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Preface

We recommend you to read the installation manual **before** the product is installed and come into use.

Please check that the product is undamaged. Possible transport damages must be noticed **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 installation 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 further 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, gutter, etc.

NB! The product must not be placed in direct sun light and in ambient temperature 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 2.
The functions of the LCC 2 are divided into menus, which give a good overview of the possibilities for the optimum setting of the climate computer.

LCC 2 is built in a standard model and can be expanded regartding 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 2, (an example showing a setting in the LCC 2) and a more detailed going through the operation of the computer and descriptions of the individual functions.

This set of constructions has been compiled to make sure that you will obtain reliable performance from the LCC 2 from the very start. If you follow the instructions carefully the LCC 2 will operate to your entire satisfaction over a long period.

Operation of the panel.

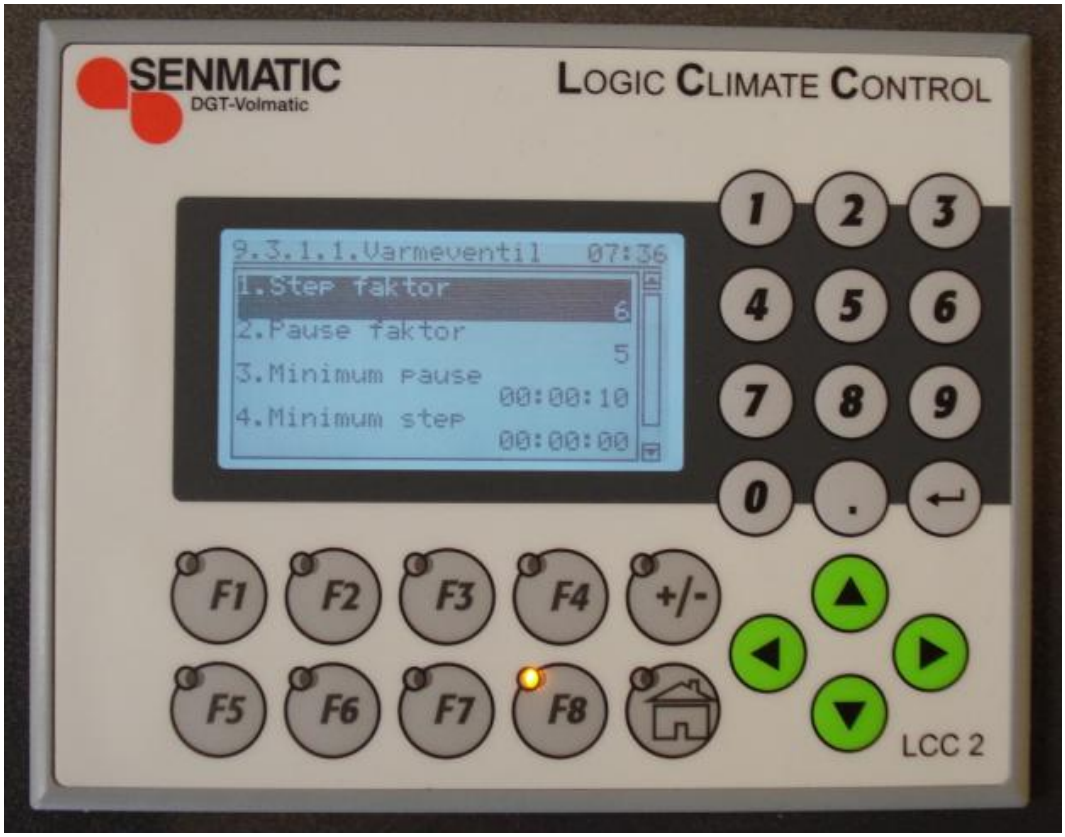


Figure 1
The control panel for LCC 2

The "home button"  changes to the main menu.

The function keys F1 – F8 provides fast access to the following menu items.

F1: Readings
F2: Temperature
F3: Ventilation
F4: Screens
F5: CO_2 + Light
F6: Irrigation
F7: Humidity
F8: Alarm

The four green arrow keys have following functions.

 Moves the marking to the menu above or adjusts a setpoint up.

 Moves the marking to the menu below or adjusts a setpoint down.

