, the options for setting the required irrigation amount have therefore been expanded.

If you use ViP 'Phase 2 dosing quantity' for the recipe, the following settings state the unit to be used for irrigation:

by crop section:
regulation time/litres

and by recipe:
unit phase 2 dosing

For both settings, you had the following options when dosing by quantity was required:
- cc/plant
- litres/m²
- volume in m³

To be able to set this even more accurately, the settings above have now been extended with option:
cc/m²

Settings	Unit	Value
unit phase 2 dosing		
phase 2 dosing amount: ViP		volume in m³
phase 2 dosing time: ViP	m:s	liters/m²
EC regulation EC value: ViP	EC	cc/plant
re-use EC value: ViP	EC	time
		cc/m³

Illustration 7 - Irrigation by cc/m²

9. Energy management

9.1 Alarm for no gas registration

From this version onwards, there is an alarm if no gas is measured. This provides you with an immediate notification that there is no good gas registration. This instantly indicates a possible exceeding of your gas contract, so you can take measures to prevent this. Up to now, a defect, for instance a break in the gas pipe, was not noticeable from the gas measurement, but from this version onwards, you will be properly notified.

The new alarm triggered by the controller if there is no gas registration is:
Energy: energy monitoring: no energy measurement

alarm no energy measurement: minimum measurement
This alarm is activated if:
* setting 'energy measurement' is smaller than 'energy monitoring: no gas registration: minimum measurement' for too long
* and one of the connected boilers or CHPs is running.

alarm no energy measurement: switch-off time
To prevent false alarms, you can set a switch-off time. The alarm will not be activated if the gas measurement is too low during this switch-off time.

> ⚠️ To prevent unnecessary alarms, set the alarm together with your engineer or Hoogendoorn.

9.2 Circuit pipe minimum: ViP with influence energy monitoring

With the ViP-influence 'energy monitoring' you can analyse heat demand in relation to a heat or gas contract.
The ViP-influence 'energy monitoring' is now also available in ViP minimum pipe, and you can now use this in a particularly flexible manner, by using these as per your own requirements in ViP minimum pipe and/or ViP maximum pipe.

Example: In situations where a minimum energy demand is required (with regard to supplier conditions), the minimum pipe can be increased in energy monitoring to achieve the envisaged energy demand. On the other hand, the minimum pipe can be decreased whenever energy demand is becoming too high.

9.3 Heat removal link per circuit

Many users have to expel heat in the night via the heating circuits to make room in the tank. They would like to link the different circuits or a compartment to different heat removal groups. This is to provide an option to, for instance, expel heat using the pipe/rail with a normal heat excess in the tank, and to only switch on the grow pipe with a big heat excess in the tank. This much-mentioned request has now been addressed. To be able to expel heat with circuit 1 and circuit 2 at different tank levels, you may require more heat removal groups.

Illustration 8 - Connection of circuits – heat removal

9.4 Pipe maximum heat removal VIP

circuit: pipe maximum heat removal: ViP
With this new ViP, you can determine the heat removal when vents are shut because of rain, or if the greenhouse temperature is increasing too much for another reason. To this end, the ViP includes the ViP-influences 'rain' and 'difference heating temperature'.

By using different periods in 'circuit: pipe maximum heat removal: ViP' , heat removal for the different circuits can be switched on in phases, for instance by only removing heat with circuit 1 at 21:30 h and switch on circuit 2 as well at 23:30 h. The new ViP 'circuit: pipe maximum heat removal: ViP' replaces the old setting 'circuit: pipe maximum heat removal'

		start time	re:	transition	value	greenhouse temp. °C		dif. heat. temp. °C	No influence
						22.0	24.0	Outside temp. °C	
1	J	01:18	Sunrise	02:33	64		0	snow	
2	J	-01:00	Sunset	02:04	80		-20	greenh.temp. °C	
3	N							differ. VD - g/m³	
4	N							differ. RH - %	
5	N							vent pos. - %	
6	N							dif. heat. temp. °C	

Illustration 9 - Circuit pipe maximum heat removal with ViP settings

PART II

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OPTIONS

An option is a possible addition to the automated control of your site.
Options are not supplied as standard in the Economic process computer and can be chosen by you.
An example is plant temperature measurement via a GROWLAB camera.

