SENMATIC
DGT

User manual for LCC 4

Version 0 revision 0

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Preface

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

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

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

For installation we refer to the installation manual and diagrams posterior in the manual.

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

NB! LCC 4 must not be installed in direct sun light or in ambient temperatures above 45°C.

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

Due to modular construction some programs might not be included though described in the manual.

Best regards

Senmatic A/S

DGT-Volmatic

Introduction

Congratulations with your new Climate Computer, LCC 4.

The functions of LCC 4 are divided into menus, which give a good overview of the possibilities for the optimum setting of the climate computer.

LCC 4 is built in a standard model and can be expanded regarding software and hardware in modules according to requirements. The options are numerous.

This manual contains a short description of the computer functions, a section showing how to control the LCC 4, (an example showing a setting in the LCC 4), an overview of the numerous possibilities followed by a more detailed going through the operation of the computer and descriptions of the individual functions.

This set of instructions has been compiled to make sure that you will obtain reliable performance from the LCC 4 from the very start. If you follow the instructions carefully the LCC 4 will operate to your entire satisfaction over a long period.

Short description of LCC 4

General

The system contains a LCC 4 and a number of expansion units.
The LCC 4 contains the main software and the operation panel.
The expansion units contain the all inputs and outputs.
The LCC 4 climate computer can control all climate functions in 1-16 compartments.

Temperature Settings

The compartments can be divided into 2 climate zones, each with its own temperature sensor, heating and/or ventilation controller.
Each zone can be controlled by a common heating- and ventilation demand, or have its own local demand.
The local demand can be relative to the common demand, or it can have its own local set points.

Time Zones + Day - Night

The time zones are used for heating temperature, ventilation temperature, humidity control and CO_2 control. It is possible to set 4 day time zones and 2 night time zones. Shifting from night to day and day to night can happen on fixed time or relative to sunrise and sunset

Common Heating Temperature

The common heating temperature can be used as “basis” for the 2 zones.
It contains all the advanced temperature demand strategy:

Basic heating temperature.
Time zone addition.
Light dependent addition.
Negative DIF.
High humidity addition.
Light sum night addition.
Average temperature control addition.
Manual addition.

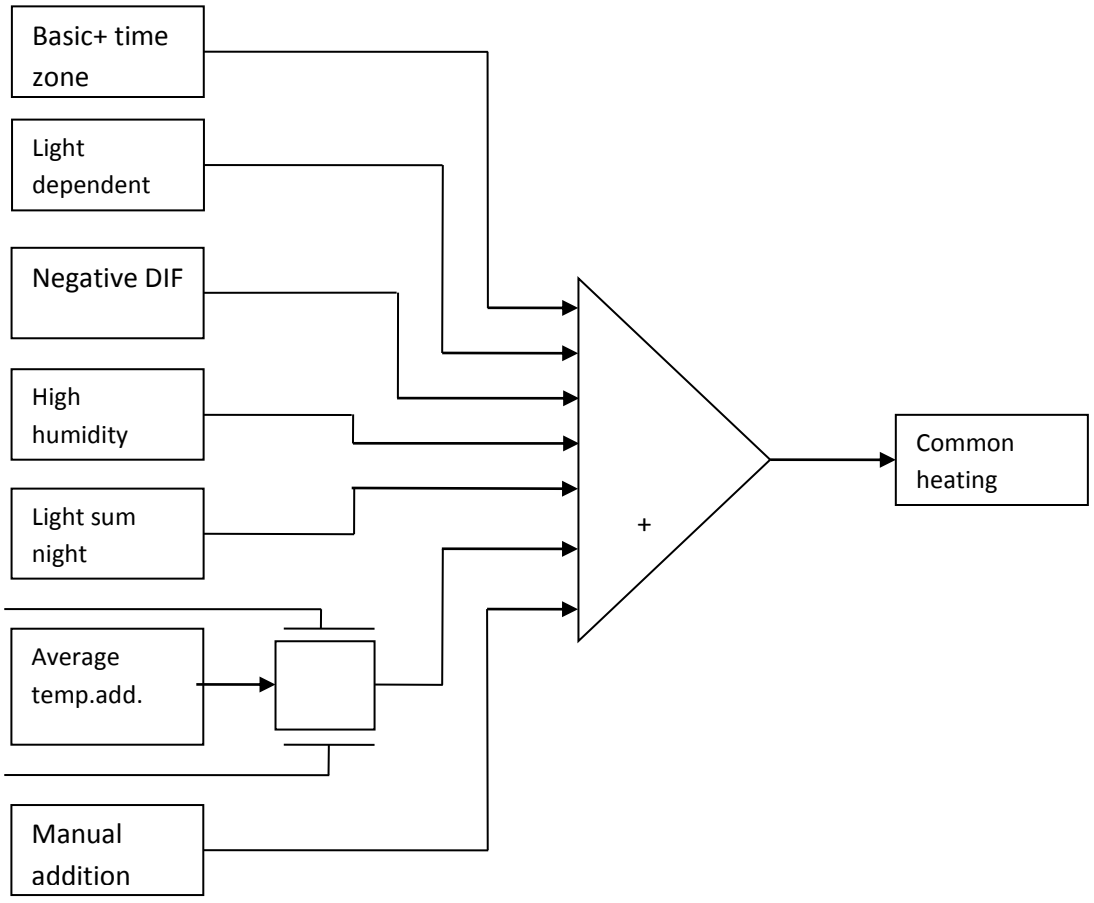


Figure 1
Common heating temperature demand.

Light Levels and Ramps

The light levels determine the light intensity for start of light dependent addition and for full addition.

The ramps determine the rate/speed of temperature change in each time zone e.g. the ramp in time zone 2 will give the rate/speed of temperature change going from time zone 1 to time zone 2.

Average Temperature Control

Average temperature control can be used to achieve a wanted average temperature over a certain priod of time. The control will give an addition to the normal temperature demand in all time zones depending on the error in average temperature and the limits set for the allowed addition (recovery temperature).

Negative DIF

Negative DIF/Drop is used for handling the stretching of the crop.
Negative DIF is an additional temperature for the heating temperature demand.
Negative DIF has 2 time zones, 1 on each side of a fixed/absolute time or a time relative to sun rise.

Common Ventilation Temperature

The Common ventilation temperature can be used as "basis" for the zones.
It contains all the advanced temperature set point strategy, and can be relative to the heating temperature demand. You can choose between Relative and Absolute.

Low Humidity Dependent Addition

Low Humidity Dep. Addition will increase the ventilation temperature demand when the humidity comes below a set limit. Increasing the ventilation temperature demand or lowering the maximum vent limits by low humidity will normally avoid or delay the low humidity problem, because the ventilation will be decreased or delayed.
It is possible to choose between RH% and DX.

CO_2 Dependent Addition

CO_2 dependent addition on ventilation temperature demand gives the opportunity to have a higher temperature when the CO_2 is high.
The optimum crop temperature is CO_2 and light dependent.

NB! When the temperature gets higher than the ventilation temperature demand, the vents start to open, the CO_2 concentration drops and the ventilation temperature demand drop as well – the result will be a sudden higher opening of the vents.

Heating Control

Heat Valves

Each compartment can control up to 4 mixing valves.
The primary and secondary have advanced cascade control.

Circulating Pumps

The circulating pumps are activated when the inlet temperature demand is exceeding the required air temperature.
The pumps are always started for 5 minutes at midnight in order to avoid locking of the pumps caused by coating.

Heat Steps

Each zone can have 2 heat steps to be activated by decreasing temperature and/or maximum humidity.
It is possible to have the heating steps pulsing by max humidity (steam).

Ventilation Control

Each compartment can have up to 4 vents, 2 top vent and 2 side vents or 4 top/side vents.

Ventilation Steps

Each zone can have 2 ventilation steps that are activated by increasing temperature and/or maximum humidity.

Super Step

Super Step is a step controller with 6 steps.
The temperature steps are activated depending on the ventilation demand from ventilation PI-controller 2.
This means Ventilations-PI controller 1 can be used for normal vents and Ventilation-PI controller 2 can be used for “Super Step”.
Super Step functions in the following way:
The set point (vent controller 2) can set to be absolute or relative to the normal ventilations set point (vent controller 1). At increasing ventilation demand the temperature step number (0-6) will increase.
Each temperature step is activated when the ventilation demand exceeds a set point ± a hysteresis i.g. 20% ±5%.
For each output the wanted activity in each temperature step can be selected.
For each output it can be set if it should be active in time zone 1-6 (overrules step).
For each output it can be selected if it should be active at low humidity. Normal min. hum demand.
For each output it can be selected if it should be active at high humidity. Normal max. hum demand.
The max humidity signal can be constant or pulsing. Pulse and interval are adjustable.
For each output it can be selected if it should be deactivated at high humidity.
For each output it can be selected if it should be deactivated at low outdoor temperature.
For each output it can be selected if it should be deactivated at rain.

Forced closing of top vents (Vent controller 1) can be selected for each temperature step.

Screens

Each compartment has 2 screen controls.
The screens can be used either as shading, blackout or energy screens.
The night-day changeover can be overruled by energy cost.

CO_2 Control

The CO_2 demand can be time zone and light dependent.

Supplementary Light

The supplementary light control contains up to 4 separate controls, each with possible 3 step control.

Maximum Humidity

The maximum humidity control can be divided into 2 zones. Both zones will have the same set point for maximum humidity except for an offset for zone 2 relative to zone 1.

The maximum humidity set point can be dependent on the time zones.

The control can be depending on relative humidity RH% or saturation deficit Delta X = DX.

Strategy for Control of maximum humidity

It is possible to control the maximum humidity in 4 different ways and the combinations are as follows:

Increasing minimum flow temperature:	Can be used by all mixing valves
Increasing air heating temperature demand:	Can be used by common or local heating temperature demand
Increasing minimum position leeside vents:	Can be used by top and side vents
Decreasing maximum position screens:	Can be used by both screens

HAF Fans

Each ventilation zone can have 1 HAF control.
The HAF fan can be started by high temperature and/or high humidity.
The HAF fan can be stopped by a selected ventilation demand.

Misting

Each compartment has 2 misting controllers.
The 2 misting controllers have common auto period.
Each misting can be started by low humidity (Humidification) and/or by high temperature (Cooling).
Each misting controller can activated up to 8 valves in a sequence.

Irrigation

Irrigation is not possible with more valves in parallel.
There is no priority between the various irritation controllers.

The irrigation controller has the following functions:
16 valves executed in numerical order
1 pump output
Manual and external standby

Start options:
Automatic period can be absolute time or relative time (sun up - down)
Manual start
Sun integrator overruled by auto period yes/no
Fixed interval overruled by auto period yes/no
24 hour program with 8 starts on absolute time
External start overruled by auto period yes/no

Alarm

LCC 4 has 2 alarm outputs each controlled by a time clock
Low priority alarm and High priority alarm
For each output the wanted alarms can be selected

Operation of the Panel

The Panel is a touch panel, so activation is done by pressing the fingers directly on the screen. There is 2 overview picture which are accessed by pressing the below buttons. Each of these displays can show 8 compartments. NB that the selected overview picture is indicated with a dark green button.


Setting of times

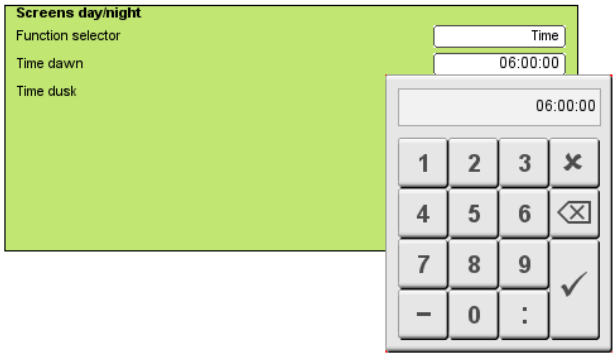


Figure 2
Colon is used to separate hours, minutes and seconds
Ex. Type: 6:00:00

All settings of time in the LCC 4 have the format hours, minutes and seconds.

Overview pictures

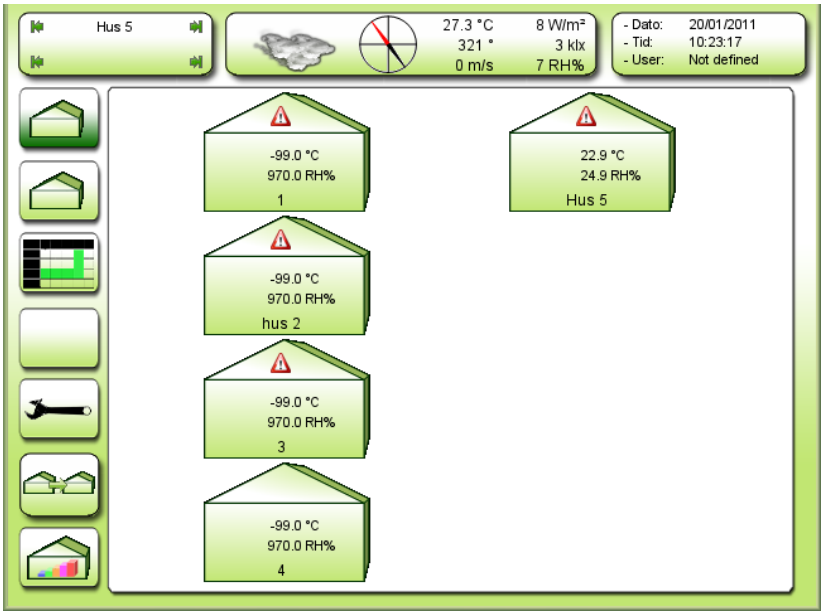


Figure 3
Overview picture

By pressing a house on the overview picture, the key menu for the selected compartment is appearing

Menu Overview

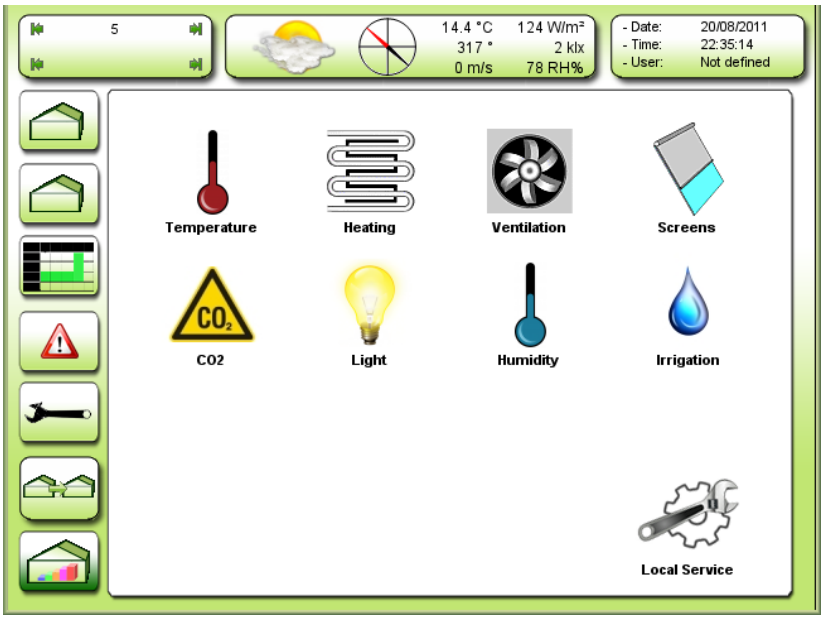


Figure 4
Menu overview for the selected compartment

On the menu overview 8 icons can be activated. These icons lead to the various submenus, e.g. ventilation, where settings and readings are possible. These submenus are split up into tabs and possibly some buttons at the bottom. Below all these settings and readings are described.

Tabs for settings and readings

Ventilation

Overview

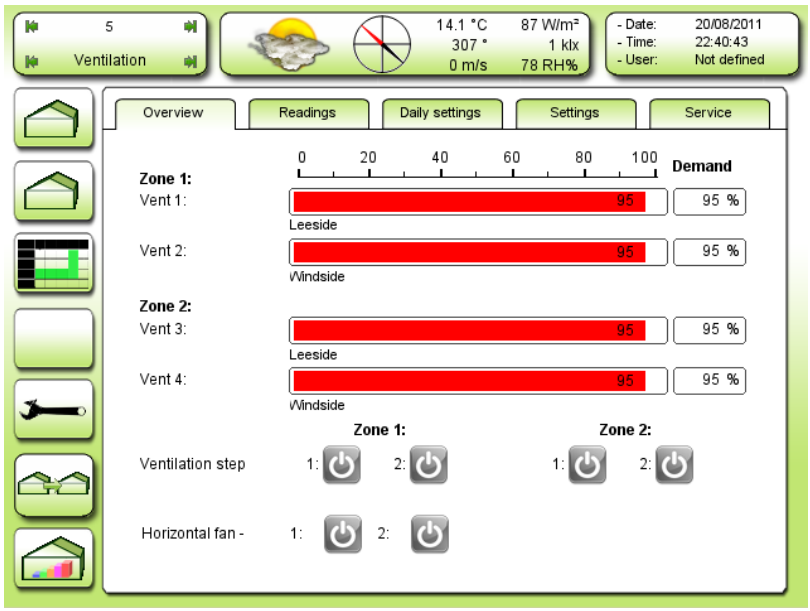


Figure 5
Overview for ventilation, ventilation steps and HAF.

HAF:
Horizontal **A**ir **F**an

Reading of demand for opening of the ventilating windows. Ventilation 1-4

Ventilation step and horizontal air fan activity is read as green icons grey icons indicates inactivity.

Reading

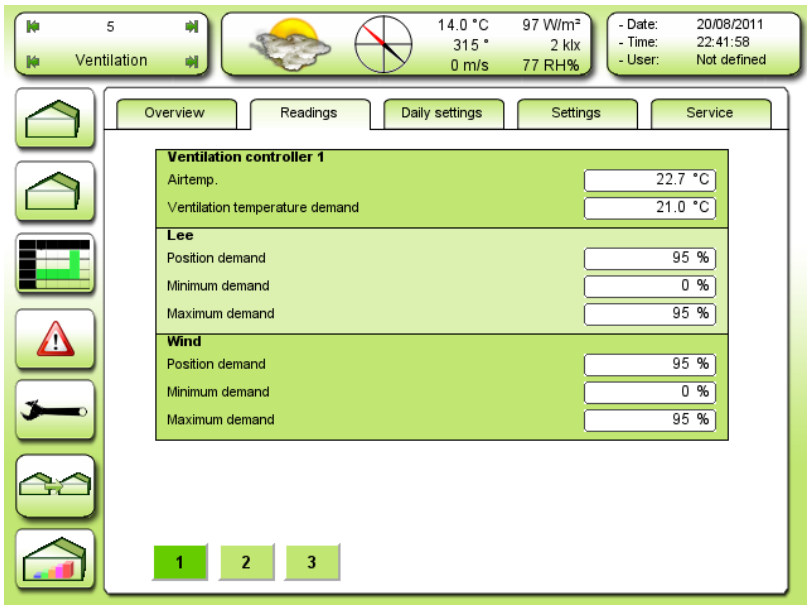


Figure 6
Reading of ventilation controller 1

Air temperature

Reading of actual temperature in the compartment/ventilation zone.

Ventilation temperature demand

Reading of estimated ventilation temperature demand for the compartment/ventilation zone.

Position demand

Reading of the estimated opening demand in %

Minimum demand

Reading of estimated minimum demand for opening.

Maximum demand

Reading of estimated maximum demand for opening.

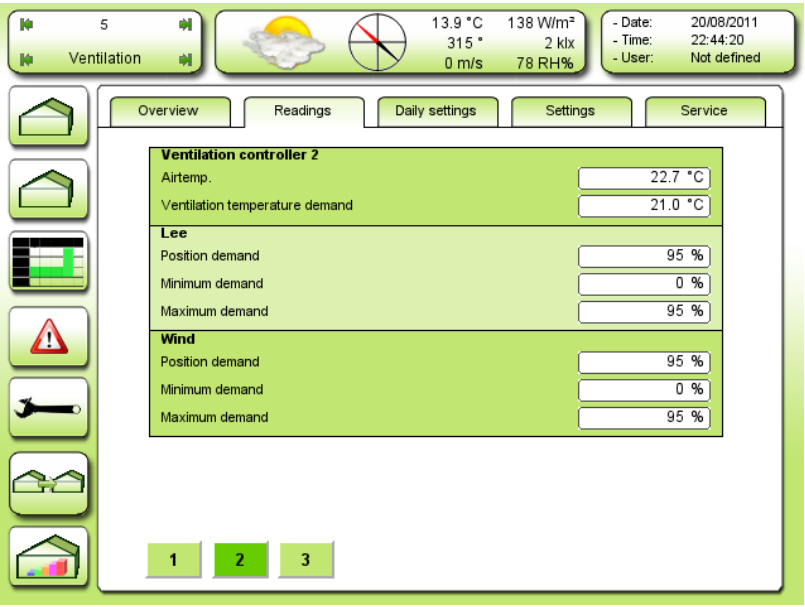


Figure 7
Reading of ventilation controller 2

See description for reading of ventilations controller 1 (Figure 6).

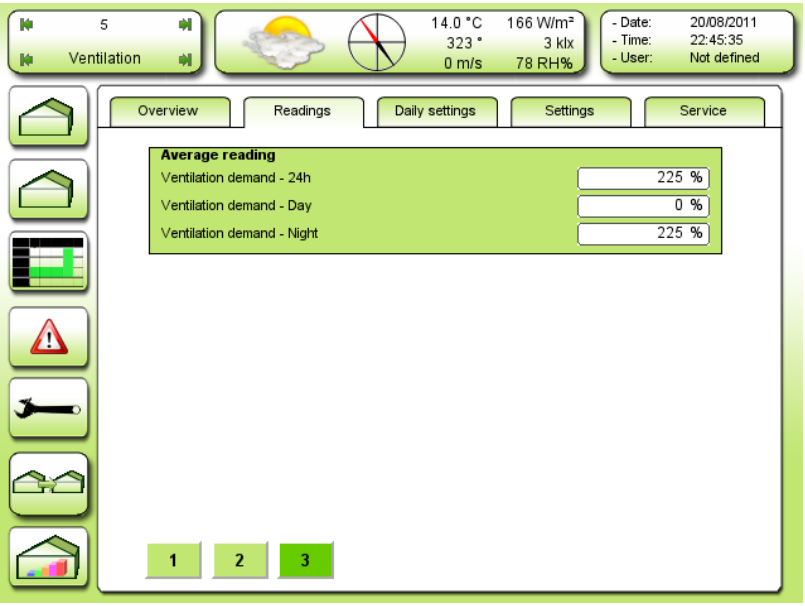


Figure 8
Reading of average values

The values in the example is not in accordance with normal adjustment.

Settings for ventilation

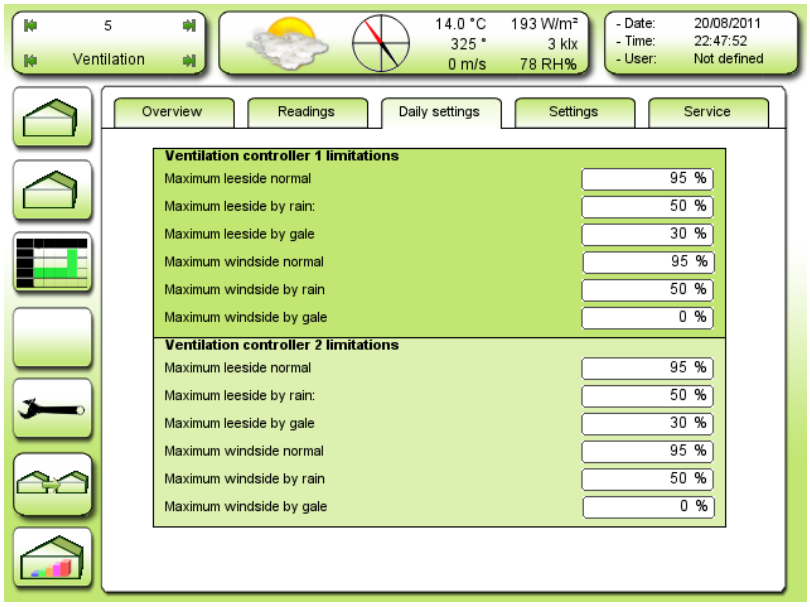


Figure 9
Daily settings for ventilation.

Maximum leeside normal
Adjustment of "fixed" maximum position leeside.

Maximum leeside by rain
Adjustment of "fixed" maximum position at rain.

Maximum leeside by gale
Adjustment of "fixed" maximum position at gale/high wind speed

NB! Max. Pos. leeside can be reduced dependent of low humidity. See Figure 11.

NB! Max. Pos. leeside can also be reduced dependent of low outdoor temperature and high wind speed. See Figure 25.

Maximum wind side normal
Setting of “fixed” maximum position windward.

Maximum wind side by rain
Adjustment of maximum position windside at rain.

Maximum wind side by gale
Adjustment of maximum position wind side at gale/high wind speed.

NB! Max. Pos. wind side can be reduced dependent of low humidity.
NB! Max. Pos. wind side can also be reduced dependent of low outdoor temperature and high wind speed .

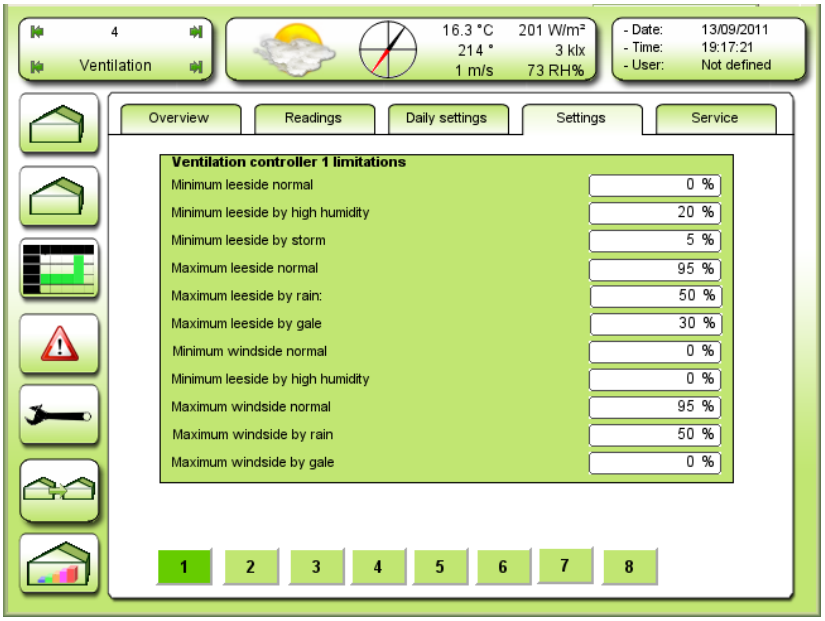


Figure 10
Detailed settings min. and max. Vent position controller 1.

For settings not described here, see Figure 10.

Minimum leeside normal
Minimum limitation of leeside for controller 1. That is **forced opening**, which however can be overruled by low outdoor temperature, high wind speed and low indoor. See Figure 25**.**

Minimum leeside normal at high humidity
Adjustment of minimum position leeside for controller 1, at high humidity.

Minimum leeside at storm
Setting of minimum position leeside for controller 1, at storm.
By opening the leeside a little in case of blasts of wind, damages on the green house may be avoided.

Minimum wind side normal
Adjustment of minimum wind side for controller 1. That is **forced opening**, which however can be overruled by low outdoor temperature, high wind speed and low indoor. See Figure 25**.**

Minimum wind side at high humidity
Adjustment of minimum position wind side at high humidity.

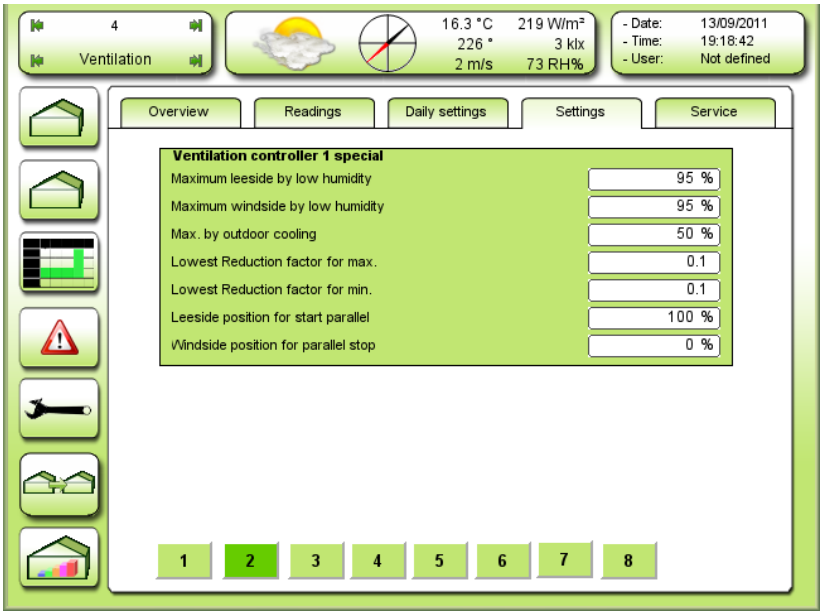


Figure 11
Special settings for ventilation, controller 1.

Max. leeside at low humidity

Adjustment of leeside at low humidity. Maximum will be gradually reduced towards this setting at decreasing humidity, under minimum humidity. Adjustment of minimum humidity: See Figure 49.

Max. windside at low humidity

Adjustment of wind side at low humidity. Maximum will be gradually reduced towards this setting at decreasing humidity, under minimum humidity. Adjustment of minimum humidity: See Figure 49.

Max. at outdoor cooling

Adjustment of maximum lee – and wind side at active outdoor cooling. (external signal)

Lowest reduction factor for max.

Adjustment of lowest possible reduction of max. lee- and wind side. 0.1 means that max. can be reduced to 10% of the original value.

Lowest reduction factor for minimum

Adjustment of lowest possible reduction of min. lee- and windside. 0.1 means that max. can be reduced to 10% of the original value.

Leeside position for start parallel

Adjustment of position demand leeside for start parallel operation on lee- and wind side. When the ventilation demand exceeds this position, the extra demands will be split between lee- and wind side in a fixed ratio (can be adjusted in service settings). 100% means parallel again.

Wind side position for stop parallel

Adjustment of position demand for stop opening of wind side, after parallel operation, at start ventilation. E.g. if the adjustment is 10 %, then both windows will open from start ventilation, until the wind side reaches 10%, then only the leeside will open, until parallel operation is continued at leeside position for parallel start.

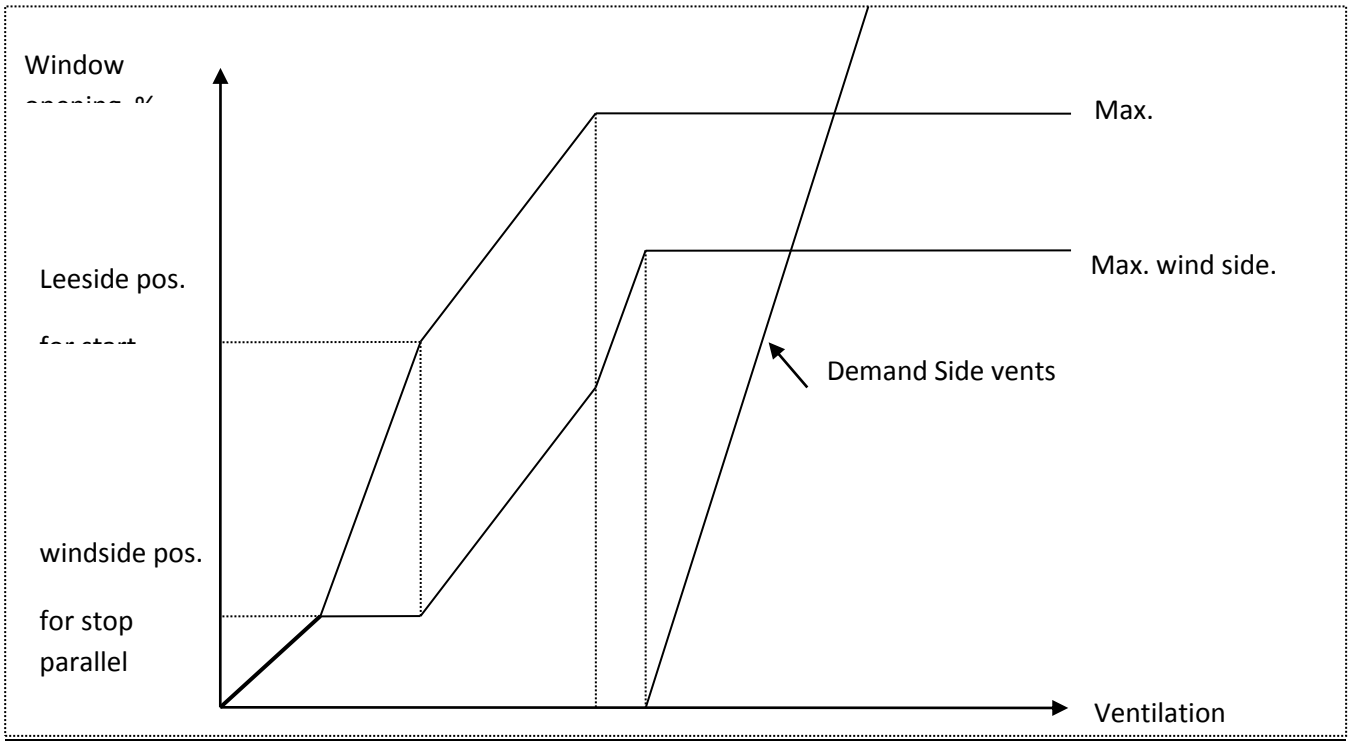


Figure 12

Cascade control of lee - and wind side.

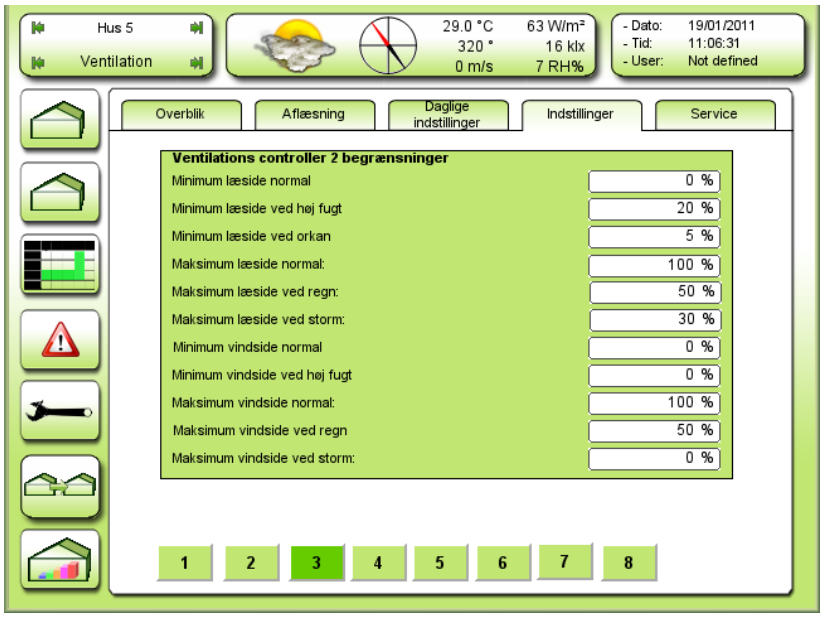


Figure 13
Detailed settings min. and max. Vent position controller 2.

See description for controller 1 under Figure 10.

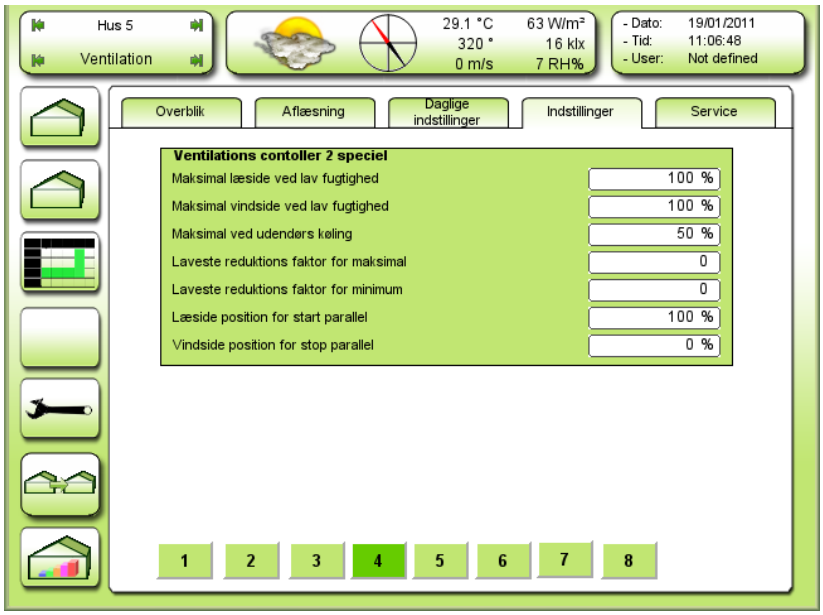


Figure 14
Special settings for ventilation controller 2.

See description for controller 1 under Figure 11.

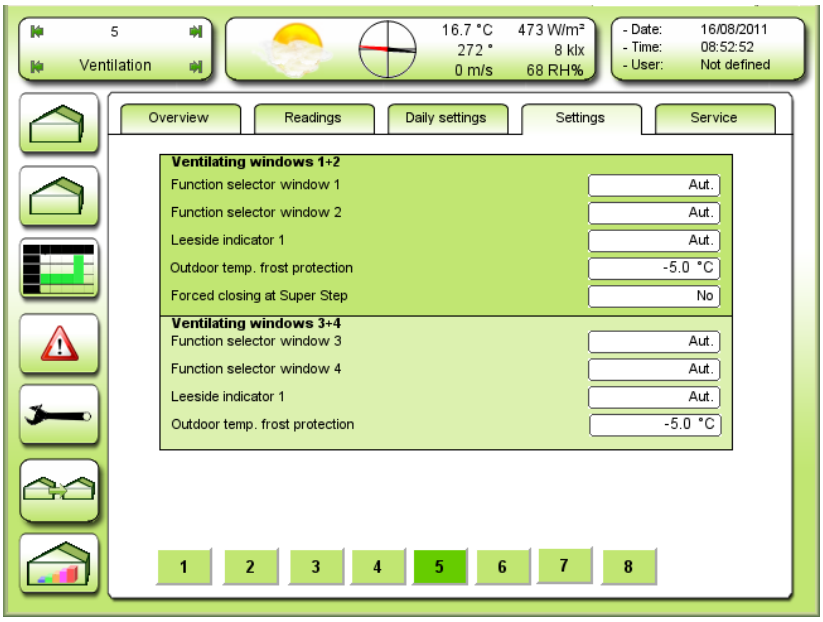


Figure 15
Function selectors for all 4 vents. etc.

Functions selector window 1
Choice of function for window 1.

Functions selector window 2
Choice of function for window 2.

Close: The window is closing totally, manually.
Aut.: The window is opening and closing automatically dependant from the ventilation demand from the regulator.
Open: The window is closing totally, manually.
Stop: The window stops instantly.

Leeside-indicator **1/2**
Indication showing if leeside-indicator **1** or **2** is selected for controlling ventilation 1+2. Furthermore one can read whether or not the selected leeside regulator is automatic or fixed.

Outdoor temp frost protection
Setting the limit for outdoor temperature under which vents 1 + 2 are forced closed.

Forced Closing at SuperStep
Choosing whether or not vents 1 + 2 can be forced closed, when the selected SuperStep outputs are active.
0 = no.
1 = yes.

Functions selector window 3

Choice of function for window 3.

Functions selector window 4.

Close: The window is closing totally, manually.

Aut.: The window is opening and closing automatically dependant from the ventilation demand from the regulator.

Open: The window is closing totally, manually.

Stop: The window stops instantly.

Leeside-indicator **1/2**

Indication showing if leeside-indicator **1** or **2** is selected for controlling ventilation 3+4. Furthermore one can read whether or not the selected leeside regulator is automatic or fixed.

Outdoor temp frost protection

Adjusting the limit for outdoor temperature under which vents 3 + 4 are forced closed.

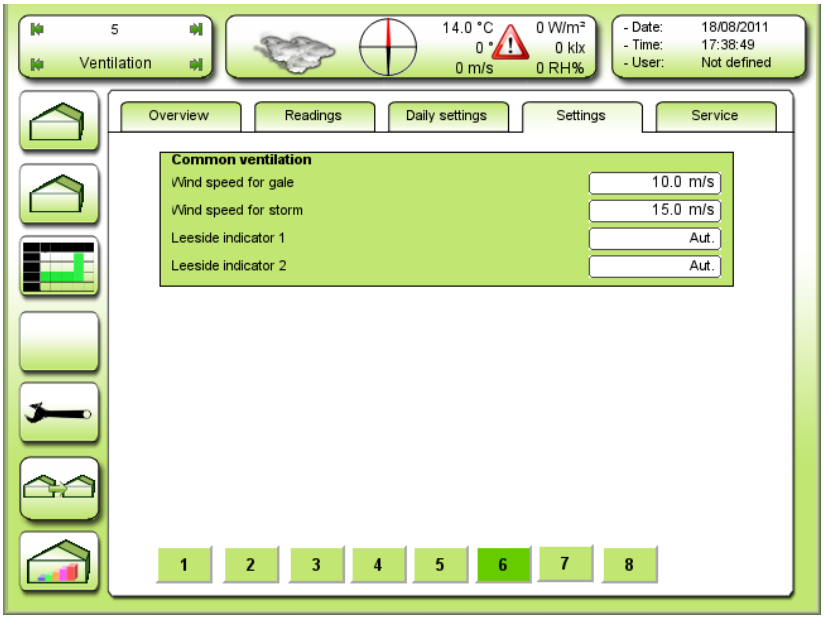


Figure 16
Common settings for both sets of vents.

Wind speed for gale

Adjusting the wind speed for “gale” condition, which will cause lowering the vent maximum.

Wind speed for storm

Adjusting the wind speed for “storm” condition, which will cause completely closed vents. It’s also possible to get a little opening at the leeside if wanted. See Figure 10. By opening the leeside a little, in conditions of storm, the vacuum maybe equalizes so the glass won’t damage.

Leeside-indicator 1

Selecting the mode for leeside indicator 1

Aut.: The leeside is controlled by the wind direction.
1: Vent 1/3 is fixed leeside
2: Vent 2/4 is fixed leeside

Leeside-indicator 2

Selecting the mode for leeside indicator 2

Aut.: The leeside is controlled by the wind direction.
1: Vent 1/3 is fixed leeside
2: Vent 2/4 is fixed leeside

Adjustments for Ventilation - step.

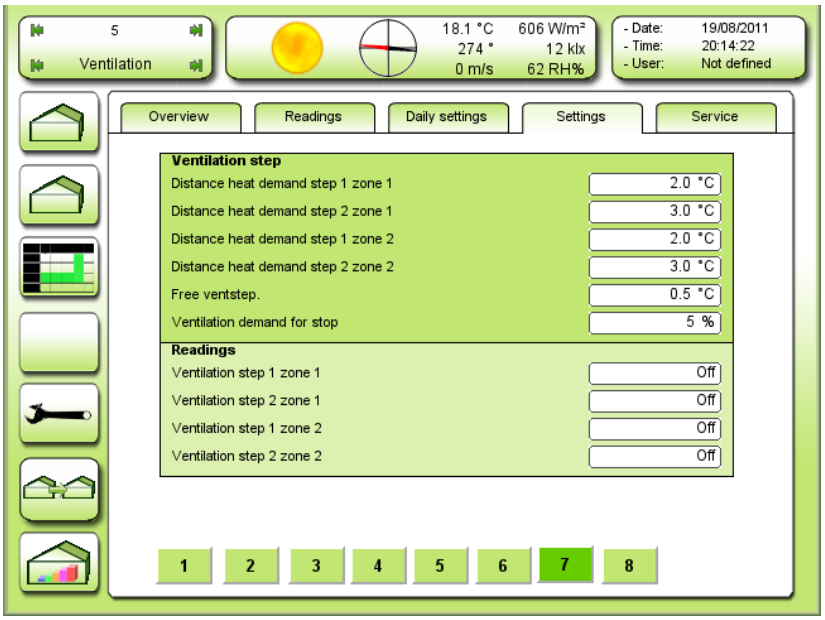


Figure 17
Adjustings and readings for ventilation steps.
TODO **Free ventstep skal ændres til: Hysteresis ventilation steps**

Distance heat demand step 1 zone 1
Adjusting the distance to heating temperature demand for starting ventilation step 1 in zone 1.

Distance heat demand step 2 zone 1
Adjusting the distance to heating temperature demand for starting ventilation step 2 in zone 1.

Distance heat demand step 1 zone 2
Adjusting the distance to heating temperature demand for starting ventilation step 1 in zone 2.

Distance heat demand step 2 zone 2
Adjusting the distance to heating temperature demand for starting ventilation step 2 in zone 2.

Hysteresis ventilation steps
Adjusting the hysteresis (on-off difference) on the ventilation steps.
NB! 1.0°C means ± 1.0 °C

Ventilation demand for stop
Adjusting the ventilation demand above which the ventilation steps will stop.

Ventilation step n zone n
Reading if the ventilation steps are active or not.

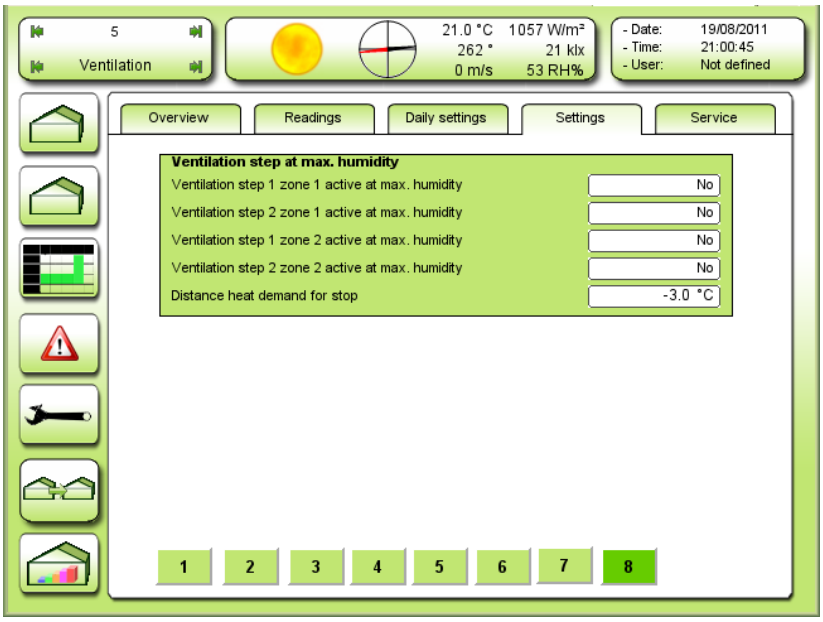


Figure 18
Adjustments for step activity at max. humidity.

Ventilation step 1 in zone 1 active at max. humidity
Selecting whether or not, ventilation step 1 in zone 1 will be activated at maximum humidity.

Ventilation step 2 in zone 1 active at max. humidity
Selecting whether or not, ventilation step 2 in zone 1 will be activated at maximum humidity.

Ventilation step 1 in zone 2 active at max. humidity
Selecting whether or not, ventilation step 1 in zone 2 will be activated at maximum humidity.

Ventilation step 2 in zone 2 active at max. humidity
Selecting whether or not, ventilation step 2 in zone 2 will be activated at maximum humidity.

Distance heat demand for stop

Adjusting the distance to heating temperature demand below which the ventilation steps activated by maximum humidity will stop.

Service settings ventilation.

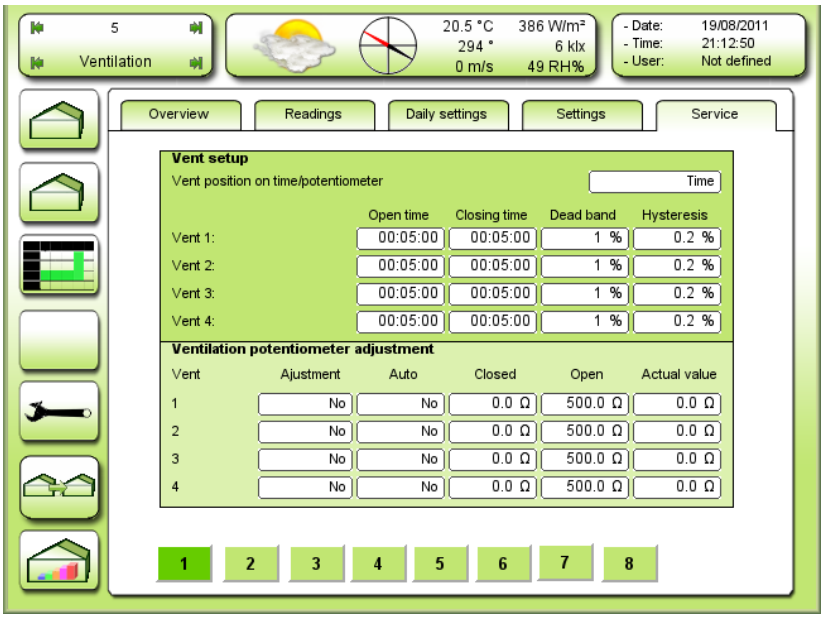


Figure 19
Setup for Vent control based on time or with potentiometer feedback.

Vent 1-2 belongs to vent controller 1.
Vent 3-4 belongs to vent controller 2.
Number of ventilation controllers must be set on 2 if vent 3-4 are going to be used. See Figure 20.

If time control is selected:

Here are the actual running times for the 4 ventilation gears adjusted.
I.e. a stop watch can be used for the measurement. Elapsed time from completely closed until completely open gives Open time. Elapsed time from completely open until completely closed gives Closing time.