 Has the same function as “Enter”  . Moves to a marked menu or an adjustment is confirmed.

 Moves back in the menu system.

Time setting

All time settings in the LCC 2 have the format hours, minutes and seconds.
One enters hours, minutes, seconds and complete with “Enter” or “arrow to the right”.
Example: 0 6 0 0 0 0 → results in 06:00:00.

Main menu

```
Hovedmenu
    Aflæsninger
    Temperatur
    Ventilation
    Gardiner
    CO2 + Lys
    Fugt
    Vanding
    Alarm+opsætning
    Setup + Service
```

Figure 2
Main menu

Readings

```
Aflæsninger
        Oversigt klima
        Oversigt varme
        Oversigt Ventilation
        Oversigt gardiner
        Oversigt CO2
        Oversigt assimilationslys
        Oversigt fugtighedskontrol
        Oversigt vanding
        Afdelings middel aflæsninger
        Afdelings registreringer
        Vejrstations aflæsninger
```

Figure 3
Menu for readings

Overview climate

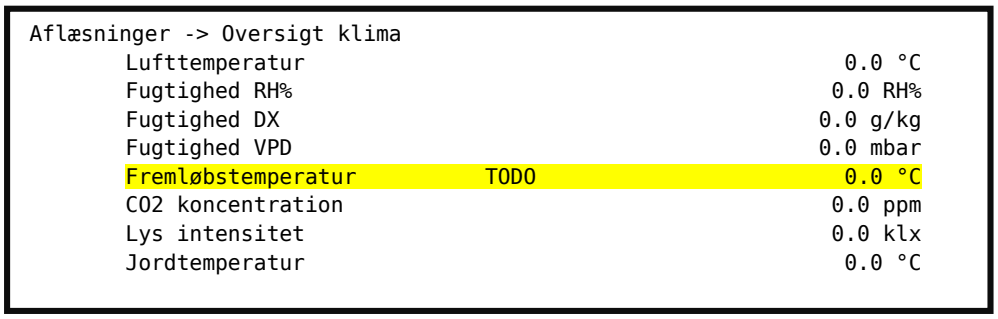


Figure 4
Overview climate

Air temperature

Reading of the current temperature in the compartment.

Humidity RH%

Reading of the humidity measurement, which is the input for humidity control 1. Can be 1, 2 or 4 sensors. Average, lowest or highest.

Humidity DX

Reading of the saturation deficit Delta X = DX 0-100 g/kg (How many gram per kilogram air is needed to saturate the air at the given temperature). The choice between RH% and Delta X are made under Service. Fejl! Henvisningskilde ikke fundet.. It is important to remember that the scale is reverse. By DX 0 is the most humid, corresponding to a relative humidity at 100%.

Humidity VPD

Reading of the distance to saturation as m bars.

Fremløbstemperatur TODO 1-3 føler

Flow temperature TODO 1 – 3 sensors

CO_2 concentration

Reading of the current CO_2 concentration.

Lys intensitet TODO. er denne korrigeret?

Light intensity

Reading of the light intensity corrected for suppl. light, greenhouse and screens, if they are on. That is, the external light dimed by the glass and the screens, if they are on + the light from the lamps.

Soil temperature

The temperature measured in e.g. the sphagnum/potting compost.

Overview heating

```
Aflæsninger -> Oversigt varme
        Varmeregulator
        Ventil 1
        Ventil 2
```

Figure 5
Overview menus for heating

```
Aflæsninger -> Oversigt varme -> Varmeregulator
        Lufttemperatur                                  0.0 °C
        Varmekrav                                       0.0 °C
        Varme regulator krav                            0.0 °C
```

Figure 6
Readings for heat regulator

Air temperature

The temperature measured in the air in the greenhouse.

Heating demand

Current air temperature demand by heating.

Heating regulator demand

The pipe temperature demand from the heating regulator for the achievement of the **heating demand**.

```
Aflæsninger -> Oversigt varme -> Ventil 1
        Fremløbstemperatur krav                         0.0 °C
        Min. fremløbs temp                             10.0 °C
        Max. fremløbs temp                            100.0 °C
```

Figure 7
Overview for heating valve 1

Flow temp. demand

Reading of the demand for the flow temperature from valve 1.