Would you like to know more about options?

Ring: +44 (0)1243 – 555501
E-mail: sales@hoogendoorn-uk.com

or

Fax: +44 (0)1243 – 555505

We will then contact you as soon as possible.

9.5 PAR measurement

PAR is the abbreviation of Photosynthetically Active Radiation. This involves those wavelengths in the spectrum of the overall radiation that can be utilised by plants for photosynthesis. The official unit of PAR is µmol/m^2/s.

For the growth and production of your crop, the quantity of PAR is therefore a very important factor, and it is therefore important to know how much PAR reaches your crop. The problem is that the quantity of PAR cannot simply be derived from the light via the quantity of overall radiation measured with your solarimeter.

The overall radiation consists of roughly 45% PAR. The ratio is not however constant, but among other things depends very much on the cloudiness and the position of the sun. In addition to the cloudiness, the type of greenhouse roof, lime wash or dirt on the greenhouse roof and the use of screens also influence the quantity of PAR that reaches the plant in the greenhouse. The only way to therefore know how much PAR the plant receives in the greenhouse is to measure the quantity of PAR in the crop with a special PAR sensor.

9.5.1 Use of influence PAR weather for screen

A PAR sensor has been added to the weather configuration. You do not need to buy a special module for this. It is now no longer necessary to work with conversion factors and uni-switches. If your service engineer specifies the PAR sensor in the configuration, that is enough to be able to use this. You can set up the PAR weather sensor outside, as well as in the greenhouse (for example above the screen).

It is not possible to share the PAR sensor via shared weather mast.

The measurements of the PAR weather sensor are added and recorded per day, night and 24 hour period. These measurements can be added to week and period reports. The measurement and undelayed measurement are actually recorded, and you can set these out in a graph. At a glance, you can then see how great the quantity of overall radiation and PAR light is. The actual measurements of the PAR sensor are shown in µmol/s/m^2 and the sum in the unit 0.01 Mol/ m^2.

You can use the PAR measurement as "influence PAR weather" in a number of screen settings. Using settings for maximum rise and fall speed, you can adjust the response speed of the measurement as required.

You can use the influence 'PAR weather' in the following screen ViP settings:

- **screen: ViP crack**
- **screen: ViP screen position**
- **screen: ViP close on radiation**
- **screen: ViP open on radiation difference**

9.5.2 PAR in the greenhouse

It is possible to connect two PAR sensors for each climate section. In a similar way as for the aspirators, a choice can then be made whether one must work with the highest, the lowest or average value of the selected sensors. When selecting average, it is also still possible to set a weighting factor for both sensors.
The quantity of PAR is added and recorded per day, night and 24 hour period. The values can be viewed in weekly and period reports. It is possible to put the actual PAR sum and the actual PAR measurement per climate group in a graph.

9.5.3 Influence of PAR crop

Based on the measured quantity of PAR in the greenhouse, four screens can influence ViPs and the lighting ViP. This is done with the ViP influence "PAR crop".

The influence can be used in the screen ViPs:

- **screen: ViP crack**
- **screen: ViP screen position**
- **screen: ViP close on radiation**
- **screen: ViP open on radiation difference**

and in the lighting ViP:

- **lighting: ViP on (100=on; 0=off)**

The influence is computed based on the undelayed PAR measurement. The speed of rise and fall can be set so that it is possible to indicate yourself how quickly you can respond to a changing quantity of PAR.
For the screens, the influence from the climate group to which the screens are connected is used. For lighting, it is possible to make a choice for each lighting section of the climate group from which the influence must be used.