If Potentiometer control is selected:

An example for calibrating Gear potentiometer:

In the column under Adjustment,"Closed" is chosen.
Wait until the actual vent gear has closed completely.
While the vent gear is completely closed, "Closed" is changed to "Open". The ohm value for position closed is now being saved and the gear begins to open the vent. Wait until the actual vent gear is completely open.
While the vent gear is completely open, "Open" is changed to"No". The ohm value for position open is now being saved and the gear begins to operate normally again.

The saved ohm values for the particular gears can be seen in the columns under Closed and Open. Also the actual value can be seen to the right.

Auto: **Yes** here, causes the Ohm value to be saved automatically every midnight. Continuous auto calibration.

Dead band and hysteresis:

Dead band and hysteresis are valid for both time control and potentiometer feedback control.
Dead band: The gear **starts moving** when the position demand comes outside the dead band with reference to the position.
Hysteresis: The gear **stops moving** when the position is inside the hysteresis with reference to the position demand.

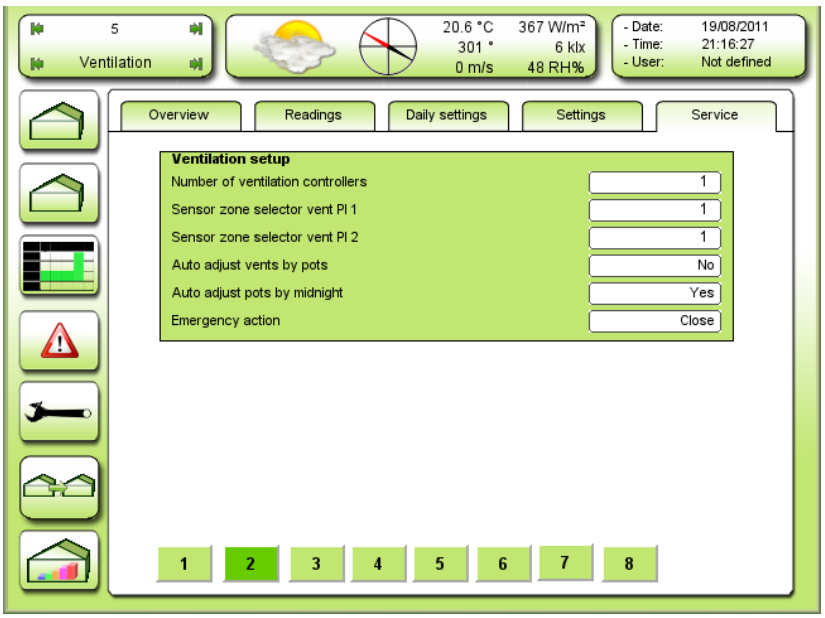


Figure 20
Number of ventilation controllers can be chosen here.

Number of ventilation controllers

Adjust whether 1 or 2 vent. controllers are to be used. That will be 1 or 2 sets of vents. each containing lee- and wind side.

Two PI regulators exist for air temperature regulation implemented by the windows ventilation.
(PI regulator = Proportional Integral regulator)
Freely chose which of the 4 sensors to be used at each regulator input. A combination of up to 4 sensors is possible at the inputs. Look at Figure 141

Sensor zone selector vent PI1

Choice of sensor zone for the input of PI1.

Sensor zone selector vent PI2

Choice of sensor zone for the input of PI1, if 2 PI regulators are used.

Auto adjust vents. by pots

Selecting if the vents are to be auto adjusted (closed) when pots are installed.

This is useful when several vents are running in parallel.

Auto adjust pots by midnight

Selecting if the pots are to be auto adjusted (closed) by midnight.

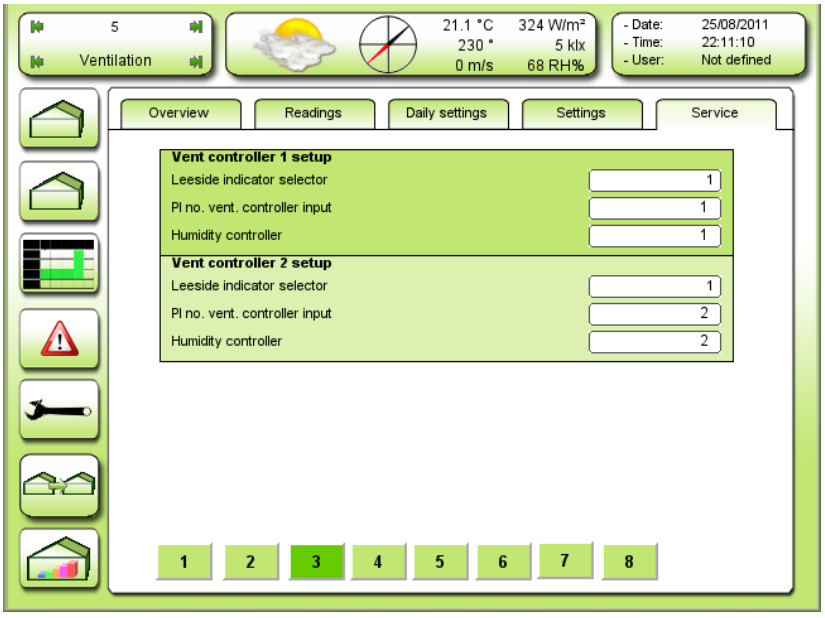


Figure 21
Ventilation controllers input setup.

Vent controller 1 setup.

Leeside indicator selector

Selecting the leeside indicator to be used on ventilation controller 1

Each compartment has 2 leeside indicators which can bee used by the ventilation controllers.

If vent 1+2 and vent 3+4 do not have the same direction e.g. 90° and 180 °, then vent 1+2 can use leeside indicator 1 and vent 3+4 can use leeside indicator 2. Normally 1 is selected here. In case of only 1 vent is presented, it should be fixed leeside. See Figure 139 for 162the directions setup.

PI no. vent. controller input

Chose which PI regulator and thus also which sensor/sensor combination, are controlling vent. 1 and 2.

Humidity controller

Chose which humidity controller is to control vent. 1 and 2.

Ventilations controller 2 setup.

Leeside indicator selector

Selecting the leeside indicator to be used on ventilation controller 2

Each compartment has 2 leeside indicators which can bee used by the ventilation controllers.

If vent 1+2 and vent 3+4 do not have the same direction e.g. 90° and 180 °, then vent 1+2 can use leeside indicator 1 and vent 3+4 can use leeside indicator 2.

PI no. vent. controller input

Chose which PI regulator and thus also which sensor/sensor combination, are controlling vent. 3 and 4.

Humidity controller

Chose which humidity controller is to control vent. 3 and 4.

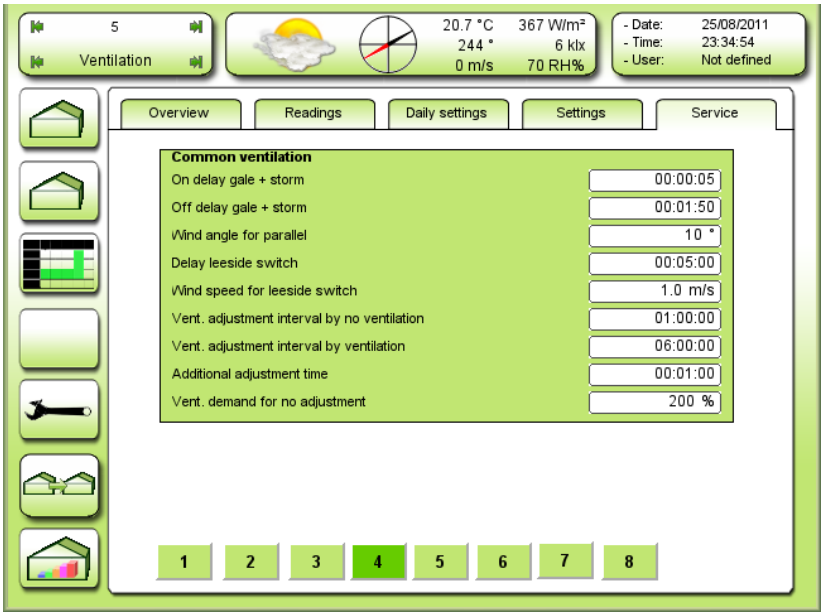


Figure 22
Service settings common for ventilation.

On delay gale + storm

Adjusting the time delay for the vents reaction on gale or storm. A gust of wind shorter than this time gives no reaction. When storm or gale is detected the next set point will delay the cancellation.

Off delay gale + storm

The wind speed must be under the limit for gale / storm for at least this time for cancellation.

Wind angel for parallel
When the wind blows along the ridge, wind- and lee side will do parallel. This set point allows the wind direction to turn while the wind- and lee side are still doing parallel. When the wind direction turns more than this set point, normal lee side regulation is performed again.

Delay leeside switch
Adjusting the time delay for shifting lee side, after the wind direction has crossed the gable direction.

Wind speed for leeside switch
If the wind speed is lower than this setting, there will be no change in lee side.

In case of no position feedback is installed, the vents can get out of step with the climate computer control. That is why automatic calibration is possible. If this feature is activated, the vents will close from time to time with a fixed interval for synchronization.

Vent. adjustment interval by no ventilation
The time that has to pass between automatic calibration of the vents when no ventilation is carried out due to high temperature. I.e. humidity control.

Vent. adjustment interval by ventilation
The time that has to pass between automatic calibration of the vents when ventilation is carried out due to high temperature.

Additional adjustment time
Extra time for the closing signal, to ensure that the vents will be completely closed when calibration is performed.

Vent. demand for no adjustment
By ventilation demand above this set point, no auto calibration will be take place. Complete ventilation is **200 %**. 100 % per vent.

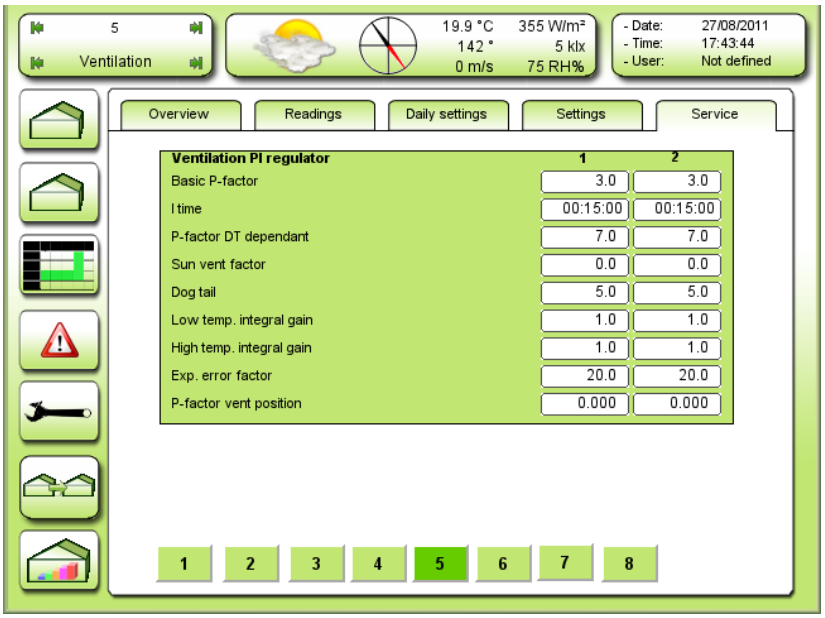


Figure 23
Setup for the PI regulator for ventilation.

Basic P-factor

Adjustment for the basic P-factor.
The P-factor gives a change in the ventilation demand proportional with temperature error.
The P-factor is actual the sensitivity of the regulator.
If the P-factor is too high it could cause temperature pendling.
If the P-factor is too low, the regulation will be slow.
A greenhouse with huge vents has an efficient air change and needs a low P-factor.
A greenhouse with small vents has an inefficient air change and needs a high P-factor.

I time

Adjustment of the I time for the PI regulator.
The I-time is the time that has to pass, to give the same changement of the ventilation demand as the P contribution, at a constant temperature error.

Example:

Temperature error:	+1.0 °C constantly.
P-factor:	10 %/°C
I time:	00.15 hour
P contribution =	10 % change
I contribution =	10 % change after 15 minutes.

Tip: The I-time should be equal to the reaction time of the ventilation system of the green house.

P-factor DT dependant
Set point which reduces the basic P-factor, dependant from the temperature difference inside and outside. A lower temperature outside will cause a lower P-factor. Les ventilation. Unit: %/°C

Sun vent factor
This factor can be used for reduction of the ventilation model.

0.0 = no influence
1.0 = complete use of "sun ventilation"

Dog tail
Adjustment of the limitation of the integral related to the actual vent position. Integrating stops at the actual vent position +/- **dog tail.** If the vents stops at i.e. 80 %, the integral will stop at 85 %, with a dog tail of 5 %.

The following two set points must be different if they are to have an effect.
If i.e. **Low temp. integral gain** is 2.0 and **High temp. integral gain** is 1.0, the vents will regulate twice as fast down compared to up

Low temp. integral gain
Speeds up the I regulator, when it's too cold. If this set point is higher than 1.0, the simulated error will be higher than the actual error. This means that the integral function will act faster.

High temp. integral gain
Speeds up the I regulator, when it's too hot. If this set point is higher than 1.0, the simulated error will be higher than the actual error. This means that the integral function will act faster.

Exp. error factor
Adjusting the gain of the exponential error function. If the error becomes greater than 1.0 °C the simulated error for the integral function will increase exponentially.

P-factor vent position
Adjusting the change in ventilation temperature demand depending on the vent position.
0.005 °C/% gives 0.5 °C increase in ventilation temperature demand by vent position on 100%.

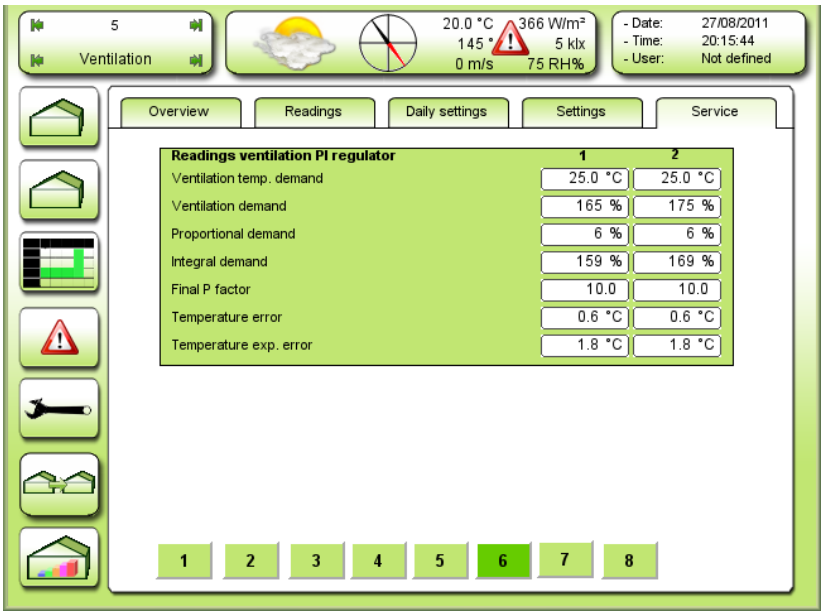


Figure 24
Service readings for the PI regulator for ventilation.

Ventilation temp. demand

Reading the current ventilation temperature demand for the PI regulator.

Ventilation demand

Reading the current ventilation demand from the PI regulator.

Proportional demand

Reading the current ventilation demand from the P function.

Integral demand

Reading the current ventilation demand from the I function.

Final P factor

Reading the current final P factor for the ventilation PI regulator.

Temperature error

Reading the current air temperature error.

Temperature exp. error

Reading the current simulated air temperature error for the integral function.

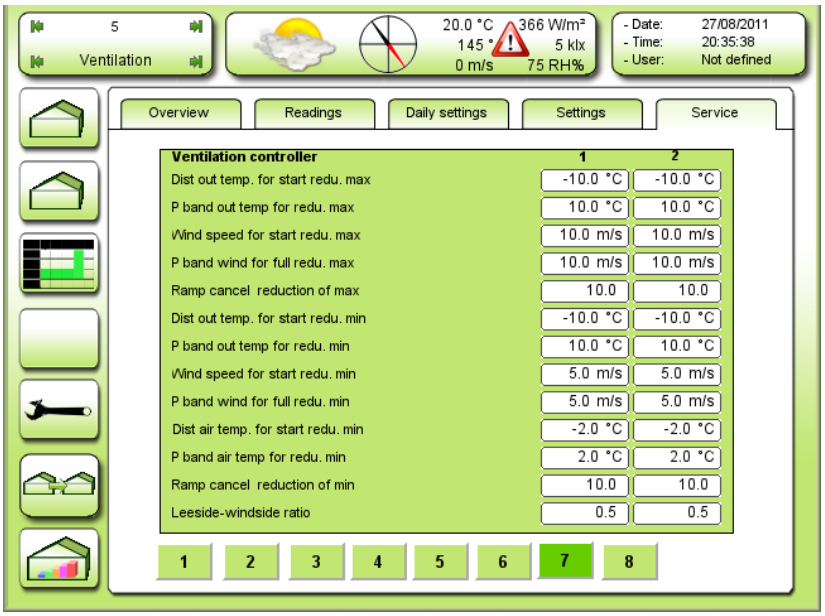


Figure 25
Service settings for the ventilation controllers.

Dist out temp. for start redu. max
Adjusting the difference between ventilation temperature demand and outdoor temperature, below which a reduction of maximum vent position will take place (**negative** value is below the ventilation temperatur).

P band out temp. for redu. max
Adjusting the P band on outdoor temperature for full reduction of maximum vent position.

Wind speed for start redu. max
Adjusting wind speed, below which a reduction of maximum vent position will take place.

P band wind for full redu. max
Adjusting the P band on wind speed for full reduction of maximum vent position.

Ramp cancel reduction of max
Adjusting the maximum rate/speed of changing the factor for reduction of maximum vent position.

Dist out temp. start redu. min
Adjusting the difference between heat temperature demand and outdoor temperature, below which a reduction of minimum vent position will take place.

P band out temp. for redu. min
Adjusting the P band on outdoor temperature for full reduction of minimum vent position.

Wind speed for start redu. min
Adjusting wind speed, below which a reduction of minimum vent position will take place.

P band wind for full redu. min

Adjusting the P band on wind speed for full reduction of minimum vent position.

Dist air temp. for start redu. min

Adjusting the difference between heat temperature demand and air temperature, below which a reduction of minimum vent position will take place.

P band air temp. for redu. min

Adjusting the P band on air temperature for full reduction of minimum vent position.

Ramp cancel reduction of min

Adjusting the maximum rate/speed of changing the factor for reduction of minimum vent position.

Leeside-windside ratio

Adjusting the ratio between leeside and windside opening increase, when running in parallel.
0.5 means 50 % on each.
0.6 means 60 % on leeside and 40 % on windside.

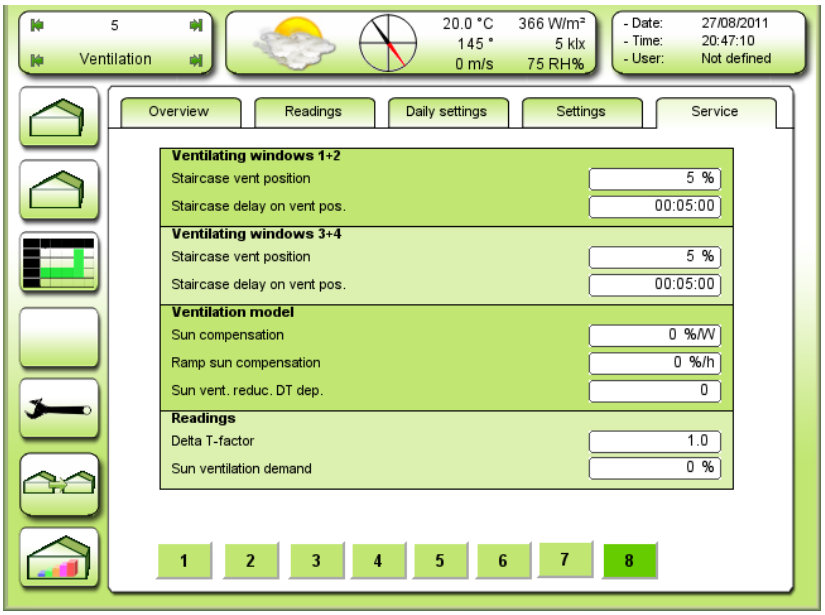


Figure 26
Staircase- and model settings for ventilation.

Staircase vent position

Adjusting the change in vent position demand for instant movement of the vents.
If the demand change is smaller the vents will not move until the **Staircase delay on vent pos**. has expired.

Staircase delay on vent pos.
Adjusting the delay on changes in vent position demand smaller than **Staircase vent position.**

Sun compensation
Adjusting the factor for calculating the sun ventilation demand by 0 °C temperature difference inside – outside. The measured sun radiation is reduced for heating the greenhouse before used for calculating the sun ventilation demand.

Sun vent =((Light power+SunRad) – (K*DeltaT))*SunComp/((DeltaT*SunVentRed)+1)

[W] [W] Factor depending of outdoor temp.

W ⇨ % opening of vent.

Ramp sun compensation
Adjusting the maximum rate/speed for changing the sun ventilation demand.

Sun vent. reduce. DT dep.
Adjusting the reduction of the sun ventilation depending on the temperature difference inside – outside.

Delta T factor
Reading the current factor for changing the ventilation PI regulator P-factor depending on the temperature difference inside – outside.

Sun ventilation demand
Reading the current sun ventilation demand.

Screens.

LCC4 can control 1, 2, 3 or 4 screens individually. Only screen 1 is described. The possibilities are the same for all four. Normal screen, blackout or outdoor screen control can be selected under service.

Overview

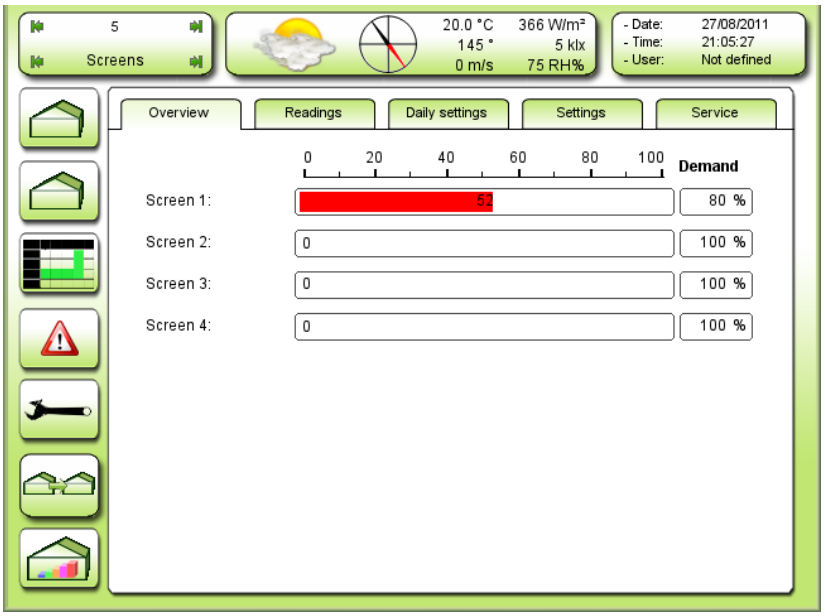


Figure 27
Overview for the screens positions.

Screen positions are shown here as bars. The demand can be seen to the right. If position and demand doesn't match, it's possible that the mode selector is not set automatic.

Reading

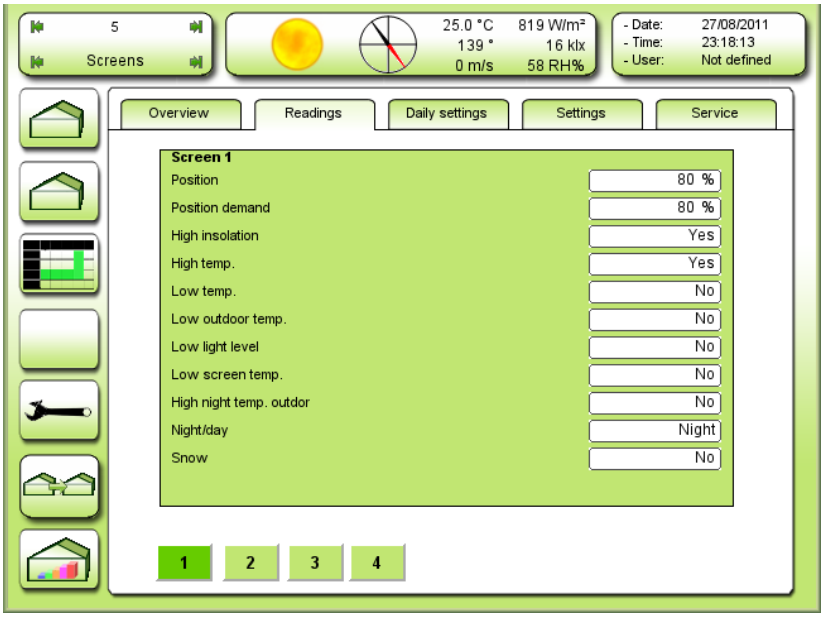


Figure 28
Status readings screen 1. Screen 2, 3 and 4 are exactly the same.

Position
Current position.

Position demand
Current position demand.

High insolation
Screen ON caused by high insolation.

High temp.
Screen ON caused by high air temperature.

Low temp.
Screen ON caused by low air temperature.

Low outdoor temp.
Screen ON caused by low outdoor temperature

Low light level
Screen ON caused by low light when supplementary light is ON

Low screen temp.
Screen stopped or ON caused by low screen temperature.
NB! This function can have a separate temperature sensor by the screen opening.

High night temp. outdoor
Screen **not ON at night** caused by high outdoor temperature. According the limit setting, see Figure 37.

Night/day
Screen ON caused by night

Snow
Screen position limited by snow

Settings

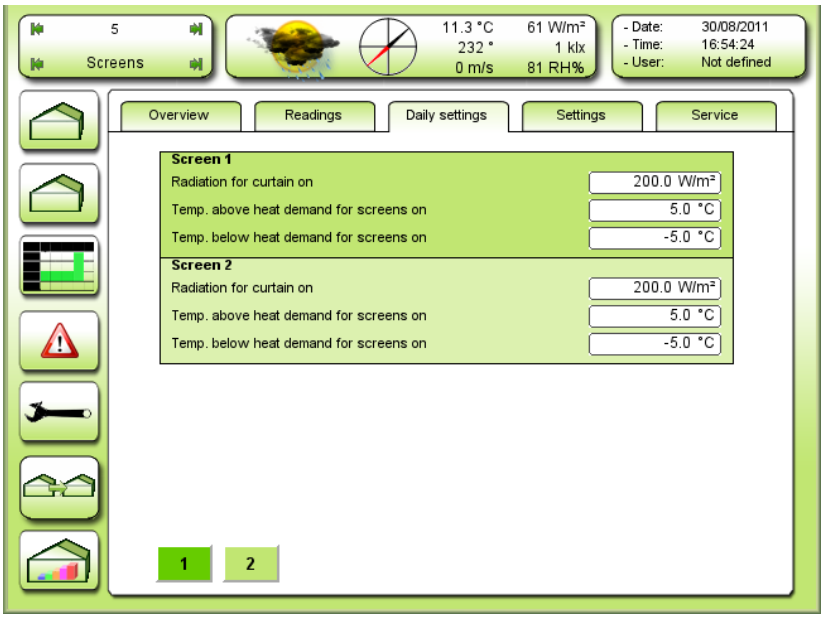


Figure 29
Daily settings for screens 1 and 2. 3 and 4 on the next menu.

Radiation for curtain on

Limit value for sun radiation, measured on the weather station. If the measurement exceeds this set point, this curtain will go on.

Temp. above heat demand for screens on

If the temperature inside the greenhouse exceeds the heat demand + this set point, this curtain will go on.

Temp. below heat demand for screens on

If the temperature inside the greenhouse goes under the heat demand + this set point, this curtain will go on.

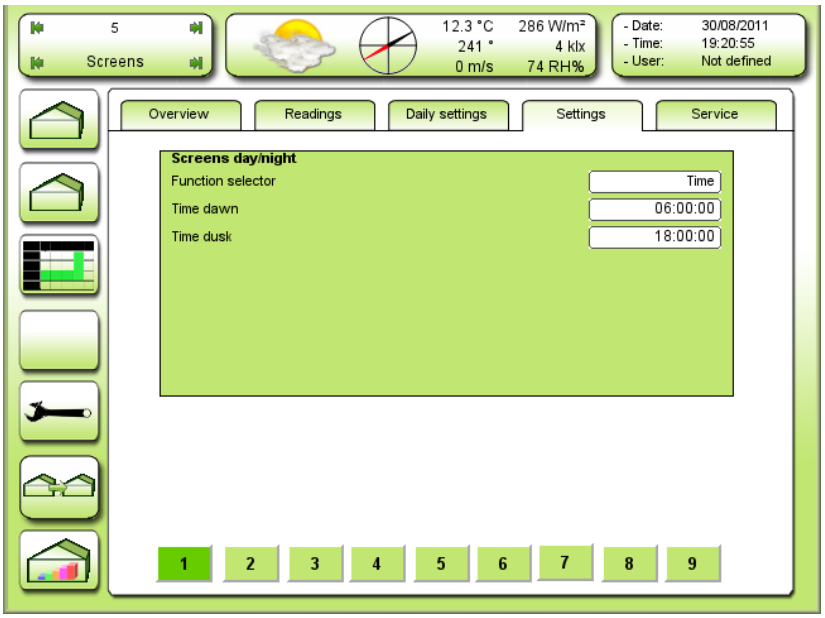


Figure 30
Setting the functions of the screens.
Function selector. 6 possibilities are given.

Function selector

Selecting how the screens are changing between night and day:

Time: Change is performed at fixed time.

Sun up/down: Change is performed in relation to sun up and sun down.

Light+sun up/down: Change is performed dependent on light-intensity **and** sun up / sun down.

Heat reg.: Change is performed dependent on time zone day-night change: 1-4 = day, 5-6 = night.

Night: Permanent night mode.

Day: Permanent day mode.

Time

Fixed time is used for night/day and day/night change.

Time dawn

This is the time for the screens to go off in the morning.

Time dusk

This is the time for the screens to go on in the evening.

Figure 31
Control relative to the season.

Sun up/down

Dawn relative to sunrise

Screen off follows the sunrise with a time offset. Figure 31 shows an example of one hour before sunrise.

Dusk relative to sunset

Screen on follows the sunset with a time offset. Figure 31 shows an example of two hours after sunset.

The times for sunrise and sunset are calculated from date, latitude and longitude.

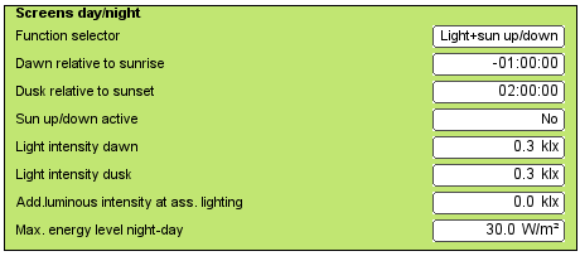


Figure 32
Control related to the season and light measurement is chosen.

Light + sun up/down

Sun up/down active

No: Light measurement and only light measurement controls the screens day / night change.
Yes: Control related to the season and light measurement is chosen.
NB! If the combination **Light + sun up/down** is used, the screens will change to day mode, when the first condition is true. And change to night mode, when the last condition is true.

Light intensity dawn

When the light intensity exceeds this set point in the morning, the screens will go off.

Light intensity dusk

When the light intensity goes under this set point in the evening, the screens will go on.

Add. luminous intensity at ass. lighting

Adjusting how much more light, when assimilation light is on, has to be measured outside, compared to **Light intensity dawn** and **Light intensity dusk,** before screens will change from night to day / day to night.
Only visible when the adjustment of the function selector is set on: **Light + sun up/down.**

Max. energy level night - day

Adjustment of allowed energy cost for opening the screens.

When the calculated cost is higher than this set point, the light intensity, which controls the screen night to day / day to night, will increase proportional.
The set points **P-band energy cost** [W/m²] and **Max increase factor** can be adjusted in service. See **Fejl! envisningskilde ikke fundet.**.

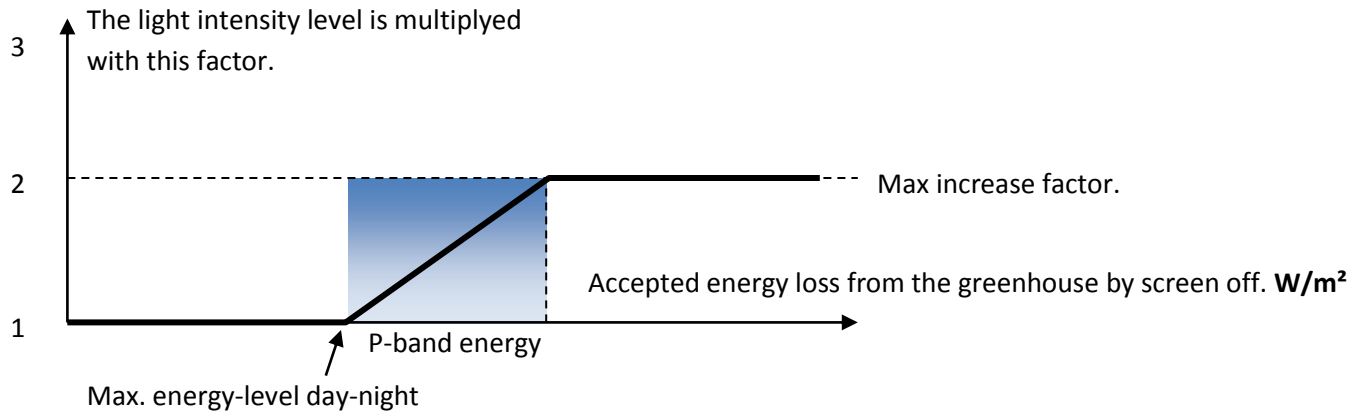


Figure 33
The more expensive pulling back the screens, the more light is needed from outside.

Figure 34
The heatregulator controls the screens, morning and evening.

Heat reg.

The change is performed dependant from the time zones day / night change. 1-4 = day, 5+6 = night.

Figure 35
Permanent night mode is selected.

Figure 36
Permanent day mode is selected.

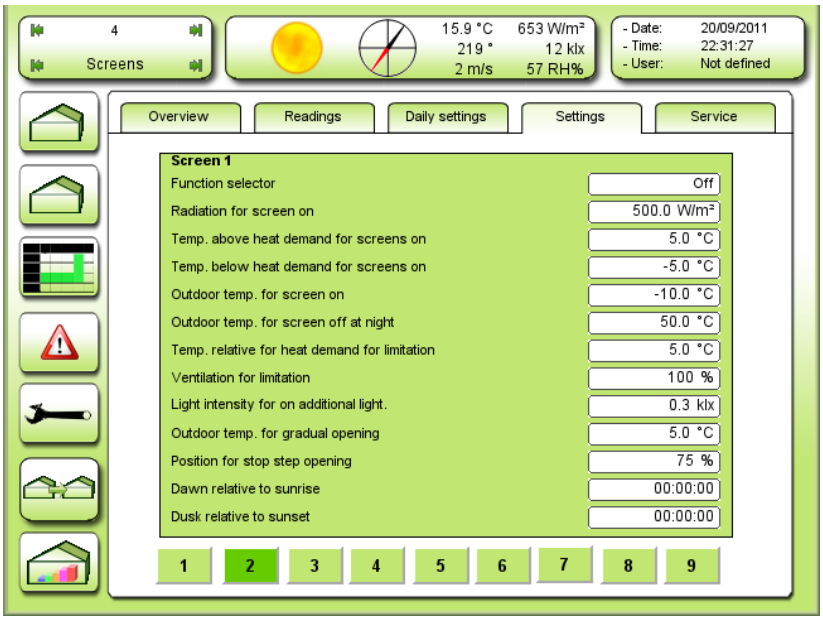


Figure 37
Settings for screen 1. TODO screenshot

Function selector

Aut.: **S**creen 1 is controlled automatically.

Off: **S**creen 1 is permanently pulled back.

On: **S**creen 1 is permanently closed.

Stop: **S**creen 1 is frozen.

Radiation for screen on

Adjusting the limit for the sun intensity over which screen 1 will go on.

Temp. above heat demand for screens on

Adjusting the addition to the greenhouse air temperature demand which gives the limit over which screen 1 will go on.

Temp. below heat demand for screens on
Adjusting the addition to the greenhouse air temperature demand which gives the limit under which screen 1 will go on.

Outdoor temp. for screen on
Adjusting the limit for the outdoor temperature under which screen 1 will go on.

Outdoor temp. for screen off at night
Adjusting the limit for the outdoor temperature over which screen 1 will go off. This is active during night time. Normally used in connection with isolation screen.

Temp. relative to heat demand for limitation
Adjusting the addition to the greenhouse air temperature demand the limit over which screen 1 will be limited to **Max. position at high temperature.** See Figure 38.

Ventilation for limitation
Adjusting the ventilation demand causing limitation for screen 1 to **Max. position at ventilation**

Light intensity for on additional light
Adjusting the limit for outdoor light intensity under which screen 1 will be forced to go on while the supplementary light is on.

Outdoor temp. for stepwise opening
Adjusting the limit for outdoor temperature under which screen 1 will open stepwise until the position is less than **Position for stop opening.**

Position for stop step opening
Adjusting the screen position under which gradual opening expire.

Dawn relative to sunrise
If the screens 1 - 4 must have different day/night night/day changing times, the possibility **Separate dawn-dusk** have to be selected for each screen. See Figure 41. This set point and the next one **Dusk relative to sunset** are only active when **Separate dawn-dusk** is selected for the present screen. 00:00:00 means at sunrise. Negative time means before and positive time means after sunrise.

Dusk relative to sunset
The time for the screen to enter night mode relative to sunset when **Separate dawn-dusk** is selected.

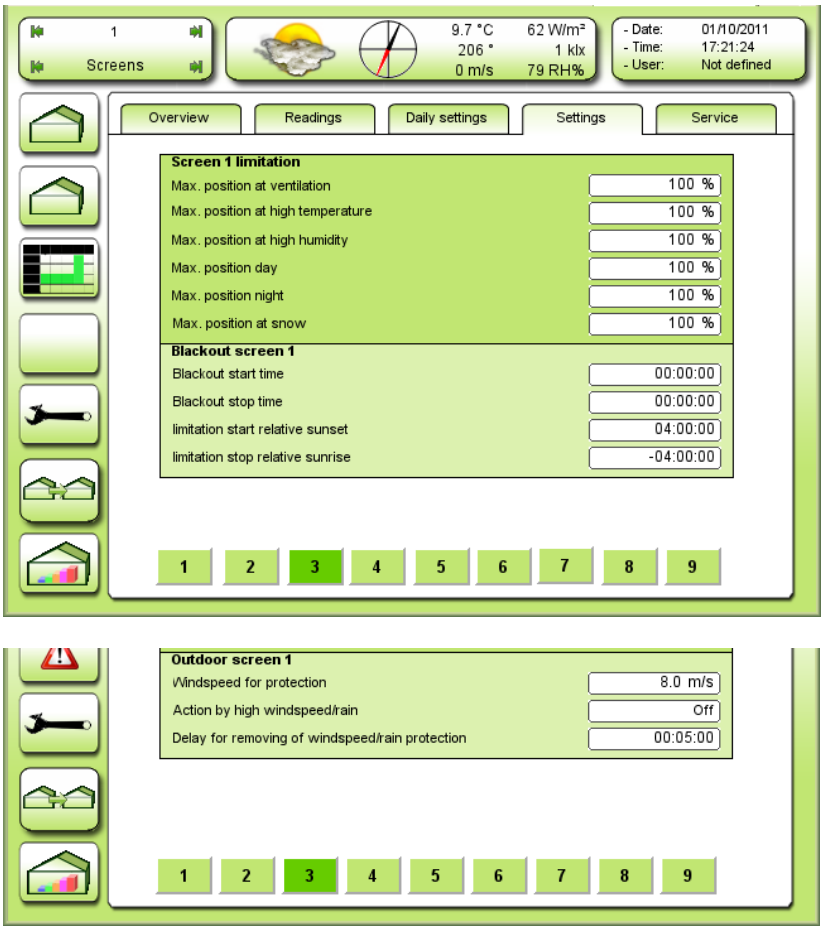


Figure 38
Adjustments concerning limitations for screen 1.
Besides normal screen, blackout or outdoor screen can be chosen.

Max. position at ventilation

Adjusting the maximum screen position at ventilation demand more than **Ventilation for limitation.** See Figure 37**.**

Max. position at high temperature

Adjusting the maximum screen position at air temperature more than **Temp. relative to heat demand for limitation** See Figure 37.

Max. position at high humidity

Adjusting the maximum screen position at high humidity.
The distance to max. humidity which starts the reduction of max. screen position and the P band can be adjusted. See Figure 51.

Max. position day

Adjusting the maximum screen position during day time.

Max. position night
Adjusting the maximum screen position during night time.

Max. position at snow
Adjusting the maximum screen position when snow is detected. The warm air will go to the roof and the snow will melt to avoid collapse.

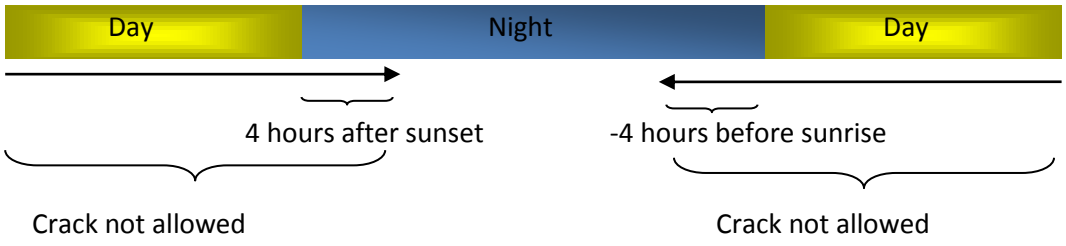
Blackout must be chosen under service for the following set points to be active. See Figure 41.

Blackout start time
Adjusting the start time for the blackout.

Blackout stop time
Adjusting the stop time for the blackout.

Limitation start relative sunset
Adjusting the time relative to sunset. Until this time is reached, crack is not allowed for the blackout. The reason for this is to avoid light to get to the plants inside the blackout period.

Limitation stop relative sunrise
Adjusting the time relative to sunrise. After this time, crack is not allowed for the blackout. The reason for this is to avoid light to get to the plants inside the blackout period.



Service indstillinger

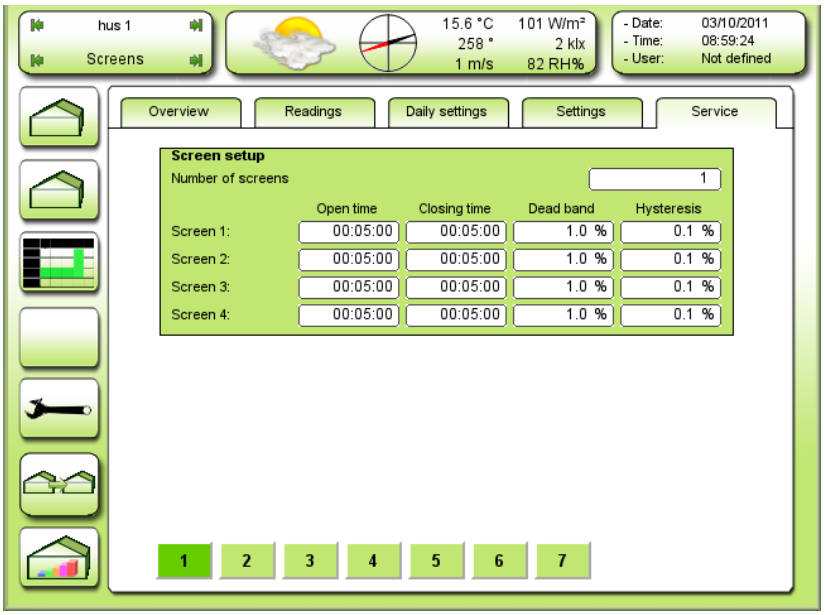


Figure 39
Service settings for screens.

Screen 1-4

Open time
The total running time measured with i.e. a stopwatch from closed to open.

Close time
The total running time measured with i.e. a stopwatch from open to closed.

Dead band
The distance between the position demand and the position in which the screen doesn't move.
The gear **starts up** when the position demand comes outside the dead band with reference to the position.

Hysteresis
The distance between the position demand and the position in which the screen doesn't move.
The gear **stops** when the position demand comes inside the hysteresis with reference to the position.

Figure 40
Common set points for the screens.

Dawn delay

Adjusting the delay for change from night to day.

NB: When absolute time is used to control the screens day / night change, this delay will still be active!

Dusk delay

Adjusting the delay for change from day to night.

NB: When absolute time is used to control the screens day / night change, this delay will still be active!

Dawn-dusk light hysteresis

Hysteresis according the light measurement which controls the screens day / night change.

P-band energy cost

Adjusting the needed extra W/m2 above **Max energy level day - night** to give full increase in light level for night-day and day-night changeover. See Figure 33.

Max. increase factor

Adjusting the max allowed increase in light level for night-day and day-night changeover, caused by **Max. energy level night – day.** See Figure 33.

Temperature control hysteresis

Adjusting the hysteresis for forcing the screens on by too high or too low air temperature.

Forced on hysteresis by suppl. light

Adjusting the hysteresis in light when forcing the screens On by active supplementary light.

According the adjustment of the low light level see Figure 37. **Light intensity for on additional light**

Delay of max. screen by ventilation

The crack for the screen can be delayed after start of ventilation.

K factor change screen on-off

Adjustment of the screen properties according isolation.

Day-night shading

Reading the day-night condition.

Energy cost

Reading the energy cost by opening the screens.

Energy cost factor

Reading the current factor for increasing the dawn-dusk light level, caused by too high energy cost.

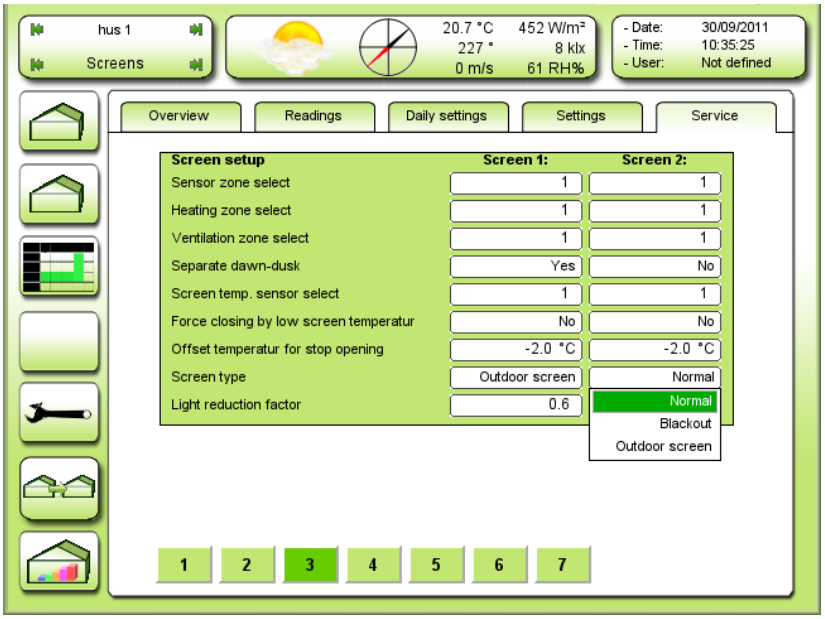


Figure 41
Screen setup.

Following describes screen 1-4.

Sensor zone select
Select the sensor zone which is covered by the screen.
The screen uses temperature and humidity control for the calculation of the position.

Heating zone select
Select the local heat temperature demand which is covered by the screen.
1 = heating zone 1
2 = heating zone 2

Ventilation zone select
Select the local ventilation temperature demand which is covered by the screen.
1 = ventilation zone 1
2 = ventilation zone 2
5 = the highest demand from ventilation zone 1 and 2

Separate dawn-dusk
Select if the screen has its own transition from day to night vice versa, or if the common settings are valid.

Screen temp. sensor select
Select which temperature sensor to use for the screen temperature measurement.
NB Only one of the available sensors can be selected. Check how many are really selected! See Figure 140.

Force closing by low screen temperature
Select if the screen has to be forced closed, (instead of pausing) if the screen temperature falls under

Her kan vælges, om gardinet skal tvangs påkøres, (i stedet for at holde pause) hvis gardin temperaturen kommer under **Offset temperature for stop opening.** Look below.

Offset temperature for stop opening
Distance from heat demand below which stepwise opening (at dawn) takes a brake until the temperature comes up again.

Screen type

Normal	Isolation/shade screen
Blackout	Isolation/shade/blackout screen The screen acts as a normal screen but with additional blackout properties.
Outdoor screen	The screen acts as a normal screen but with additional outdoor screen properties.

Light reduction factor
Adjusting the properties for the screen according the amount of light passing through. 1 means no reduction. 0 means full reduction.

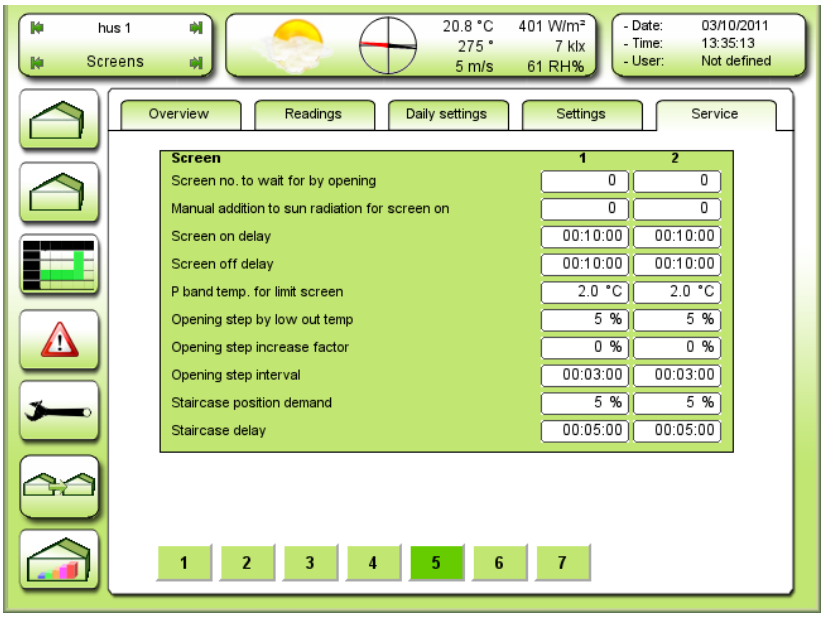


Figure 42
Service settings for screens.