TODO Hvad med aflæsningen?

Min. flow temp.

Reading of the minimum flow temperature demand for the current heating valve. A possible influence could be from the humidity control.

Max. flow temp.

Reading of the maximum flow temperature adjusted for the current heating valve.

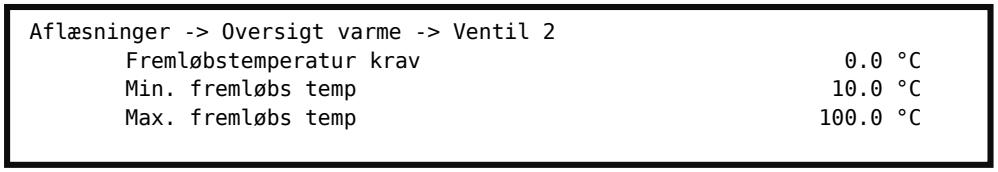


Figure 8
Overview for heating valve 2

Flow temp. demand

Reading of the demand for the flow temperature from valve 1.

TODO Hvad med aflæsningen?

Min. flow temp.

Reading of the minimum flow temperature demand for the current heating valve. A possible influence could be from the humidity control.

Max. flow temp.

Reading of the maximum flow temperature adjusted for the current heating valve.

Overview ventilation

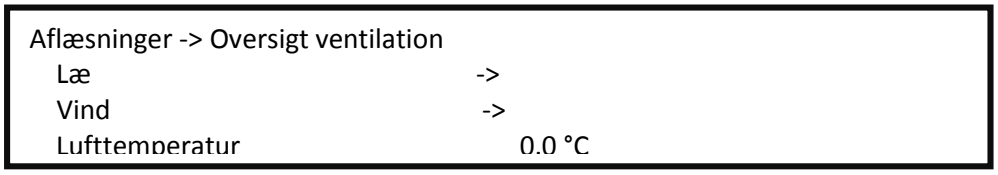


Figure 9
Overview ventilation

Air temperarture

The temperature measured in the air in the greenhouse.

Ventilation temperature demand

Reading of the estimated ventilation temperature demand for the compartment.

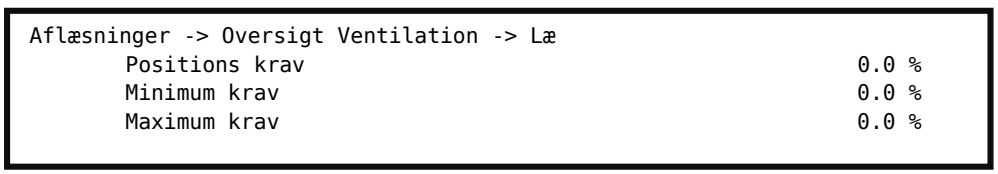


Figure 10
Overview leeside

Position demand

Reading of the estimated opening demand for the leeside in %.

Minimum demand

Reading of the estimated minimum demand for opening the leeside.

Maximum demand

Reading of the estimated maximum demand for opening the leeside.

```
Aflæsninger -> Oversigt Ventilation -> Vind
        Positions krav                                          0.0 %
        Minimum krav                                            0.0 %
        Maximum krav                                            0.0 %
```

Figure 11
Overview windside

Position demand

Reading the estimated opening demand for the windside in %.

Minimum demand

Reading the estimated minimum demand for opening the windside.

Maximum demand

Reading the estimated maximum demand for opening the windside.

Overview screens

```
Aflæsninger -> Oversigt gardiner
        Gardin 1                                                ->
        Gardin 2                                                ->
```

Figure 12
Screen menus

```
Aflæsninger -> Oversigt gardiner -> Gardin 1
    Position                                              0.0 %
    Positions krav                                        0.0 %
    Høj indstr.                                             Nej   [Nej, Ja]
    Høj temp.                                               Nej   [Nej, Ja]
    Lav temp.                                               Nej   [Nej, Ja]
    Lav udetemperatur                                       Nej   [Nej, Ja]
    Lavt lysniv.                                            Nej   [Nej, Ja]
    Lav gardintemp.                                         Nej   [Nej, Ja]
    Høj udetemperatur om natten                              Ja   [Ja, Nej]
    Nat/dag                                                 Nat   [Nat, Dag]
    Sne                                                     Nej   [Nej, Ja]
```

Figure 13
Overview screens

Position
The current position of screen 1.