This can be done using a new connection in the lighting section :

- **influences: coupling lighting section - greenhouse climate**

9.5.4 Alarm on PAR level too high

Too high a PAR level in the greenhouse may have harmful consequences for the crop. Normally such an increase to a too high level is prevented, for example with whitewash on the roof or by closing a screen. The level in the greenhouse could still however become too high, for example if the screen is operated manually, or a lot of whitewash is washed off the roof. To indicate this, it is possible to use the "climate: PAR crop too high" alarm. The alarm limit for each climate group can be set together with a delay time for the incoming alarm. The alarm is cancelled with setting:
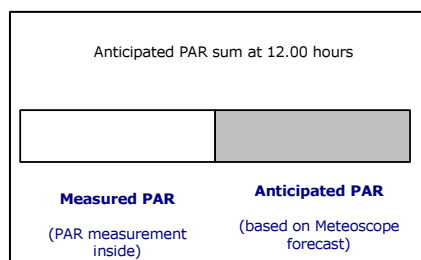
- **PAR crop too high: difference alarm off**

This alarm gives you extra safety to prevent crop damage due to too much (PAR) radiation in the greenhouse.

9.5.5 Influence PAR sum crop

The influence "PAR sum crop" is a measure of the anticipated quantity of PAR in the greenhouse during a day. The PAR sum crop consists of 2 components. The first part is the measured PAR sum in the greenhouse up to the time of computation. The second part is the anticipated PAR sum that is expected to be measured during the coming hours in the greenhouse. The further on in the day, the greater the share of the measured radiation.

In the example below the sum runs from 0.00 hours to 23.59 hours.

Anticipated PAR sum at 12.00 hours

Measured PAR
(PAR measurement inside)

Anticipated PAR
(based on Meteoscope forecast)

The anticipated quantity of PAR outside for the part of the 24-hour period still to run is, among other things computed on the basis of MeteoScope data. In order to be able to use the influence "PAR sum crop" a weather forecast (MeteoScope) and a PAR measurement is necessary in the greenhouse.
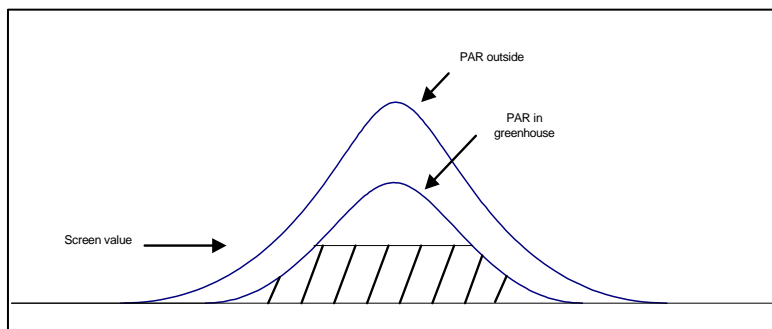
For the conversion of the anticipated PAR outside to the anticipated PAR inside, two settings are used.
In the first, you state how much PAR is retained by greenhouse roof, lime wash and so on.

In a second setting, you indicate how much PAR you expect as a maximum in the greenhouse as a result of using a screen.

Knowing the anticipated quantity of PAR during the coming day, you can already ensure at the start of the day that screening is carried out faster if the PAR forecast is (too) high. In case of a low quantity of PAR, screening can be carried out later, or additional lighting can be provided.

The influence "PAR sum crop" can be used in the screen ViPs:

- **screen: ViP crack**
- **screen: ViP screen position**
- **screen: ViP close on radiation**
- **screen: ViP open on radiation difference**

and in the lighting ViP:

- **lighting: ViP on (100=on; 0=off)**

10. Measurement of outside RH with weather mast

In addition to the standard measurements of rain, temperature and radiation, you can now also install an RH meter on the weather mast.

To measure RH, you require an electronic RH meter. Hoogendoorn or your dealer can tell you more about this. If you have several Economic configurations on your site which are linked via a network, and only 1 RH meter, it is possible to share the outside RH via a shared weather mast.