Screen no. to wait for by opening
Select which screen to wait for by opening. Pull back will take place when the selected screens position is less than 5 %. 0 = no screen to wait for.

Manual addition to sun radiation for screen on
Adjusting a fixed addition to the normal set point for screen ON by high radiation.

Screen on delay
Adjusting the delay for running the screen ON, by day conditions.

Screen off delay
Adjusting the delay for running the screen OFF, by day conditions.

P band temp. for limit screen
Adjusting the p-band in air temperature for giving full reduction in max screen position by high air temperature.

Opening step by low out temp.
Adjusting the first step length by step opening caused by too low outdoor temperature.

Opening step increase factor
Adjusting the increase of the opening steps by low outdoor temperature.

The factor is the amount of increase pr. % opening.
0.1 means the steps will be doubled by 10 % opening and tripled by 20 % opening.
The steps will be: Opening step * (1 + % opening * increase factor)

Opening step interval
Adjusting the interval between opening steps caused by too low outdoor temperature.

Stair case position demand
Adjusting the minimum change in position demand for immediate movement.
A smaller change will be made with a delay “Stair case delay”.

Stair case delay
Adjusting the delay for change in position demand smaller than “Stair case position demand”.

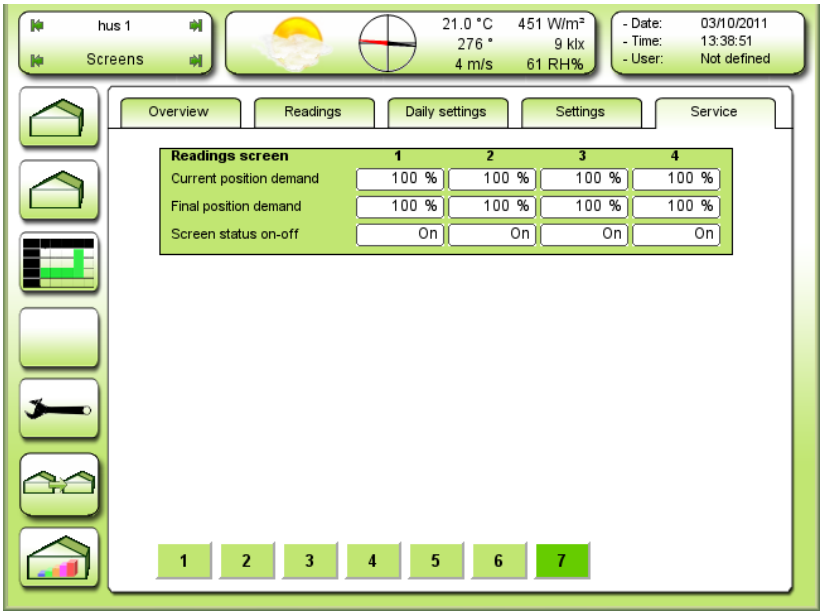


Figure 43
Service readings for the screens.

Current position demand
Reading the current screens position demand.

Final position demand
Reading the final screen position demand.

The current and the final position demand can be different caused by the screen staircase function, which will delay a too small change in the current position demand.

Screen status on-off
Reading if the screen is on or off.

Humidity

Overview

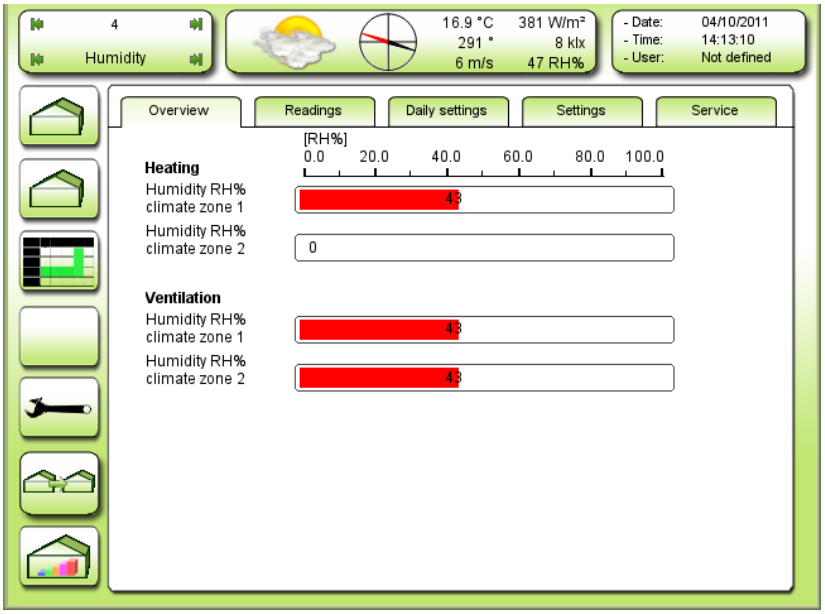


Figure 44
Overview for the humidity conditions in the two zones of the glass house.

This description for humidity control is based on the unit RH%. Relative humidity 0-100%.
The control can be depending on relative humidity RH% or saturation deficit Delta X = DX.
DX is not described, it works the same way just upper sit.

Reading for the humidity measured in the greenhouse. Can be from 1, 2 or 4 sensors. Average, lowest or highest. See Figure 141.

Heating

Humidity RH%
climate zone 1
Reading for the humidity measured in climate zone 1 used for humidity control based on heating. See Figure 89, **Sensor zone selector heat PID 1.**

Humidity RH%
climate zone 2
Reading for the humidity measured in climate zone 2 used for humidity control based on heating. See Figure 89, **Sensor zone selector heat PID 2.**

Ventilation

Humidity RH%
climate zone 1
Reading for the humidity measured in climate zone 1 used for humidity control based on ventilation. See Figure 20**, Sensor zone selector vent PI1.**

Humidity RH%
climate zone 2
Reading for the humidity measured in climate zone 2 used for humidity control based on ventilation. See Figure 20, **Sensor zone selector vent PI2.**

Readings

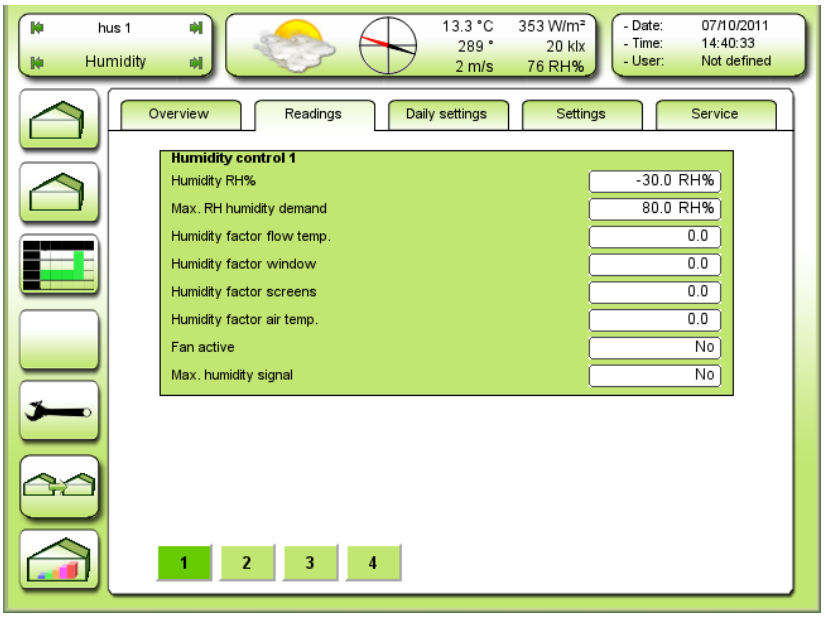


Figure 45
Readings for the humidity conditions.

Humidity RH%
Reading humidity measurement which is the input for humidity control 1. Can be 1, 2 or 4 sensors. Average, lowest or highest. See Figure 141

Max. RH humidity demand

Current maximum acceptable humidity over which intervention is done by the humidity control.

Humidity factor flow temp.

Reading humidity factor for increment minimum flow temp. at high humidity.

0.00: No increment

1.00: Full increment

Humidity factor window

Reading humidity factor for increment minimum vents-position at high humidity.

0.00: No increment

1.00: Full increment

Humidity factor screens

Reading humidity factor for screen position limitations position at high humidity.

0.00: No increment

1.00: Full increment

Humidity factor air temp.

Reading humidity factor for increment air temperature at high humidity.

Fan active

Reading the fan status dependant from temperature, humidity and vents position. See Figure 50.

Max. humidity signal

Here is **yes** read if the humidity measurement has exceeded **Max. RH humidity demand.**

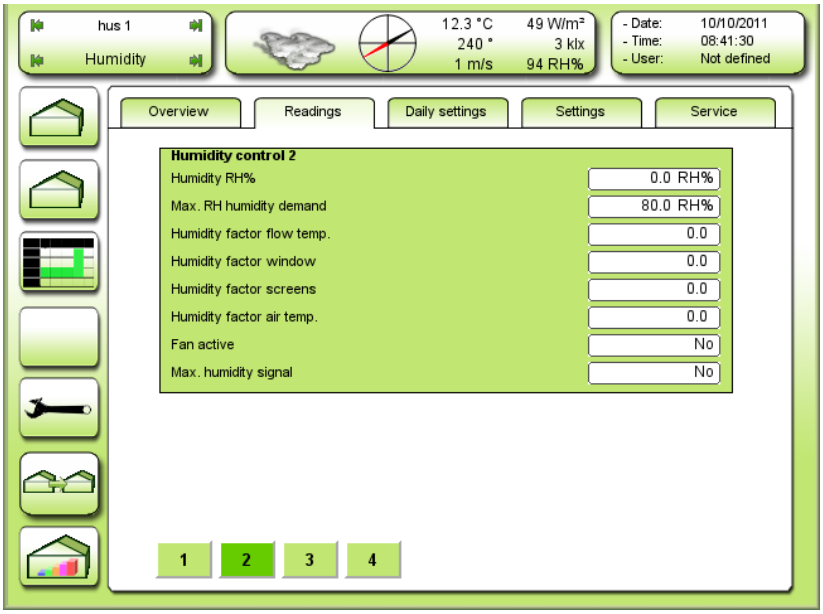


Figure 46
Readings for the humidity conditions. TODO screenshot

For description see Figure 45.

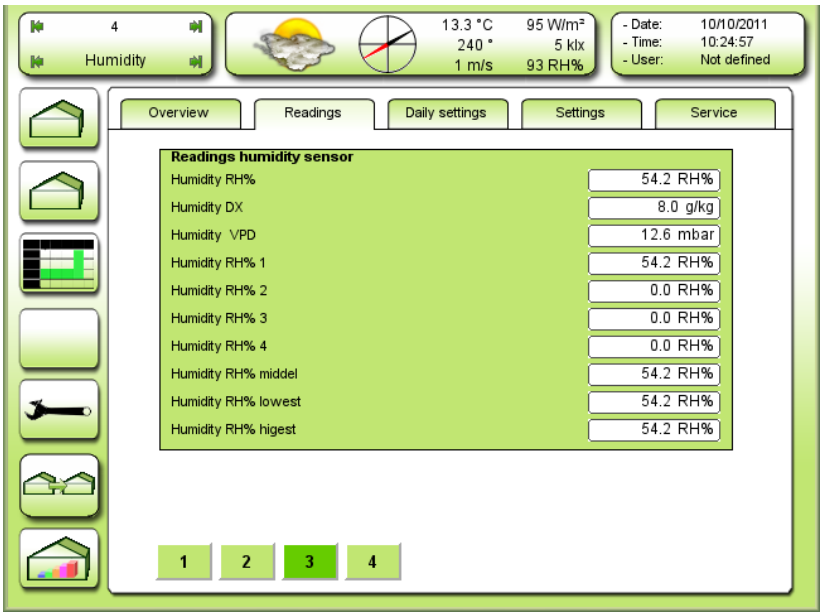


Figure 47
Reading the individual humidity sensors. TODO screenshot

Humidity RH%
Reading humidity in the compartment. Can be 1, 2 or 4 sensors. Average, lowest or highest. See Figure 141

Humidity DX
Reading the current humidity deficit delta X [g/kg].

Humidity VPD
Reading the distance to saturation as m bars.

Humidity RH% 1-4
Reading the current humidity from each humidity sensor 1-4.

Humidity RH% average
Reading the current average humidity from the selected humidity sensors.

Humidity RH% lowest
Reading the lowest humidity readout from the connected sensors.

Humidity RH% highest

Reading the highest humidity readout from the connected sensors.

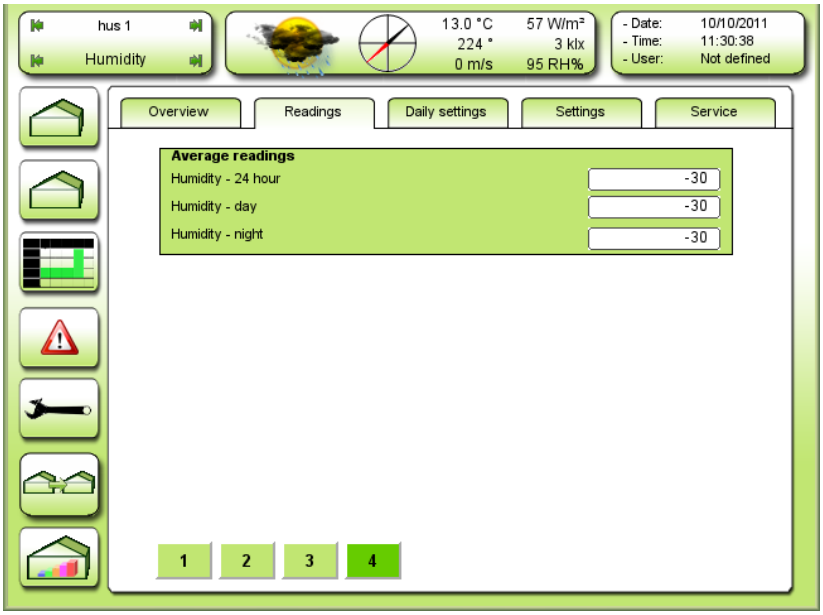


Figure 48
Average calculations for the humidity.

Humidity – 24 hour

24 hour average calculations for the humidity.

Humidity – day

Day average calculations for the humidity.

Humidity – night

Night average calculations for the humidity.

Settings

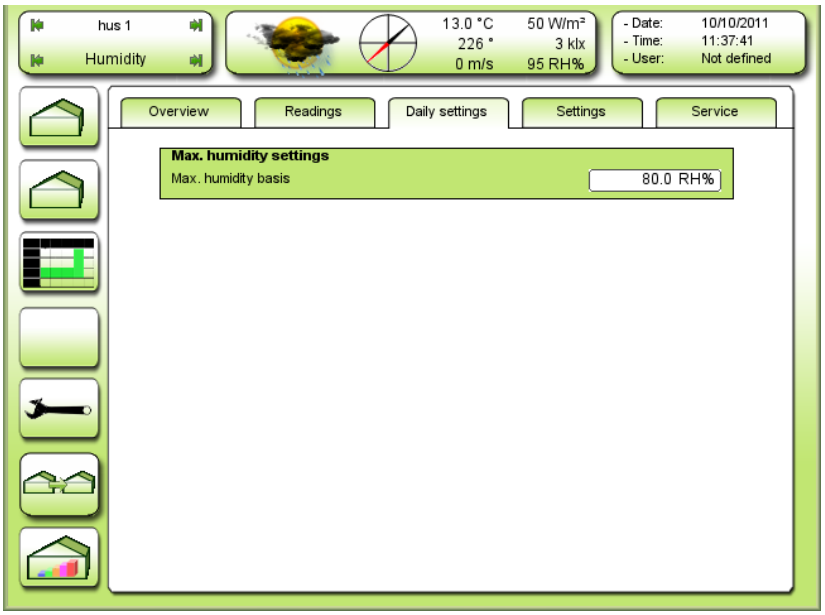


Figure 49
Daily setting for maximum humidity.

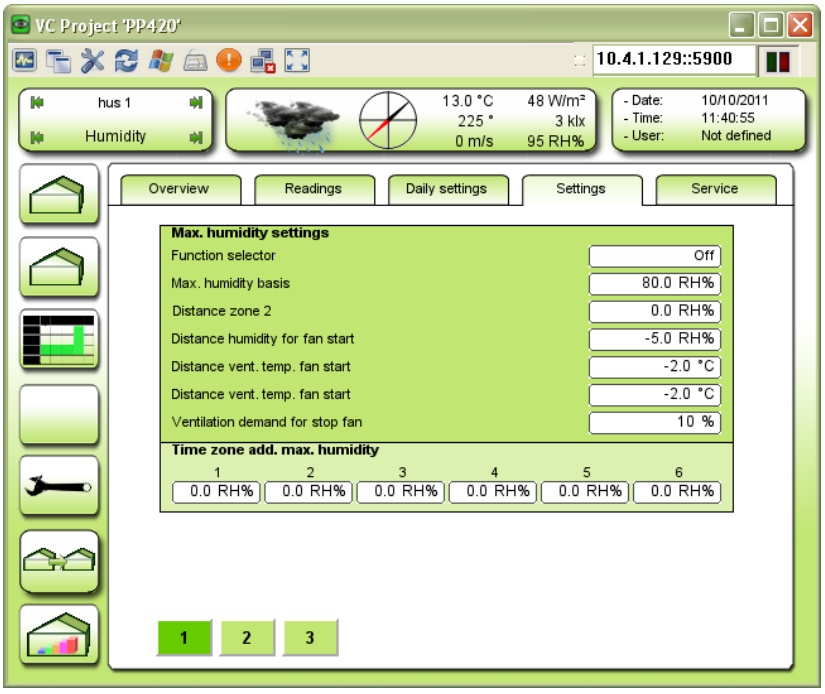


Figure 50
Settings for maximum humidity.

Function selector

The humidity control can be activated or deactivated with this setting.

Max humidity basis

Adjusting the basic maximum RH% for all time zones.

Additional for each time zone can be adjusted in **Time zone add. max. humidity.**

Distance zone 2

Adjusting the offset on maximum humidity controller in zone 2.

Distance humidity for start fan

Adjusting the offset to maximum humidity for starting the HAF fan.

Typically this set point is **negative** for start the HAF at a **lower** humidity.

Distance vent. temp. fan start

Adjusting the offset to ventilation temperature demand for starting the HAF fan.

Typically this setpoint is negative for start the HAF at a lower temperature before ventilation.

Ventilation demand for stop fan

Adjusting the ventilation demand for stopping the HAF fan.

Time zone add. max. humidity

Adjusting the addition on maximum RH% demand for each time zone.

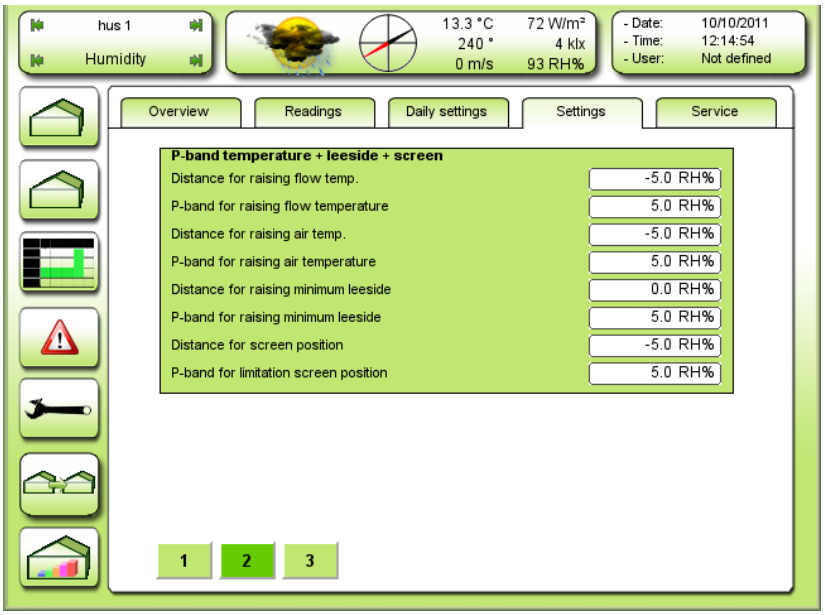


Figure 51
Maximum humidity control in P-bands.

It is possible to control the maximum humidity in 5 different ways, which can be combined:

Start of fans (HAF)

Increasing minimum flow temperature:	Can be used by all mixing valves.
Increasing air heating temperature demand:	Can be used by common or local heating temperature demand.
Increasing minimum position leeside vents:	Can be used by top and side vents.
Decreasing maximum position screens:	Can be used by both screens.

Distance for raising flow temp.
Adjusting the offset for start increasing the minimum flow temperature.
A negative offset will increase the minimum flow temperature before the maximum RH% has been achieved (lower humidity).

P-band for raising flow temp.
Adjusting the P-band for full increase on the minimum flow temperature.
A larger P-band will cause a higher increase in humidity before the full increase in minimum flow temperature has been achieved.

The P-band starts at the distance from maximum humidity. That means that the P-band moves by changing the distance.

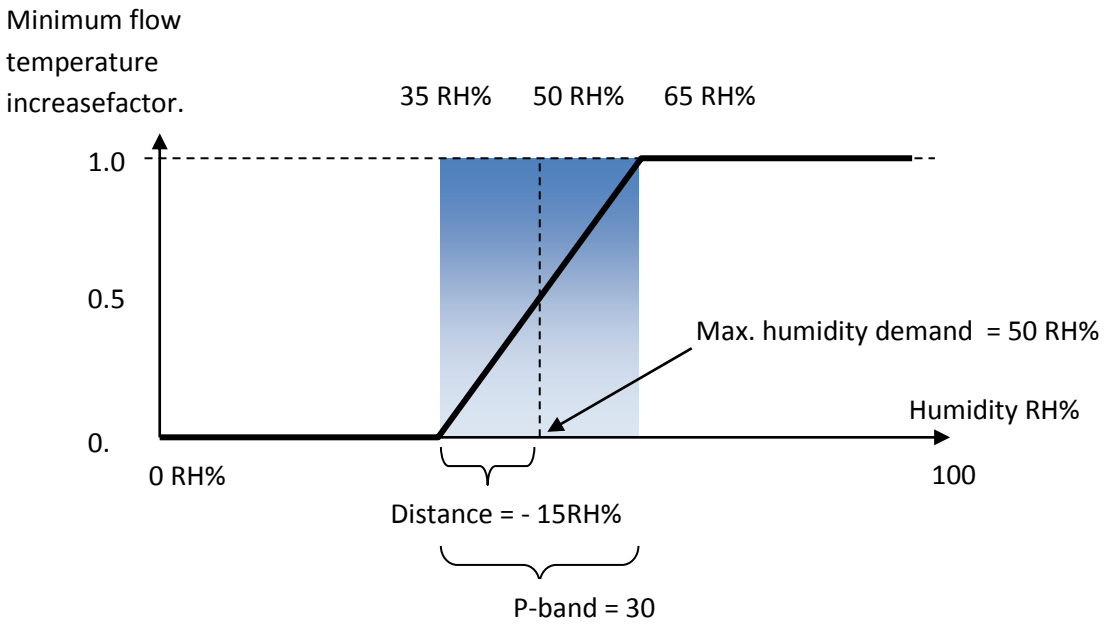


Figure 52
Increasing minimum flow temperature at high humidity.

Distance for raising temp.

Adjusting the offset for start increasing the air temperature.
A negative offset will increase the air temperature before the maximum RH% has been achieved (lower humidity).

P-band for raising air temperature

Adjusting the P-band for full increase on the air temperature.
A larger P-band will cause a higher increase in humidity before the full increase in air temperature has been achieved.

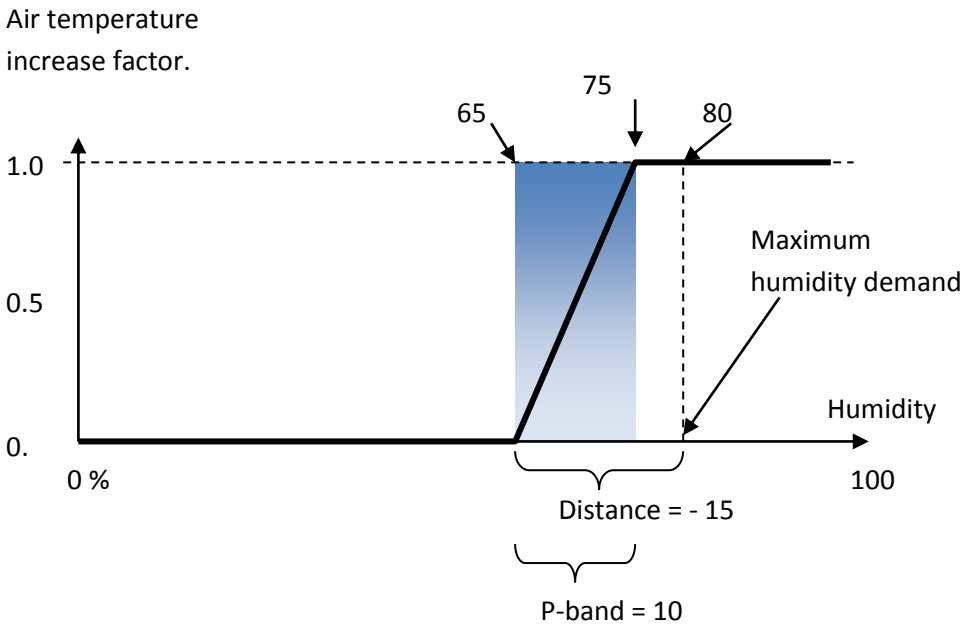


Figure 53
Increasing air temperature at high humidity.

Distance for raising minimum leeside

Adjusting the offset for start increasing the minimum leeside.

A positive offset will increase the minimum leeside after the maximum RH% has been achieved.
(higher humidity).

P-band for raising minimum leeside

Adjusting the P-band for full increase on the minimum leeside.
A larger P-band will cause a higher increase in humidity before the full increase in minimum leeside has been achieved.

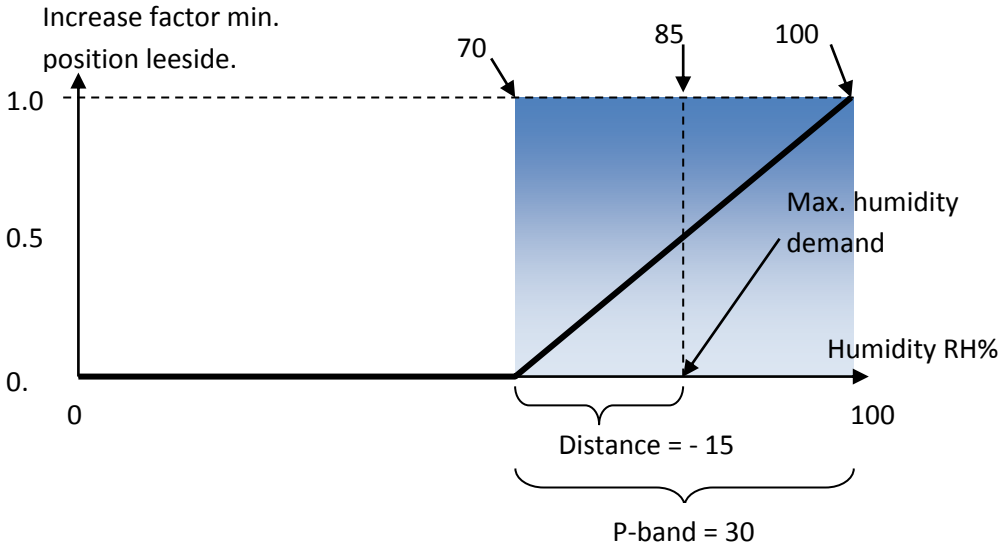


Figure 54
Strategy for leeside ventilation at increasing humidity.

Distance for screen position

Adjusting the offset for start decreasing the screen position.

A negative offset will decrease the maximum screen position before the maximum RH% has been achieved (lower humidity).

P-band for limitation screen position

Adjusting the P-band for full decrease on the maximum screen position.
A larger P-band will cause a higher increase in humidity before the full decrease on the maximum screen position has been achieved.

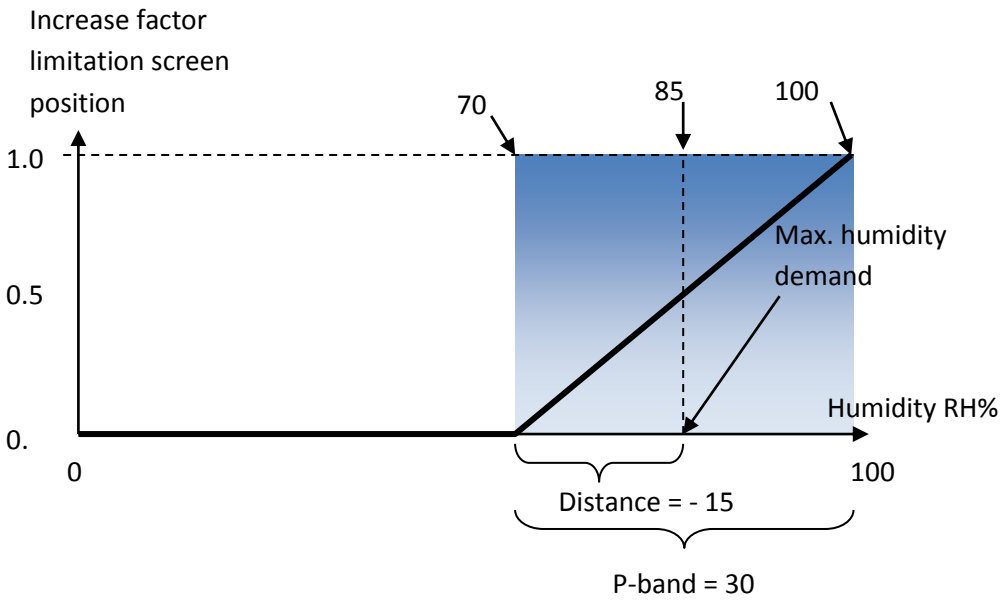


Figure 55
In this case the screen crack starts when the humidity exceeds 70 RH%

Figure 56
Botrytis reduction.
Activity of the fungus increases by high humidity. Thereafter a quick drying up.
That's bad conditions for the fungus.

Delay of max. humidity

Selecting if the minimum vent position by high humidity is canceled until the maximum humidity signal is present.

Band for delay max. humidity

Adjusting the humidity band within which the maximum humidity signal is delayed
If the humidity increases above this band or the delay has expired the maximum humidity signal is released.

Distance for drying-up

Adjusting the lowering of the maximum humidity setpoint after the period with higher humidity.
NB! To lower the setpoint a negative value must be entered.

Start-delay max. humidity

Adjusting the accepted delay time on opening the vents by high humidity.

Stop-delay max. humidity

Adjusting the drying time in which the maximum setpoint is lowered.

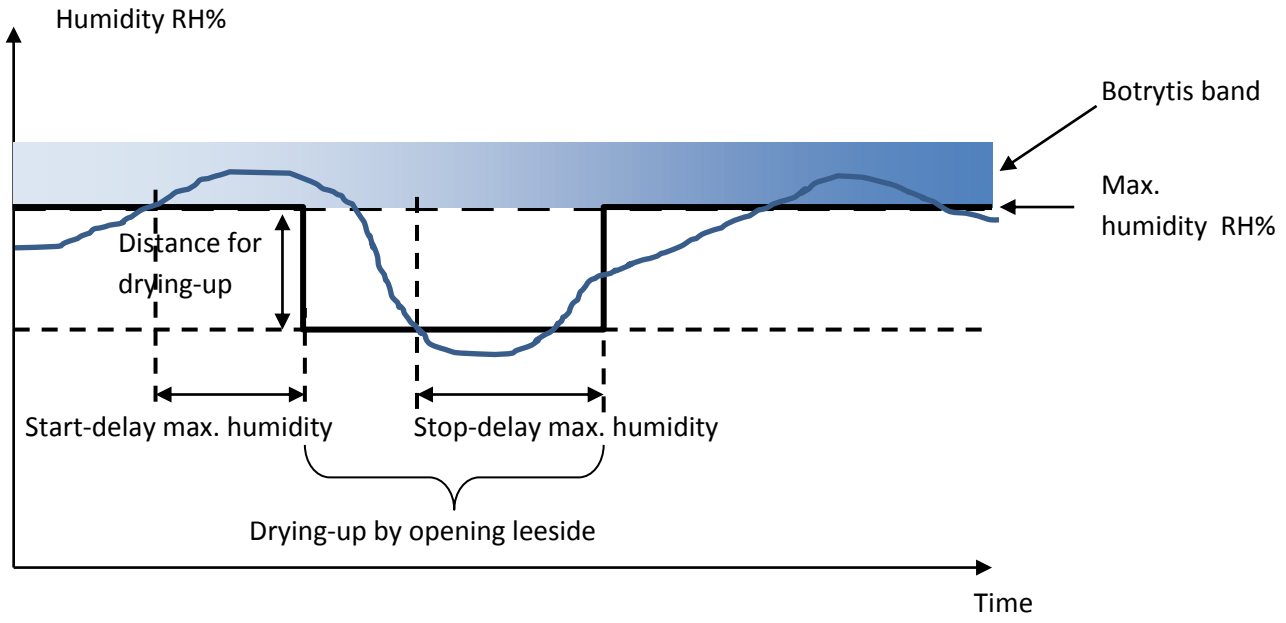


Figure 57
Example 1. Procedure after ” Delay of max. humidity” is choosen (Yes).

The humidity is allowed to enter the botrytis band without intervention from the humidity regulation until the time delay has gone.
After the time delay, max. humidity will be decreased. Ventilation will start. The humidity goes under the original max. humidity and the stop delay begins. After this delay the max. humidity will be reset to normal and the botrytis function will again be hesitant.

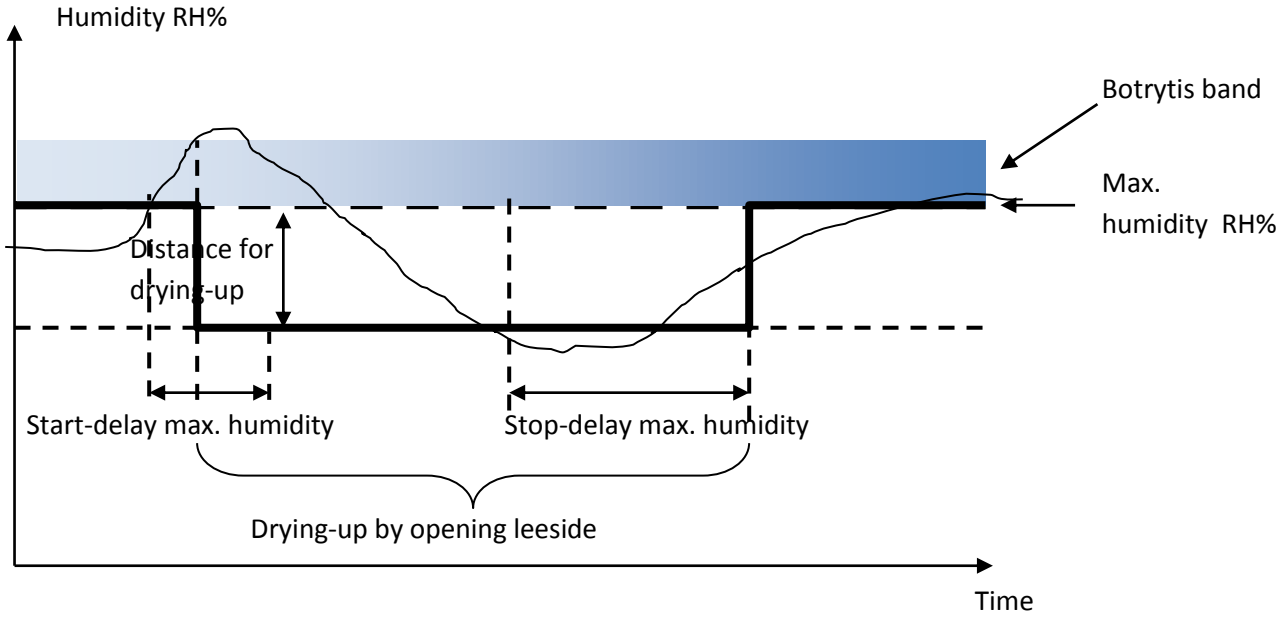


Figure 58
Example 2. Procedure after ” Delay of max. humidity” is choosen. (Yes).

The humidity is allowed to enter the botrytis band without intervention from the humidity regulation. In this example however, the humidity passes by the botrytis band before the start delay has expired. The start delay is canceled and the drying-up period start immediately . Ventilation will start. The humidity goes under the original max. humidity and the stop delay begins. After this delay the max. humidity will be reset to normal and the botrytis function will again be hesitant.

Service

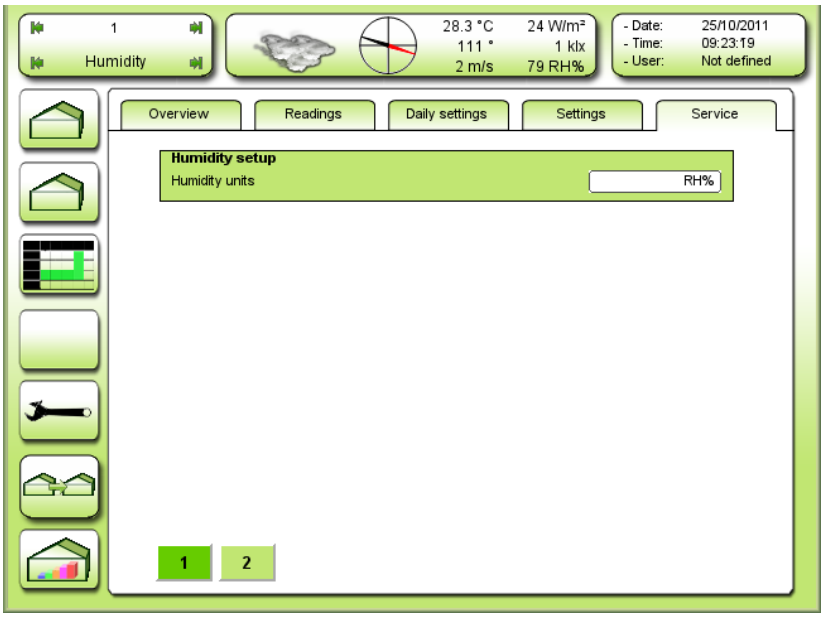


Figure 59

Humidity units

Selecting the humidity unit to be used

RH%: All humidity control will use RH% as humidity unit.

g/kg: All humidity control will use g/kg = Delta X as humidity unit.

DX: ”deltaX”
The amount of water [g] missing in 1 [kg] air for saturating.

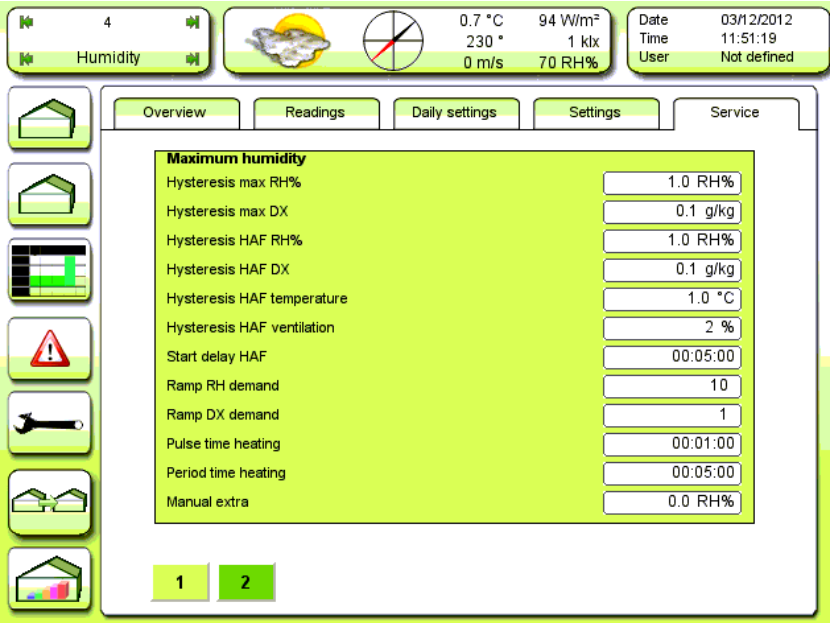


Figure 60
Maximum humidity service settings.

Hysteresis max RH%

Adjusting the hysteresis for the maximum humidity flag when using %RH as humidity unit

Hysteresis min DX

Adjusting the hysteresis for the maximum humidity flag when using DX as humidity unit.

Hysteresis HAF RH%

Adjusting the hysteresis for the HAF fan when using %RH as humidity unit

Hysteresis HAF DX

Adjusting the hysteresis for the HAF fan when using DX as humidity unit.

Hysteresis HAF temperature

Adjusting the temperature hysteresis for the HAF when turning on-off depending on air temperature.

Hysteresis HAF ventilation

Adjusting the hysteresis on the ventilation demand for the HAF when turning on-off depending on ventilation demand.

Start delay HAF

Adjusting the delay for starting the HAF depending on humidity, temperature and ventilation.

Ramp RH demand

Adjusting the maximum ramp [RH%/hour] when the demand is going to change due to i.e. time-zone addition.

Ramp DX demand

Adjusting the maximum ramp [(g/kg)/hour] when the demand is going to change due to i.e. time-zone addition.

Pulse time heating

Adjusting the pulse time on heating steps when activated by high humidity.
This is only used by steam heating.

Period time heating

Adjusting the period time on heating steps when activated by high humidity.
This is only used by steam heating.

Manual extra

Adjusting a manual addition to the calculated maximum humidity setpoint

Light

Overview

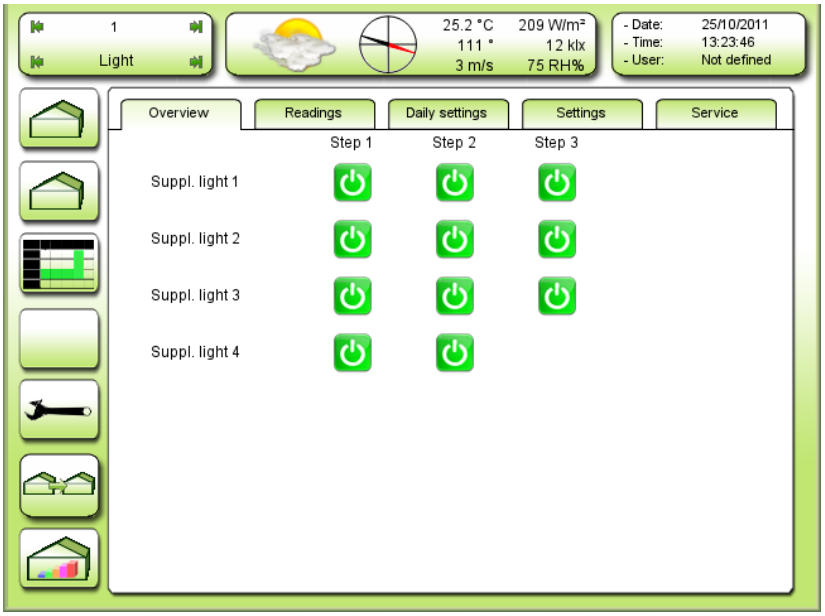


Figure 61
Overview. Which light outputs are active.

The supplementary light control contains up to 4 separate controls, each with possible 3 step control.

A green icon  indicates light is on. Disappeared icon indicates light is off.

Readings

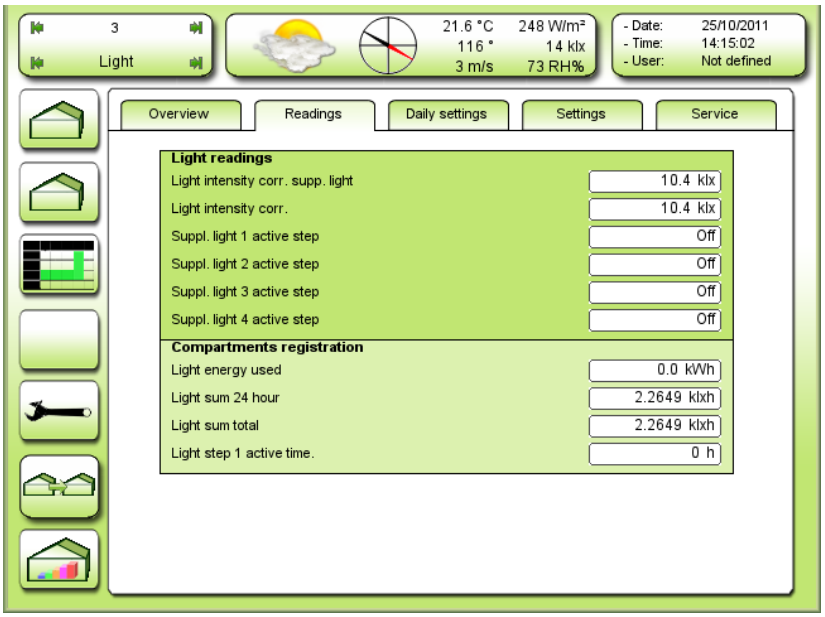


Figure 62
Light readings and registrations.

Light intensity corr. supp. light

Reading the corrected light intensity. The supplementary light is not included in this correction. Included is the light from outside reduced by glass and screens, if on.

Lys intensitet korrigeret

Reading the corrected light intensity. The supplementary light is included in this correction. Included is also the light from outside reduced by glass and screens, if on.

Suppl. light 1-3 active step

Reading the mode for the light:

Off the outputs are turned off.
1 first step is on.
1+2 first and second steps are on.
1+2+3 first, second and third steps are on.

Compartments registration

Light energy used
Reading consumed energy for light.

Light sum 24 hour
Reading light sum within 24 hours.

Light sum total
Reading light sum total.

Light step 1 activ time
Reading the total active time for the lamps controlled from light 1 step 1. Cannot be reset.

Settings

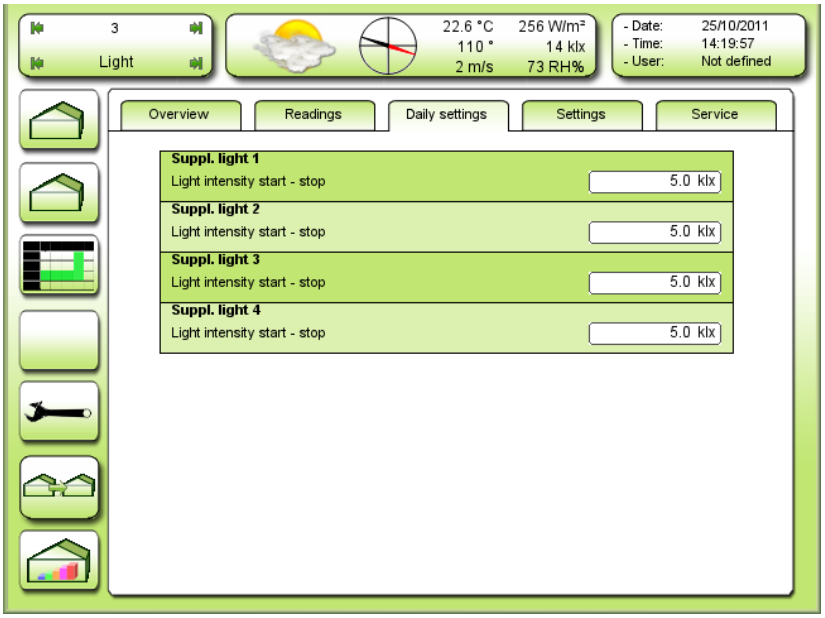


Figure 63
Daily settings for the 4 lights start-stop levels.

Supple light 1-4

Light intensity start - stop
Limit for the light measured outside. A measuring lower than this will cause the light to turn on. A measuring

higher than this will cause the light to turn off. In addition there is a hysteresis, a start- and a stop delay. The hysteresis works both over and under the limit value. See Figure 64. According the setting of the hysteresis, see Figure 71.

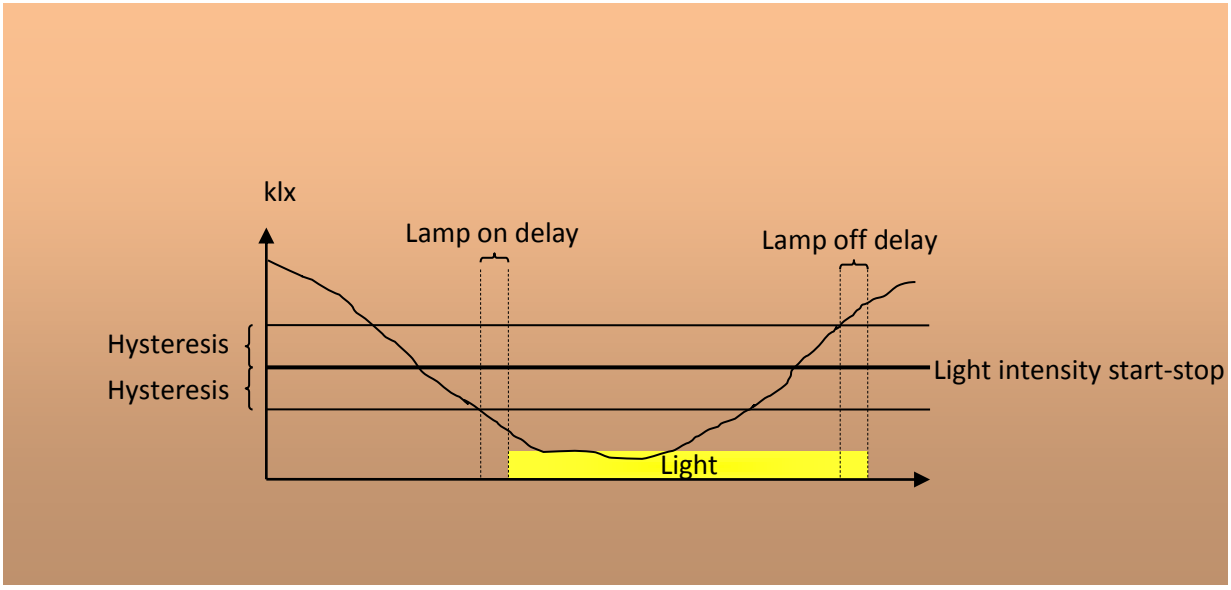


Figure 64
Conditions for the light to turn on and off in the auto period.