Position demand
The demand for the position of screen 1.

The following readings can help to an understanding of the screen position:

High radiation
Yes indicates high radiation and that screen 1 is on or partial on for protection of the plants.

High temp.
Yes indicates that the temperature in the greenhouse is too high, which causes screen 1 on.

Low temp.
Yes indicates that the temperature in the greenhouse is too low, which causes screen 1 on.

Low outdoor temp.
Yes indicates that a low outdoor temperature causes screen 1 on.

Low light level
Yes indicates that screen 1 is on because of low light level while the supplementary light is on.

Low screen temp.
Yes indicates that screen 1 has stopped (gradual adjustment) or forced entirely on.
NB! This function can have separate screen sensors installed.

High outdoor temp. night
Yes indicates that the screen is off because of high outdoor temperature at night. For adjustment of the limit value, see **Fejl! Henvisningskilde ikke fundet..**

Night/day
Indicating whether it is night or day for screen 1.

Snow

Reading whether or not detected snow causes limitation for the position of screen 1.

```
Aflæsninger -> Oversigt gardiner -> Gardin 2
    Position                                          0.0
    Positions krav                                  0.0 %
    Høj indstr.                                       Nej   [Nej, Ja]
    Høj temp.                                         Nej   [Nej, Ja]
    Lav temp.                                         Nej   [Nej, Ja]
    Lav udetemperatur                                 Nej   [Nej, Ja]
    Lavt lysniv.                                      Nej   [Nej, Ja]
    Lav gardintemp.                                   Nej   [Nej, Ja]
    Høj udetemperatur om natten                        Ja   [Ja, Nej]
    Nat/dag                                           Nat   [Nat, Dag]
    Sne                                               Nej   [Nej, Ja]
```

Figure 14
See description by figure 13

Overview CO_2

```
Aflæsninger -> Oversigt CO2
    CO2 koncentration                             0.0 ppm
    CO2 konc. Krav                                0.0 ppm
    CO2 dosering aktiv                                Nej   [Nej, Ja]
    CO2 doserings tid                            00:00:00
    CO2 forbrug pr time                        0.0 kg/m2
```

Figure 15
Overview CO_2

CO_2 concentration

Reading the current CO_2 concentration.

CO2 concentration demand

Reading the estimated CO_2 concentration demand.

CO_2 dosing active

Reading whether or not the CO_2 dosing is active.

CO_2 dosing time

Reading the estimated dosing time.

CO2 consumption per hour

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

Overview suppl. light

```
Aflæsninger -> Oversigt assimilationslys
    Lys int.korr.-ass.lys                                  0.0 klx
    Lys intensitet korrigeret                              0.0 klx
    Ass.lys                                                    Fra   [Fra, Til]
```

Figure 16
Overview suppl. light

Light intensity corr. – suppl. light

Reading the corrected light intensity minus supplementary light. That is, the external light dimed by the glass and the screens, if they are on.

Light intensity corr.

Reading the light intensity corrected for supplementary light, greenhouse and screens, if they are on. That is, the external light dimed by the glass and the screens, if they are on + the light from the lamps.

Suppl. light

Reading whether the light is on or off.

Overview humidity control

```
Aflæsninger -> Oversigt fugtighedskontrol
    Fugtighedskontrol                                          ->
    Aflæsning fugtigheds-føler                                 ->
```

Figure 17
Humidity menus

```
Aflæsninger -> Oversigt fugtighedskontrol -> Fugtighedskontrol
    Fugtighed RH%                                        0.0 RH% 1)
    Fugtighed DX                                       0.0 g/kg 2)
    Max.RH fugtighedskrav                                0.0 RH% 1)
    Min.DX fugtighedskrav                              0.0 g/kg 2)
    Fugt-faktor freml.temp.                                  0.0
    Fugt-faktor vinduer                                      0.0
    Fugt-faktor gardiner                                     0.0
    Fugt-faktor luft-temp.                                   0.0
    FAN aktiv                                                Fra   [Fra, Til]
    Max.fugt signal                                          Fra   [Fra, Til]
```

Figure 18
Readings for the humidity control.