Amongst others, this RH is used to determine the enthalpy (heat content) of the outside air.

11. Influence difference enthalpy

The enthalpy or heat content of air is the total energy content of the air, consisting of the energy content of the dry air plus the energy content of the water vapour. Enthalpy is expressed as number of kJ per kg dry air.

Knowledge of the enthalpy is for instance important to be able to choose correctly between cooling by opening the doors, or by keeping the vents closed and switching mechanical cooling on. As long as energy can be expelled from the greenhouse by the vents, that's the most beneficial method.

Difference enthalpy can be used as an influence in a number of ViPs which are important for influencing the energy content of the greenhouse air, for instance:

Ventilation:
- ventilation temperature lee side: ViP
- ventilation temperature wind side: ViP

Cooling:
- cooling temperature: ViP

Aircomatic unit:
- unit: capacity: ViP
- unit: temperature: ViP
- unit: temperature: pulse length: ViP
- unit: temperature: interim period pulse: ViP

Examples for the use of the influence 'difference enthalpy: greenhouse - Weather':

- cooling

The difference between enthalpy in the greenhouse and outside is for instance important so you can make a proper decision to either cool by opening the vents or by keeping the vents closed and starting mechanical cooling. As long as energy can be expelled from the greenhouse by the vents, that's the most beneficial method.
This means that the outside temperature either has to be sufficiently lower than the greenhouse temperature, or that outside is relatively dry, so that the plants in the greenhouse can cool it by evaporation. Although this last effect is not that big, it also helps.

- misting

The influence 'difference enthalpy' in the ViP 'pulse length' can for instance be used for a better utilization of the misting system. Especially in the evening hours, this influence is suitable to cool down the greenhouse in a controlled way with a combination of ventilation and humidification.

The influence can only be used if you have an Economic cooling module / Aircomatic unit in your system and an outside RH meter on your weather mast. Ask Hoogendoorn or your dealer about these options.

PART III

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INTERNET SERVICES

Hoogendoorn Economic version 12.21

12. Internet

12.1 VPN-dial in connection

If you would like to connect to your network from a computer, e.g. your PC at home or your laptop via the Internet, we call this a VPN connection.
You require an Internet connection with fixed IP address at your site for this. In addition, this connection is linked to a NetScreen firewall which can establish the VPN-connection. We will install a program on your computer at home or on your laptop which contacts the IP address of your site.

12.2 Firewall and virus scanner

With an ADSL connection, a standard modem is supplied. We connect a reliable NetScreen firewall in line straight behind it to perfectly secure your connection. This firewall keeps all offenders from the Internet away, so that your computer is safe. There is also a virus scanner inside this firewall which controls all traffic for viruses: your e-mail, the Internet pages you visit and files you download. A reassuring feeling if you consider that over 110,000 virus are circulating on the Internet!