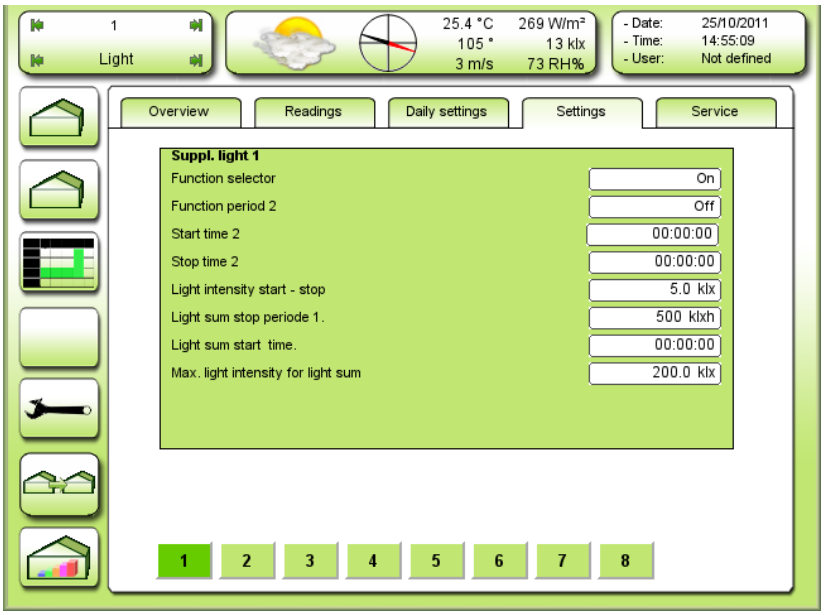


Figure 65
Settings for supplementary light 1. TODO new dump
Supplementary 2, 3 and 4 isn't described in the manual, because all 4 are constructed equal, except "Light sum start time" which only exists in supplementary light 1.

Funktion selector

Off: The supplementary light control is not operating.

Abs.: The suppl. light control is active and the first active period is starting and ending on absolute time.

Rel.: The supplementary light control is active and the first active period is starting and ending relative to sunrise and sunset.

On: Manual ON. The supplementary light, all 3 steps, are ON.

Function period 2

Selecting the mode of automatic period 2

Off: Not active

Aut.: Active

Start time 2

Adjusting the start time for active period 2.

Stop time 2

Adjusting the stop time for active period 2.

Light intensity start-stop

Adjusting the light level/intensity for starting-stopping suppl. Light.

Light sum stop period 1
Adjusting the light sum for stopping active period 1.
The light sum is calculated from **Light sum start time.**

Light sum:
Light, integrated over time [klxh]
klux * hours.

Light sum start time
Adjusting the time for starting the light sum calculation.

Max light intensity for light sum
Adjusting the maximum light level/intensity to be used for calculating the light sum.
If the light intensity is higher, this set point will be used for calculating the light sum.

Start time period 1
Adjusting the start time for active period 1.
Only active when **Abs.** has been selected in the function selector.

Stop time period 1
Adjusting the stop time for active period 1.
Only active when **Abs.** has been selected in Mode selector.

Start 1 relative to sunrise
Adjusting the start time relative to sunrise for active period 1.
Only active when **Rel.** has been selected in Mode selector.

Stop 1 relative to sunset
Adjusting the stop time relative to sunset for active period 1.
Only active when **Rel.** has been selected in Mode selector.

Relative time. Negative means before sunrise/sunset. Positive means after.

Triple Tariff Control

The triple tariff overruns the normal supplementary light controls, by allowing a selected number of steps to be active in 4 different time zones through the 24 hours.
The Triple Tariff Control has 2 independent sets of time zones: A and B
For each weekday one of these 2 sets of time zones can be selected: See TIME ZONE SELECT
For each time zone the maximum allowed steps can be selected.

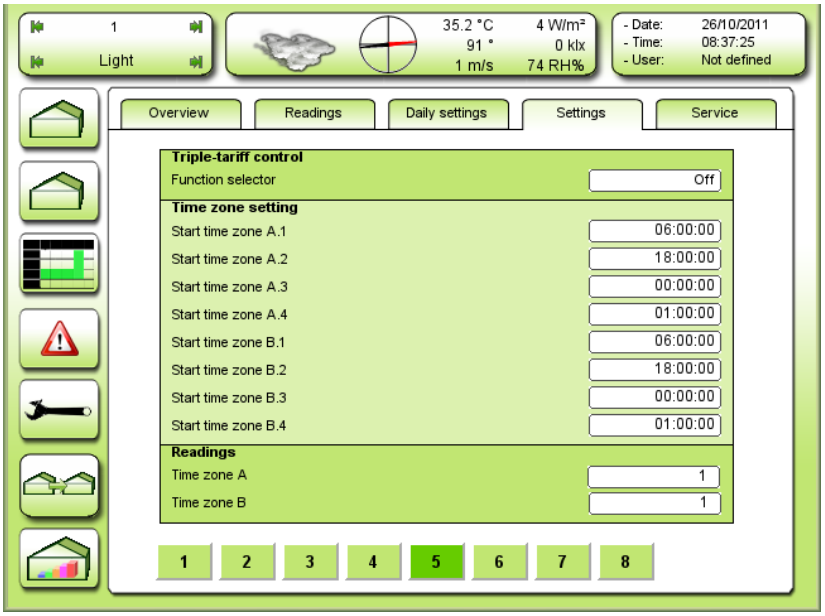


Figure 66
Settings for Triple-tariff control.

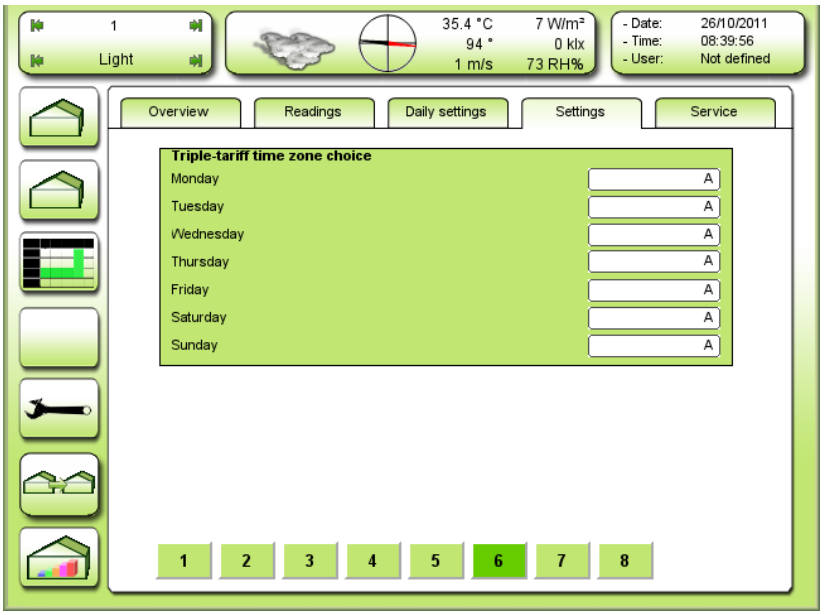


Figure 67

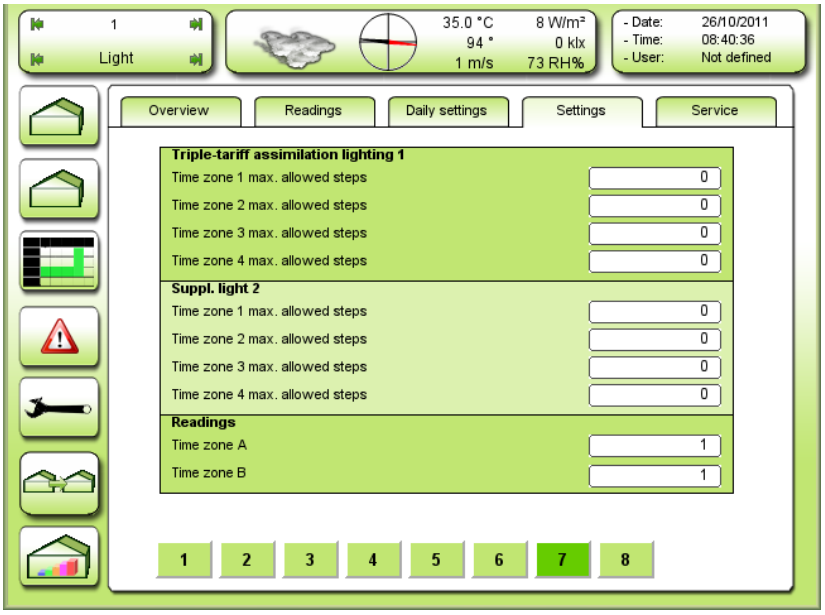


Figure 68

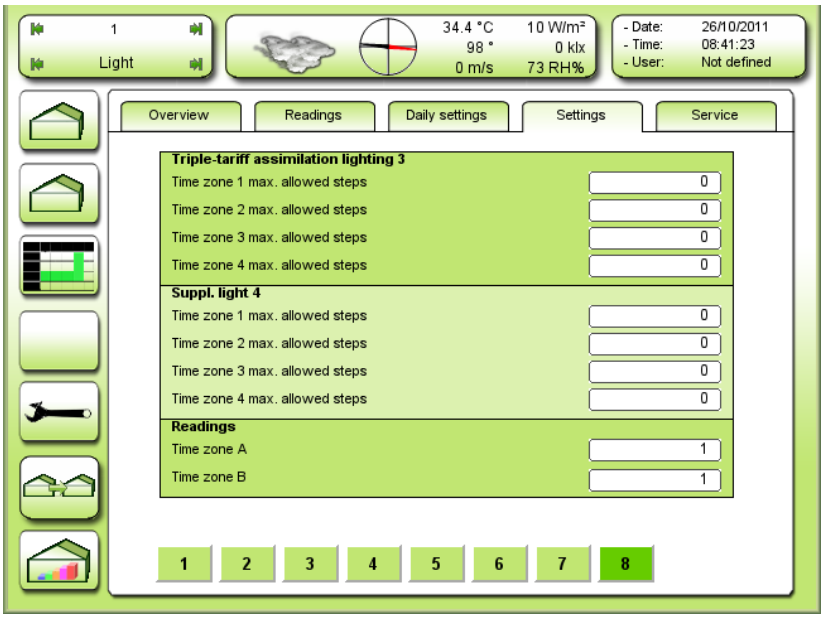


Figure 69

Service

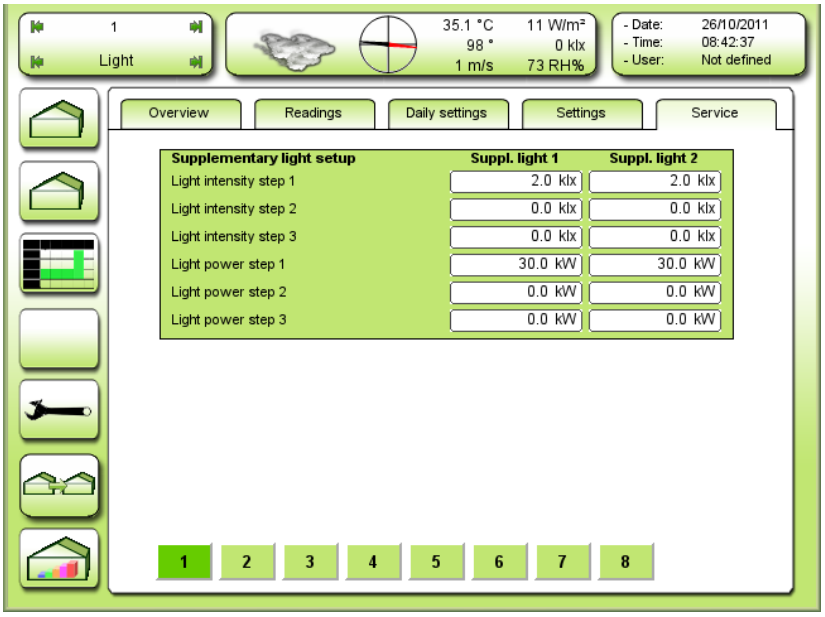


Figure 70
Service settings for supplementary light.

Light intensity step 1-3

Adjusting the light intensity coming from the lamps connected to each step output.

Light power step 1-3

Adjusting how much power is consummate from each step.

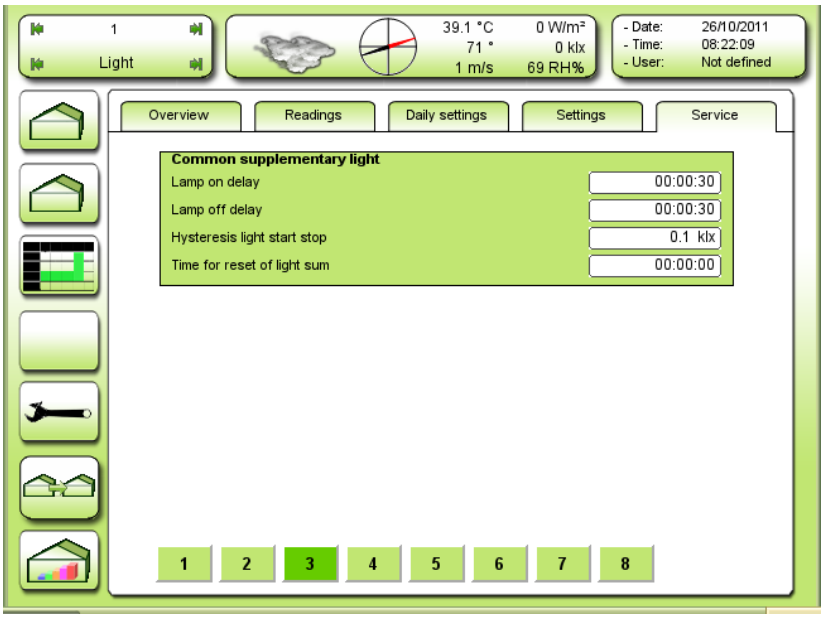


Figure 71
Service settings common for the 4 lights.

Lamp on delay

Adjusting the delay for turning the supplementary light ON by low outdoor light.
This delay is also active after power failure.

Lamp off delay

Adjusting the delay for turning the supplementary light OFF by high outdoor light.

Hysteresis light start stop

Adjusting the hysteresis for turning the light ON-OFF depending the outdoor light intensity.

Time for reset of light sum

Adjusting the time for resetting the light sum used by the light sum control.

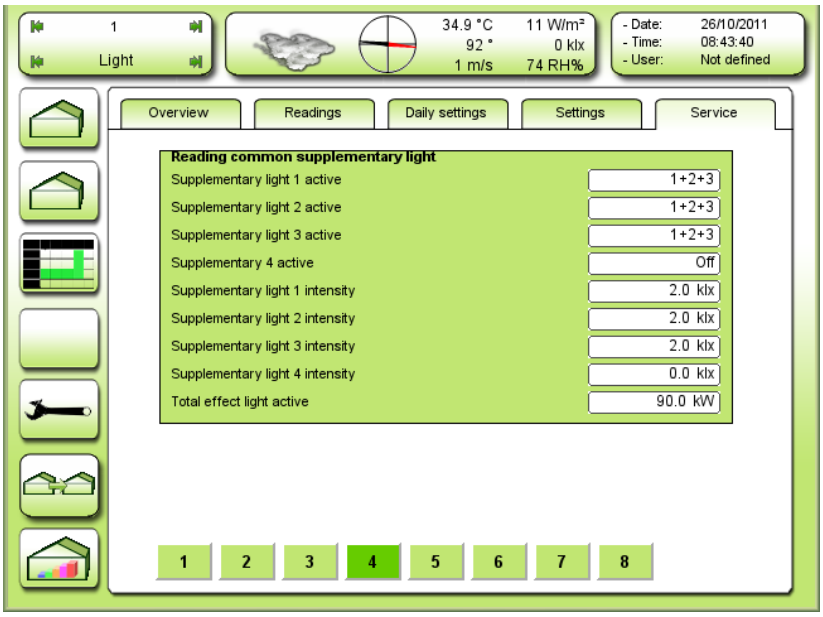


Figure 72
Service readings common for the 4 lights.

Supplementary light 1-4 active
Reading which steps are active.

Supplementary light 1-4 intensity
Reading the light contribution from each step.

Total effect light active
Reading the total power used for supplementary light.

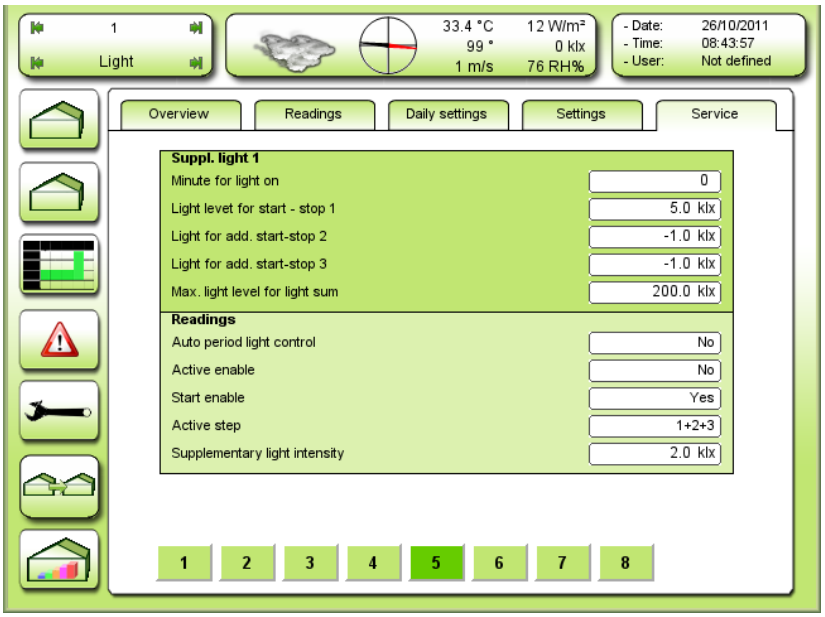


Figure 73
Service settings for supplementary light 1.
Supplementary light 2, 3 and 4, which are found under
button 6-8 are not described here as they do not differ from supplementary light 1.

Minute for light on

Adjusting the minute of time when the light is allowed to be activated.

0 = instant

1= minute 1 like 12:01, 12:11

10= minute 0/10 like 12:00, 12:10

Light level for start - stop 1

Adjusting the light level for turning on-off light step 1

NB! This a user setpoint and also visible in the user menu.

Light add. for start-stop 2 **TODO panel tekst!**

Adjusting the light level offset for step 2 relative to the level for step 1

Light add. for start-stop 3 **TODO panel tekst!**

Adjusting the light level offset for step 3 relative to the level for step 1

NB! The value must be larger **negative** than the level for step 2

Max light level for light sum

Adjusting the highest light level for calculating the light sum.

Light intensity above this level will be used as this level

Auto period light control

Reading the state of the auto period for light control 1

No : Not in auto period

Yes: In auto period

Active enable

Reading the state of the active enable flag, which includes:

Mode selector

Auto period

Light sum

External light enable

Start enable

Reading if the time (minute value) is correct for turning on the lamps.

Active step

Reading the active step no.

Suppl. Light intensity

Reading the light contribution from light control 1

Heat

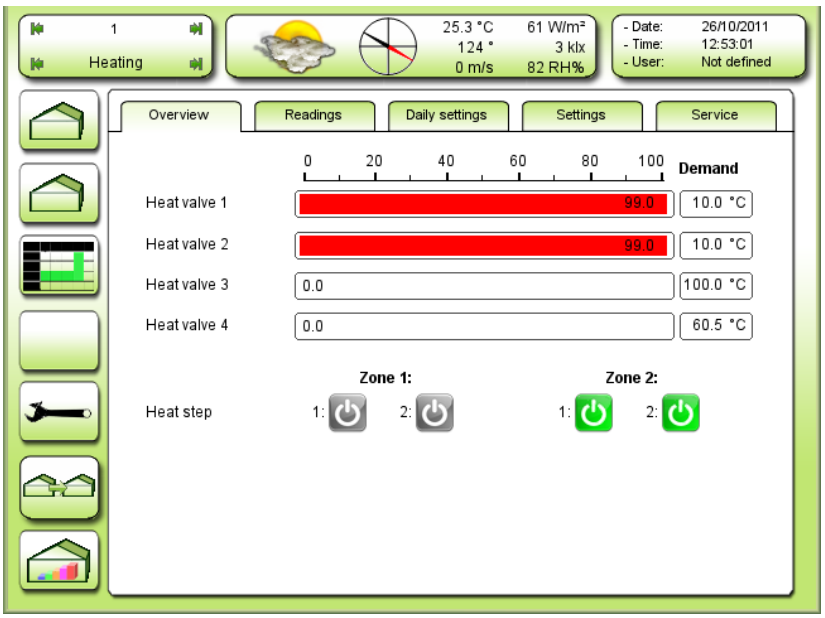


Figure 74
Overview for the 4 heat valves and the steps.

Heat valve 1-4

The 4 pipe temperatures are shown graphically. Also the controller demands are shown as values.

Heat step

The status of the two heat steps in each zone are indicated by color change.

Active step is green and grey is inactive

Readings

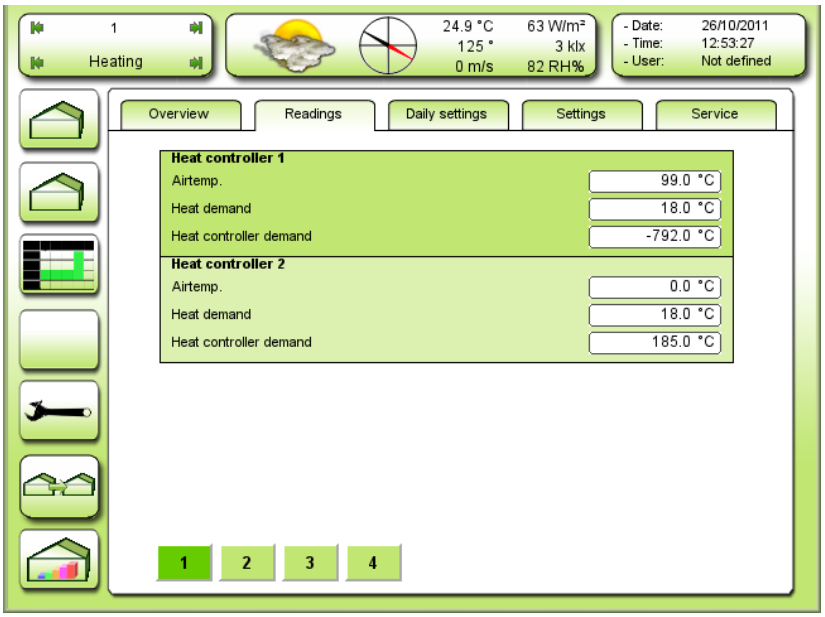


Figure 75
Aflæsning af varmeregulatorernes inputs og outputs.

Air temp.

The temperature that have to be regulated. You're free to choose which of the air temperature sensors are to be used for the regulator inputs. It's also possible to use a combination from 2 through 4 sensors. See Figure 89

Heat demand

Current air temperature demand by heating.

Heat controller demand

The pipe temperature demand from the heat controller for the achievement of the wanted air tempareature. This demand can be split into more pipes.

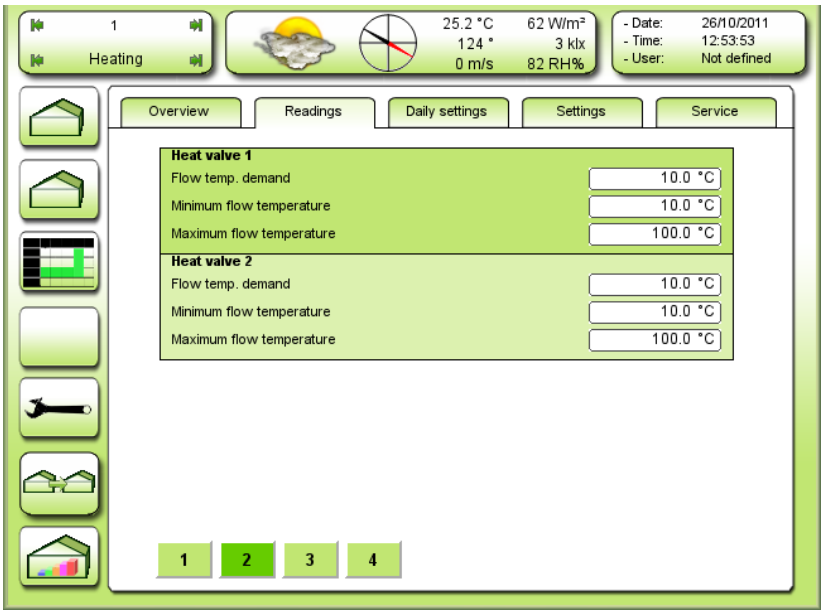


Figure 76
Reading the demand for heating valves 1 and 2.

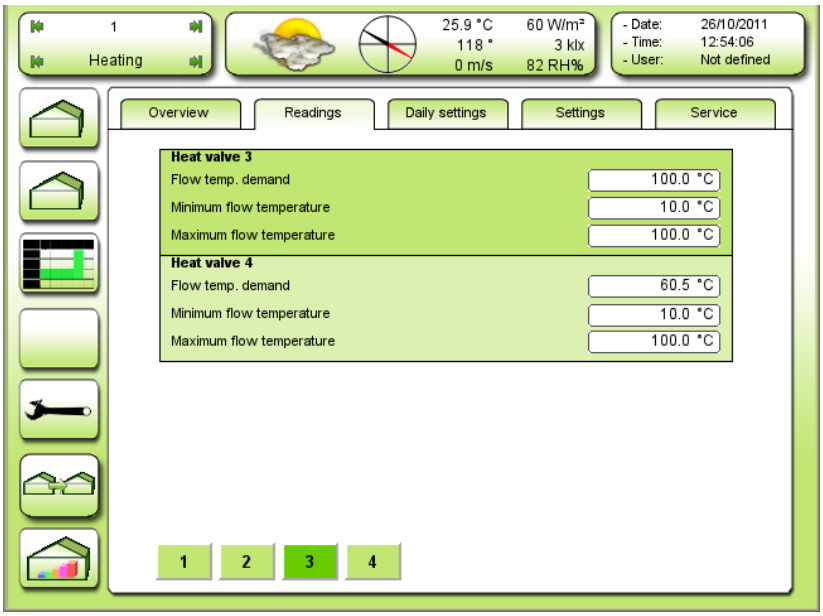


Figure 77
Reading the demand for heating valves 3 and 4.

Flow temp. demand
Reading the demand for the pipe temperature from heat valves 1-4.

Minimum flow temperature
Reading the minimum flow temperature calculation for the heating valve 1-4. A possible influence could be from the humidity control.

Maximum flow temperature
Reading the maximum flow temperature calculation for the heating valve 1-4.

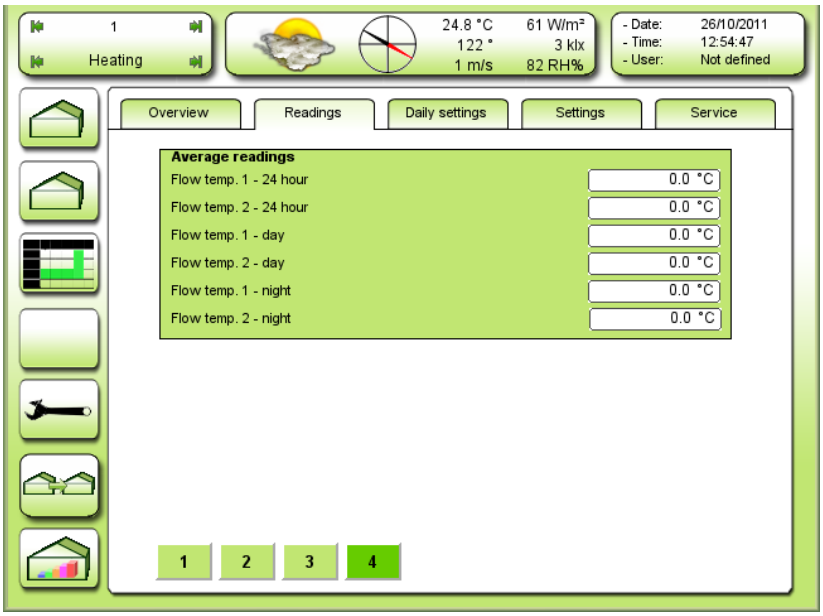


Figure 78
Average readings for the flow temperatures.

Daily settings

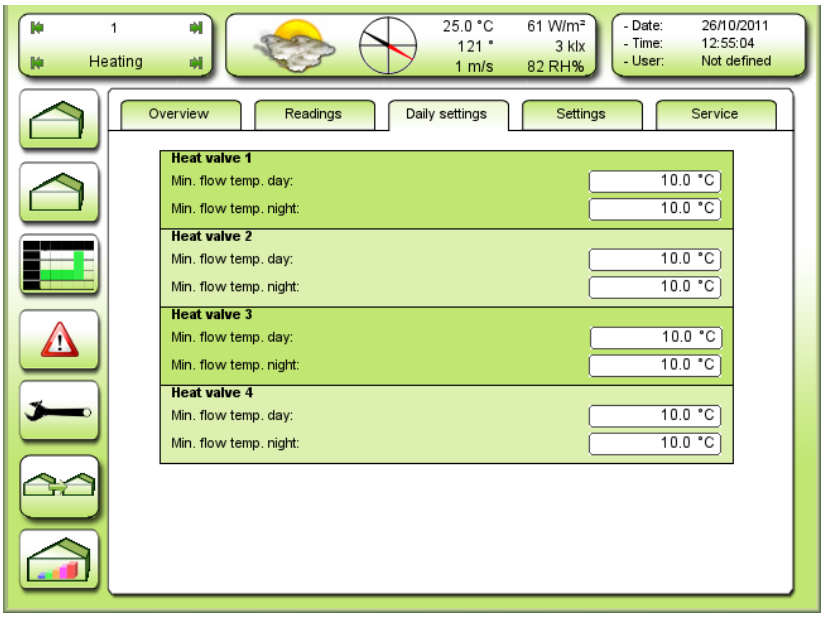


Figure 79
Daily settings for heating valves.

Min. flow temp. day

Setting a **fixed** minimum flow temperature by day.

Min. flow temp. night

Setting a **fixed** minimum flow temperature by night.

NB! Minimum flow temperature can be reduced light dependant. See Figure 84.

Settings for the heat valves

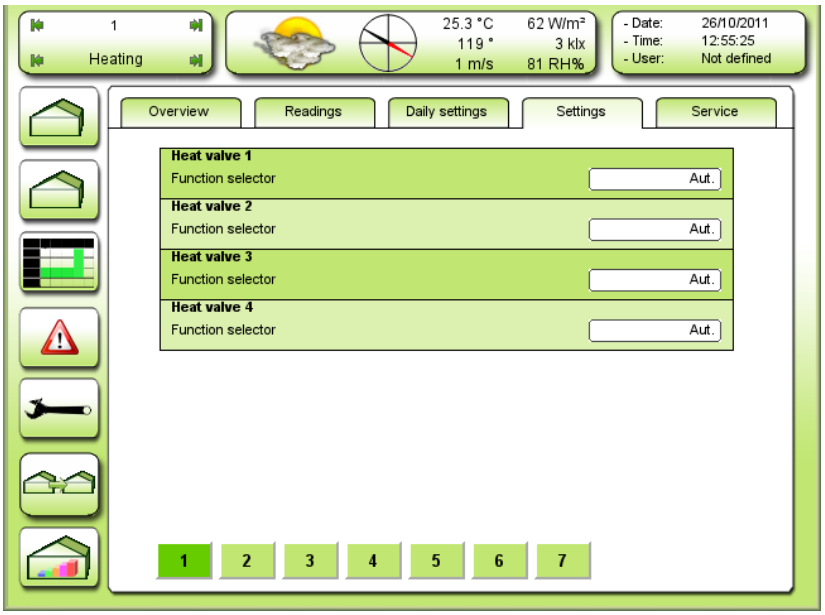


Figure 80
Function selectors for heating valves 1-4 makes it possible to test the installation.

Function selector

Selecting the operation on the mixing valve for heating.

Close: The mixing valve will close completely.

Aut.: The mixing valve will operate depending on the heating demand from the controller.

Open: The mixing valve will open completely.

Stop: The mixing valve will stop in the current position.

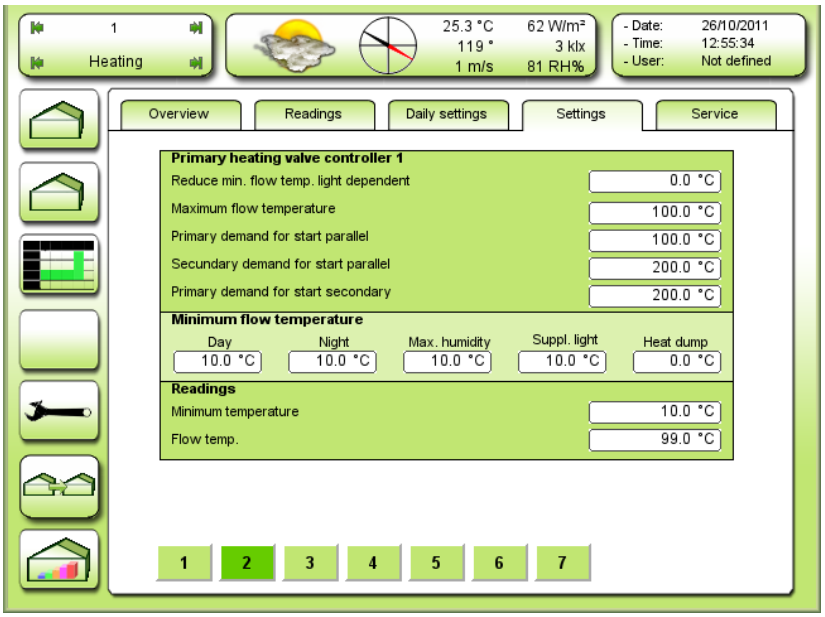


Figure 81
Settings for the heating valves and how they influence each other.

TODO screendump stavefejl: ~~secundary~~ secondary

Heating controller 1 contains 2 heating valves. A primary and a secondary. These can be cascade controlled. This is also true for heating controller 2. See Figure 82 and Figure 83.

Reduce min. flow temp. light dependant
Adjusting the reduce on minimum flow temperature depending on light intensity.
The light intensity for start and full decrease follows the settings in: Se Figure 105.

Maximum flow temperature
Adjusting the maximum flow temperature.
When the flow temperature demand exceeds the maximum, the excess temperature will be passed to mixing valve 2, if it's setup to be secondary mixing valve.

Primary demand for start parallel
Adjusting the flow temperature demand on mixing valve 1 for start mixing valve 2. The increasing demand will then be split between the 2 valves at a fixed ratio (can be changed in service settings).

Secondary demand for start parallel
Adjusting the flow temperature demand on mixing valve 2 for continue opening mixing valve 2.
This is used after using **Primary demand for start secondary**, which will stop mixing valve 1

Primary demand for start secondary
Adjusting the flow temperature demand on mixing valve 1 for stopping mixing valve 1 and start opening mixing

valve 2.Mixing valve 2 will take over until it reaches **Secondary demand for start parallel** then both mixing valves will operate.

Minimum flow temperature

Day Adjusting the "fixed" minimum flow temperature in day time.

Night Adjusting the "fixed" minimum flow temperature in night time.

Max. humidity Adjusting the minimum flow temperature by high humidity.
The offset to max humidity for starting the increase on flow temperature, and P-band can be adjusted. See Figure 51.

Suppl. light Adjusting the minimum flow temperature by active supplementary light 1. Is useful when ventilation is active because of heat over production from the lamps and the temperature thereby gets too low for the plants. In that case the minimum flow temperature should be performed at the under pipes.

Heat dump Adjusting the minimum flow temperature by heat dump request from the boiler room control EMA Completa. The heat dump request will be transmitted when the storage tank is almost full.

NB! The minimum flow temperature can be reduced depending on light intensity. See **NB!** The minimum flow temperature can be reduced depending on light intensity.
See **Decrease min. temp. Light dep.** Figure 81

Readings

Minimum temperature Reading the current minimum flow temperature.

Flow temperature Reading the current flow temperature.

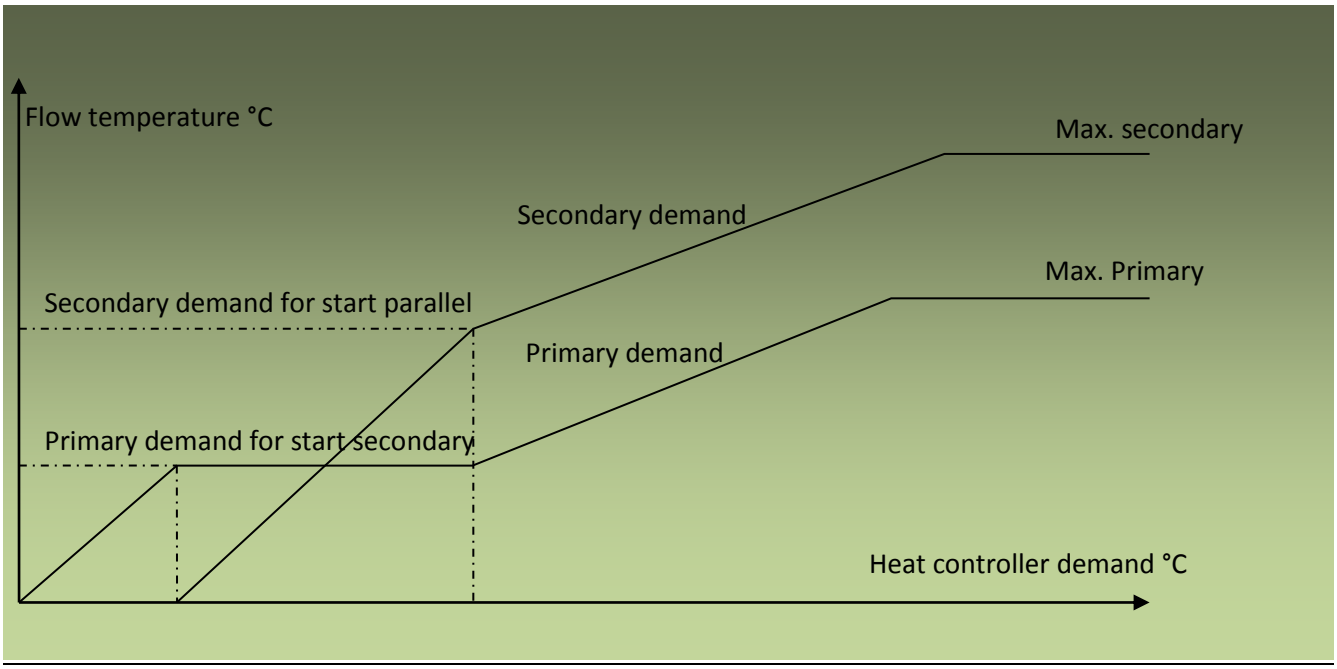


Figure 82
Caskade control of heat valves.

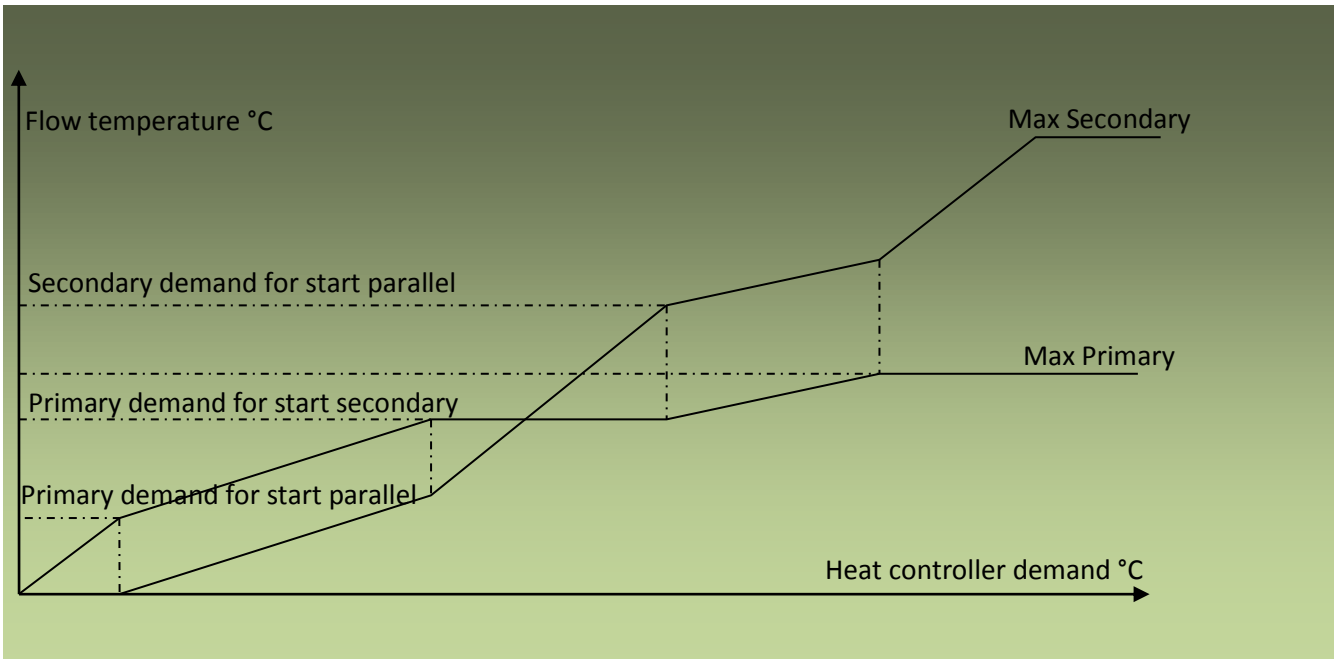


Figure 83
Caskade control including stop primary + parallel.

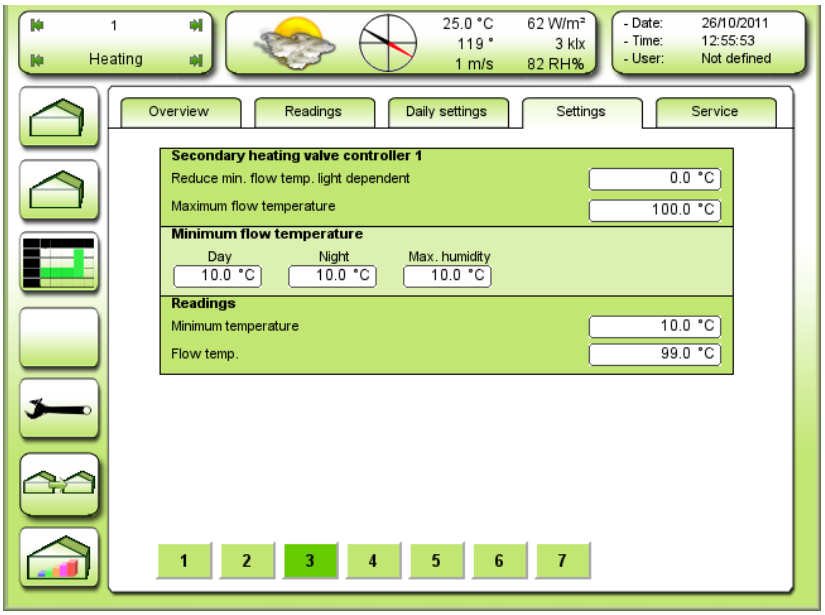


Figure 84
Heating valves settings.

See Figure 81.

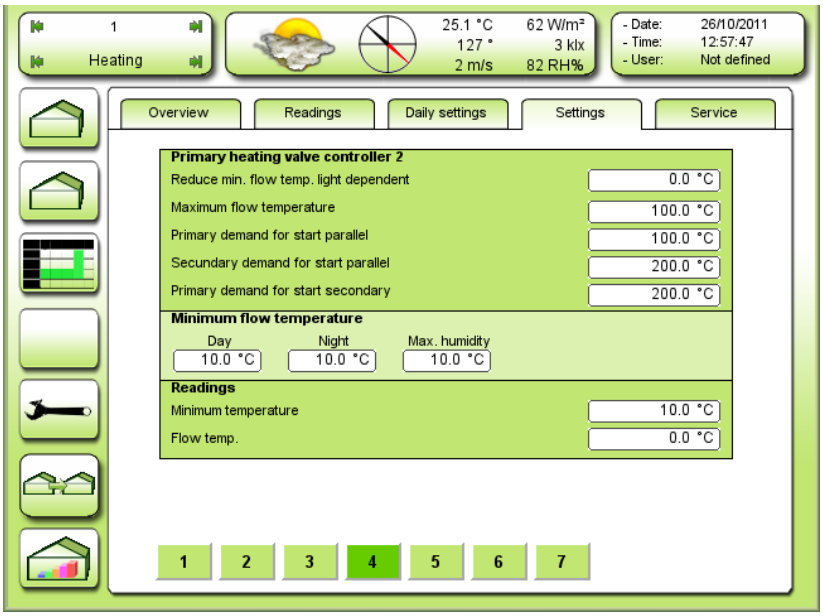


Figure 85
Heating valves settings.

See Figure 81.

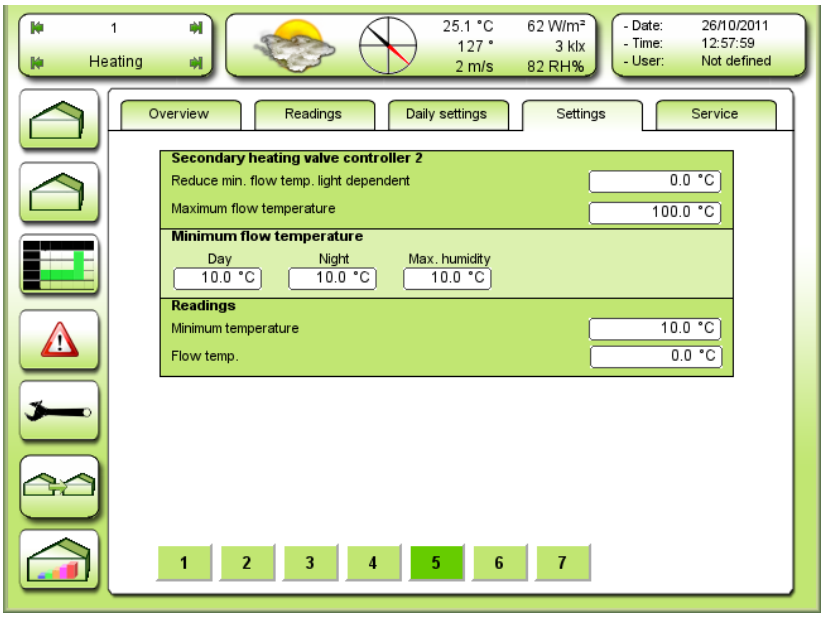


Figure 86
Heating valves settings.

See Figure 81.

Heating step

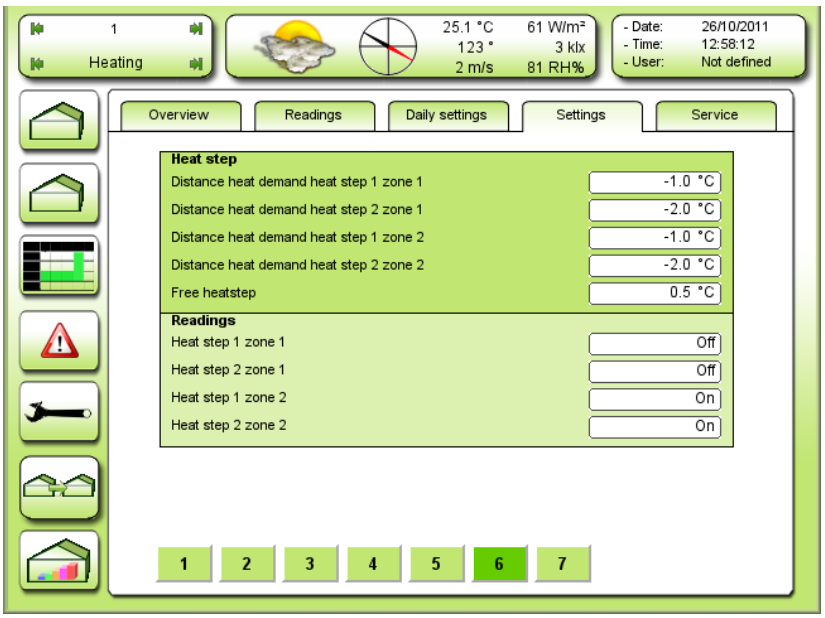


Figure 87
Settings for heat steps in the two climate zones.

Distance heat demand heat step 1 zone 1

Adjusting the distance to heating temperature demand for starting heating step 1 in zone 1.

Distance heat demand heat step 2 zone 1

Adjusting the distance to heating temperature demand for starting heating step 2 in zone 1.

Distance heat demand heat step 1 zone 2

Adjusting the distance to heating temperature demand for starting heating step 1 in zone 2.

Distance heat demand heat step 2 zone 2

Adjusting the distance to heating temperature demand for starting heating step 2 in zone 2.

Afstand varmekrav-varmestep 2 i zone 2

Indstilling af temperaturafstanden til varmetemperaturkravet for aktivering af varmestep 2 i zone 2.