Humidity RH%

Reading the relative humidity measured by the humidity sensor.

Humidity DX

Reading the humidity deficit DX measured by the humidity sensor.

Max. RH% demand

Reading the current maximum accepted humidity above which the humidity control intervenes.

Min. DX humidity demand

Reading the current minimum accepted humidity deficit below which the humidity control intervenes.

Humidity factor flow temp.

Reading the humidity factor for increasing the minimum flow temperature by high humidity.

0.00: No increase

1.00: Full increase

Humidity factor vent

Reading the humidity factor for increasing the minimum vent position by high humidity.

0.00: No increase

1.00: Full increase

Humidity factor screens

Reading the humidity factor for limitation of the screen position by high humidity.

0.00: Full limitation

1.00: No limitaion Skal det byttes? TODO

Humidity factor air temp.

Reading the humidity factor for increasing the air temperature by high humidity.

HAF active

Reading the status of the HAF (Horizontal Air Fan) dependent on temperature, humidity and vent position.

Max. humidity signal

"**On**" indicates that the humidity measurement has exceeded **Max. RH% demand**.

```
Aflæsninger -> Oversigt fugtighedskontrol -> Aflæsning fugtigheds-føler

Fugtighed RH%                                          0.0 RH% 1)
Fugtighed DX                                         0.0 g/kg 2)
Fugtighed VPD                                        0.0 mbar
```

Figure 19
Readings for humidity.

1) Only visible if **RH** is chosen as unit.
2) Only visible if **DX** is chosen as unit.

Setup + Service -> Installation setup -> Humidity control setup -> Humidity unit **TODO Sprog?**

Humidity RH%

Reading the relative humidity measurement used for the humidity control.

Humidity DX

Reading the measured humidity deficit used for the humidity control.

Humidity VPD

Reading the distance to saturation as mbars.

Overview irrigation

```
Aflæsninger -> Oversigt vanding
    Oversigt overbrusning                                    ->
    Oversigt vanding                                         ->
```

Figure 20
Overview for irrigation.

```
Aflæsninger -> Oversigt vanding -> Oversigt overbrusning 1
    Auto-periode                                             Fra    [Fra, Aut., Man.]
    Overbrusning aktiv                                       Nej    [Nej, Ja]
    Ventil nummer    TODO                                    0
    Intervaltid                                          00:00:00
```

Figure 21
Overview for misting.

Auto period

Off: The misting is not in the auto period or turned off.

Aut.: The misting is in the auto period.

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

Misting active

Reading whether the misting is active or not.

Valve number TODO

Reading the active valve number.

Interval time

Reading the current misting interval.

By humidification or cooling the interval is variable.

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

```
Aflæsninger -> Oversigt vanding -> Oversigt overbrusning 2
    Auto-periode                                          Fra   [Fra, Aut., Man.]
    Overbrusning aktiv                                    Nej   [Nej, Ja]
    Ventil nummer                                           0
    Intervaltid                                      00:00:00
```

Figure 22
TODO

```
Aflæsninger -> Oversigt vanding -> Oversigt vanding
    Ventil nummer        TODO                               0
    Udført vandingstid                               00:00:00
    Udført ventil-pausetid                           00:00:00
    Manuel vandingsomgange                                  0
    Resterende vandinger solint.                          0 Wh
    Akk.sol siden sidste start                          0.0 Wh
    Ekstern start aktiv                                   Nej   [Nej, Ja]
    Tidspunkt for sidste start                            0 s
    Udførte vandinger i dag                                 0
    Udførte vandinger totalt                                0
    Kontroller tilstand                                 Klar
                                  [Klar, -, -, Aktiv, Standby, -, Ventil-pause, -]
```

Figure 23
Overview for irrigation.

Valve number TODO

Reading which valve (number) is active.

Elapsed irrigation time

Reading of the elapsed irrigation time on active valve.

Elapsed valve pause time

Reading of the elapsed valve pause time.