12.3 Hoogendoorn website

The Hoogendoorn website can be accessed via www.hoogendoorn-uk.com.
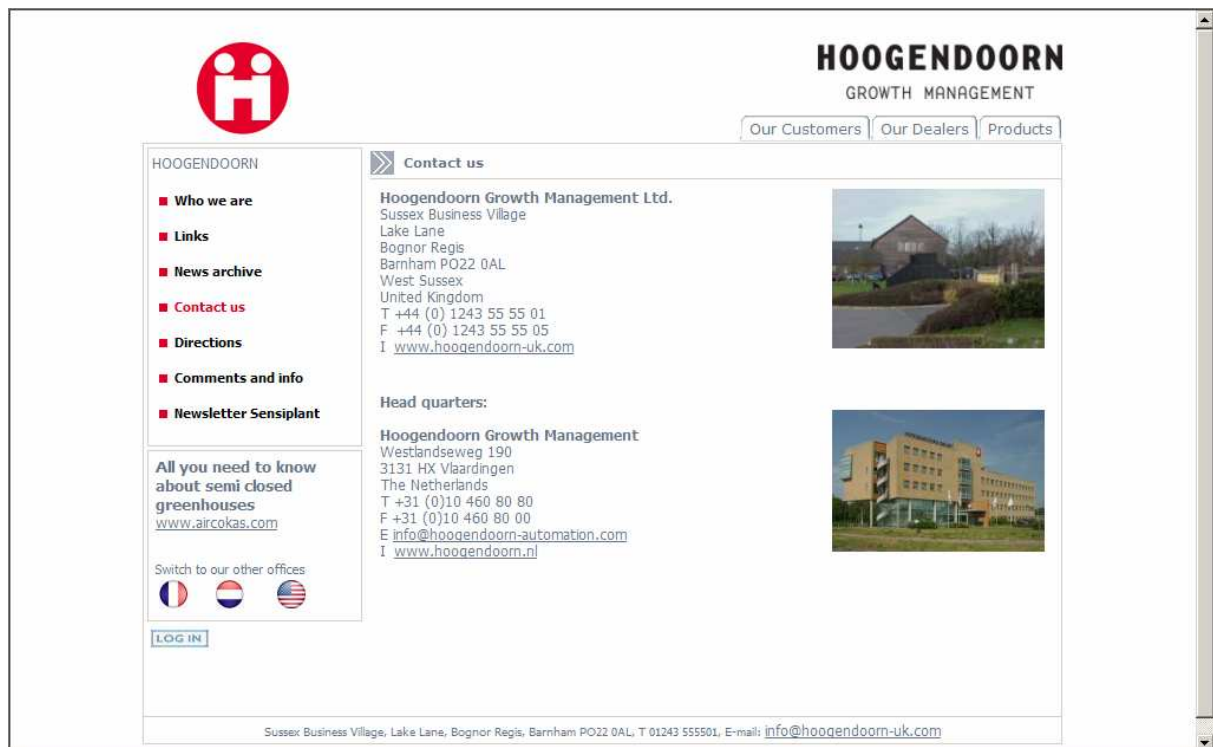

Illustration 10 - Screen print website

PART IV

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SERVICE

13. Service

13.1 Alarm with no gas registration

new service setting:
energy monitoring: no gas registration: counter switch-off time

13.2 Heat removal link per circuit

The following settings have been moved from process 'Heating general' to process 'Heating circuit'
- Link greenhouse heating – heat removal
- greenhouse heating: configuration heat removal (cluster)
- greenhouse heating: group number heat removal (cluster)
- cooling water temperature threshold: removal
- heat removal: line regulation
- heat removal: difference monitoring
- cooling water temperature: dead zone cooling water

The upper three settings have had a slight name change:
- Link circuits - heat removal
- circuit: configuration heat removal (cluster)
- circuit: group number heat removal (cluster)

13.3 Roof washer registration

roof washer: notification
This service item can now be shown in a graph. This can be a good tool in case you are looking for a defect. When this notification is active, this means the roof washer wants to enter the relevant climate group, or is already inside it.

13.4 Outside RH via shared weather mast

With a site with several Economic configurations linked via a network, and only one RH meter, it is possible to share the outside RH via a shared weather mast.

ANNEX - Terminology

In order to make optimum use of the information in this booklet, it is important to distinguish between the following terms.

Release
The whole of all new, modified or existing program components made available at a point in time for operation.

Version
Hoogendoorn numbers their releases and calls each successive release a version. The release for 2009 is version 12.20.

Sub-version
Modification to a release during the year, a component of an existing version (see above).

Module
A complete part of computer software that controls a particular process, for example Hoogendoorn ECONAUT.

Option
A possible addition to the computerised control of your business. Options are not incorporated as standard in the Economic process computer, and you can therefore select to have these or not. Examples are temperature control with ECONAUT, and plant temperature measurement with the GROWLAB camera.

Hoogendoorn Economic version 12.21