Negative value means lower temperature.

Readings

Reading which steps are active.

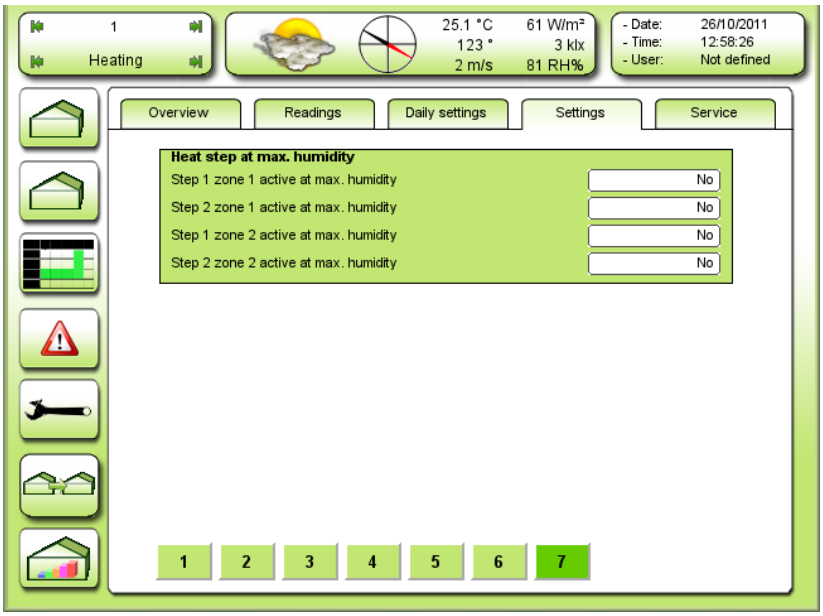


Figure 88
Selecting if the heating steps are going to be active by high humidity.

The heating steps can be activated by maximum humidity.
It is possible to have the heating steps pulsing by max humidity. (Steam heating)
The pulse and period time is set in the service menu. See Figure 60.

Step 1 zone 1 active at max humidity
Selecting if heating step 1 in heating zone 1 must be active at maximum humidity.

Step 2 zone 1 active at max humidity
Selecting if heating step 2 in heating zone 1 must be active at maximum humidity.

Step 1 zone 2 active at max humidity
Selecting if heating step 1 in heating zone 2 must be active at maximum humidity.

Step 2 zone 2 active at max humidity
Selecting if heating step 2 in heating zone 2 must be active at maximum humidity.

Step 1.1 active on max hum. No/Yes
Selecting if heating step 2 in heating zone 2 must be active by maximum humidity.

Service

Figure 89
Heating and heating valves setup.

Number of heat valve controllers

Selecting the number of heating valve controllers to be used.

Each heating valve controller can control 2 heating valves: Primary + secondary.

Sensor zone selector heat PID 1

Selecting the sensor zone to be used for heating PID regulator and heating valve controller 1

Sensor zone selector heat PID 2

Selecting the sensor zone to be used for heating PID regulator and heating valve controller 2

Number of heating valves

Adjusting the number of heating valves to be controlled in the compartment.

NB! This number is not the same as the number of heating valves in the Expansion unit.

Demand heating valve 1-4

Selecting the flow temperature demand for heating valve 1-4

- 1 = Primary heating valve on heating controller 1
- 2 = Secondary heating valve on heating controller 1
- 3 = Primary heating valve on heating controller 2
- 4 = Secondary heating valve on heating controller 2
- 9 = Boiler flow temperature demand. Please take contact to Senmatic A/S for further information.

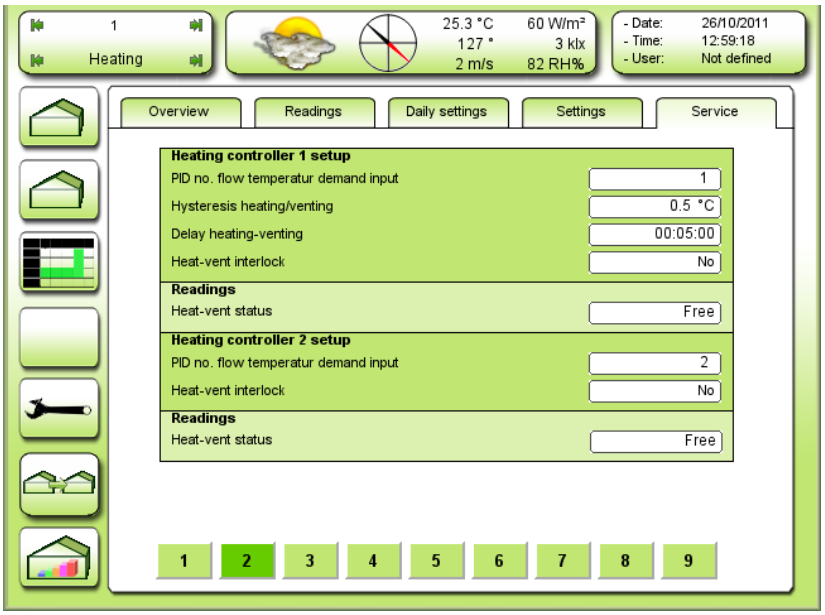


Figure 90
Setup the heat controllers 1 and 2.

PID no. flow temperature demand input

Here you setup which PID regulator output controls the primary- and secondary heating valves in heating controller 1. So saying which sensor zone.

PID:
Proportional **I**ntegral **D**ifferential regulator.

Hysteresis heating/venting

Adjusting the temperature error heating/ventilation for switching from heating to ventilation and back.

Delay heating-venting

Adjusting the delay from passing the temperature error hysteresis, until the changeover from heating to venting and back switch takes place.

Heat-vent interlock

Selecting if the heating and ventilation control cannot be active at the same time

No: Independent heating and ventilation control.

Yes: Heating and venting cannot be active at the same time

Heating-vent. status

Reading the status on the heating-ventilation interlock.

Free: Independent heating and ventilation control.

Heating: The heating controller is active and the ventilation controller is locked.

Venting: The ventilation controller is active and heating controller is locked.

Heating controller 2 setup See Figure 90.

Heating valve setup

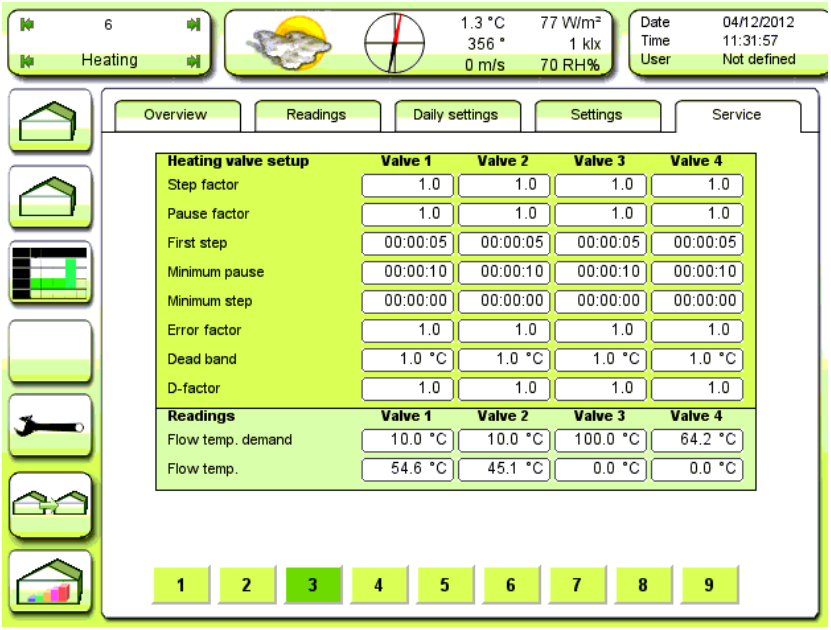


Figure 91
Heating valves setup

Step factor

Adjusting the factor for step length on mixing valve 1.
If the running time is half of a DGT-Volmatic valve (appr. 5 min.) the step factor must be changed to half size.
Step length before multiplied by the factor is 0 - 40 seconds.

Pause factor

Adjusting the factor for pause length on the mixing valve.
If the reaction time on the flow temperature sensor is very long the pause factor must be increased.

First step

Adjustment of the duration of the first open signal for the heating valve, when the regulator asks for heat and the total time for the close signal has been 10 minutes. This can be a benefit for the temperature regulation, if a “dead time” is a property of the heating valve. “Dead time” meaning no flow gets through the heating valve before the open signal has been active for more than “dead time”.

Minimum Pause

Adjusting the minimum pause between the steps.

Minimum step

Smallest pulse width to the heating valve.

Error factor

Adjusting the temperature error band wherein the step-pause controller works.

Example:

10 = 10 °C	If the flow temperature error surpasses 10 °C, there will be a constant step on the mixing valve.
5 = 20 °C	If the flow temperature error surpasses 20 °C, there will be a constant step on the heating valve.

Dead band

Adjusting the dead band on the mixing valve flow temperature controller.

D-factor

Adjusting the sensitivity of the flow controller related to the flow temperature differential.
1.0°C means ± 1°C dead band.

Readings

Flow. temp. demand	Reading current demands.
Flow. temp.	Reading current temperatures.

Energy balance model

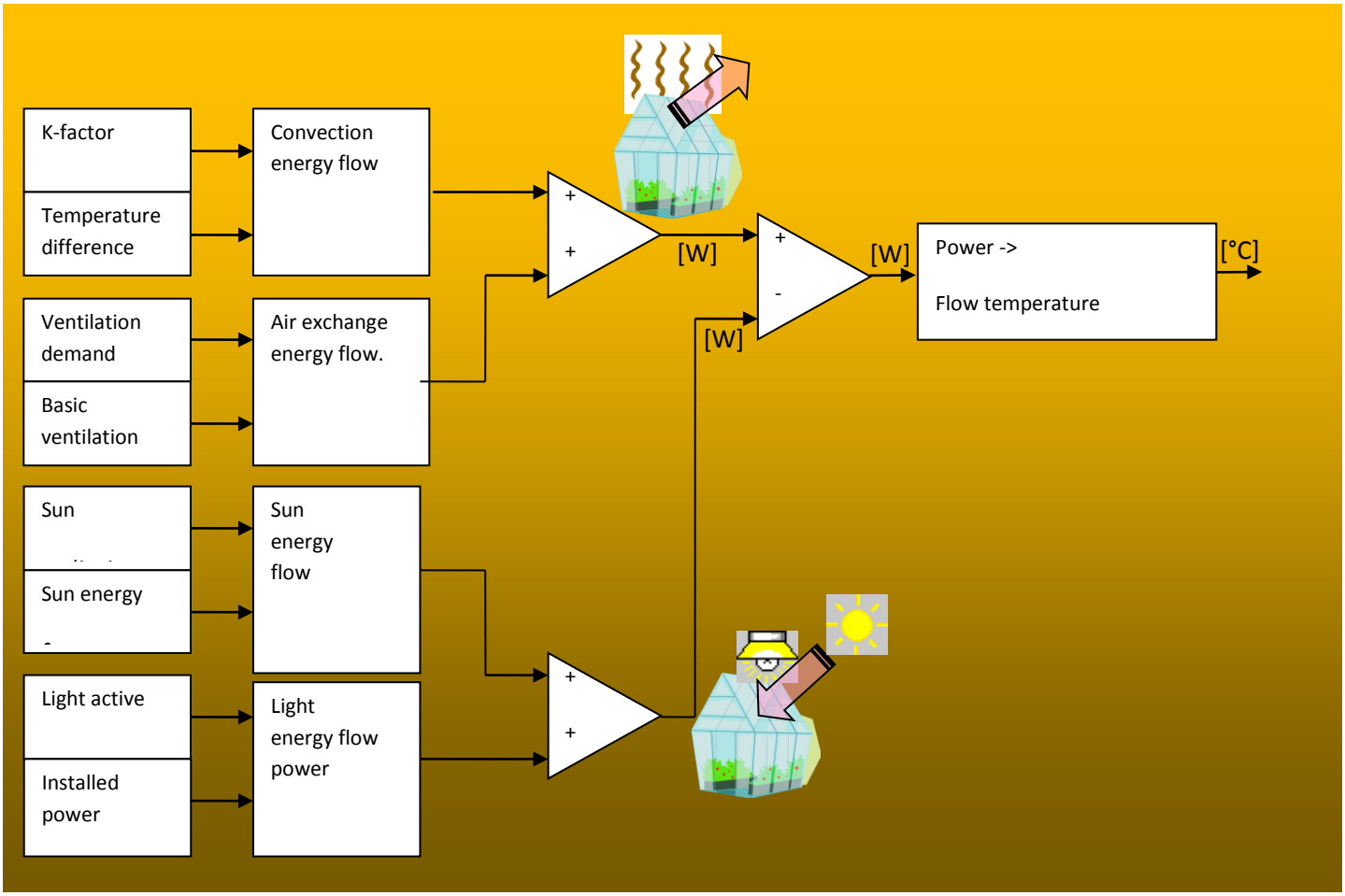


Figure 92
Energy balance model

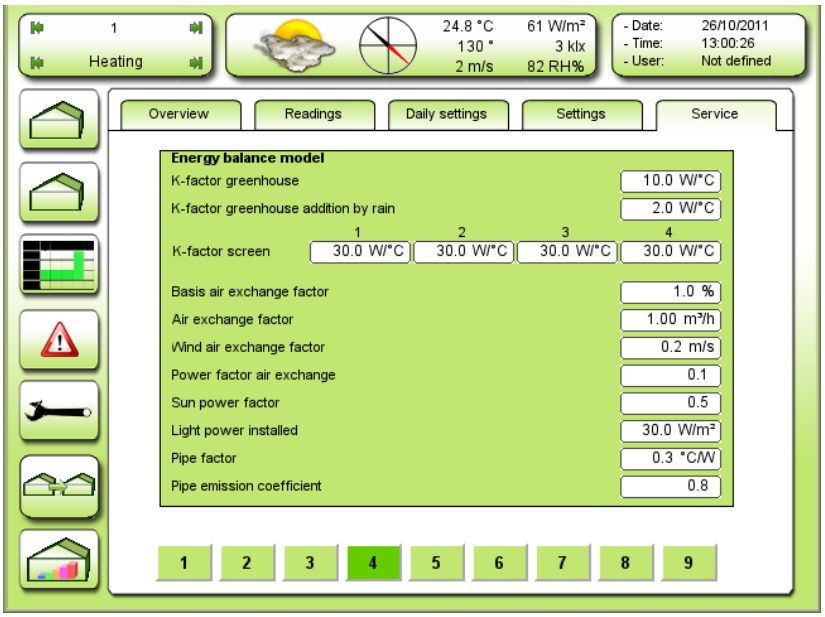


Figure 93
Settings for the energy balance model.

Activation of the Energy balance model: See Figure 95

K-Factor greenhouse

Adjusting the K-factor for the greenhouse in W/°C pr. m^2

The K-factor is the heat conductivity of the construction.

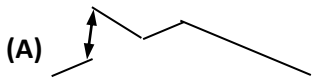
10W/°C means it takes 10W/ m^2 to warm up the greenhouse 1 °C.

K-Factor greenhouse addition by rain

Adjusting the increase of the K-factor for the greenhouse by rain.

K-Factor screen 1-4

Adjusting the K-factor for each screen 1-4.

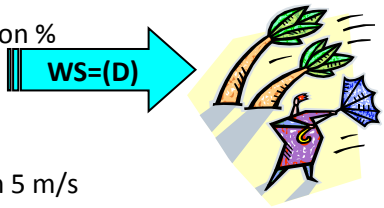


Basic air exchange factor **(B)**

Adjusting the basic air exchange as simulated ventilation at closed vents and no wind.

Air exchange factor /% **(C)**

Adjusting the factor for calculating the air exchange depending on ventilation %



Wind air exchange factor /m/s **(E)** 0.20

Adjusting the wind speed influence on the air exchange

0.20 means the calculated air exchange will be doubled by a wind speed on 5 m/s

Power factor air exchange **(F)**

Adjusting the power loss caused by the air exchange. (W/m3)/h

NB! This wind influence will also have affect on the green house K-factor.

Sun power factor

Adjusting the amount of the sun power is heating up the greenhouse.
0.5 means ½ of the sun power is heating the greenhouse.

Light power installed

Adjusting the power contribution when the supplementary light is activated.

Pipe factor (W ⇨ °C)

Adjusting the increase in pipe/flow temperature needed in order to give an increase in power on 1 w/m^2.

Pipe emission coefficient

Adjusting the pipe emission coefficient.
The emission coefficient expresses the pipes ability to give away infrared heating power as.
1.0 means the pipes are “perfect” black.
0.0 means the pipes are as a “perfect mirror”.

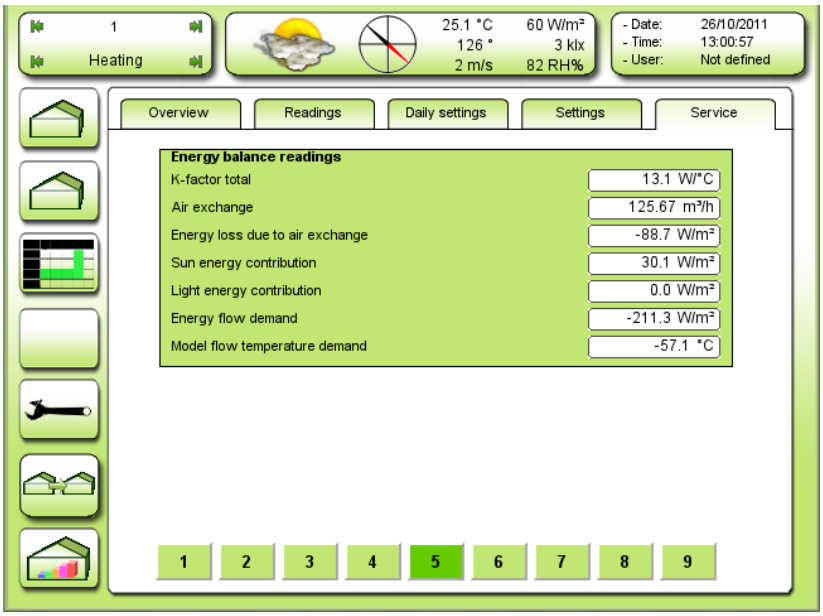


Figure 94
Readings for the energy balance model.

K factor total

Reading the final K factor
The total K-factor is the heat conductivity of the whole construction including screens.
The total K-factor is also depending on wind speed and rain.

10W/°C means it takes 10W/ m^2 to warm up the greenhouse 1 °C.

Air exchange

Reading the final air exchange pr. m^2

Energy loss due air exchange

Reading the energy loss caused by air exchange

Sun energy contribution

Reading the energy flow contribution from the sun radiation.

Light energy contribution

Reading the energy flow contribution from the supplementary light.

Energy flow demand

Reading the total energy flow demand calculated by the energy model.

Model flow temperature demand

Reading the increase in flow temperature caused by the energy model.

Heating PID regulator

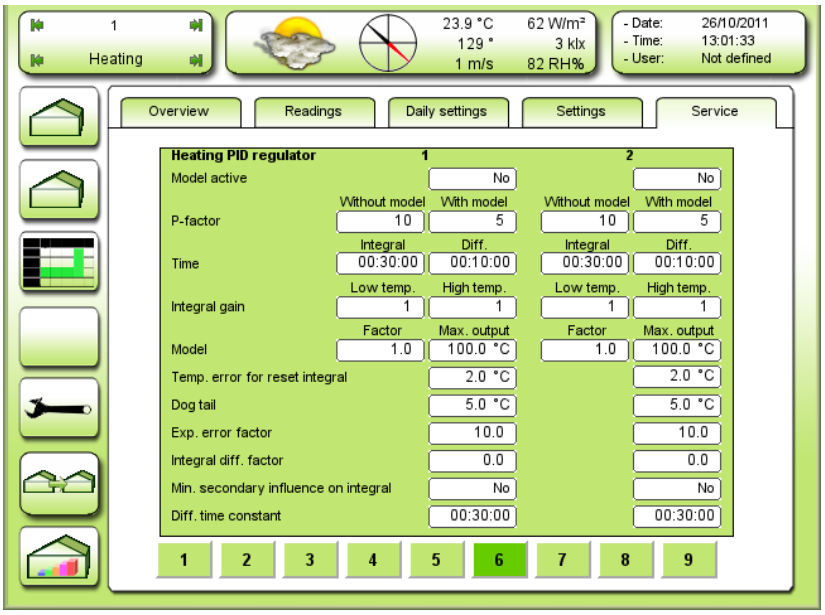


Figure 95
Settings for the heating PID regulators.

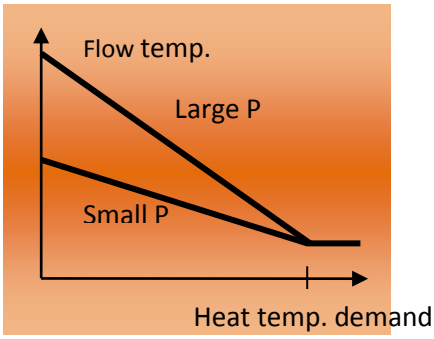
Model active

Selecting if the energy model is used or not. Without model the temperature is adjusted with the PID regulator.

If the model is activated, the regulation of the temperature is a mix of model and PID.

P-factor without model

Adjusting the P-factor used when not using the energy model. °C/°C
The P-factor gives a change in flow temperature proportional to the temperature error.
The P-factor is actually the sensitivity of the regulator.
A too high P-factor causes oscillations.
A too low P-factor will cause a slow regulator.
An installation with many pipes pr. m2 is more efficient and must have a lower P-factor.
An installation with few pipes pr. m2 is less efficient and must have a higher P-factor.



P-factor with model

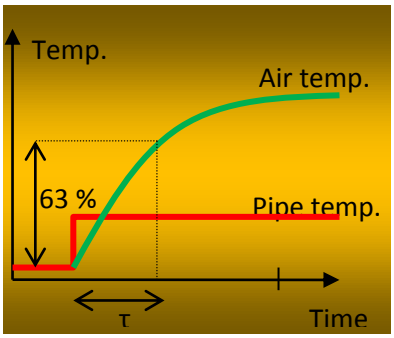
This P-factor can be set lower, as the model works as it should. A more stabile regulator can thereby be obtained.

Time Integral (I time)

Adjusting the I time for the PID regulator.
The I time is the time to give the same change in flow temperature as the P part of the PID regulator with a constant temperature error.
Example:

Temperature error:	-1.0 °C constant.
P-factor:	10 °C/°C
I time:	00.30 hour
P change:	10 °C
I change:	10 °C after 30 minutes

A too long I time will slow the PID regulator. A too short I time will cause oscillation.
Hint: An optimal adjustment of the I time is the reaction time of the air temperature τ changed by the pipe temperature.



Time Diff. (D time)
Adjusting the D time for the PID regulator.
Adjusting the sensitivity of the PID regulator to the change in temperature error.
An adjustment at 00.00 will remove the D regulator. A too high adjustment will cause a troubled regulation.

Integral gain
Adjusting the gain of the temperature error by too low air temperature.
If the gain is higher than 1,0 the simulated error will be higher than the actual. This means the integral function will act faster.

Temp. error for reset integral
Adjusting the **positive** temperature error for resetting the integral demand.

Dog tail
Adjusting the limits relative to the actual flow temperature for stopping the integral. An adjustment at 5 °C will result in the following:
If the flow temperature stops at 80 °C the integral demand will stop at 85 °C.

Exp. error factor
Adjusting the gain of the exponential error function.
If the error becomes greater than 1.0 °C the simulated error for the integral function will increase exponentially.

Integral diff. factor
Adjusting the diff. factor for changing the temp. error for the integral (Temperature exp. error) depending on the differential contribution from the PID regulator. This adjustment will be able to brake/dampen the integral contribution on the basis of the amount of the diff. contribution.
The temperature is thereby adjusted without overshoot. This function is only active when the air temperature error is smaller than 1 °C.

Min. secondary influence on integral
Selecting if the secondary min. should have influence on the value, which the integral is forced to obtain when

the heating starts. **Yes** means that the highest von min. secondary and min. primary is selected. **No** selects min. primary.

Diff. time constant

Adjusting the time constant of the air temperature differential calculation.

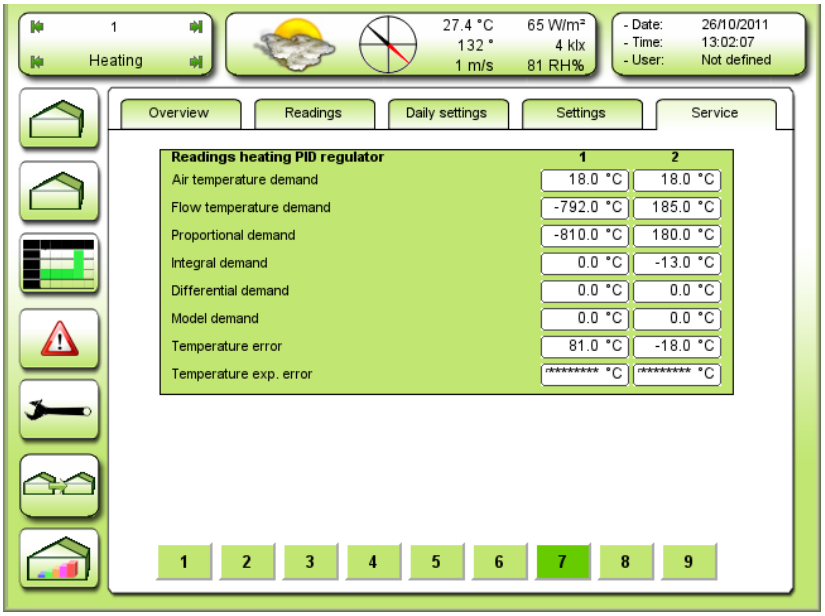


Figure 96
Readings for the heating PID regulators

Air temperature demand

Reading the current air temperature demand for this PID regulator.

Flow temperature demand

Reading the current flow temperature demand from the PID regulator.

Proportional demand

Reading the current flow temperature demand from the **P** function.

Integral demand

Reading the current flow temperature demand from the **I** function.

Differential demand

Reading the current flow temperature demand from the **D** function.

Model demand

Reading the current flow temperature demand from the energy balance model.

Temperature error

Reading the current air temperature error.

Temperature exp. error

Reading the current simulated air temperature error for the integral function.

Heating controller

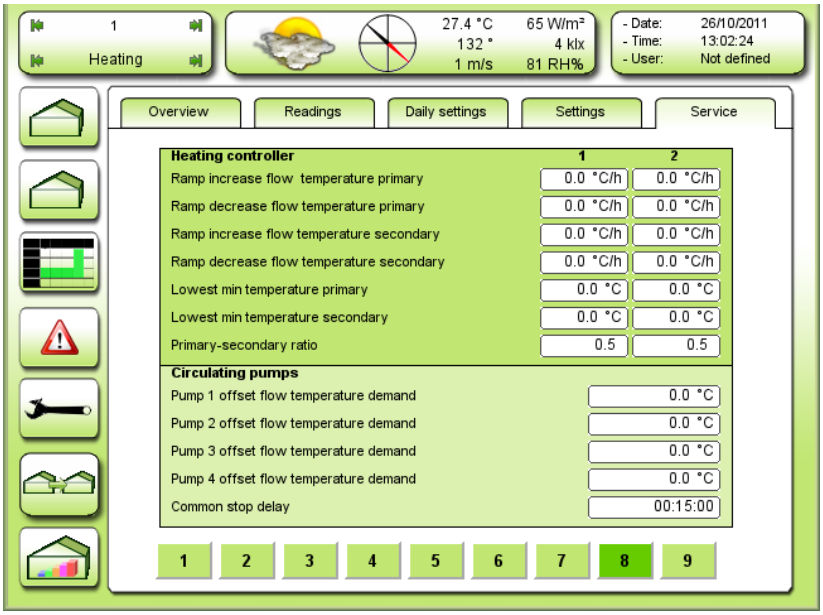


Figure 97
Settings for the heating controllers and the circulating pumps.

Ramp increase flow temperature primary

Adjusting the maximum rate/speed for increasing the primary flow temperature.
0 » no ramp.

Ramp decrease flow temperature primary

Adjusting the maximum rate/speed for decreasing the primary flow temperature.
0 » no ramp.

Ramp increase flow temperature secondary

Adjusting the maximum rate/speed for increasing the secondary flow temperature.
0 » no ramp.

Ramp decrease flow temperature secondary
Adjusting the maximum rate/speed for decreasing the secondary flow temperature.
0 » no ramp.

Lowest min. temperature primary
Adjusting the absolute lowest minimum flow temperature on the primary valve.

Lowest min. temperature secondary
Adjusting the absolute lowest minimum flow temperature on the secondary valve.

Primary-secondary ratio
Adjusting the ratio between primary and secondary flow temperature increase when running in the parallel.
0.5 means 50 % on each.
0.6 means 60 % on primary and 40 % on secondary.

Pump 1-4 offset flow temperature demand
The pump starts when the flow temperature demand surpasses the heat temperature demand + this offset setting. See Figure 98.

Common stop delay
The pump stops when the flow temperature demand gets below the heat temperature demand + the offset setting and this time setting is expired. This setting is used at all 4 pumps. See Figure 99.

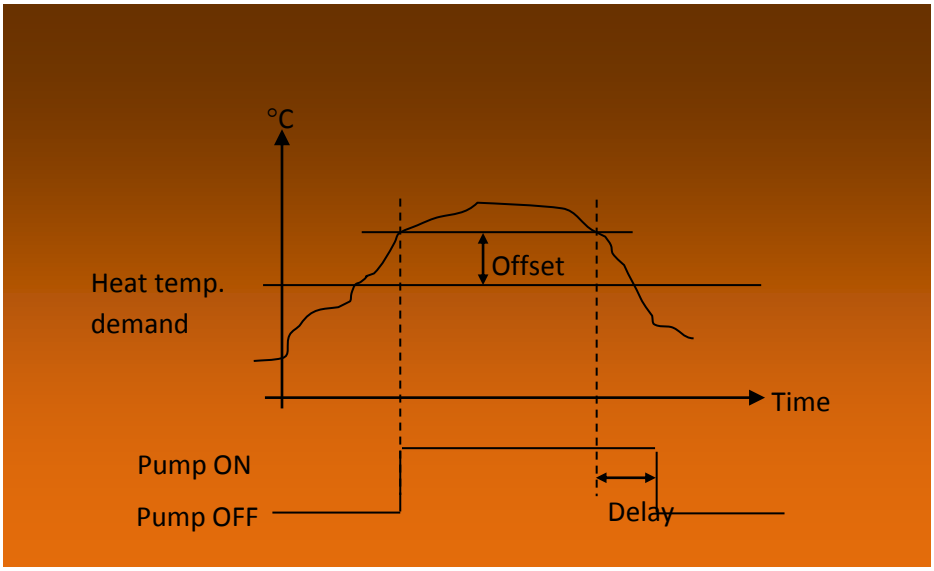


Figure 98
Start – stop off the pumps.

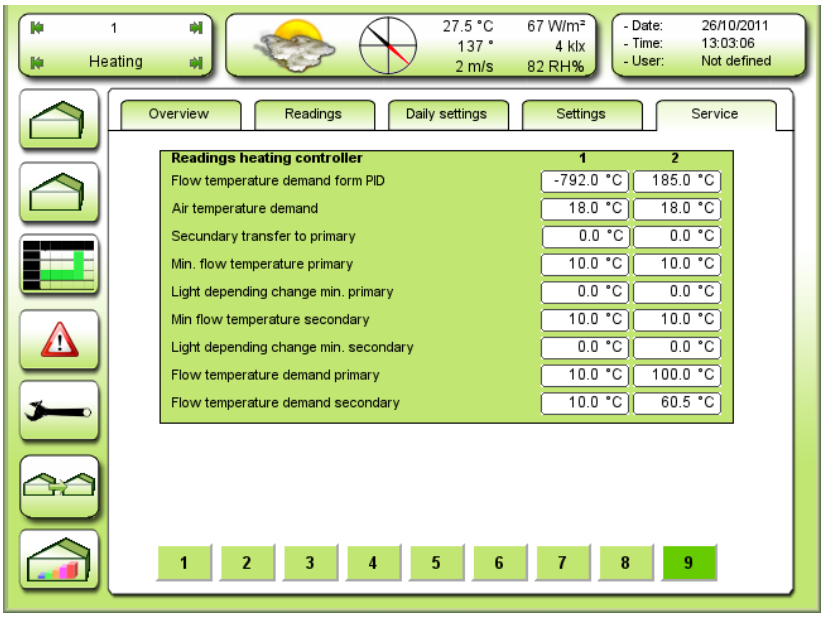


Figure 99
Readings for the two heating controllers.

TODO screendump stavefejl: ~~secundary~~ – secondary

Flow temperature demand from PID
Reading the current flow temperature demand for controller 1-2.

Air temperature demand
Reading the current air temperature demand for controller 1-2.

Secondary transfer to primary
Reading the current flow temperature demand transferred from the secondary to primary heating valve caused by limits on the secondary flow temperature.

Min. flow temperature primary
Reading the current minimum flow temperature demand on the primary heating valve. The minimum flow temperature demand can be fixed or depending on humidity and/or light.

Light depending change min. primary
Reading the current change of minimum flow temperature on the primary heating valve depending on the light intensity.
NB! The light dependency follows the same curve as the dependency on air temperature.

Flow temperature demand primary
Flow temperature demand on the primary heating valve.

Flow temperature demand secondary

Flow temperature demand on the secondary heating valve.

Temperature

Overview

Figure 100
Overview over temperatures, measurements and demands in the 2 climate zones.

Readings

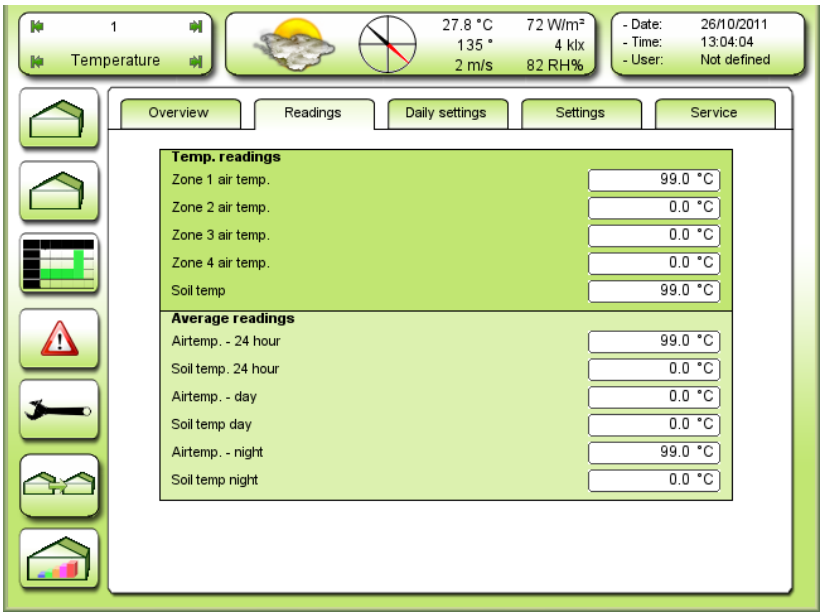


Figure 101
Readings for the temperature measurements in the 4 sensor zones.

TODO screendump stavefejl: ~~24 hour~~ – 24 hours

Zone 1-4 air temperature
Reading of the temperature measurements of the 4 sensor zones.

Average readings
Airtemp. – 24 hours
Readings for the calculated average of the air temperature the last 24 hours.

Soil temp. – 24 hours
Readings for the calculated average of the soil temperature the last 24 hours.

Airtemp. – day
Readings for the calculated average of the air temperature the last day.

Soil temp. – day
Readings for the calculated average of the soil temperature the last day.

Airtemp. – night
Readings for the calculated average of the air temperature the last night.

Soil temp. – night

Readings for the calculated average of the soil temperature the last night.

Settings

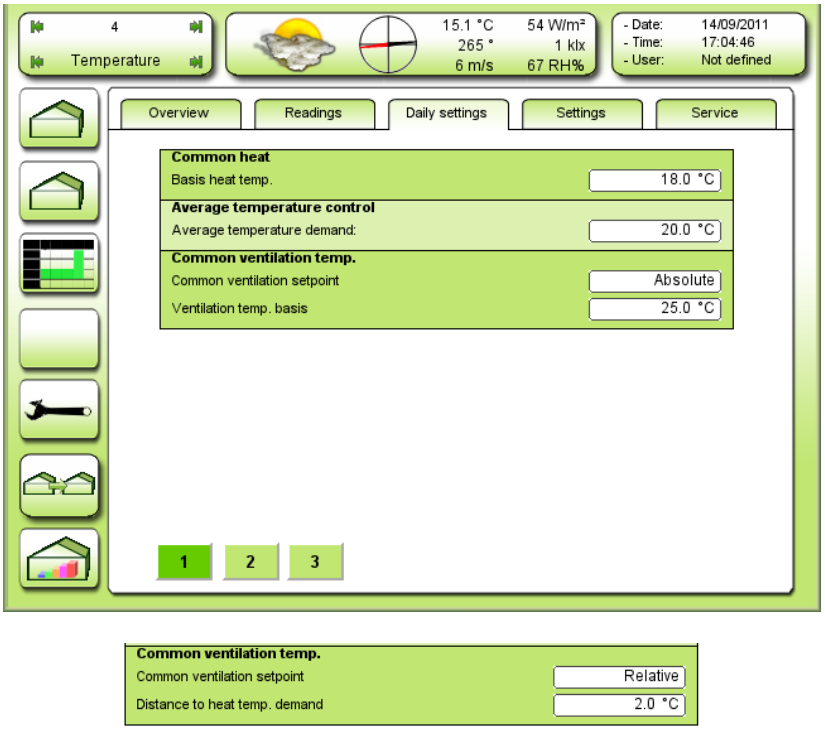


Figure 102
Daily settings for temperature.
The menu for common ventilation temperature changes depending on the choice of common ventilation set point.

Basis heat temp.

Adjustings for the basis temperature of the greenhouse by heating.

Average temperature demand

Adjustings for the desired average temperature if control by average temperature is chosen. See Figure 106 Settings for the average temperature control.

Common ventilation setpoint

Absolute Fixed limit value.

Relative The limit value follows the basis temperature of the greenhouse with a set distance.

Ventilation temp. basis

If **Absolute** is chosen this will be the fixed limit value for the ventilation.

Distance to heat temp. demand

If **Relative** is chosen this distance counts for the **Basis heat temp.** for the limit value of the ventilation.

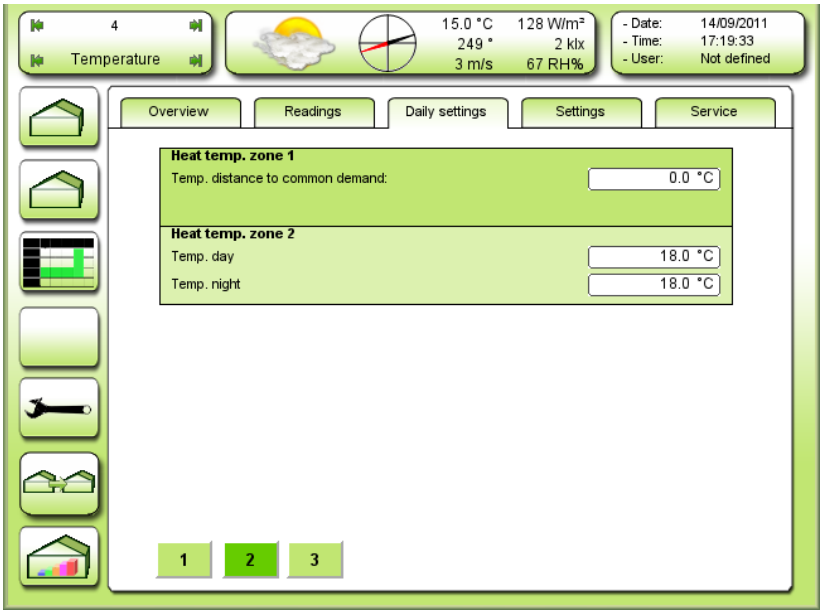


Figure 103
Settings for the temperature in climate zone 1 and 2.

See Figure 112 regarding whether or not the temperature setting for each zone relates to the common demand or a fixed day – night temperature is chosen.

Temperature distance to common demand

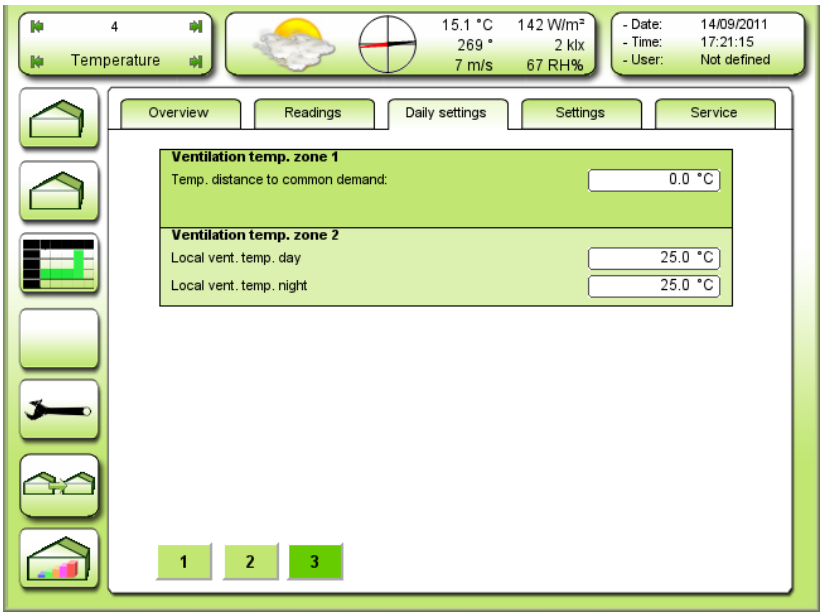
The distance to the common demand (if chosen) is set here.

Temp. day

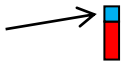
Fixed temperature (if chosen) during the day (if chosen) is set here.

Temp. night

Fixed temperature (if chosen) during the night (if chosen) is set here.



Temp. distance to common demand



Setting of distance to common heating-temperature-demand.

The final common ventilation temperature will follow the heating-temperature-demand and can be added the following:

Fixed addition dependent of time zone
Light dependent addition dependent on time zone
Low humidity addition dependent on time zone
CO_2 dependent addition dependent of time zone

Only active if the **Common ventilation set point** selector is set on "Relative". See Figure 114.
If the **Common ventilation set point** selector is set on "Absolute" the following applies:

Local vent. temp. day/night

Adjustment of the ventilation temperature regardless of heating temperature. Make sure that it does not go below.
Ventilation zone 1/2 uses own local setting and can be added the following:

Light dependent local addition
Local manual addition

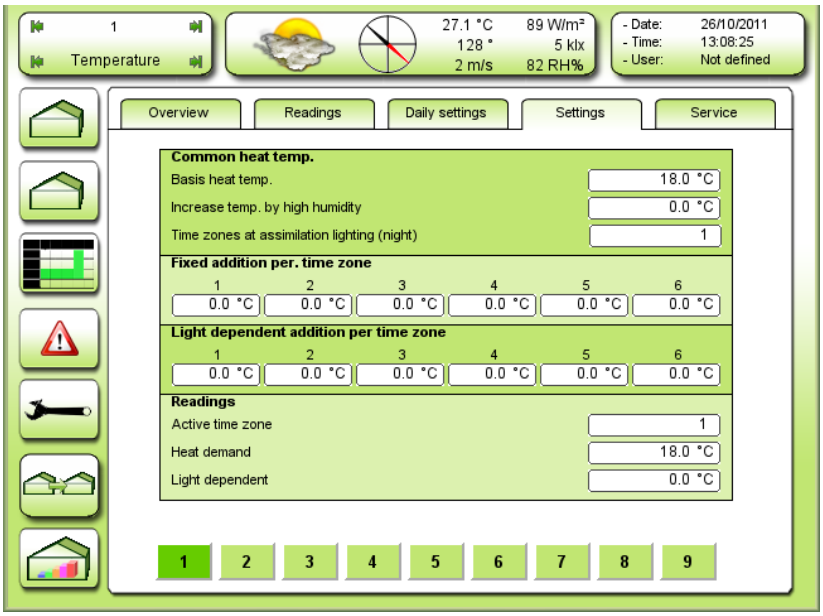


Figure 104
Settings for common heat and addition in the time zones.

TODO screendump stavefejl: ~~manual extra~~ – manual addition
TODO screendump stavefejl: ~~assimilation lighting~~ – supplementary lighting

Basis heat. temp.
Setting of the basis temperature of the greenhouse by heating.
The basis heat temperature is the foundation for **common heat temp. demand**, which can include the following:

- Basis heat temperature
- Time zone addition
- Light dependent addition
- Average temperature control addition
- Negative DIF
- Light sum night addition
- High humidity addition
- Manual addition

Increase temp. by high humidity
Adjustment of the increase of the heat temperature as a result of high humidity.
Regarding the distance for max. humidity and P-band, see Figure 51.

Time zones at supplementary lighting (night)
Selecting the time zone by supplementary light on during the night, i.e. time zone 5 and 6. If **1** is chosen the

temperature will change to time zone 1 when the supplementary light turns on. If the supplementary light turns back off during the night, time zone 5 or 6 is selected again.

Fixed addition per time zone 1 – 6
Adjusting the fixed addition in the time zones. Regarding the ramps/speeds of the temperature change in each time zone, see Figure 105.

Light dependent addition per time zone 1 – 6
Adjusting the light dependent addition in each time zone.

Active time zone
Indicating which time zone is selected.

Heat demand
Current demand at the air temperature by heating.

Light dependent
Reading the current temperature addition based on the light dependency.

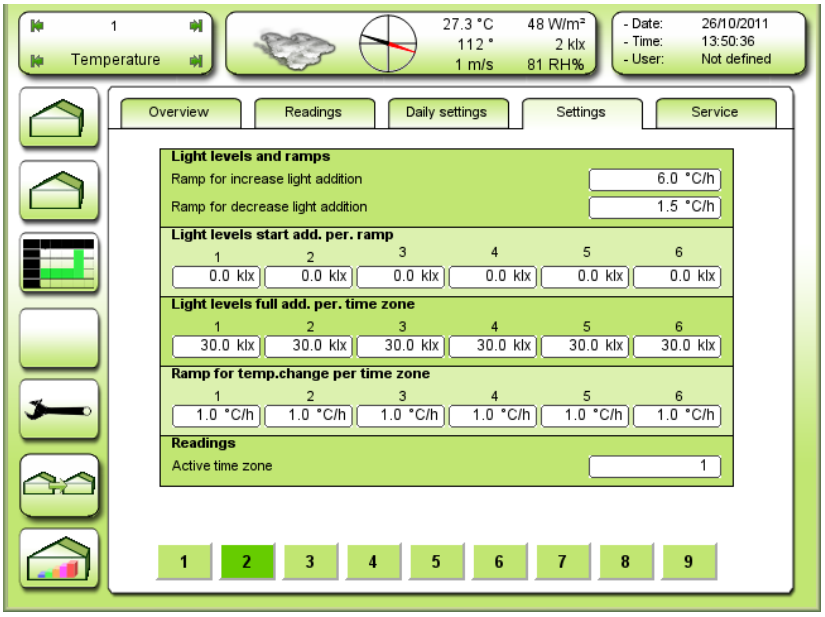


Figure 105
Settings for the light dependent temperature addition and time zone ramps.

TODO screendump – Ændringer

Ramp for increase light addition
Adjusting the speed of the light addition increase.

Ramp for decrease light addition
Adjusting the speed of the light addition decrease.

Light levels start add. per time zone 1 – 6
Adjusting the light level for starting the light dependent addition.

Light levels full add. per time zone 1 – 6
Adjusting the light level for full light dependent addition.

Ramp for temp.change per time zone 1 – 6
Adjusting how rapid the temperature is allowed to change in each time zone.
0 » no ramp.

Active time zone
Indicating which time zone is selected.

Average temperature control

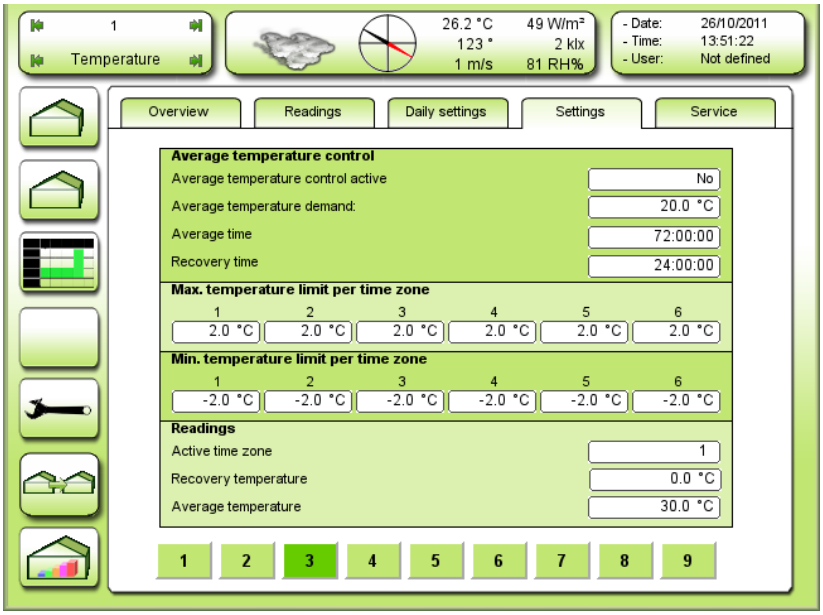


Figure 106
Settings for the average temperature control.

TODO screendump stavefejl: ~~average time~~ – average period

Average temperature control can be used as a method to save energy as a temperature surplus during the day will allow a colder night temperature in the greenhouse.

Average temperature control can also with advantage be used in connection with planning of cultural preparation.

Average temperature control active
Selecting the operation of the average temperature control.