Manual irrigation cycles

Reading of the remaining manual irrigation cycles. (**Can be adjusted**)

Remaining irrigations sun integrator

Reading of the remaining irrigation cycles for the sun integrator. (**Can be adjusted**)

Acc. sun since last start

Reading of 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 adjusted**)

Elapsed irrigations totally/total

Reading the number of elapsed irrigations totally. (**Can be adjusted**)

Check status

Reading the status of the irrigation program:

Ready, Active, Standby, Valve pause.

Average readings

```
Aflæsninger -> Afdelings middel aflæsninger
    Middel-Døgn                                          ->
    Middel-Dag                                           ->
    Middel-Nat                                           ->
```

Figure 24
Readings for average values.

```
Aflæsninger -> Afdelings middel aflæsninger -> Middel-Døgn
    Lufttemperatur                                    0.0 °C
    Fugtighed                                            0.0
    CO2 koncentration                                0.0 ppm
    Fremløbstemp. 1                                   0.0 °C
    Fremløbstemp. 2                                   0.0 °C
    Jordtemperatur                                    0.0 °C
    Vent. Krav                                         0.0 %
```

Figure 25
Readings for average values for the day.

Air temperature

Average calculation of the air temperature for the day.

Humidity

Average calculation of the humidity for the day.

CO_2 concentration

Average calculation of the CO_2 concentration for the day.

Flow temp. 1

Average calculation of the temperature for flow temperature sensor 1 for the day.

Flow temp. 2

Average calculation of the temperature for flow temperature sensor 2 for the day.

Soil temperature

Reading the estimated average of the soil temperature the last 24 hours.

Vent. demand

Reading the average ventilation demand the last 24 hours.

```
Aflæsninger -> Afdelings middel aflæsninger -> Middel-Dag
    Lufttemperatur                                    0.0 °C
    Fugtighed                                           0.0
    CO2 koncentration                                 0.0 ppm
    Fremløbstemp. 1                                   0.0 °C
    Fremløbstemp. 2                                   0.0 °C
    Jordtemperatur                                    0.0 °C
    Vent. Krav                                          0.0 %
```

Figure 26
Readings for the average values for the day.

Air temperature

Average calculation of the air temperature for the day.

Humidity

Average calculation of the humidity for the day.

CO_2 concentration

Average calculation of the CO_2 concentration for the day.

Flow temp. 1

Average calculation of the temperature for flow temperature sensor 1 for the day.

Flow temp. 2

Average calculation of the temperature for flow temperature sensor 2 for the day.

Soil temperature

Reading the estimated average of the soil temperature the last 24 hours.

Vent. demand

Reading the average ventilation demand the last 24 hours.

```
Aflæsninger -> Afdelings middel aflæsninger -> Middel-Nat
    Lufttemperatur                                    0.0 °C
    Fugtighed                                           0.0
    CO2 koncentration                                 0.0 ppm
    Fremløbstemp. 1                                   0.0 °C
    Fremløbstemp. 2                                   0.0 °C
    Jordtemperatur                                    0.0 °C
    Vent. Krav                                         0.0 %
```

Figure 27
Readings for the average values for the night.

Air temperature

Average calculation of the air temperature for the night.

Humidity

Average calculation of the humidity for the night.

CO_2 concentration

Average calculation of the CO_2 concentration for the night.

Flow temp. 1

Average calculation of the temperature for flow temperature sensor 1 for the night.

Flow temp. 2

Average calculation of the temperature for flow temperature sensor 2 for the night.

Soil temperature

Reading the estimated average of the soil temperature for the recent night.

Vent. demand

Reading the average ventilation demand for the recent night.

Registrations

```
Aflæsninger -> Afdelings registreringer
    CO2 forbrugt                                  0.0 kg/m2
    CO2 aktiv tid                                  00:00:00
    Lys-energi forbrugt                                 0.0
    Lyssum døgn                                    0.0 klxh
    Lyssum total                                   0.0 klxh
    Lystrin 1 aktiv tid                                 0 s
```

Figure 28
Registrations.

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.

Light energy used

Reading the used energy for light.

Light sum 24 hours

Reading the light sum within the 24 hours.

Light sum total

Reading the total light sum.

Light step 1 active time

Reading the total time where light step 1 has been active.