Average temperature demand
Adjusting the wanted average temperature.

Average period
Adjusting the time period for calculation of the average temperature.

Recovery time
Adjusting the time for recovering the wanted average temperature, when correction is needed.

Max. temperature limit per time zone 1 – 6
Adjusting the maximum limit for allowed temperature addition in the time zones.

Min. temperature limit per time zone 1 – 6
Adjusting the minimum limit for allowed temperature addition in the time zones.

Active time zone
Indicating which time zone is selected.

Recovery temperature
Reading the current temperature addition of the Average Temperature Control.

Average temperature
Reading the current average temperature.

Negative DIF

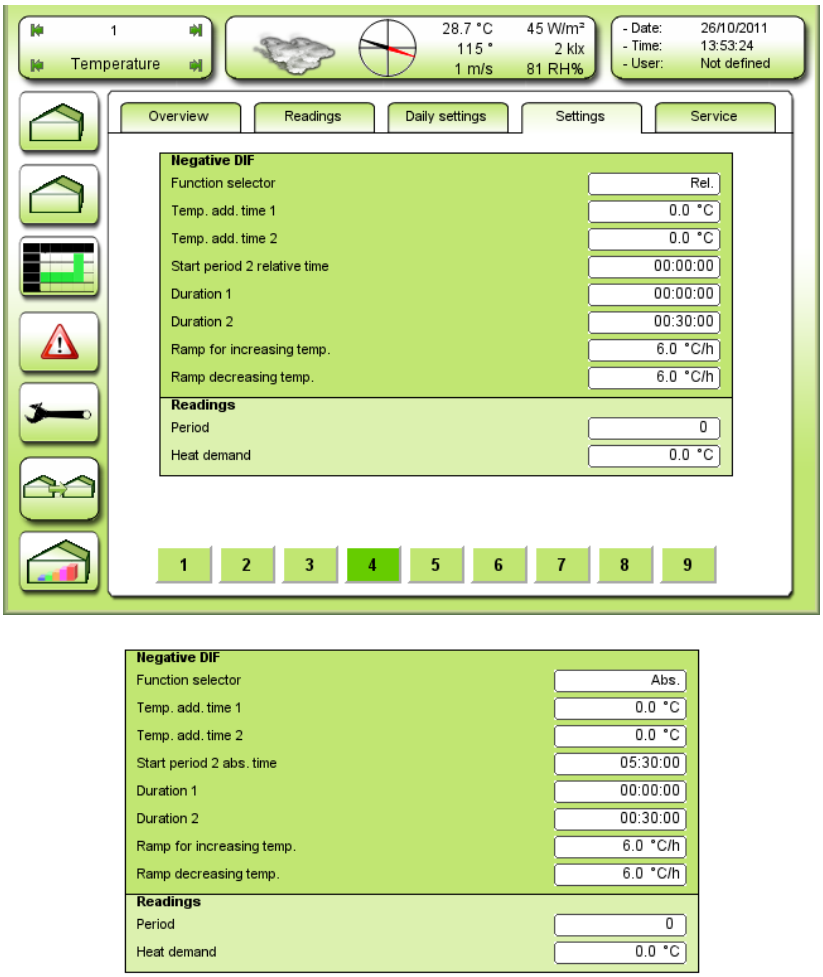


Figure 107
Settings for negative DIF

TODO screendump stavefejl: ~~Temp. add. time~~ – Temp. add. period
TODO screendump stavefejl: ~~Start period 2 relative time~~ – Start period 2 rel. time
TODO screendump stavefejl: ~~Duration 1~~ – Duration period 1
TODO screendump stavefejl: ~~Duration 2~~ – Duration period 2
TODO screendump stavefejl: ~~Ramp for increasing temperature~~ – Ramp increasing temperature

Negative DIF/Drop is used for handling the stretching of the crop.
Negative DIF is an additional temperature positive/negative for the heating temperature demand.
Negative DIF has 2 time zones, 1 on each side of a fixed/absolute time or a time relative to sun rise called “drop time”.

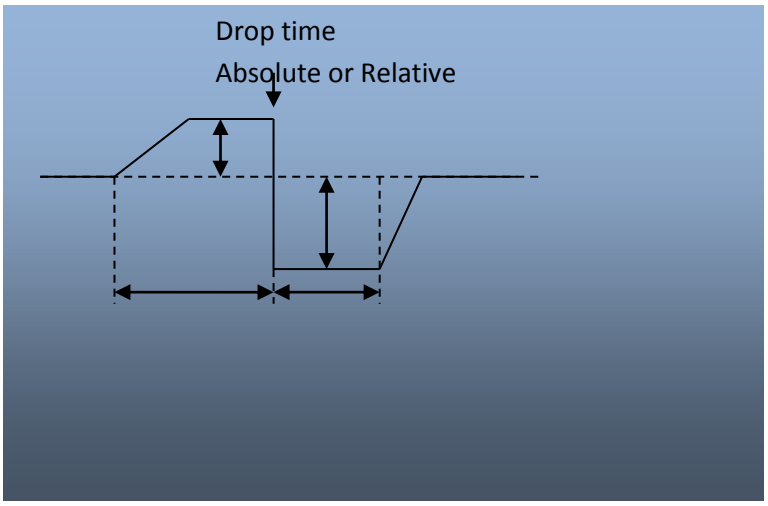


Figure 108
Progress of negative DIF

Function selector

Selecting of mode of the Negative DIF operation.

Off: No operation.

Abs.: The Negative DIF is active and the *drop time* will be at a fixed time.

Rel.: The Negative DIF is active and the *drop time* will be relative to sunrise.

The *drop time* is the time switching from period 1 to period 2.

Temp. add. period 1

Adjusting the temperature addition in time period 1.

Temp. add. period 2.

Adjusting the temperature addition in time period 2.

Start period 2 abs. time

Adjusting the time for switching from period 1 to period 2 = *drop time*

Only visible when the function selector is on abs.

Start period 2 rel. time

Adjusting the time for switching from period 1 to period 2 = *drop time*

Only visible when the function selector is on rel.

Duration period 1

Adjusting the length of period 1.

Period 1 is the period **before** the *drop time*.

Duration period 2

Adjusting the length of period 2.

Period 2 is the period **after** the *drop time*.

Ramp increasing temperature

Adjusting the rate/speed of the temperature **increase** caused by the Negative DIF.

0 » no ramp.

Ramp decreasing temperature

Adjusting the rate/speed of the temperature **decrease** caused by the Negative DIF.

0 » no ramp.

Period

Reading the current period of the Negative DIF.

0 = no active period.

1 = time period before the *drop time*.

2 = time period after the *drop time*.

Heat demand

Reading the current temperature addition caused by the Negative DIF.

Light sum night add. and CO_2 dependent vent. temp. addition

Light sum night addition gives an addition at the common heat temp. during the night depending on the light sum the previous day.

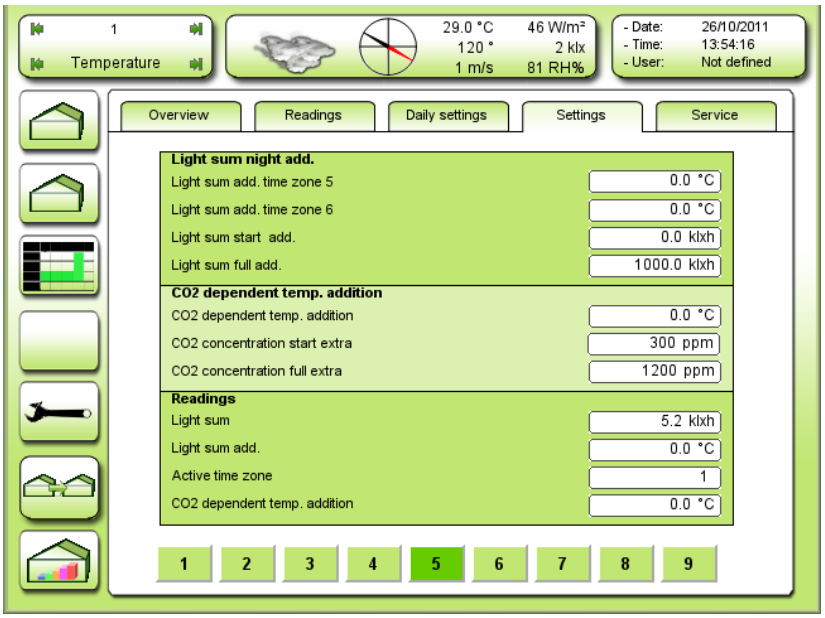


Figure 109
Settings and readings for light sum night add. and CO2 dependent vent. temp. addition.

TODO screendump stavefejl: ~~CO2 dependent temp. addition~~ – CO2 depenent vent. temp. addition
TODO screendump stavefejl: ~~CO2 concentration start extra~~ – CO2 concentration for start addition
TODO screendump stavefejl: ~~CO2 concentration full addition~~ – CO2 concentration for full addition

Light sum add. time zone 5
Adjusting the maximum night temperature addition in time zone 5, depending on the accumulated light the previous day.

Light sum add. time zone 6
Adjusting the maximum night temperature addition in time zone 6, depending on the accumulated light the previous day.

Light sum start add.
Adjusting the light sum for starting the temperature addition depending on the light sum.

Light sum full add.
Adjusting the light sum for full temperature addition depending on the light sum.

CO_2 dependent temp. addition
Adjusting the desired increase on the ventilation temperature demand, depending on the CO_2 concentration.

CO_2 concentration for start addition
Adjusting the CO_2 concentration for start increasing the ventilation temperature demand.

CO_2 concentration for full addition
Adjusting the CO2 concentration for full increase on the ventilation temperature demand.

Light sum
Reading the light sum.
Day: The current light sum
Night: Light sum the previous day

Light sum add.
Reading the light sum addition.
This reading is always 0 °C in the day time. (Time zone 1-4)

CO_2 dependent temp. addition
Reading the current CO_2 dependent concentration addition for the ventilation temperature demand.

Common ventilation temp.

The common ventilation temperature can be used as ”basis” for the ventilation zones.
It contains all the advanced temperature demand strategy and can be relative to the heating temperature demand. You can choose between Relative and Absolute as shown in the menu.

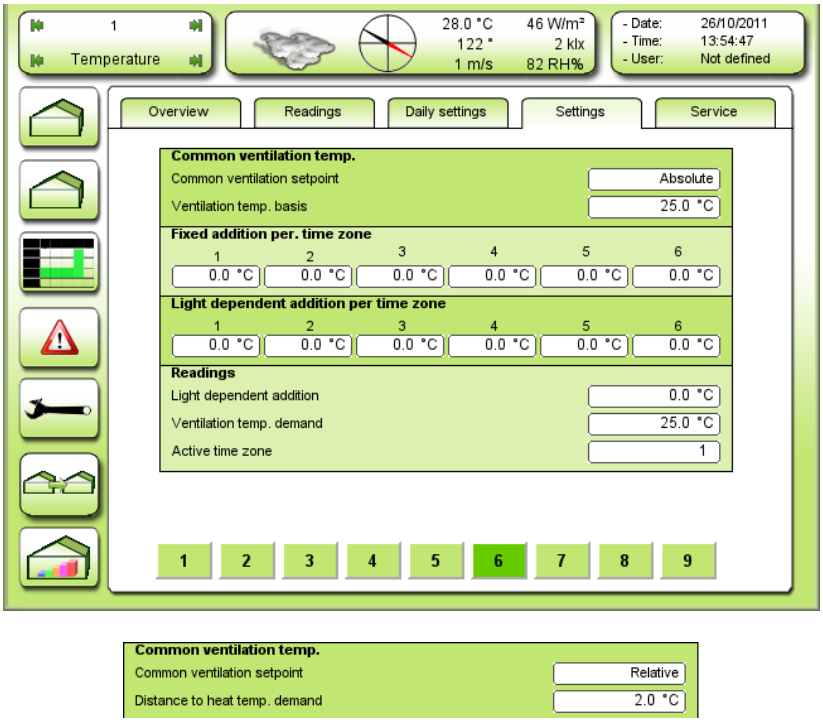


Figure 110
Settings for the common ventilation temperature.

TODO screendump stavefejl: ~~Ventilation temp. basis~~ – Ventilation temp. basic

Common ventilation setpoint

Selecting between a ”fixed” ventilation temperature or a ventilation temperature that follows the heating temperature with an offset.

Absolute: The ventilation temperature has its own setpoint, not depending on the heating temperature.

Relative: The ventilation temperature follows the heating temperature demand with an offset depending on the time zone.

Both Absolute and Relative can have following additions:

Fixed additions depending on the time zone

Light dependent addition depending on the time zone

Low humidity addition depending on the time zone
CO_2 dependent addition depending on the time zone

Distance to heat temp. demand
Adjusting the addition/distance to the common heating temperature demand.
Only active and visible when the **common ventilation setpoint** selector is set on **Relative**.
The final common ventilation temperature will follow the heating temperature demand with possible additions:

Fixed additions depending on the time zone
Light dependent addition depending on the time zone
Low humidity addition depending on the time zone
CO_2 dependent addition depending on the time zone.

Ventilation temp. basic
Adjusting the basic ventilation temperature.
Only active and visible when the **common ventilation setpoint** selector is set on **Absolute**.
The final common ventilation temperature will be **ventilation temp. basic** with possible additions:

Fixed additions depending on the time zone
Light dependent addition depending on the time zone
Low humidity addition depending on the time zone
CO_2 dependent addition depending on the time zone.

Fixed addition per time zone 1 – 6
Adjusting the time zone dependent addition.
Regarding the ramps for the different time zones, see Figure 105.

Light dependent addition per time zone
Adjusting the light dependent addition for each time zones.
The light level for start and full addition are the same as for **common heat temp.**, see Figure 105.

Light dependent addition
Reading the current light dependent addition of the ventilation temperature.

Ventilation temp. demand
Reading the current ventilation temperature demand.

Active time zone
Indicating which time zone is active.

Temp. addition by low humidity

Temperature addition by low humidity will increase the ventilation temperature demand, when the humidity goes below a limit. The increase is proportional to a further decrease in humidity.
The increase of the ventilation temperature and the low humidity limit is depending on the time zone.
It is also possible to lower the maximum vent position. See Figure 11.
Increasing the ventilation temperature demand or lowering the maximum vent position by low humidity, will normally avoid or delay the low humidity problem, because the ventilation will be decreased or delayed.

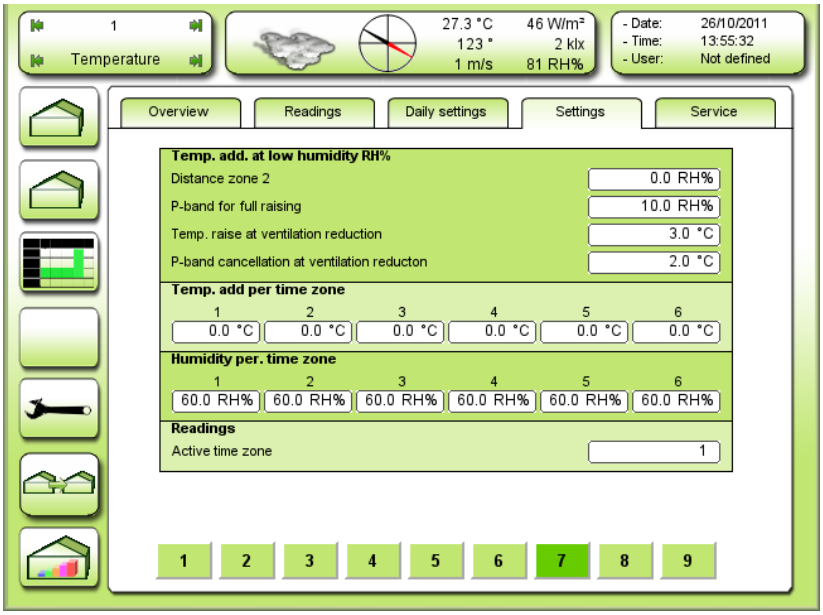


Figure 111
Temperature addition by low humidity.

TODO screendump stavefejl: ~~Temp. add. at low humidity RH%~~ – Temp. addition by low humidity
TODO screendump stavefejl: ~~P-band for full raising~~ – P-band for full addition
TODO screendump stavefejl: ~~Temp. raise at ventilation reduction~~ – Temp. increase by vent. reduction
TODO screendump stavefejl: ~~P-band cancellation at ventilation reducton~~ – P-band cancellation at ventilation reduction

Distance zone 2
Adjusting the maximum humidity distance between zone 1 and zone 2.

P-band for full addition
Adjusting the humidity P-band for full increase of ventilation temperature demand and/or full lowering of the maximum vent position by low humidity.

Temp. increase by vent. Reduction
Adjusting the allowed increase on the ventilation temperature, when **maximum vent position** is reduced caused by low humidity. If the temperature exceeds this allowed increase, the reduction of maximum vent. position will be cancelled depending on the **P-band cancellation at ventilation reduction**.

P-band cancellation at ventilation reduction
Adjusting the temperature P-band for cancelling the **maximum vent position** reduction caused by low humidity.

Temp. add. per time zone
Adjusting the addition at the ventilation temperature demand by low humidity for each time zone.

Humidity per time zone
Adjusting the humidity for start increasing the ventilation temperature in each time zone and/or decreasing the maximum vent position.

Heat temperature zone 1 and 2

Heat temperature zone 1 /2 is the actual heat temperature demand for the heating zone. The heating zone can use the common heat temp. demand with an offset or its own local set points.

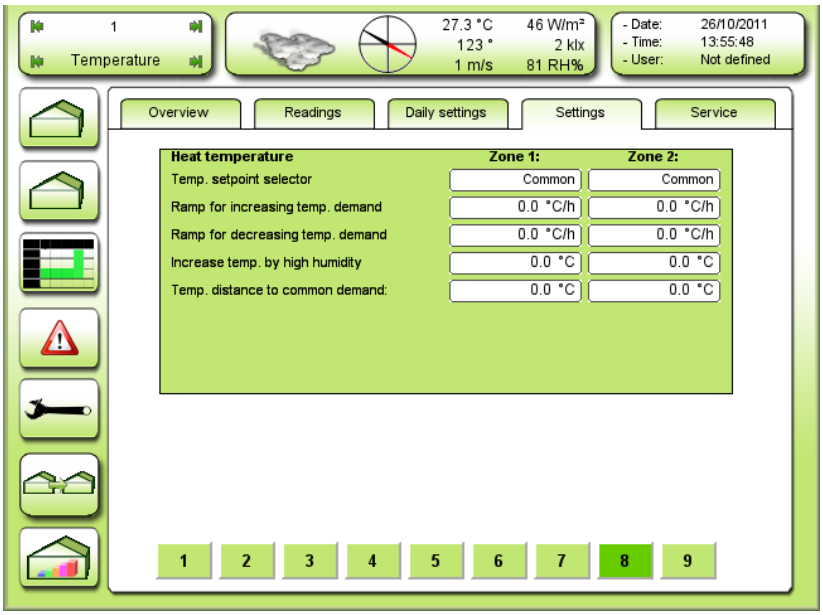


Figure 112
Heat temperature zone 1 and 2. On this figure zone 1 is set on common and zone 2 is set on local. Note that only the relevant settings are shown.

Temp. setpoint selector

Selecting the ”basis” heat temperature setpoint for zone 1/2.

Common: Heat zone 1/2 uses the common heat temperature as basis.
The heating zone can have following local additions:
Temp. distance to common demand.
Increase temp. by high humidity.

Local: Heating zone 1/2 uses its own local setpoint and will contain following:
Temperature day/night.
Light dependent temperature addition.
Increase temp. by high humidity.

Ramp for increasing temp. demand

Adjusting the ramp/speed for increasing the temperature demand.
0 » no ramp.
NB! The ramp is always in action in both Common and Local, i.e. the local ramp will be deciding if it is set slower than the ramp for common temperature.

Ramp for decreasing temp. demand

Adjusting the ramp/speed for decreasing the temperature demand.
0 » no ramp.
NB! The ramp is always in action in both Common and Local, i.e. the local ramp will be deciding if it is set slower than the ramp for common temperature.

Increase temp. by high humidity

Adjusting the wanted local increase of the heat temperature by high humidity.
The offset to maximum humidity and the P-band, see Figure 51.

Temp. distance to common demand

Adjusting the distance to common heat temperature demand. Only visible when the temperature setpoint selector is on **Common**.

Temp. day

Adjusting the day temperature. Only visible when the temperature setpoint selector is on **Local**.

Temp. night

Adjusting the night temperature. Only visible when the temperature setpoint selector is on **Local**.

Light dependent temperature addition

Adjusting the light dependent temperature addition.
Only visible and used when the temperature setpoint selector is on **Local**.
The dependency on the light follows the settings for Common Heat. Temp., see Figure 105.
NB! When using Common Heat. Temp., this local addition will be added to a possible addition in the Common

Heat. Temp.

Ventilation temp. zone 1 and 2

Ventilation temperature zone 1/2 is the actual ventilation temperature demand for the ventilation zone.
The ventilation zone can use the **common ventilation temp. demand** with an offset or its own local setpoints.

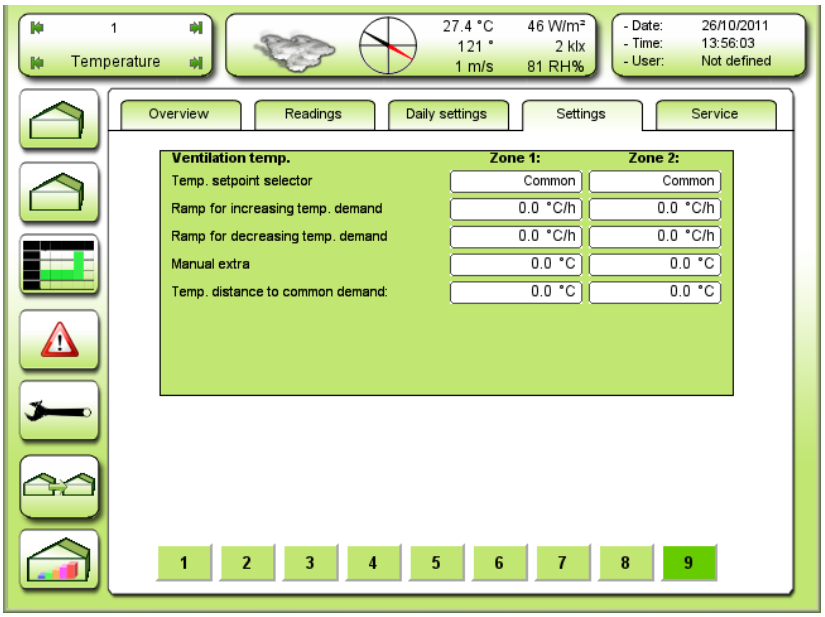


Figure 113
Ventilation temp. zone 1 and 2. On this figure zone 1 is set on common and zone 2 is set on local. Note that only the relevant settings are shown.

TODO screendump stavefejl: ~~Manual extra~~ – Manual addition

Temp. setpoint selector

Selecting the ”basis” ventilation temperature setpoint for ventilation zone 1/2.

Common: Ventilation zone 1/2 will use the **common ventilation temperature** as basis.
The ventilation zone can have following local addition:
Temp. distance to common ventilation temp.
Local manual addition.

Local: Ventilation zone 1/2 will use its own local setpoint and will contain following:
Ventilation temp. day/night.
Light dependent local addition.
Local manual addition.

Ramp for increasing temp. demand

Adjusting the ramp/speed for increasing the ventilation temperature demand.

NB! The ramp is always in action in both **Common** and **Local**, i.e. the local ramp will be deciding if it is set slower than the ramp for common temperature.

Ramp for decreasing temp. demand

Adjusting the ramp/speed for decreasing the ventilation temperature demand.

NB! The ramp is always in action in both **Common** and **Local**, i.e. the local ramp will be deciding if it is set slower than the ramp for common temperature.

Manual addition

Adjusting the wanted manual addition.

Temp. distance to common demand

Adjusting the distance for the **common ventilation temperature demand**.

Only visible when the temperature setpoint selector is on **Common**.

Local ventilation temp. day

Adjusting the day temperature.

Only visible when the temperature setpoint selector is on **Local**.

Local ventilation temp. night

Adjusting the night temperature.

Only visible when the temperature setpoint selector is on **Local**.

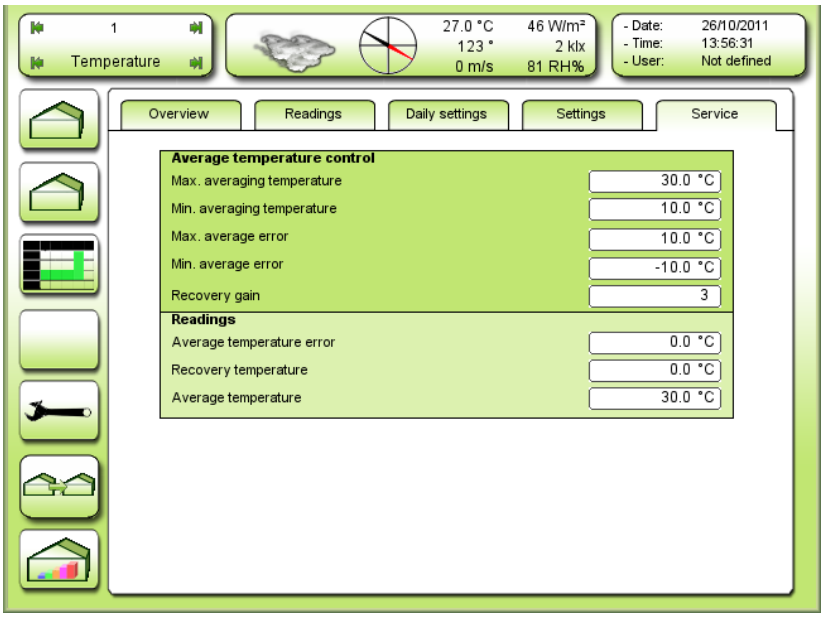


Figure 114
Service settings and readings for average temperature control.

TODO screendump stavefejl: ~~Max. averaging temperature~~ – Max. average temperature
TODO screendump stavefejl: ~~Min. averaging temperature~~ – Min. average temperature

Max. average temperature
Adjusting the maximum temperature to be accepted in the average temperature calculation. Temperature above this setting will be left out.

Min. average temperature
Adjusting the minimum temperature to be accepted in the average temperature calculation. Temperature below this setting will be left out.

Max. average error
Adjusting the maximum average temperature error.
If the temperature is still too high, the error will be limited to this value.

Min. average error
Adjusting the minimum average temperature error.
If the temperature is still too low, the error will be limited to this value.

Recovery gain
Adjusting the speed of recovering the wanted average temperature.
This setpoint will affect the time it takes to recover the wanted average temperature.

Average temperature error
Reading the current average temperature error.

Recovery temperature
Reading the current temperature added to the basic temperature, which the average temperature control uses to recover the wanted average temperature.

Average temperature
Reading the current average temperature in the calculating period.

CO_2

Overview

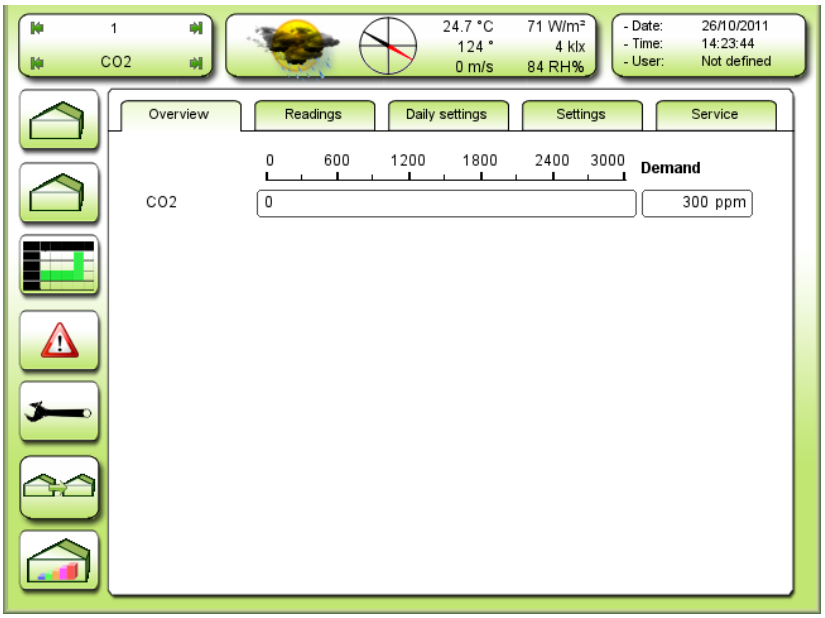


Figure 115
Overview over CO2 demand and measuring.

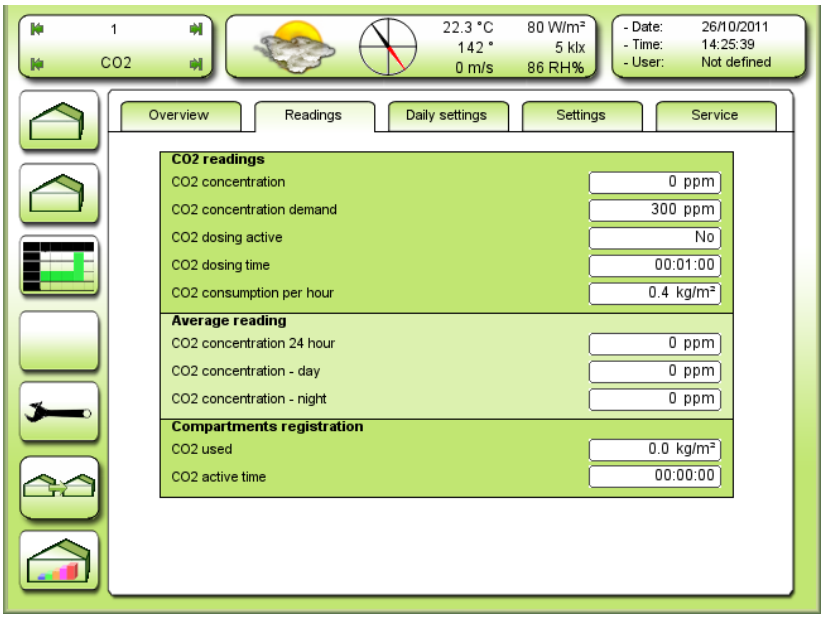


Figure 116
CO_2 readings.

CO_2 concentration
Reading the current CO_2 concentration.

CO_2 concentration demand
Reading the calculated CO_2 concentration demand.

CO_2 dosing active
Reading whether or not the CO_2 dosing is active.

CO_2 dosing time
Reading the calculated dosing time.

CO_2 consumption per hour
Reading how many kg CO_2 is used per m^2 per hour.

Average reading

CO_2 concentration – 24 hour
Reading the average CO_2 concentration on a 24 hours basis.

CO_2 concentration – day
Reading the average CO_2 concentration on a day basis.

CO_2 concentration – night
Reading the average CO2 concentration on a night basis.

CO_2 used
Reading the used kg CO_2 per m^2.

CO_2 active time
Reading how long the CO_2 dosing has been active.

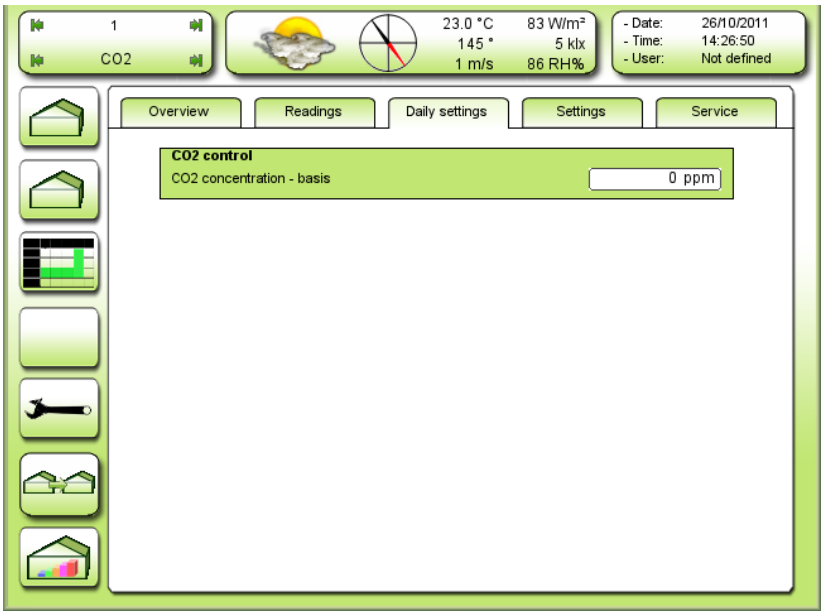


Figure 117
Daily settings for the CO_2 level.

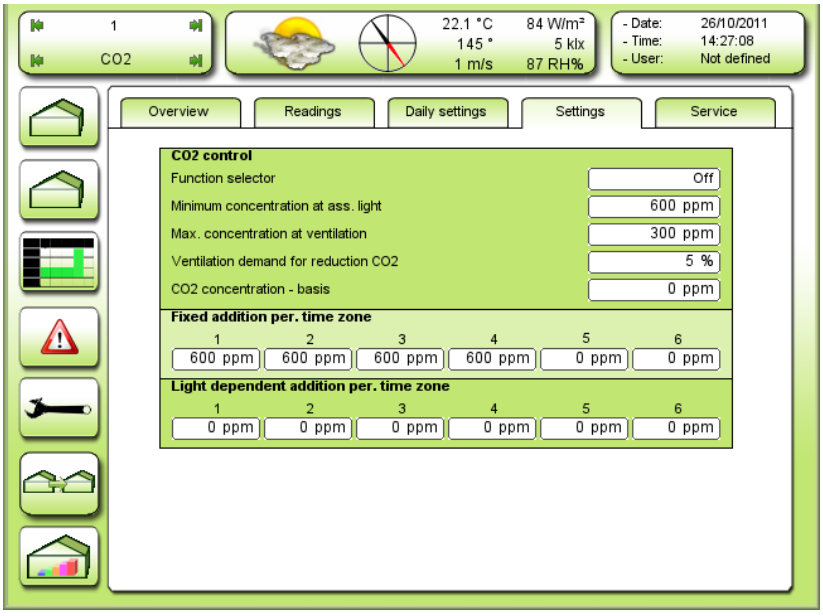


Figure 118
Settings for the CO_2 control.

TODO screendump stavefejl: ~~Minimum concentration at ass. light~~ – Min. concentration by suppl. Light
TODO screendump stavefejl: ~~Max. concentration at ventilation~~ – Max. concentration by ventilation

TODO screendump stavefejl: ~~Ventilation demand for reduction CO2~~ – Ventilation demand for reducing CO2
TODO screendump stavefejl: ~~CO2 concentration – basis~~ – CO2 concentration – basic

Function selector

Selecting the function of the CO_2 control.

Off: The CO_2 control is not operating.

Aut.: The CO_2 control is active and the CO_2 concentration demand is time zone dependent.

NB! The time zones used are the same as for the air temperature setpoints.

Min. concentration at suppl. Light

Adjusting the minimum CO2 concentration demand, when the supplementary light is activated.

NB! The final concentration demand is the highest of the two following:

1) **Demand from basis + Time zone addition + Light dependent addition** or

2) **Min. concentration by suppl. light.**

Max. concentration by ventilation

Adjusting the maximum CO_2 concentration demand by ventilation.

Ventilation demand for reducing CO_2

Adjusting the ventilation demand for reducing the CO_2 concentration to **Max. concentration by ventilation**.

CO_2 concentration – basic

Adjusting the basic CO_2 concentration for **all** time zones.

Fixed addition per time zone 1 – 6

Adjusting the addition in the time zones.

Light dependent addition per time zone 1 – 6

Adjusting the light dependent addition in the time zones.

NB! The light dependency follows the light addition at the heat temperature demand.

CO_2 setup

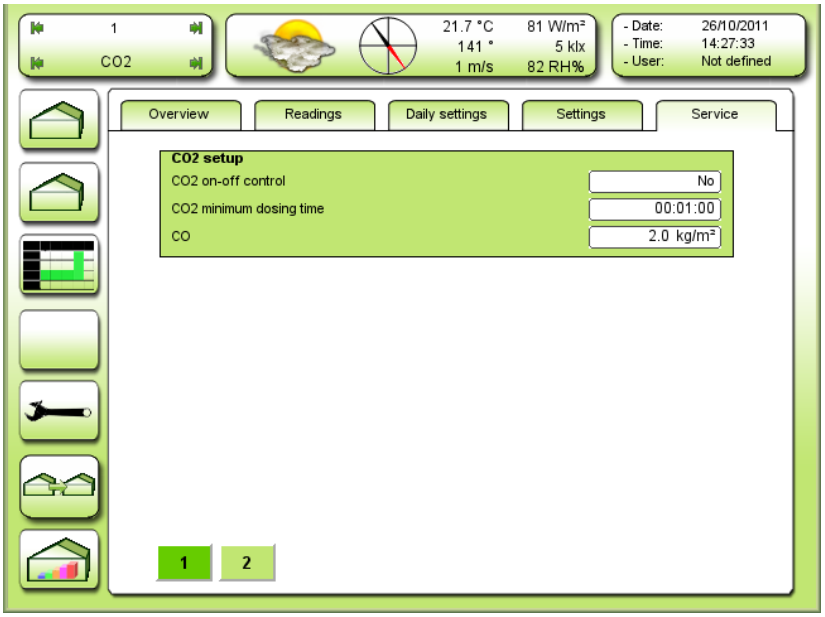


Figure 119
Service settings for CO_2.

TODO screendump stavefejl: ~~CO~~ – CO2 used per hour
TODO screendump stavefejl: ~~CO2 minimum dosing time~~ – CO2 min. dosing time

CO_2 on-off control
Selecting the type of CO_2 control.
Yes: Normal on-off control
No: Pulse-pause control with the pulse variable controlled by a PI regulator.

CO_2 min. dosing time
Adjusting the min. dosing time for the CO_2 control.

CO_2 used per hour
Adjusting how many kg CO_2 is used per hour with open dosing valve. For statistic.

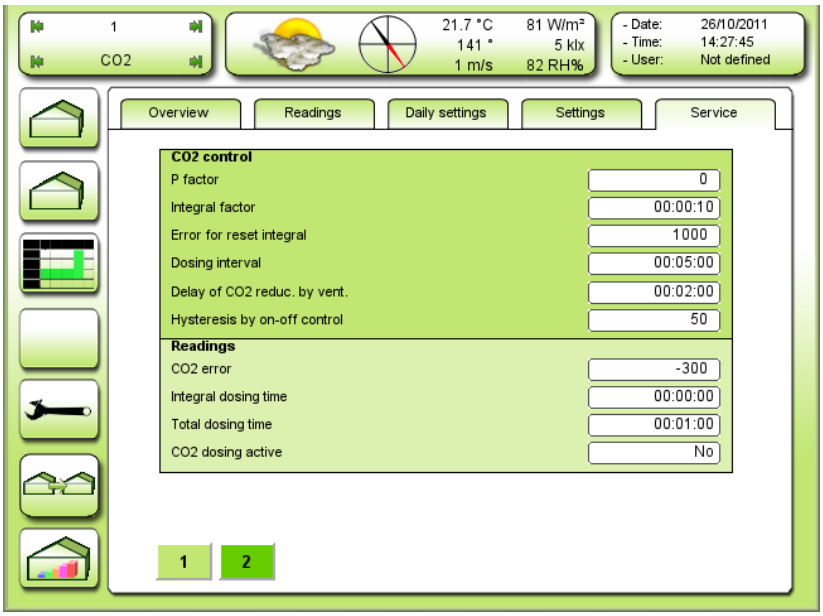


Figure 120
Settings for CO2 regulator.

TODO screendump stavefejl: ~~Delay of CO2 reduc. by vent.~~ – Delay of CO2 reduc. by too high vent.

P factor

Adjusting the P factor on the PI regulator for the variable pulse.

Integral factor

Adjusting the integral factor on the PI regulator for the variable pulse.
10.0 sec will give additional 10 sec pulse every minute by an error of -100 ppm.

Error for reset integral

Adjusting the **positive** error for resetting the integral.

Dosing interval

Adjusting the dosing interval when using a pulse-pause mode.

Delay of CO_2 reduc. by too high vent.

Adjusting the delay time for reducing the CO_2 caused by too high ventilation.

Hysteresis by on-off

This hysteresis is used when the regulator is set at on-off control in order to avoid too many start-stops.

CO_2 error

Reading the current deviation of the CO_2 measuring compared to the demand.

Integral dosing time
Reading the current dosing time output/contribution from the I regulator.

Total dosing time
Reading the current total dosing time.

CO_2 dosing active
Reading the state of the CO2 dosing output.

Irrigation and misting

The irrigation controller has following functions:
Valves **cannot** be executed in parallel.
There is no priority between the irrigation controllers (compartments).
The controller can activate up to 16 valves, executed in sequence.
1 pump output.
Manual and external standby.

If a valve has to be skipped the valve time is set to 00:00
Valve time: 00:00 to 23:59 hours
Valve pause: 00:00 to 23:59 hours
Fixed interval: 00:00 to 23:59 hours
24 hours pause: 0-99

Start possibilities:
The auto period can be absolute time or relative time (sun op-down)
Manual start
Sun integrator overrun by auto period yes/no
Fixed interval overrun by auto period yes/no
24 hours program with 8 starts on absolute time
External start overrun by auto period yes/no

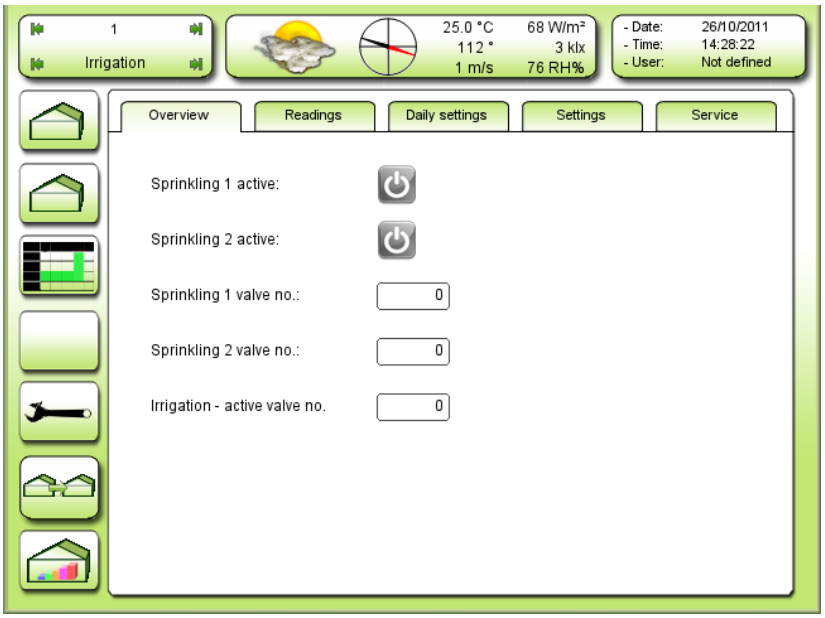


Figure 121
Overview over irrigation.

TODO screendump stavefejl: ~~Sprinkling~~ – Misting

Misting 1/2 active

Reading whether or not the misting is activated. Active misting is read as a green icon . A grey icon indicates that the misting is not activated.

Misting 1/2 valve no.

Reading the current active valve number.

Irrigation – active valve no.

Reading the current active valve number.

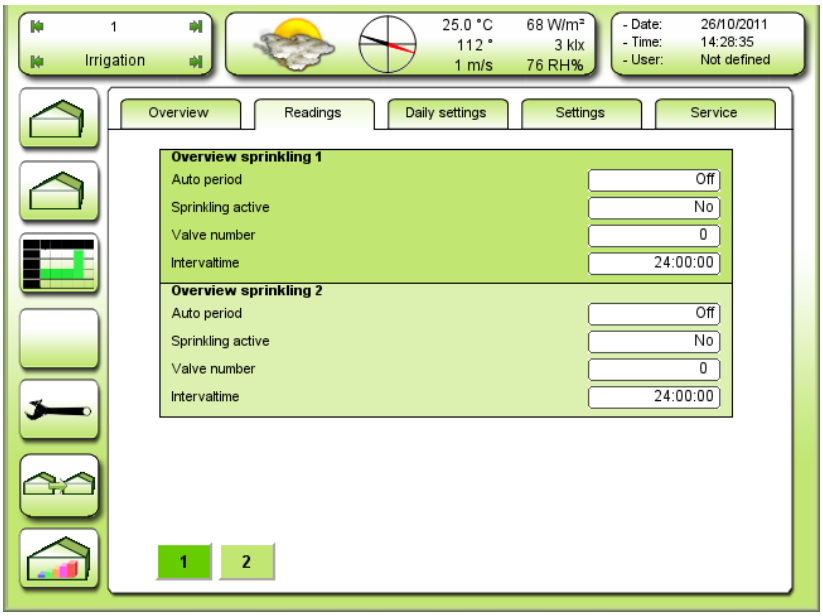


Figure 122
Readings for misting 1 and 2.

TODO screendump stavefejl: ~~Intervaltime~~ – Interval time
TODO screendump stavefejl: ~~Sprinkling active~~ – Misting active

Auto period

Off: The misting is not in the automatic period or switched off

Aut.: The misting is in the automatic period

Man.: The misting is manually activated and runs continuously.

Misting active

Reading whether or not the misting is active.

Valve number

Reading the current active valve number.

Interval time

Reading the current misting interval time.

The interval time is variable by humidification or cooling.

If the humidification or cooling is off, the interval time is constant or there is no interval time = 24:00 hours.

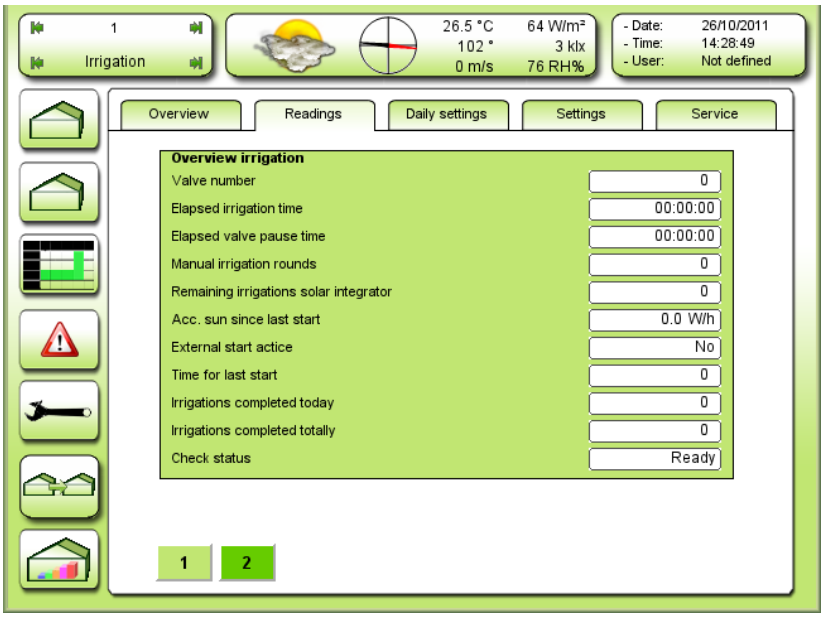


Figure 123
Readings for irrigation.

TODO screendump stavefejl: ~~Remaining irrigations solar integrator~~ – Remaining irrigations sun integrator
TODO screendump stavefejl: ~~Irrigations completed today~~ – Elapsed irritations today
TODO screendump stavefejl: ~~Irrigations completed totally~~ – Elapsed irrigations totally

Valve number
Reading the current active valve number.

Elapsed irrigation time
Reading the elapsed irrigation time of active valve.

Elapsed valve pause time
Reading the elapsed valve pause time.

Manual irrigation rounds
Reading the remaining manual irrigation rounds. (**can be adjusted**)

Remaining irrigations sun integrator
Reading the remaining irrigations for the sun integrator. (**can be adjusted**)

Acc. sun since last start
Reading the accumulated sun since last start. (**can be adjusted**)

External start active
Reading the external start input.

Time for last start
Reading the time for last irrigation start.

Elapsed irrigations today
Reading the number of elapsed irrigations today. (**can be reset**)

Elapsed irrigations totally
Reading the number of elapsed irritations totally. (**can be reset**)

Check status
Reading the status of the irrigation controller:
Ready, Active, Standby, Valve pause

Daily settings

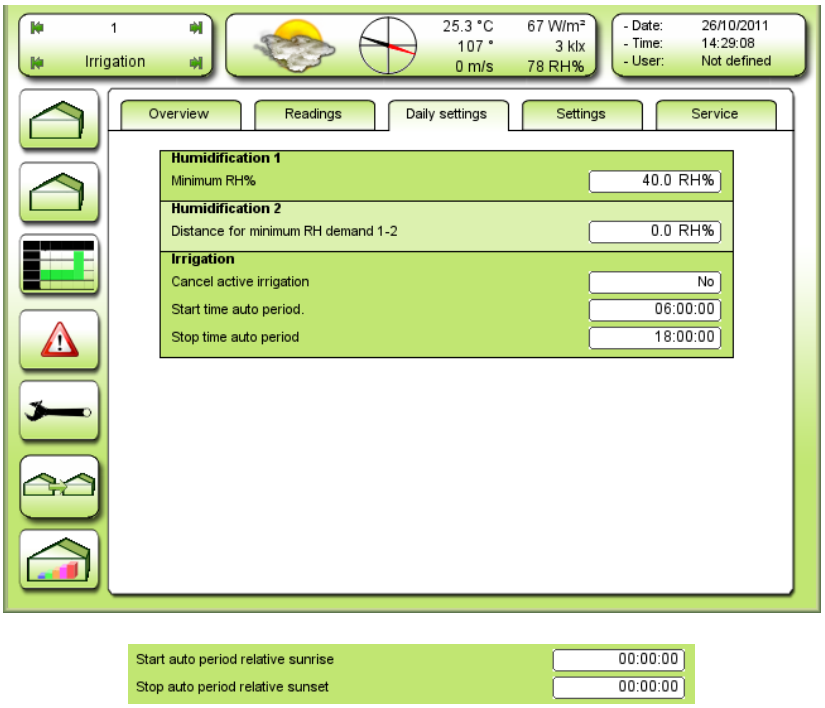


Figure 124
Daily settings for humidification and irrigation.

TODO screendump stavefejl: ~~Distance for minimum RH demand 1-2~~ – Distance for min. RH% demand 1-2
TODO screendump stavefejl: ~~Cancel active irritation~~ – Cancel current irrigation

Minimum RH%
Adjusting the low humidity for starting the humidification.

Is only active if **Absolute** is selected as humidity setpoint. See Figure 131.

Minimum RH% relative
Adjusting the low humidity compared to **'Adjusting the humidity for start increasing the ventilation temperature**' adjusted in the menu '**Temperature addition by low humidity**', see Figure 111.
Is only active if **Relative** is selected as humidity setpoint. See Figure 131.

Distance for min. RH% demand 1-2
Adjusting the min. humidity demand for humidification 2.
NB! The min. humidity demand is always compared to humidification 1.

Cancel current irritation
Select the current irrigation to be cancelled.

The following 2 set of adjustments are dependent on the adjustments of the function selector. See Figure 125.

Start time auto period
Adjusting the start time for the auto period, when the function selector is set on **time**.

Stop time auto period
Adjusting the stop time for the auto period, when the function selector is set on **time**.

Start auto period relative sunrise
Adjusting the start time for the auto period relative to sunrise, when the function selector is set on **sun**.

Stop auto period relative sunset
Adjusting the stop time for the auto period relative to sunset, when the function selector is set on **sun**.

Settings

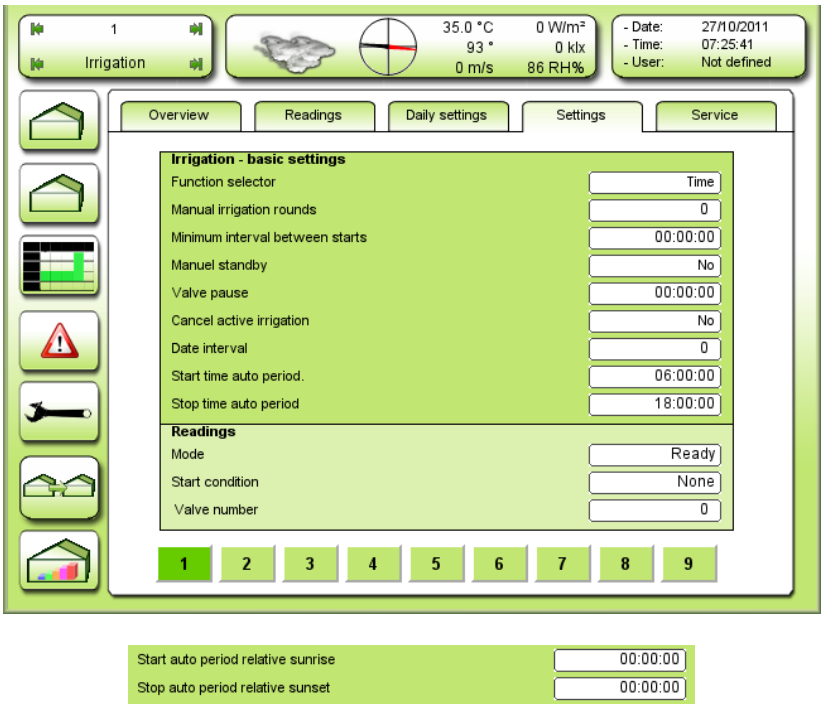


Figure 125
Basic settings for irrigation.

TODO screendump stavefejl: ~~Minimum inverval between starts~~ – Min. time between starts
TODO screendump stavefejl: ~~Cancel active irritation~~ – Cancel current irrigation
TODO screendump stavefejl: ~~Date interval~~ – 24 hours interval

Function selector

Off: Irrigation controller not active

Time: Irritation controller active. The auto period starts and stops on fixed time of day.

Sun: Irrigation controller active. The auto period starts and stops relative to sunrise and sunset.

Adjusting the P-band on the outdoor temperature for full reduction of max. ventilation position.

Manual irrigation rounds

Adjusting the number of manual irrigation rounds.

The number will be decreased every time a round is started.

Min. time between starts

Adjusting the minimum time between start of irrigation rounds.

Manual standby

Selecting manual standby.

The irrigation controller will stop immediately and wait until 'Standby' is set on 'No'.
NB! It is possible to set the controller in standby via an external signal.

Valve pause
Adjusting the wanted pause between the valves.
NB! If the pause is selected longer than '**Main pump stop delay**', the pump will stop in the '**valve pause**'.

Cancel current irrigation
Select the current irrigation to be cancelled.

24 hours interval
Adjusting the wanted 24 hours interval between irrigations (skip)
0 = No interval. Irrigation every day
1 = Irrigation every second day
2 = Irrigation every third day

The 24 hours interval overrules following start conditions:
Fixed interval
24 hours period

Start time auto period
Adjusting the start time for the auto period, when the function selector is set on **time**.

Stop time auto period
Adjusting the stop time for the auto period, when the function selector is set on **time**.

If the function selector is set on sun:

TODO screendump – DANSK!!

Start auto period relative sunrise
Adjusting the start time for the auto period relative to sunrise, when the function selector is set on **sun**.

Stop auto period relative sunset
Adjusting the stop time for the auto period relative to sunset, when the function selector is set on **sun**.

Mode
Reading the mode of the irrigation controller:
Ready, Active, Standby, Valve pause.

Start condition
Reading the start condition of the current irrigation
None, Manual, Sun int., External, Fixed interval, 24 hours

Valve number

Reading the current active valve number.

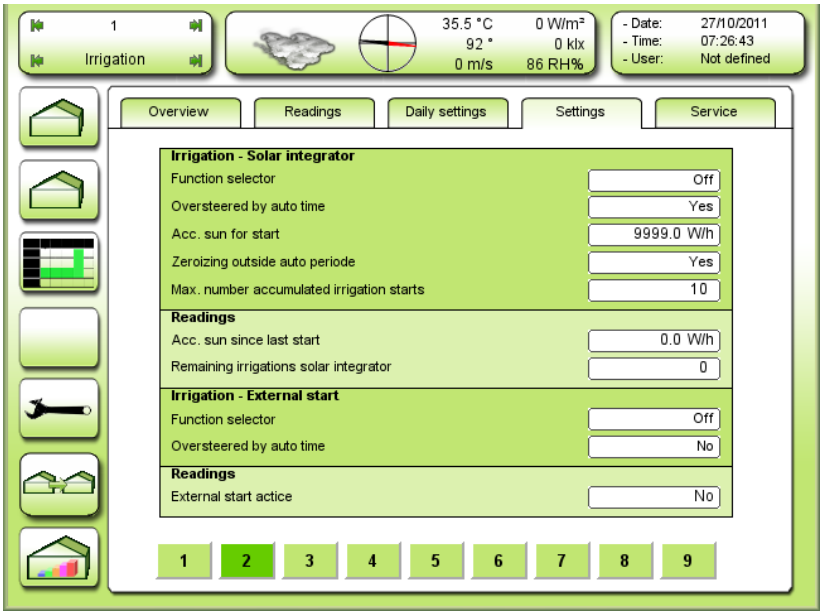


Figure 126
Settings for sun integrator.

TODO screendump stavefejl: ~~Irrigation – Solar integrator~~ – Irrigation – sun integrator
TODO screendump stavefejl: ~~Oversteered by auto period~~ – Overrun by auto period
TODO screendump stavefejl: ~~Zeroizing outside auto period~~ – Reset outside auto period
TODO screendump stavefejl: ~~Remaining irrigations solar integrator~~ – Remaining irrigations sun integrator
TODO screendump stavefejl: ~~Oversteered by auto time~~ – Overrun by auto period
TODO screendump stavefejl: ~~External start actice~~ – External start active

Function selector

Off: Sun integrator not active

On: Sun integrator active

Overrun by auto period

No: Sun integrator always active, when the function selector is set on '**On**'.

Yes: Sun integrator only active in the auto period.

Acc. sun for start

1 Wh = 3,6 kJ

Adjusting the accumulated sun energy for starting an irrigation round, in Wh or kj.
Unit for energy can be selected under service. See Figure 160.

Reset outside auto period

No: Accumulated sun and remaining irrigation starts are stored when stopping the auto period and used when starting a new auto period.

Yes: Accumulated sun and remaining irrigation starts are reset when stopping the auto period.

Max. number accumulated irrigation starts

Adjusting the maximum allowed number of accumulated irrigation rounds.

Acc. sun since last start

Reading the accumulated sun since last start. (**Can be adjusted**)

Remaining irrigations sun integrator

Reading the remaining irrigations for the sun integrator. (**Can be adjusted**)

Irrigation – external start

Function selector

Off: External start not active

On: External start active

Overrun by auto period

No: External start always active, when the function selector is on '**On**'.

Yes: External start only active in the auto period.

External start active

Reading whether or not there is an external start signal.

Irrigation – fixed interval

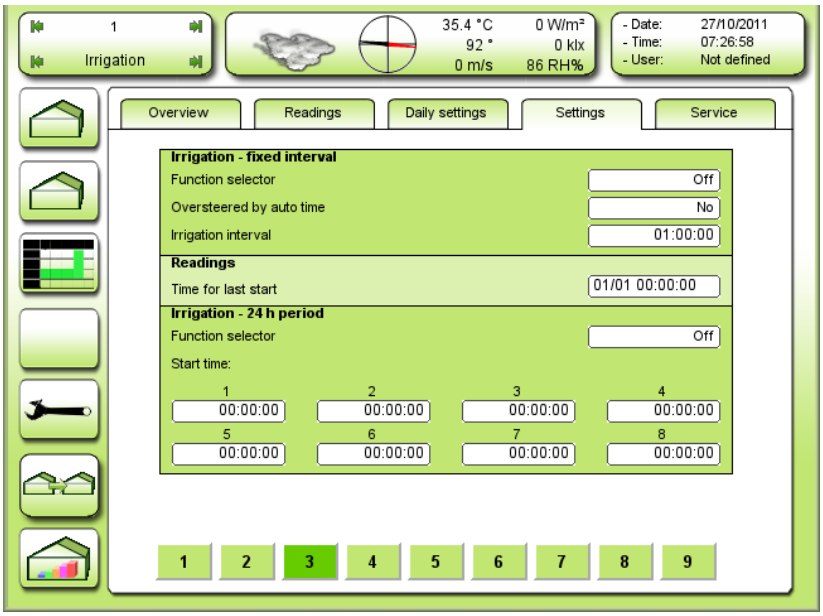


Figure 127
Settings for irrigation with fixed interval.

TODO screendump stavefejl: ~~Oversteered by auto time~~ – Overrun by auto period
TODO screendump stavefejl: ~~Irrigation - 24 h period~~ – Irrigation – 24 hours period

Function selector

Off: Fixed interval not active.

On: Fixed interval active.

Overrun by auto period

No: Fixed interval always active, when the function selector is set on '**On**'.

Yes: Fixed interval only active in the auto period.

NB! Fixed interval is overrun by 24 hours interval. See Figure 125

Irrigation interval

Adjusting the interval between the irrigation starts.

Time for last start

Reading the time for last start.

Irrigation – 24 hours period

Function selector

Off: 24 hours program is not active

On: 24 hours program is active.

Start time 1-8

Adjusting the time for starting the irrigation rounds 1-8.

NB! The 24 hours program is overrun by the 24 hours interval. See Figure 125.

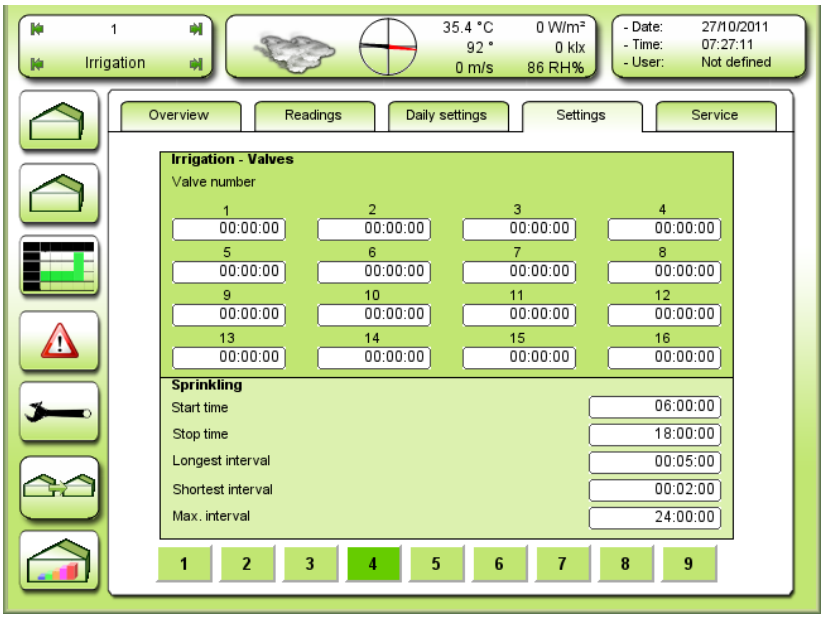


Figure 128
Settings for the irrigation times on the 16 valves.

Valve number 1-16

Adjusting the valve irrigation times on the 16 valves.

NB! If a valve is to be skipped, the valve time must be set to 00:00

Misting

It is possible to activate 2 misting programs with each 8 valves.
Both misting programs have common auto period.
The misting program can carry out:
Humidification by activating misting by low humidity

and/or

Cooling by activating misting by high temperature.

The interval between the mistings is inverse proportional to low humidity and/or high temperature.
When the humidity is not too low and the temperature is not too high, the misting can be activated with a fixed interval within the auto period.

Start time
Adjusting the time for starting the auto period.

Stop time
Adjusting the time for stopping the auto period.

NB! The auto period is common for both misting programs and for both humidification and cooling.

Longest interval
Adjusting the interval, when the humidity has just passed the low limit or the temperature has just passed the high limit.

Shortest interval
Adjusting the interval, when the humidity has reached the P-band below the limit or the temperature has reached the P-band above the limit.

Max. interval
Adjusting the interval, when **neither** the humidity has passed the low limit **nor** the temperature has passed the high limit.

NB! 24:00 = no max interval.

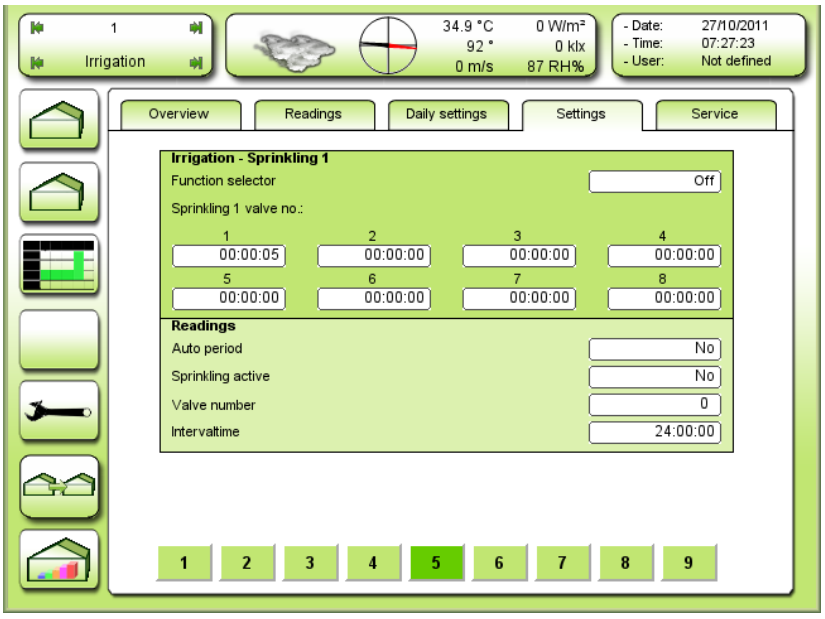


Figure 129
Settings for irrigation and misting 1.

TODO screendump stavefejl: ~~Sprinkling 1 valve no~~ – Misting 1 valve number
TODO screendump stavefejl: ~~Intervaltime~~ – Interval time
TODO screendump stavefejl: ~~Sprinkling active~~ – Misting active

Function selector

Off: Misting 1 is not active.
Aut.: Misting is active depending on the auto period.
Man.: Misting is always active and sprays with a fixed interval = max interval.

Misting 1 valve number

Adjusting the misting times on each valve: 0 … 999.0 seconds.

Readings:

Auto period

No: The misting is not in the auto period.
Yes: The misting is in the auto period.

Misting active

Reading: **No:** Misting is not active.
Yes: Misting is active.

Valve number

Reading the current active valve number.

Interval time

Reading the current interval time.
The interval time is either variable depending on the humidity and/or the temperature or if it is neither too dry nor too warm be fixed = **Max. Interval**.

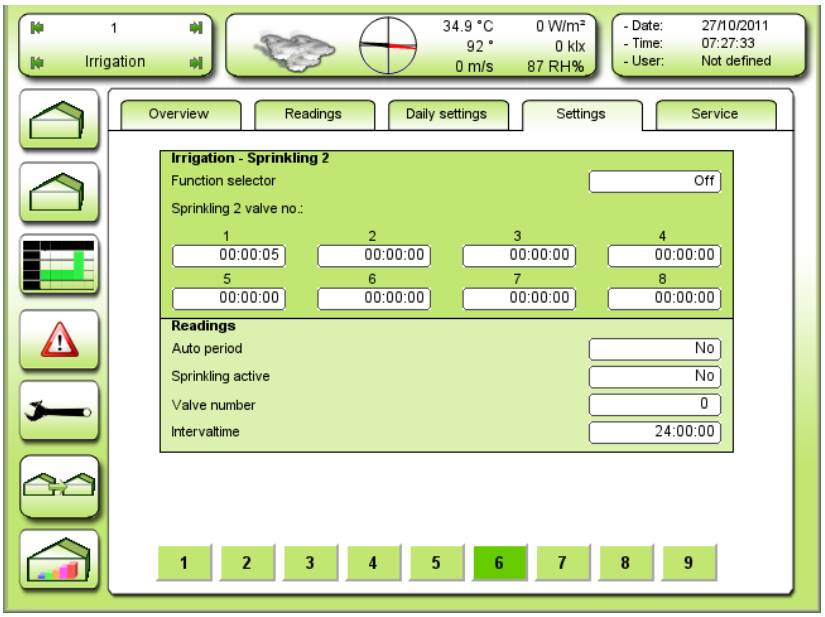
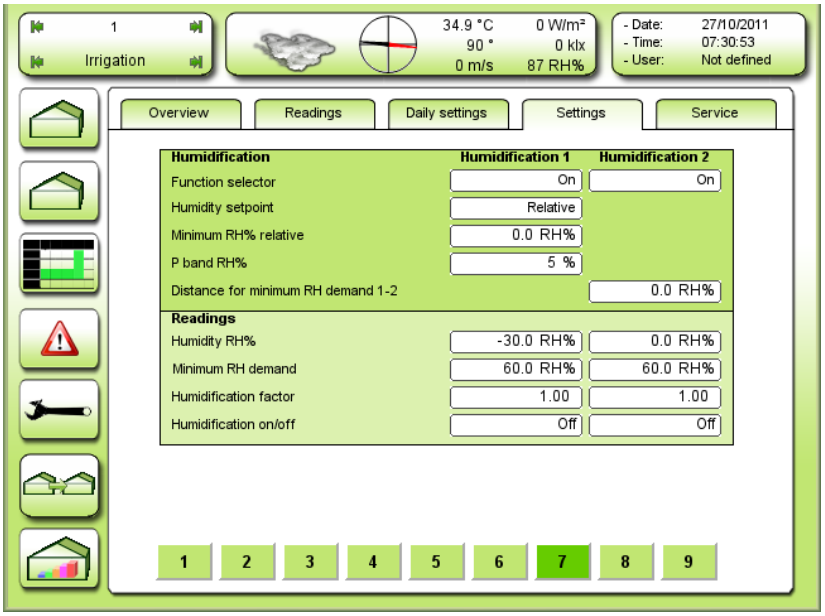


Figure 130
Settings for irrigation and misting 2.

TODO screendump stavefejl: ~~Irrigation – Sprinkling 2~~ – Irrigation – Misting 2

TODO screendump stavefejl: ~~Sprinkling active~~ – Misting active

For explanation, see Figure 129.



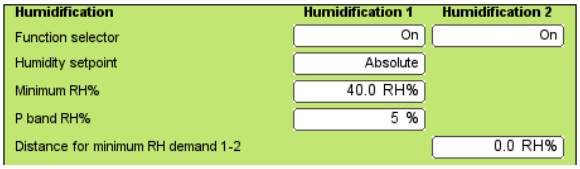


Figure 131
Settings for humidification 1 and 2. Humidification 1 can either be absolute or relative.

TODO nyt screendump
TODO screendump stavefejl: ~~Distance for minimum RH demand 1-2~~ – Distance for min. RH% demand 1-2
TODO screendump stavefejl: ~~Minimum RH demand~~ – Minimum RH% demand

Function selector

Off: Humidification 1 is not active.

On: Humidification 1 is active.

Humidity setpoint

Absolute: Low humidity setpoint is fixed **Minimum RH%**

Relative: Low humidity setpoint is set relative to '**Settings for humidity for start increasing the ventilation temperature**' adjusted in the menu '**Temperature addition by low humidity**'. See Figure 111**.**

Minimum RH%

Adjusting the low humidity for starting the humidification.
Is only visible and active if **Absolute** is selected as humidity setpoint.

Minimum RH% relative

Adjusting the low humidity relative to what is set in the menu **Temperature addition by low humidity**.
Is only visible and active if **Relative** is selected as humidity setpoint.

P-band

Adjusting the P-band (change) in humidity for changing the misting interval from longest to shortest interval.

Distance for min. RH demand 1-2

Humidification 2 follows humidification 1 with this distance setting.

Humidity RH%

Reading the current humidity in climate zone 1.

Minimum RH% demand

Reading the current minimum humidity demand, below which the humidification will be activated.

Humidification factor

Reading the current humidification factor.

0.00 = no humidification.

0.01 = longest interval.

1.00 = shortest interval.

Humidification on/off

Reading if the on/off function by low humidity is active or not.

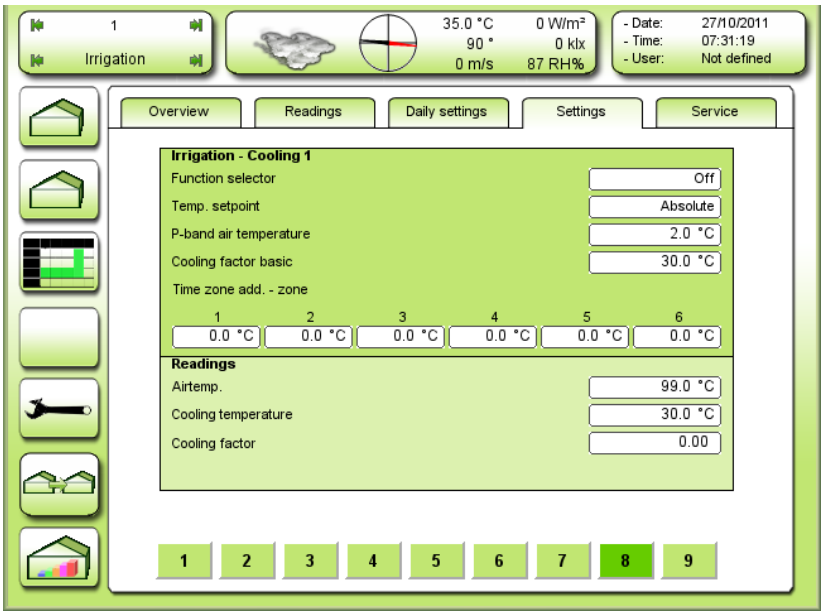


Figure 132
Settings for irrigation and cooling 1.

TODO screendump stavefejl: ~~Cooling factor basic~~ – Cooling temperature basic

TODO screendump stavefejl: ~~Airtemp~~. – Air temperature

Function selector

Off: Cooling 1 is not active.

On: Cooling 1 is active.

Temp. setpoint

Absolute: The cooling temperature, for cooling 1, is fixed **Cooling temperature basic** + addition in the time zones.

Relative: The cooling temperature, for cooling 1, is relative to the common heating temperature demand + addition in the time zones.

P-band air temperature

Adjusting the P-band (change) in temperature for changing the misting interval from the longest to the shortest interval.

Cooling temperature basic

Adjusting the wanted basic cooling temperature for cooling 1.
The final cooling temperature = **Cooling temperature basic** + addition in the time zones.

Time zone add. – zone 1-6

Adjusting the addition (negative = lowering) to the cooling temperature for cooling 1 in each time zone.

Air temperature

Reading the current air temperature in climate zone 1.

Cooling temperature

Reading the current cooling temperature for cooling 1, above which cooling 1 will be activated.

Cooling factor

Reading the current cooling factor for cooling 1.
0.00 = no cooling.
0.01 = longest interval.
1.00 = shortest interval.

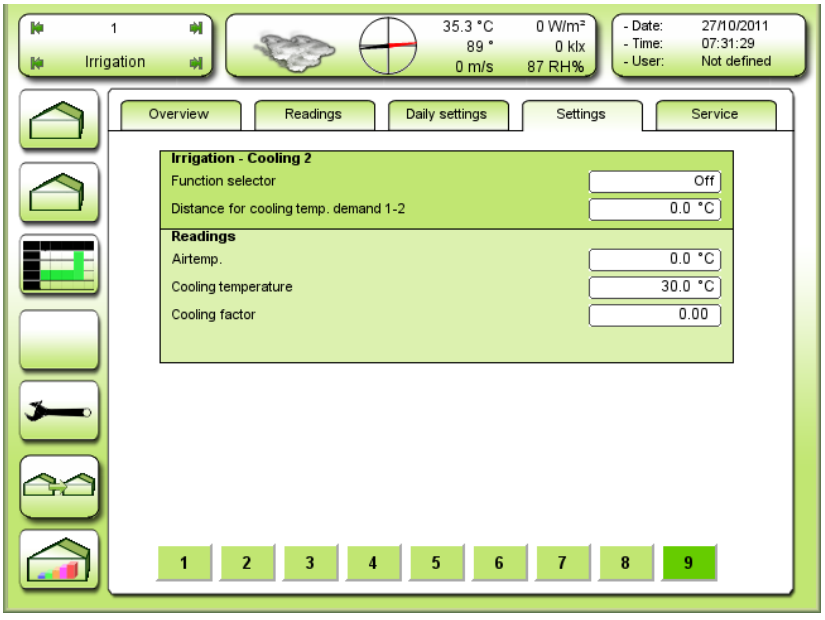


Figure 133
Settings for irrigation and cooling 2.

TODO screendump stavefejl: ~~Airtemp~~. – Air temperature

Function selector

Off: Cooling 2 is not active.

On: Cooling 2 is active.

Distance for cooling temp. demand 1-2

Adjusting the distance from the demand of cooling 1 to the demand of cooling 2.

NB! The cooling temperature demand is always relative to cooling 1.

Air temperature

Reading the current air temperature in climate zone 2.

Cooling temperature

Reading the current cooling temperature for cooling 2, above which cooling 2 will be activated.

Cooling factor

Reading the current cooling factor for cooling 2.

0.00 = no cooling

0.01 = longest interval.

1.00 = shortest interval.

Service

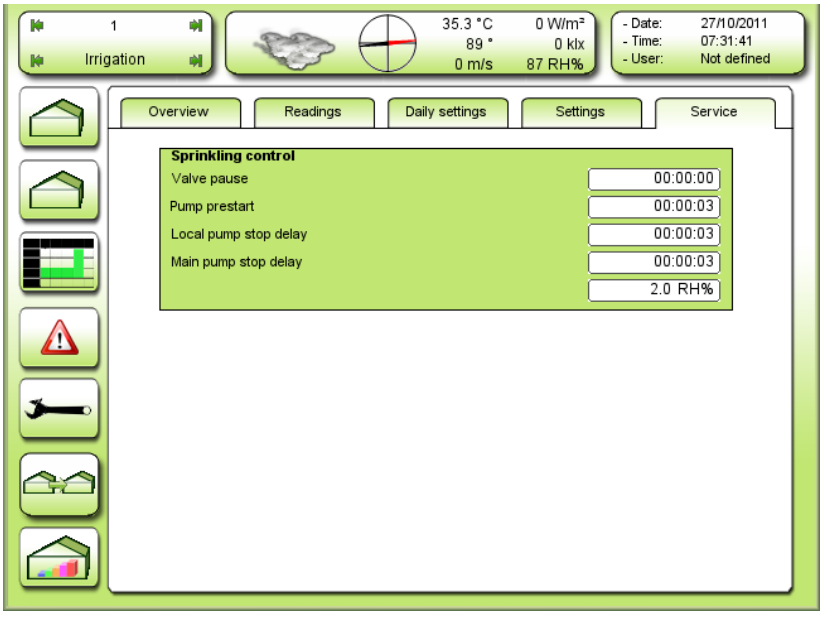


Figure 134
Service settings for misting control.

TODO screendump stavefejl: ~~Sprinkling control~~ – Misting control

Valve pause

Adjusting the pause between the valves.

Pump prestart

Adjusting the time between start of the pressure pump until the first valve is activated.

Local pump stop delay

Adjusting the time between stop of the last valve until stopping the local pressure pump.
Each compartment has an output for a local pressure pump.
For using the local pressure pump, it must be configured in the IO-table.

Main pump stop delay

Adjusting the time of the required delay between stop of the last valve until stopping the main pressure pump.
The main pressure pump has an output, which is common for all compartments.
For using the main pressure pump, it must be configured in the IO-table.

Hysteresis ON/OFF misting

Adjusting the hysteresis on the ON/OFF misting control.
An adjustment at 2.0% results in a dead band at ± 2.0 %.

Local Service

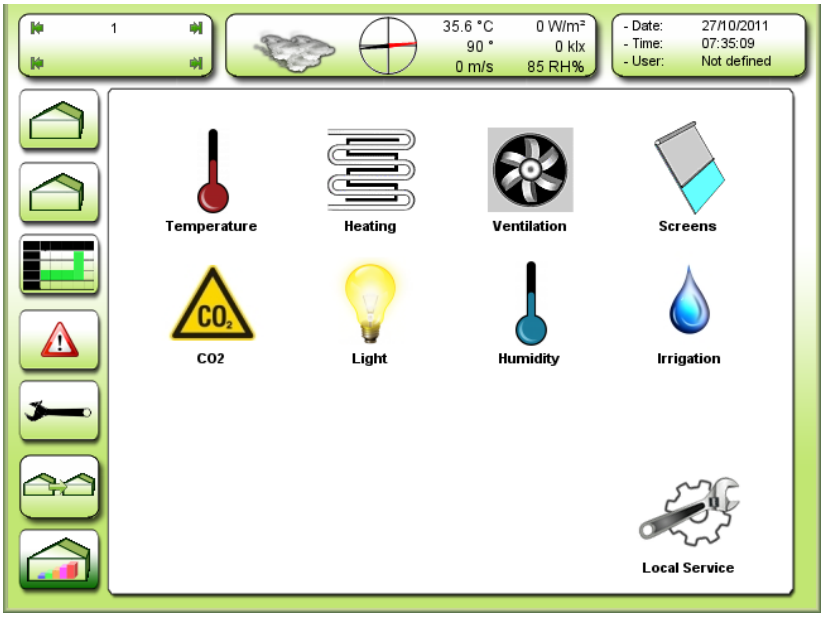


Figure 135
The button for local service provides access to service for all themes.

Push the button 

Time zone settings

The time zones are used for heat temperature, ventilation temperature, humidity control and CO_2. It is possible to set 4 day time zones and 2 night time zones.

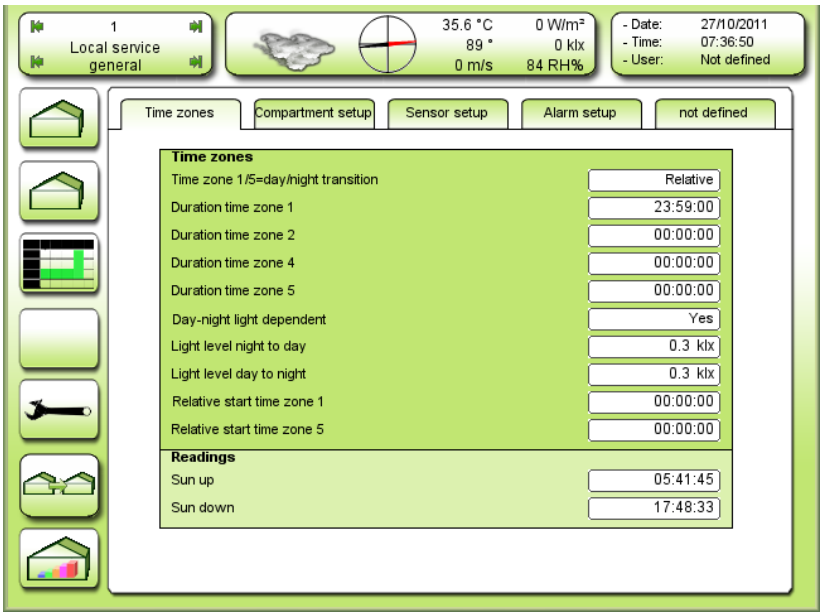


Figure 136
Setting for the start time and duration of the time zones.
Relative time decides the start of time zone 1 and 5.
Relative to sunrise and sunset.

Time zone 1/5=day/night transition

Selecting the mode for the time zone shift to 1 = day and to 5 = night.

Absolute: The shift to zone 1 = day and to 5 = night will happen on fixed time.

Relative: The shift to zone 1 = day and to 5 = night will happen at a time relative to sunrise and sunset.

Duration time zone 1, 2 and 4

Adjusting the duration of the first, the second and the last day time zone. What may be left is transferred to time zone 3.

Duration time zone 5

Adjusting the duration of the first night time zone. What may be left is transferred to time zone 6.

Day-night light dependent
The shift from day to night and reverse **also** happens on the basis of the light level. If **yes** is selected here, the following two settings will be valid.

Light level night to day
Adjusting the light level for starting time zone 1.
This light level is active from midnight until noon.

Light level day to night
Adjusting the light level for starting time zone 5.
This light level is active from noon until midnight.

NB! The shift between night-day and day-night will happen on time and/or light level depending on what happens first.

Relative start time zone 1
Selecting the time relative to sunrise for starting time zone 1.
-01:00 means 1 hour **before** sunrise.
Only visible when **Time zone 1/5=day/night transition** is set on **Relative**.

Relative start time zone 5
Selecting the time relative to sunset for starting time zone 5.
-01:00 means 1 hour **before** sunset.
Only visible when **Time zone 1/5=day/night transition** is set on **Relative**.

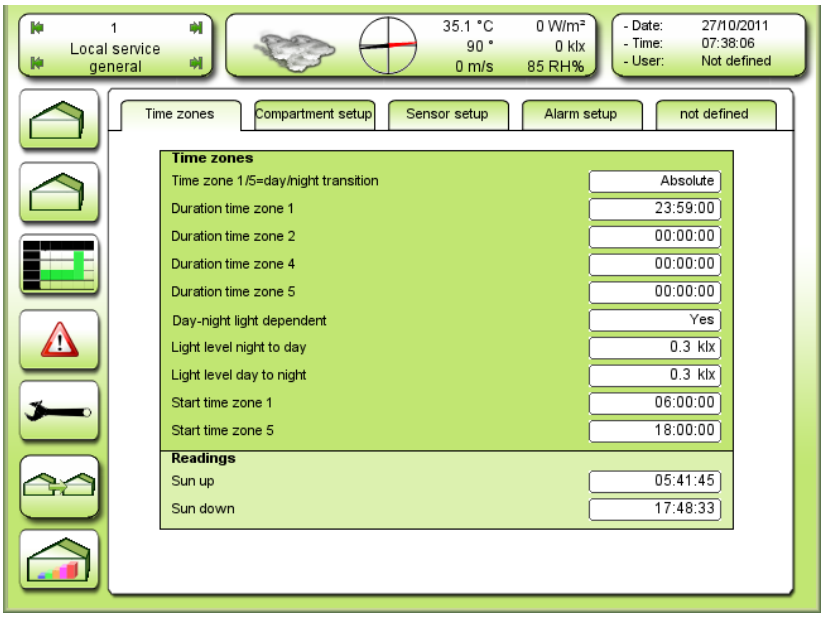


Figure 137
Settings for the start time and duration of the time zones.
Absolute time decides the start of time zone 1 and 5.

Start time zone 1

Selecting the fixed time for starting time zone 1.

Only visible when **Time zone 1/5=day/night transition** is set on **Absolute**.

Start time zone 5

Selecting the fixed time for starting time zone 5.

Only visible when **Time zone 1/5=day/night transition** is set on **Absolute**.

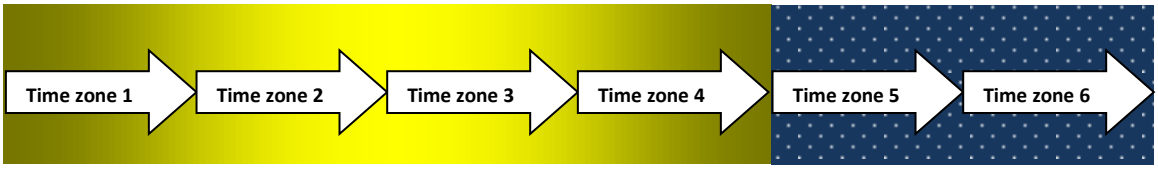


Figure 138
The 4 time zones during the day and the 2 during the night.

Compartment setup

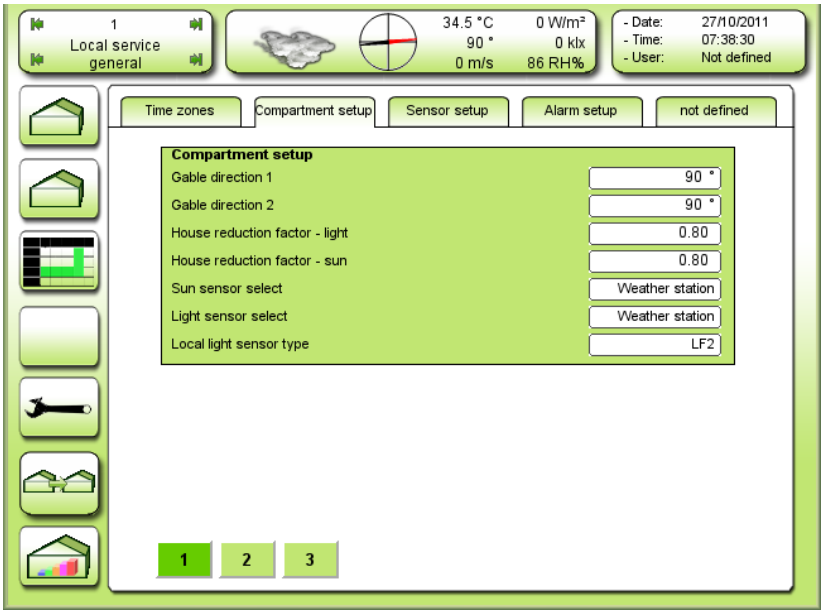


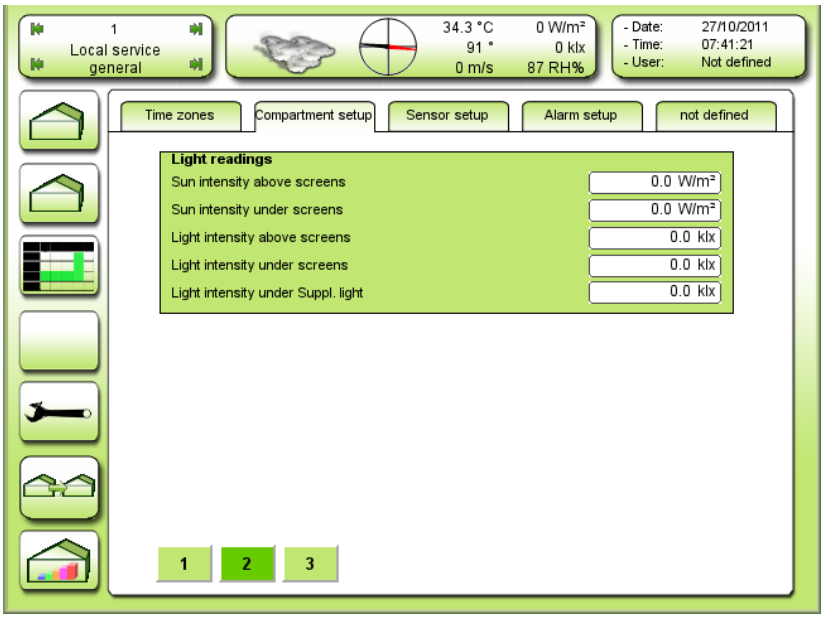
Figure 139
Compartment setup

Each compartment can have vent windows in 2 different directions. The most obvious is a pyramid-shaped greenhouse.

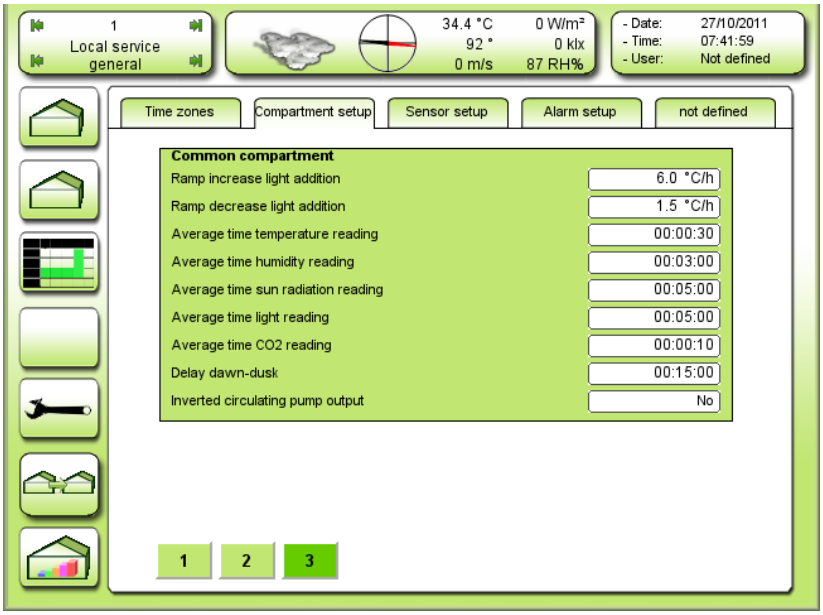
Gable direction 1
Adjusting the direction of the gable. 0 – 360°. 0° = North and 90° = East, etc.
Definition: You must stand inside the greenhouse, have gear 1 on your right hand side and be looking at the gable.

Gable direction 2
Adjusting the direction of the gable.
Definition: You must stand inside the greenhouse, have gear 3 on your right hand side and be looking at the gable.

TODO 5 nye setpunkts beskrivelser



TODO 5 nye setpunkts beskrivelser



Ramp increase light addition

Adjusting the rate/speed of the increase of **Common heat temperature demand** caused by the light intensity.

Ramp decrease light addition
Adjusting the rate/speed of the decrease of **Common heat temperature demand** caused by the light intensity.

Average time temperature reading
Adjusting the average time for air temperature reading.

Average time humidity reading
Adjusting the average time for humidity reading.

Average time sun radiation reading
Adjusting the average time for sun radiation reading.

Average time light reading
Adjusting the average time for light intensity reading.

Average time CO_2 reading
Adjusting the average time for CO_2 reading.

Delay dawn-dusk
Adjusting the delay from detecting light level below dusk and above dawn level, until the day-night shift is made.

Inverted circulating pump output
Selecting if the circulating pump outputs are inverted, i.e. an active output stops the pump and when the signal is not active anymore the pump starts. The breaking contact on the subsequent relay should be used.
Inverted circulating pump output can be used if the pumps run with interrupted automatic action.

Sensor setup

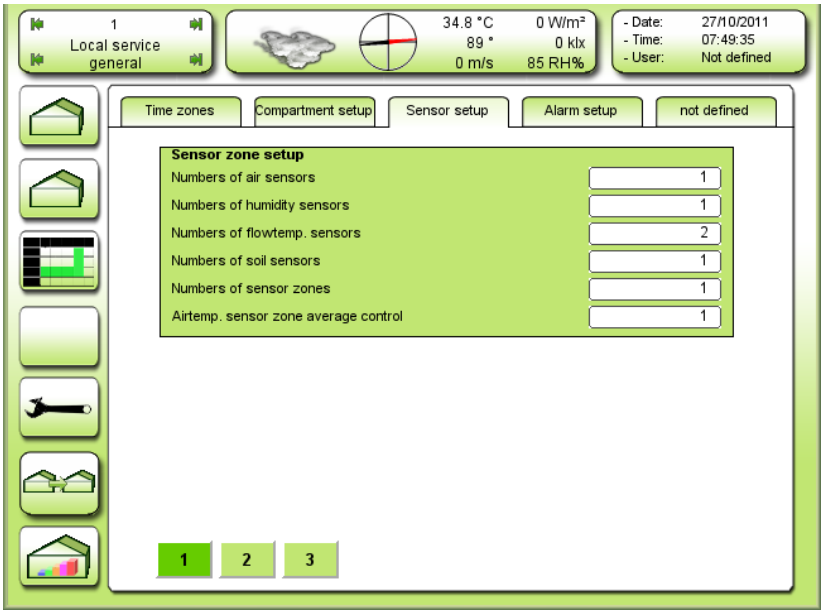


Figure 140
Local Service Common, sensor zone setup.

TODO screendump stavefejl: ~~Numbers of air sensors~~ – Numbers of air temp. sensors
TODO screendump stavefejl: ~~Number of flowtemp. sensors~~ – Number of flow temp. sensors
TODO screendump stavefejl: ~~Number of soil sensors~~ – Number of soil temp. sensors
TODO screendump stavefejl: ~~Airtemp. sensor zone average control~~ – Air temp. sensor zone average control

Numbers of air temp. sensors
Adjusting the number of installed air temperature sensors. Up to 4 sensors can be selected.
Having 2 or 4 air temperature sensors you can choose to control the air temperature depending on 1 of the 2 or 4 sensors, the highest reading, the lowest reading or the average reading.
Air temperature sensor 2 or 3+4 can be used for controlling climate zone 2 separately, if the greenhouse is divided in 2 climate zones.

Number of humidity sensors
Adjusting the number of installed humidity sensors. Up to 4 sensors can be selected.
Having 2 or 4 humidity sensors you can choose to control the humidity depending on 1 of the 2 or 4 sensors, the highest reading, the lowest reading or the average reading.
Humidity sensor 2 or 3+4 can be used for controlling climate zone 2 separately, if the greenhouse is divided in 2 climate zones.

Number of flow temp. sensors

Adjusting the number of installed flow temperature sensors. Up to 4 sensors can be selected.
Having 2 mixing valves for the heat controlling, flow temperature sensor 3 and 4 can be used for other readings.

Number of soil temp. sensors

Adjusting the number of soil temperature sensors 0 – 1 to be used.

Number of sensor zones

Adjusting the number of sensor zones. Up to 4 sensor zones can be used.

Air temp. sensor zone average control

Selecting which air temperature sensor should be used for the average temperature control.

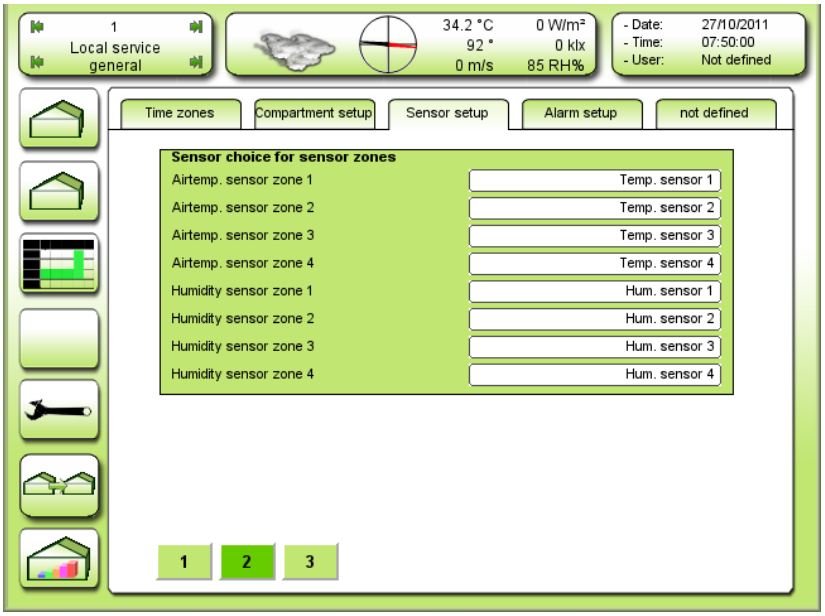


Figure 141
Sensor choice for sensor zones

TODO screendump stavefejl: ~~Airtemp. sensor zone~~ – Air temp. sensor zone

Air temp. sensor zone 1

Selecting which temperature sensor or temperature sensors should be used for air temperature sensor zone 1.
If the greenhouse is not divided, zone 1 = the greenhouse.
Following settings are possible:
Temp. sensor 1

Temp. sensor 2
Temp. sensor 3
Temp. sensor 4
Avg. temp. sensor 1-4
Lowest temp. sensor 1-4
Highest temp. sensor 1-4
Avg. temp. sensor 1-2
Avg. temp. sensor 3-4
No sensor
Soil temp. sensor

Air temp. sensor zone 2-4
See above.

Humidity sensor zone 1
Selecting which humidity sensor og humidity sensors should be used for humidity sensor zone 1.
If the greenhouse is not divieded, zone 1 = the greenhouse.
Following settings are possible:
Humidity sensor 1
Humidity sensor 2
Humidity sensor 3
Humidity sensor 4
Avg. hum. sensor 1-4
Lowest hum. sensor 1-4
Highest hum. sensor 1-4
Avg. hum. sensor 1-2
Avg. hum. sensor 3-4

Humidity sensor zone 2-4
See above.

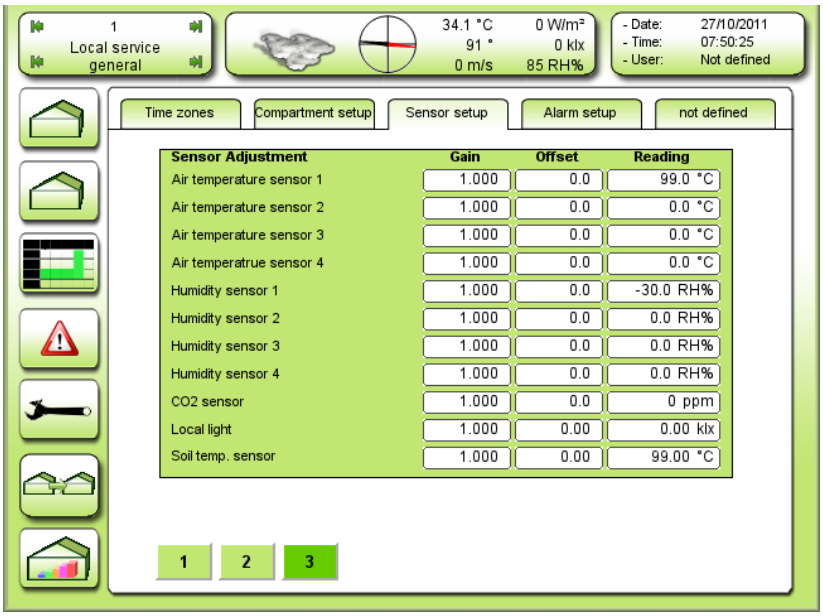


Figure 142
Sensor adjustment.

TODO screendump stavefejl: ~~Sensor Adjustment~~ – Sensor adjustment

Air temperature sensor 1-4

Here the 4 air temperature sensors can be adjusted.
"Gain" is added at the resizing, e.g. 1.010 will give an increase of 1% on the whole scale.

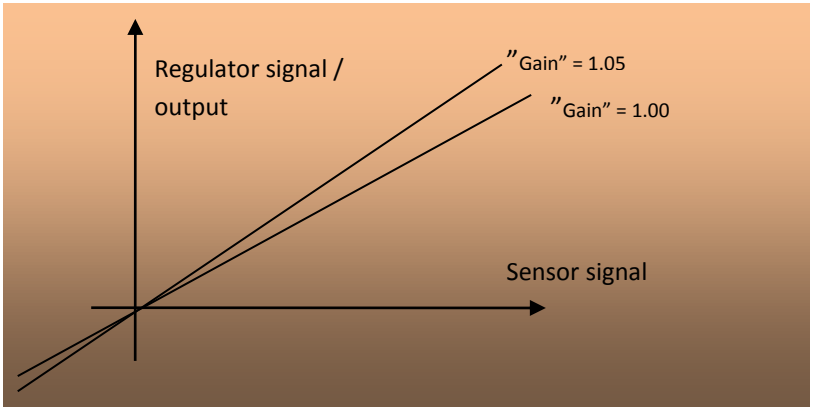


Figure 143
Effect of an increase in "gain".

"Offset" is added after the "gain" has tipped the curve.
The readings show the results of the adjustments.

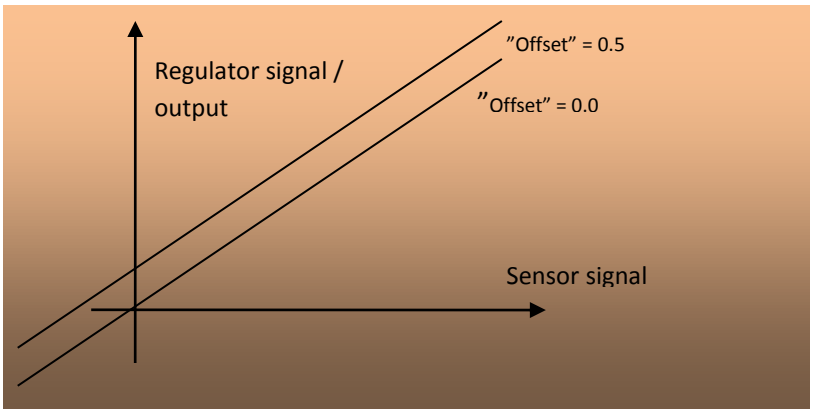


Figure 144
Offset shifts the sensor function.

Humidity sensor 1-4

Adjusting the 4 sensors for humidity measuring happens after the same principles, as by the temperature sensors. See Figure 143 and Figure 144.

Alarm setup

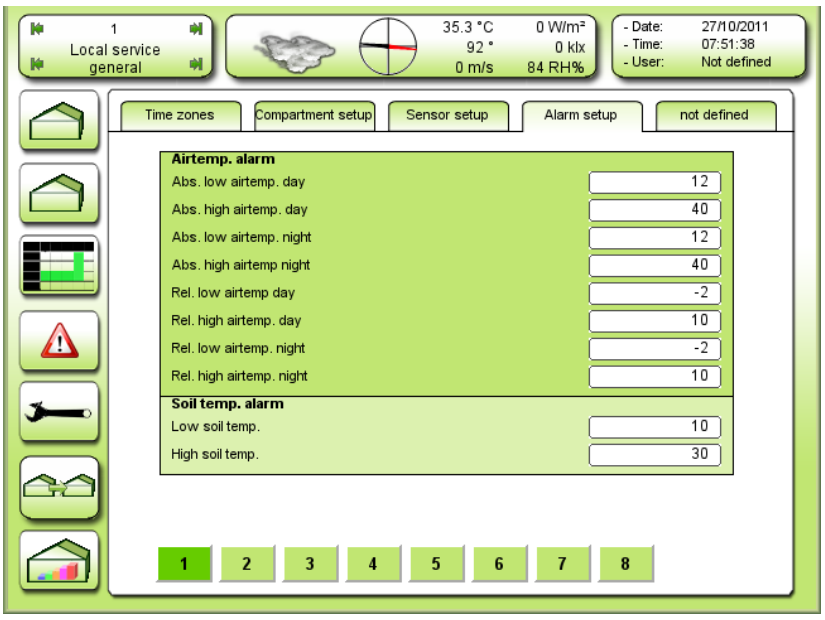


Figure 145
Settings for the alarm limits for air temperature and soil temperature.

TODO screendump stavefejl: ~~Abs. xx airtemp.~~ – Abs. xx. air temp.

Abs. low air temp. day
If the temperature during the day gets below 12 °C, this will cause an alarm after the alarm delay.
The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Abs. high air temp. day
If the temperature during the day gets above 40 °C, this will cause an alarm after the alarm delay.
The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Abs. low air temp. night
If the temperature during the night gets below 12 °C, this will cause an alarm after the alarm delay.
The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Abs. high air temp. night
If the temperature during the night gets above 40 °C, this will cause an alarm after the alarm delay.
The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Rel. low air temp. day
If the temperature during the day is more than 2 °C colder than the heat demand, this will cause an alarm after the alarm delay. The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Rel. high air temp. day
If the temperature during the day is more than 10 °C warmer than the heat demand, this will cause an alarm after the alarm delay. The alarm delay is adjusted under **Alarm delay setup**. See Figure 148.

Alarm limits for soil temperature, humidity, CO_2 and flow temperature sensors are adjusted after the same principles, as described above for the air temperature.

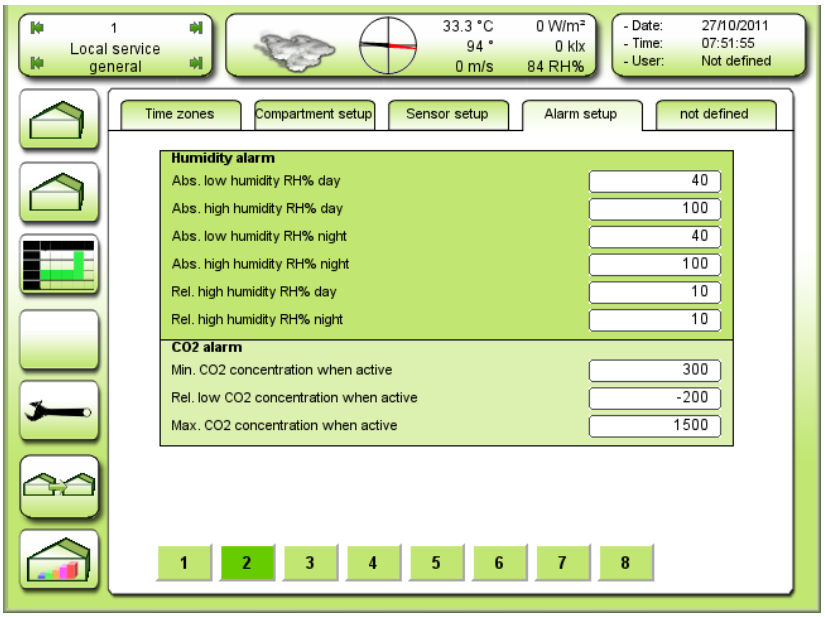


Figure 146
Settings for the alarm limits for humidity and CO_2.

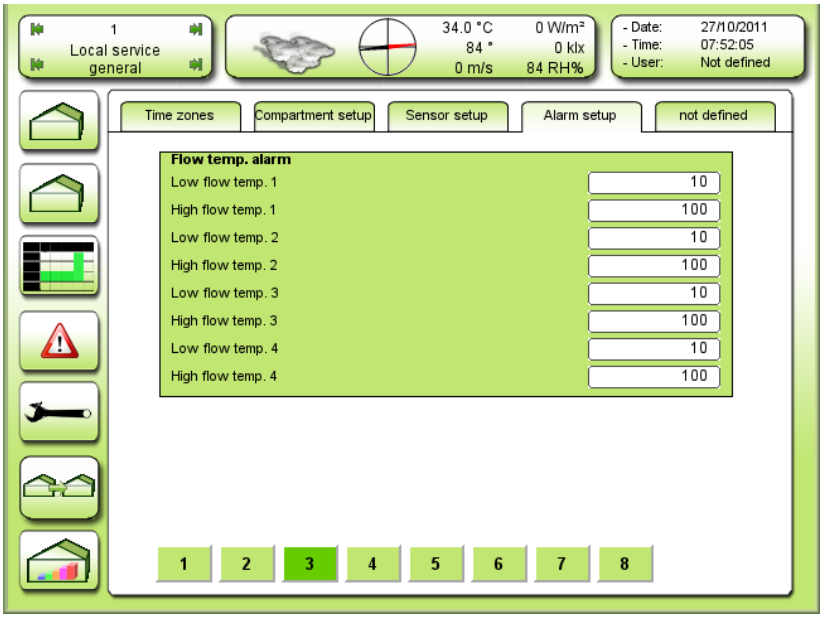


Figure 147
Settings for alarm limits for the flow temperature sensors.

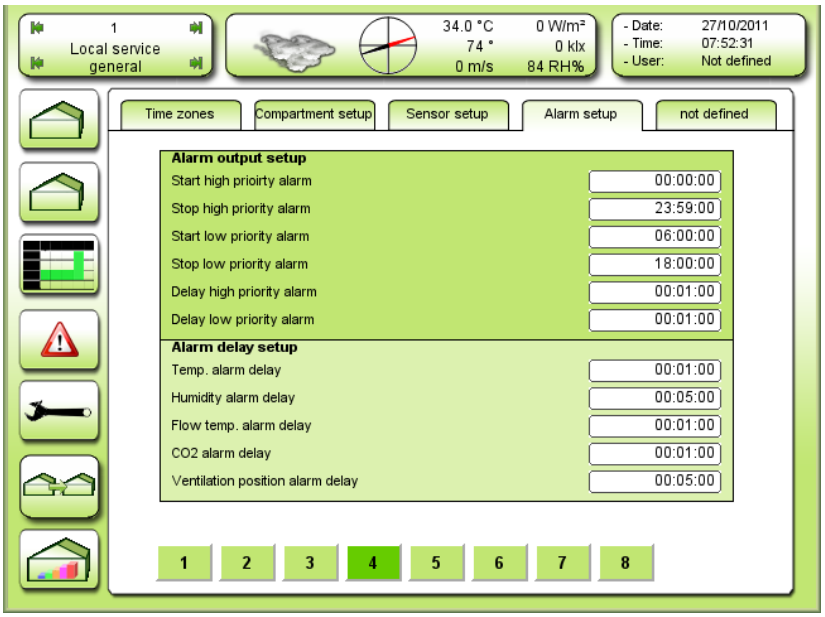


Figure 148
Setting up periods during the day, where high and low priority alarms as well as delay for each measuring can occur.

TODO screendump stavefejl: ~~Temp. alarm delay~~ – Temperature alarm delay
TODO screendump stavefejl: ~~Ventilation position alarm delay~~ – Vent position alarm delay

All alarms can either be high priority alarms, low priority alarms, both or none of the mentioned.
All high priority alarms will activate alarm output 1 in all connected Exp's within a chosen period of time.
All low priority alarms will activate alarm output 2 in all connected Exp's within a chosen period of time.

Alarm output setup

Start high priority alarm
Adjusting the start time for enabling the high priority alarms to activate alarm output 1.

Stop high priority alarm
Adjusting the stop time for enabling the high priority alarms to activate alarm output 1.

Start low priority alarm
Adjusting the start time for enabling the low priority alarms to activate alarm output 2.

Stop low priority alarm
Adjusting the stop time for enabling the low priority alarms to activate alarm output 2.

Delay high priority alarm
Adjusting the time from the alarm delay has expired to alarm output 1 is activated.

Delay low priority alarm
Adjusting the time from the alarm delay has expired to alarm output 2 is activated.

NB! The total time from e.g. the temperature gets below the alarm limit until the output is activated is:

Delay high priority alarm + Temp. alarm delay

Alarm delay setup

Temperature alarm delay
Adjusting the delay on detecting any temperature alarm.

Humidity alarm delay
Adjusting the delay on detecting any humidity alarm.

Flow temp. alarm delay
Adjusting the delay on detecting any flow temperature alarm.

CO_2 alarm delay
Adjusting the delay on detecting any CO_2 alarm.

Vent position alarm delay
Adjusting the delay on detecting any vent position alarm.

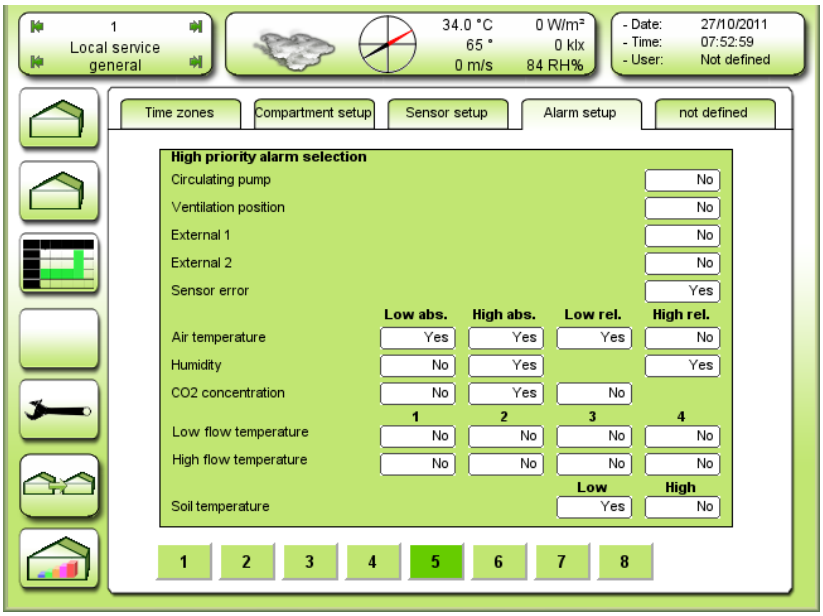


Figure 149
Selecting which alarms should be directed to alarm output 1.

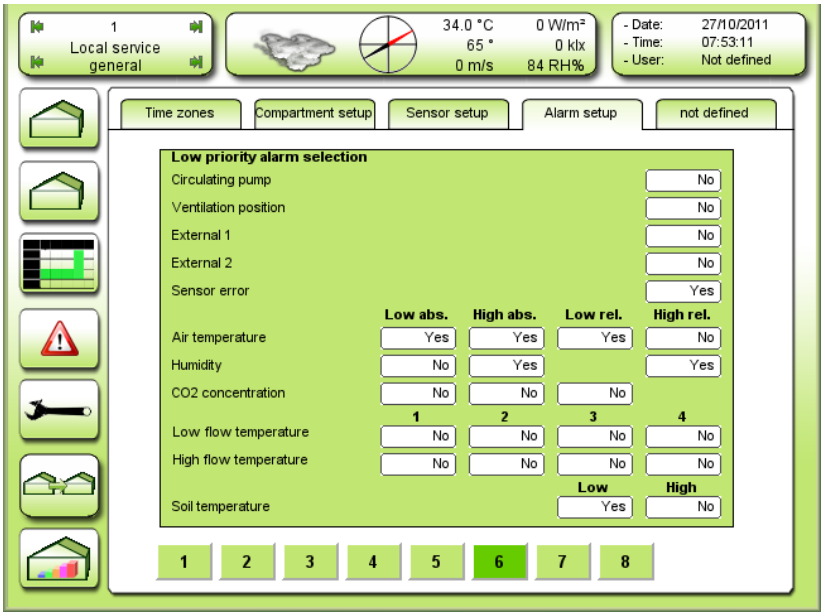


Figure 150
Selecting which alarms should be directed to alarm output 2.

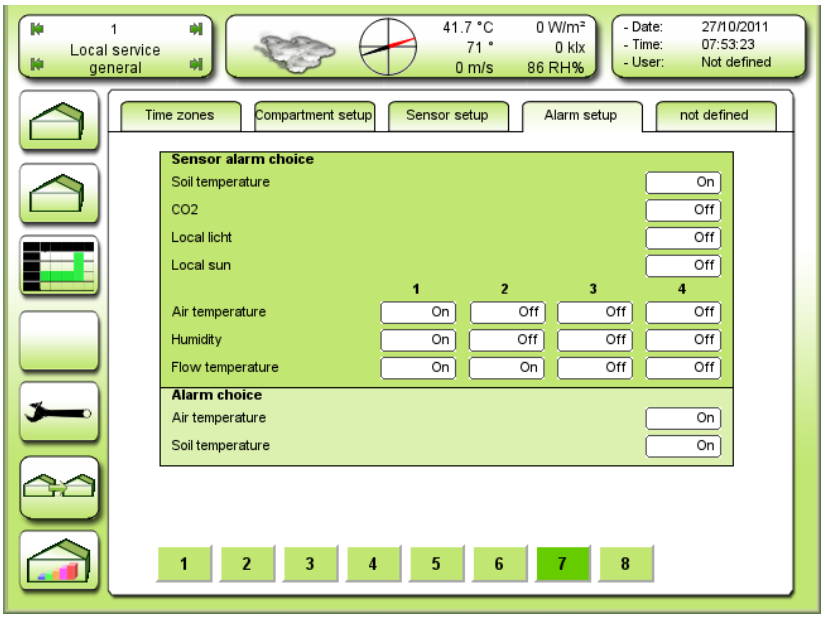


Figure 151
Selecting whether or not there should be an alarm for each sensor, if these fail to work.

Alarm choice

Air temperature
Deciding if there should be alarm on any air temperature sensors.

Soil temperature
Deciding if there should be alarm on any soil temperature sensors.

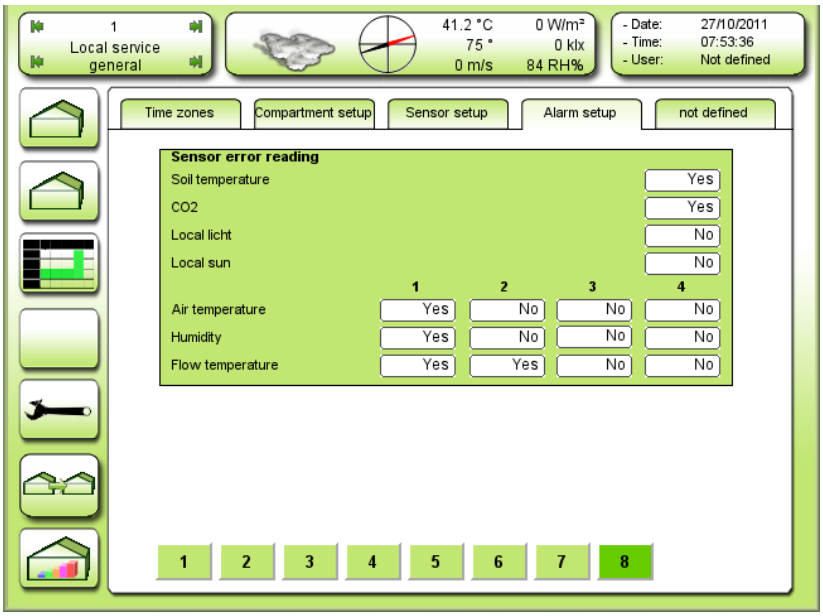


Figure 152
Readings for possible failing sensors.

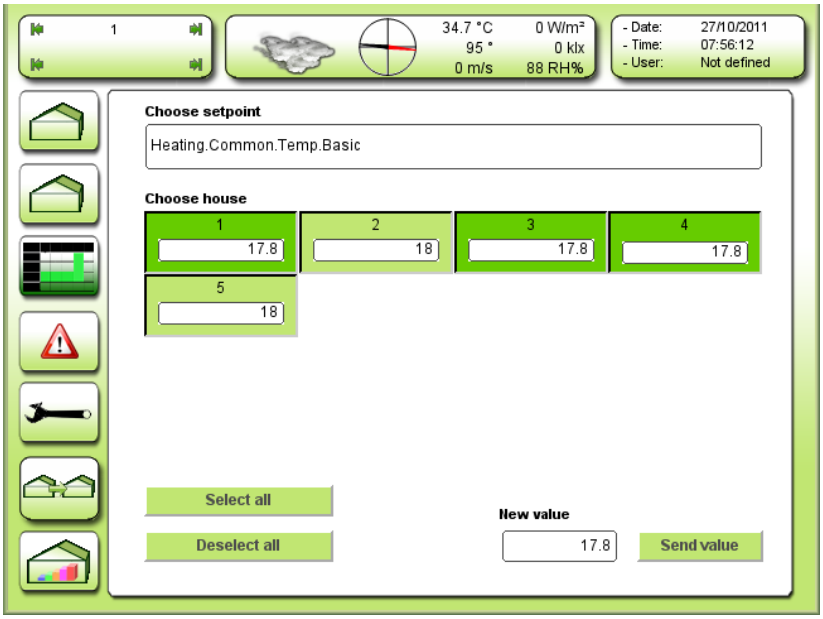


Figure 153
Table overview. Select choose setpoint.

It is possible to get an overview between the compartments by comparison of a chosen code. After selecting "Choose setpoint" the following list will appear.

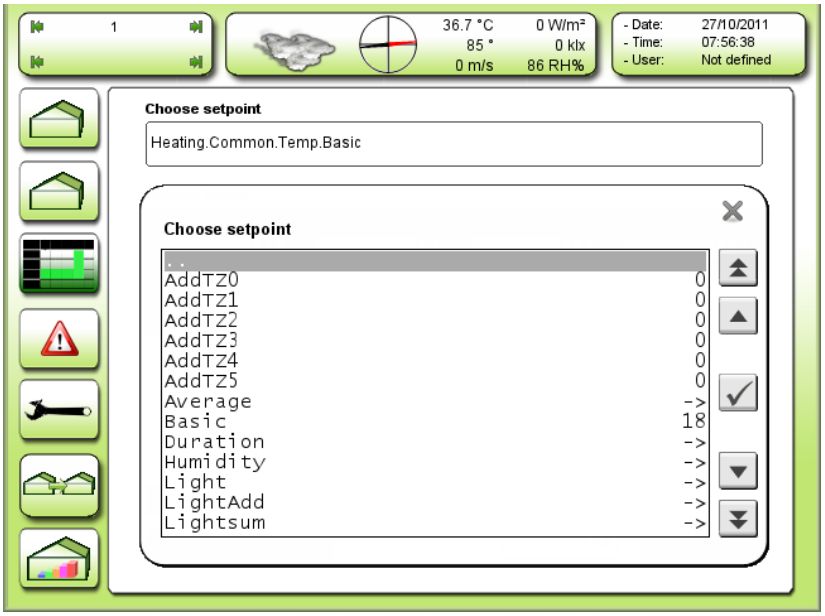


Figure 154
Selecting list for setpoint to be shown.

It is possible to send a value to all marked compartments at the same time.

The value is entered here: 

and the button "send value" is pushed. The actual marking of the compartments can be selected randomly. See Figure 155.

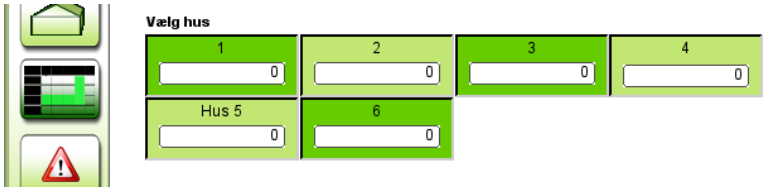


Figure 155
Randomly marking of the compartments. They are marked by pushing the green squares.

All compartments can also be marked by pushing the button 

.

To remove markings push 

.

TODO screendump – 4 x DANSK!

Alarm list

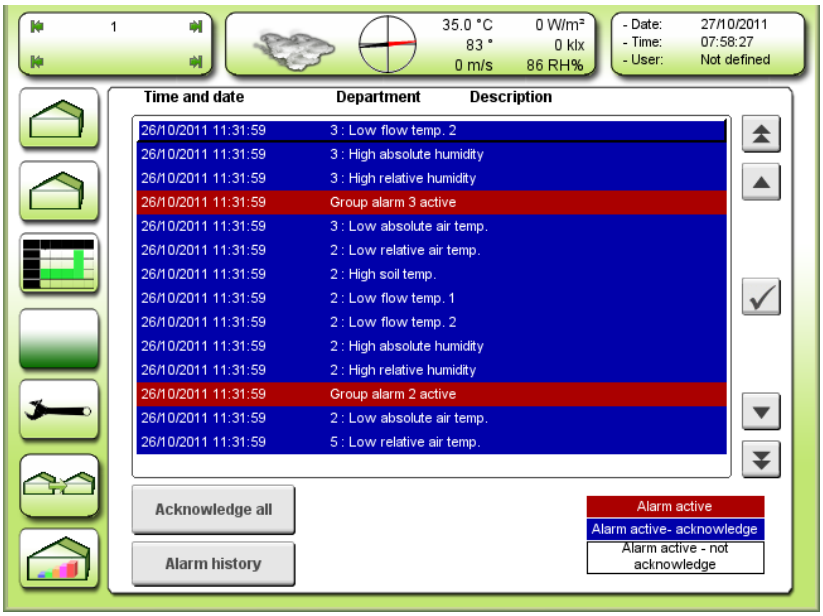


Figure 156
Alarm list for all connected compartments.

The latest alarms are shown at the top. The time for occurring are shown left. The color at the line indicates:
Red: The alarm is active.
Blue: The alarm is active, but acknowledged.
White: The alarm has been active, but not acknowledged.

The arrows at the right side are used for scrolling linewise or sidewise. The button with the checkmark  acknowledges the alarm at the chosen line.

The button 

acknowledges all the alarms on the list. Group alarms **cannot** be acknowledged.

The button 

shows a list with the history. The latest is shown at the top. Active actions from the user regarding the acknowledgements + cleared time are also shown on the list.

TODO screendump – 2 x DANSK!!

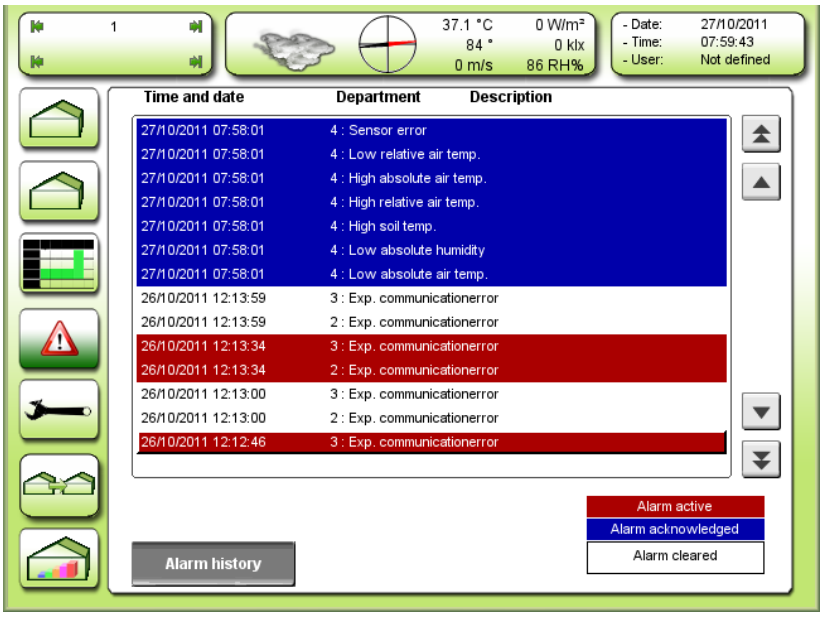


Figure 157
Alarm history.

TODO screendump
TODO screendump – 1 x DANSK! (Alarm historik)

Push the button 

to return to the alarm list.

Red: Alarm active.
Blue: Alarm acknowledged.
White: Alarm cleared.

Setup

Click at 

House setup

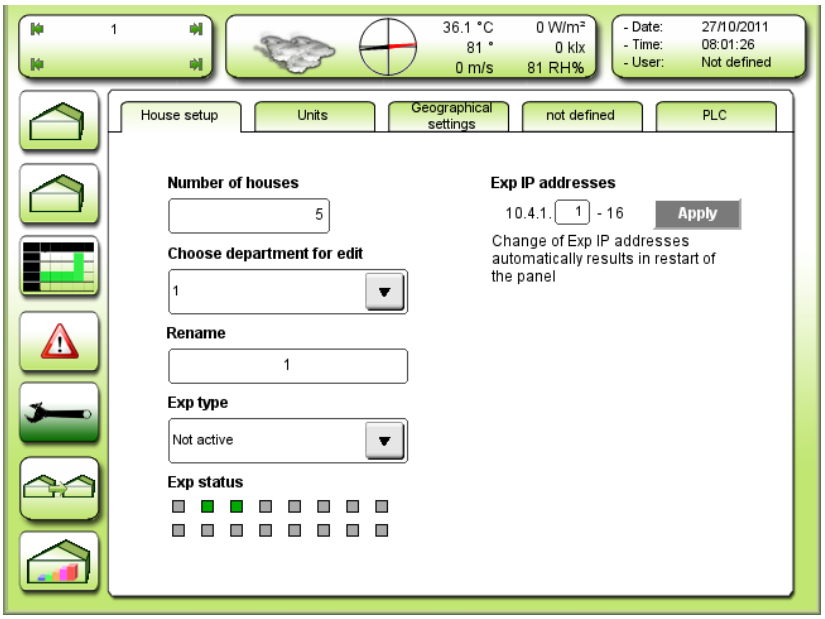


Figure 158
Settings for the number of houses, which are controlled by the LCC 4.

Chose department for edit
Chose a house to rename it. See Figure 159.

Number of houses
The number of compartments 1-16 is chosen here.

Exp type
Here one can choose between different types of expansions, which is controlled by the chosen house.

Exp status
Here is shown how many expansions are attached to the Ethernet of the LCC 4. This is marked with green or red. Red indicates that there is a problem with the expansion.

Exp IP addresses
Here the IP addresses of the expansions are entered. An automatic restart of the LCC 4 will happen after

pushing the button Udfør .

TODO screendump – 1 x DANSK (Udfør)

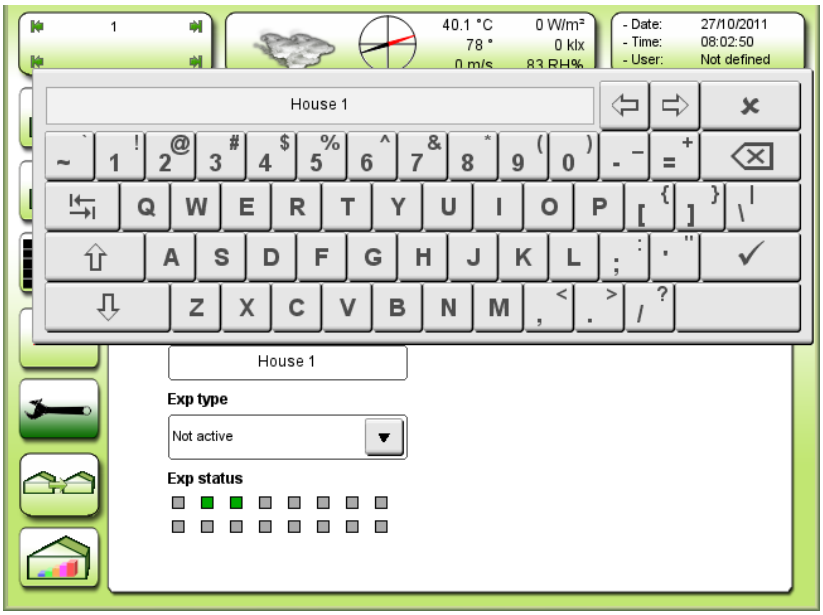


Figure 159
Typing in the name of the house.

Unit setup

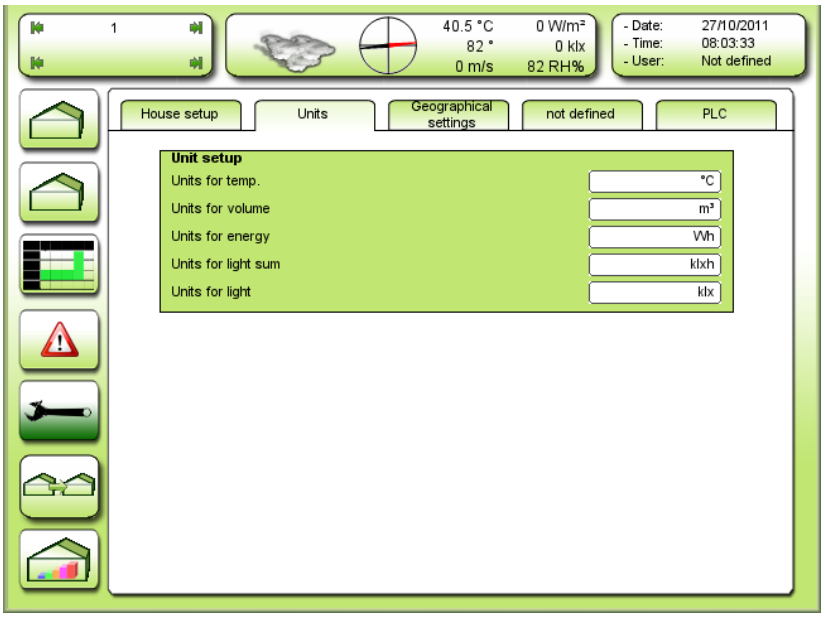


Figure 160
Selecting units for measurements.

TODO screendump: ~~units for temp.~~ – unit for temp.
TODO screendump: ~~units for volume~~ – unit for volume
TODO screendump: ~~units for energy~~ – unit for energy
TODO screendump: ~~units for light sum~~ – unit for light sum
TODO screendump: ~~units for light~~ – unit for light

Unit for temp.
Selecting the unit for temperature settings and settings.
°C = Celsius (centigrade).
°F = Fahrenheit.

Unit for volume
Selecting the unit for volume. There can be selected between: m^3 or liter gallon. This is used for reading of flow.

1 Wh = 3,6 kJ

Unit for energy
Selecting the unit for energy settings and readings.
kJ = kilo-joule.
Wh= watt-hour.
NB! This setpoint will also affect MJ and GJ settings and readings.

Unit for light sum

Selecting the unit for light sum settings and readings.

klxh

mol

MJ

Unit for light

Selecting the unit for light settings and readings.

klx

µmol

Longitude and lattitude

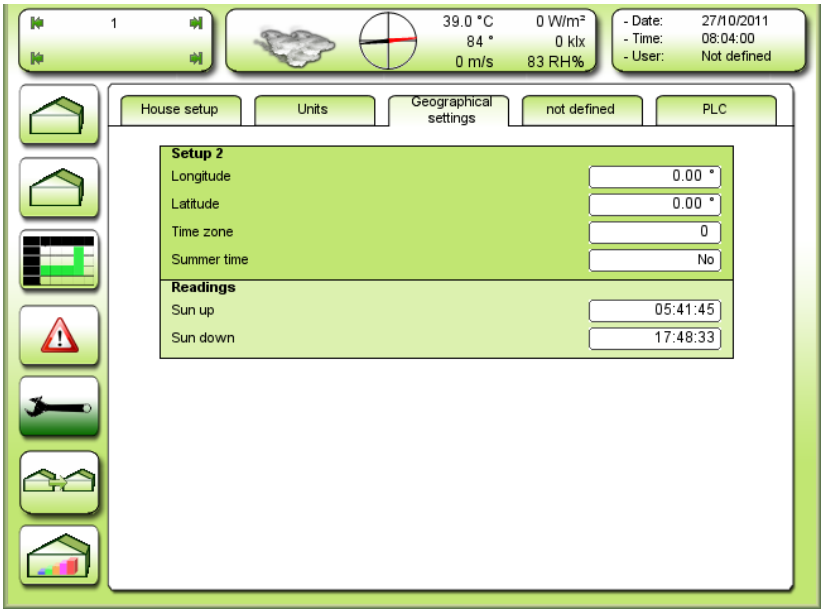


Figure 161
Settings concerning the location on the planet.

TODO screendump: ~~Time zone~~ – Time zone different to GMT

Longitude
Adjusting the degree of longitude for the location of the nursery. East for Greenwich is set negative.

Latitude
Adjusting the degree of latitude for the location of the nursery. South of equator is set negative.

NB! The setpoint is adjusted in decimal degrees and not degrees + minutes.

For local information, see Figure 162.

Time zone different to GMT
Adjusting the time zone in relation to GMT.
Positive time means earlier than GMT e.g. CET.
Negative time means later than GMT e.g. time zones in North America.

TODO 3 nye setpunkts beskrivelser

City:	Longitude: Degrees + min	Latitude: Degrees + min	Longitude Setting	Latitude Setting	Time zone
Amsterdam	04° 54' E	52° 23' N	- 04.90	52.38	1:00
Athens	23° 46' E	37° 58' N	- 23.77	37.97	2:00
Barcelona	02° 10' E	41° 21' N	- 02.17	41.20	1:00
Berlin	13° 24' E	52° 32' N	- 13.00	52.35	1:00
Bordeaux	00° 36' W	44° 50' N	00.60	44.83	1:00
Brussels	04° 21' E	50° 51' N	- 04.35	50.85	1:00
Budapest	19°0 5' E	47° 29' N	- 19.08	47.48	1:00
Bucharest	26° 10' E	44° 27' N	- 26.17	44.45	2:00
Edinburgh	03° 12' W	55° 57' N	03.20	56.95	0:00
Geneva	06° 09' E	46° 12' N	-06.15	46.20	1:00
Helsinki	25° 03' E	60° 15' N	- 25.05	60.25	2:00
Copenhagen	12° 34' E	55° 41' N	- 12.57	55.68	1:00
Köln	06° 58' E	50° 56' N	- 06.97	50.93	1:00
Lisbon	09° 10' W	38° 42' N	09.17	38.70	0:00
London	00° 05' W	51° 30' N	00.08	51.50	0:00
Madrid	03° 45' W	40° 25' N	03.75	40.42	1:00
Milan	09° 10' E	45° 28' N	- 09.17	45.47	1:00
Oslo	10° 45' E	59° 55' N	- 10.75	59.92	1:00

Palermo	13° 20' E	38° 08' N	- 13.33	38.13	1:00
Paris	02° 20' E	48° 50' N	- 02.33	48.83	1:00
Prague	14° 22' E	50° 05' N	- 14.37	50.08	1:00
Reykjavik	21° 57' W	64° 10' N	21.95	64.17	0:00
Roma	12° 30' E	41° 54' N	- 12.50	41.90	1:00
Sofia	23° 20' E	42° 45' N	- 23.33	42.75	2:00
Stockholm	18° 03' E	59° 20' N	- 18.05	59.33	1:00
Trondheim	10° 25' E	63° 36' N	- 10.42	63.60	1:00
Warszawa	21° 00' E	52° 13' N	- 21.00	52.22	1:00
Vienna	16° 22' E	48° 12' N	- 16.37	48.20	1:00
Zurich	08° 32' E	47° 22' N	- 08.53	47.37	1:00

City:	Longitude: Degrees + min	Latitude: Degrees + min	Longitude Setting	Latitude Setting	Time Zone
Amarillo	101° 46' W	35° 14' N	101.77	35.23	-6:00
Atlanta, Ga.	84° 24' W	33° 50' N	84.40	33.83	-5:00
Boston	71° 00' W	42° 20' N	71.00	42.33	-5:00
Charleston, S.C.	79° 56' W	32° 47' N	79.93	32.78	-5:00
Charlotte, N.C.	80° 46' W	35° 16' N	80.77	35.27	-5:00
Chicago	87° 40' W	41° 53' N	87.67	41.83	-6:00

Cincinnati	84° 26' W	39° 10' N	84.43	39.17	-5:00
Dallas, Texas	96° 50' W	32° 50' N	96.83	32.83	-6:00
Denver	105° 00' W	39° 45' N	105.00	39.75	-7:00
Detroit, Mich.	83° 05' W	42° 23' N	83.08	42.38	-5:00
Dubuque	90° 41' W	42° 30' N	91.68	42.50	-6:00
Edmonton	113° 30' W	53° 30' N	113.50	53.50	-7:00
Halifax	63° 35' W	44° 38' N	63.58	44.63	-4:00
Houston, Texas	95° 20' W	29° 50' N	95.33	29.83	-6:00
Indianapolis	86° 10' W	39° 42' N	86.17	39.70	-6:00
Jacksonville, Fla.	81° 38' W	30° 15' N	81.63	30.25	-5:00
Kansas City, Kans.	94° 40' W	39° 00' N	94.67	39.00	-6:00
Los Angeles	118° 10' W	34°0 0' N	118.17	34.00	-8:00
Memphis, Tenn.	90° 00' W	35° 07' N	90.00	35.12	-6:00
Mexico City	99° 10' W	19° 20' N	99.17	19.33	-6:00
Miami, Fla.	80° 15' W	25° 45' N	80.25	25.75	-5:00
Minneapolis, Minn.	93° 20' W	44° 58' N	93.33	44.97	-6:00
Minot	101° 15' W	48° 10' N	101.25	48.17	-6:00
Monterrey, Mexico	100° 30' W	25° 40' N	100.50	25.67	-6:00
Montréal	73° 34' W	45° 31' N	73.57	45.52	-5:00
New Orleans	90° 05' W	30° 00' N	90.08	30.00	-6:00

New York City	74° 00' W	40° 45' N	74.00	40.75	-5:00
City:	Longitude: Degrees + min	Latitude: Degrees + min	Longitude Setting	Latitude Setting	Time Zone
Oklahoma City	97° 30' W	35° 25' N	97.50	35.42	-6:00
Omaha	96° 06' W	41° 15' N	96.10	41.25	-6:00
Phoenix, Ariz.	112° 10' W	33° 30' N	112.17	33.50	-7:00
Pittsburg, Pa.	79° 55' W	40° 25' N	79.92	40.42	-5:00
Regina	104° 35' W	50° 27' N	104.58	50.45	-6:00
San Francisco	122° 30' W	37° 47' N	122.50	37.78	-8:00
Seattle	122° 15' W	47° 41' N	122.25	47.68	-8:00
St. Louis, Mo.	90° 12' W	38° 40' N	90.20	38.67	-6:00
Syracuse, N.Y.	76° 11' W	43° 04' N	76.18	43.07	-5:00
Tampa	82° 38' W	27° 57' N	82.63	27.95	-5:00
Toronto, Canada	79° 20' W	43° 39' N	79.33	43.65	-5:00
Vancouver, Can.	123° 10' W	49° 15' N	123.17	49.25	-8:00
Victoria, Canada	123° 25' W	48° 30' N	123.42	48.50	-8:00
Washington D. C.	77° 00' W	38° 52' N	77.00	38.87	-5:00
Wichita	97° 20' W	37° 40' N	99.33	34.67	-6:00
Winnipeg, Canada	97° 09' W	49° 54' N	97.15	49.90	-6:00

Figure 162
Longitude and latitude in degrees and minutes.
These are also shown in decimal degrees, which are used in connection with data entry in the LCC 4. The time zone is shown right.

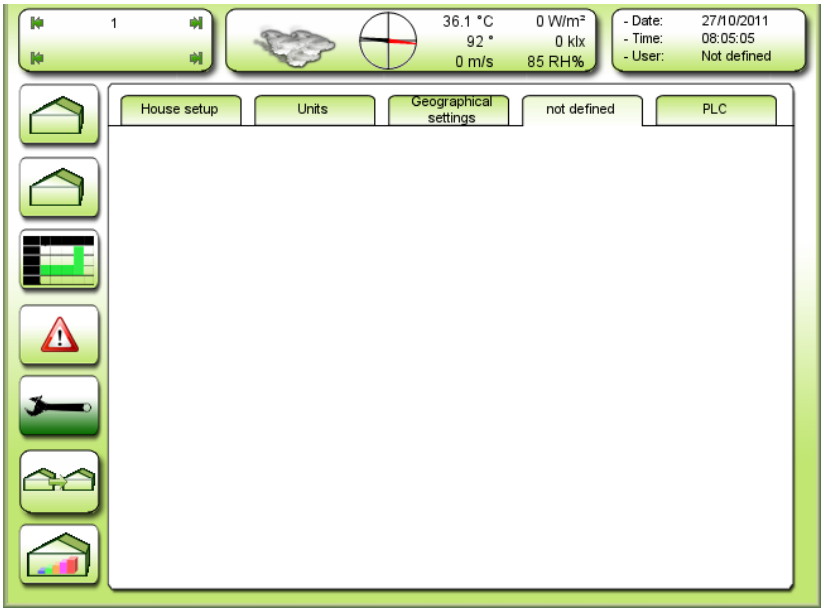


Figure 163
Blank page for possible use in the future.

Setup for display, language and IP Address

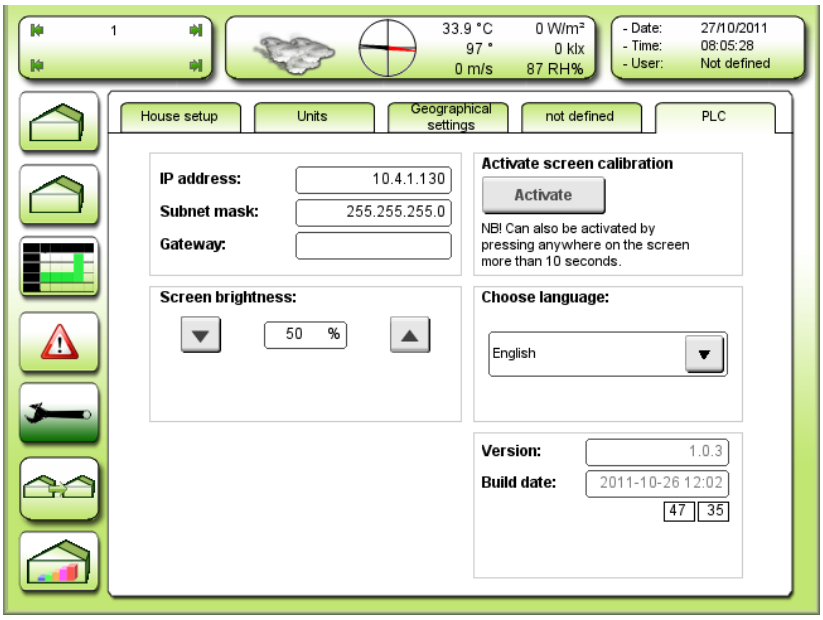


Figure 164
Settings for IP address and Subnet for LCC 4.
Here one can also choose language and activate display calibration.

TODO screendump: ~~Screen brightness~~ – Display brightness
TODO screendump: ~~Activate screen calibration~~ – Activate display calibration
TODO screendump: ~~Screen contrast~~ – Display contrast

IP address

Reading the IP address, which the LCC 4 has been given for communication on the Ethernet.

10.4.1.<node name>

Condition: 129 ≤ the node name ≤ 199 and different from all other nodes on this Ethernet.

The node name is placed hexadecimal on the hardware switch behind the panel. For further information see the installation manual for LCC 4.

Subnet mask

Reading the subnet mask for the system.

Gateway

Adjusting the gateway, when needed.

Display brightness

Adjusting the brightness of the display.

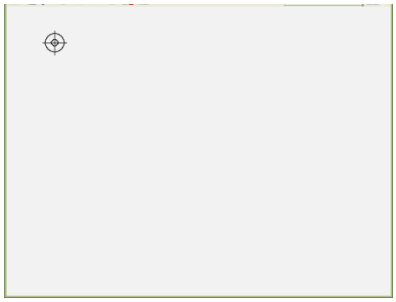
Display contrast

Adjusting the contrast of the display.

TODO screendump: 1 x DANSK (Aktiver)

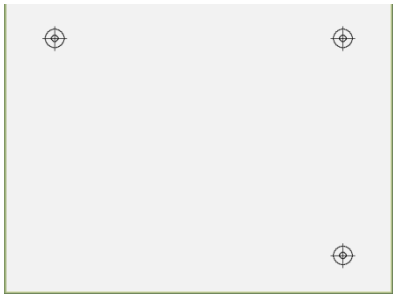
Activate display calibration

Push the button 



Afterwards push the button up left.
Push as accurate as possible!

Now push the button down right.



Then push the button up right.

Finally push the button down left.

Choose language

Translated and implemented languages can be selected here.
For further information contact Senmatic A/S DGT.