Weather station

```
Aflæsninger -> Vejrstations aflæsninger
    Udendørstemperatur                                  0.0 °C
    Lysintensitet                                       0.0 klx
    Solintensitet                                     0.0 W/m2
    Udendørsfugtighed                                    0.0 %
    Vindhastighed                                       0.0 m/s
    Vindretning                                           0.0 °
    Regn                                                  Nej   [Nej, Ja]
    Sne                                                   Nej   [Nej, Ja]
    Sol op                                            08:39:00
    Sol ned                                           17:30:00
```

Figure 29
Readings for the weather station.

Outdoor temp.

The temperature measured at the weather station.

Light intensity

The light outside measured with the kLux sensor of the weather station.

Sun intensity

The intensity of the sun light measured with the solar cell of the weather station.

Outdoor humidity

The humidity measured at the weather station.

Wind speed

Measuring the wind speed.

Wind direction

Measuring the wind direction. 0° is north, 90° is east, 180° is south and 270° is west.

Rain

Indicates whether it rains or not.

Snow

Indicates whether it snows or not. Snow is detected by low outdoor temperature combined with rain.

Sun up

Reading the time of the sunrise.

Sun down

Reading the time of the sunset.

These times are estimated on the basis of the adjustments for longitude, latitude and date.

Adjustments

```
Temperatur
    Fælles varme-temperatur                                  ->
    Middel temperatur kontrol                                ->
    Negativ dif.                                             ->
    Lyssums                                          ->
    Fælles ventilationstemperatur                            ->
    Varme-temperatur zone 1                                  ->
    Varme-temperatur zone 2                                  ->
    Varmeventiler                                            ->
    Primær varmeventil controller 1                          ->
    Sekundær varmeventil controller 1                        ->
    Primær varmeventil controller 2                          ->
    Varme step                                               ->
    Varme-step ved max.fugtighed                             ->
```

Figure 30
Menus for temperature adjustments.

Common heating temperature

```
Temperatur -> Fælles varme-temperatur
    Basis varme-temp.                                    18.0 °C
    Hævning temp.ved høj fugt.                            0.0 °C
    Tidszone ved ass.lys (nat)                               1
    Tidszone tillæg                                         ->
    Lysniveauer og ramper                                   ->
    Lysafhængig                                           0.0 °C
    Varmekrav                                             0.0 °C
    Aktiv TZ                                                 1
```

Figure 31
Settings for common heating temperature and time zones.

Basic heating temperature

Adjusting the basic temperature of the greenhouse by heating.

The basic heating temperature is basis for the **common heating temperature demand**, which can include following:

- Basic heating 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

Adjusting the increase of the heating temperature caused by high humidity.

Regarding the distance to max. humidity and P-band, see Figure 107.

Time zone by suppl. light (night)

Selecting the time zone by supplementary light at night, i.e. time zone 5 and 6.

If **1** is chosen, the temperature will change to time zone 1 when the supplementary light is on. If the supplementary light is back off, while it is still night, it changes back to time zone 5 or 6.

Light dependent

Reading the current temperature addition based on the light dependency.

Heating demand

The current demand for the air temperature by heating.

Active time zone

Indicates which time zone is currently active.

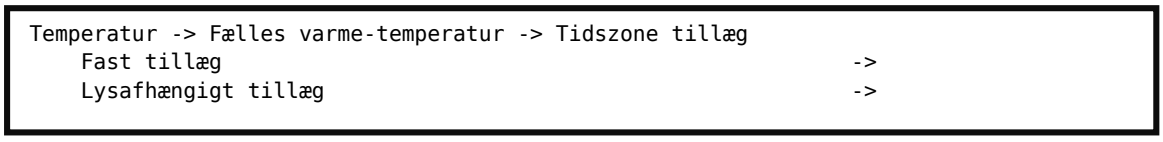


Figure 32
Menus for time zone addition.

```
Temperatur -> Fælles varme-temperatur -> Tidszone tillæg -> Fast tillæg
    Zone 1                                                  0.0 °C
    Zone 2                                                  0.0 °C
    Zone 3                                                  0.0 °C
    Zone 4                                                  0.0 °C
    Zone 5                                                  0.0 °C
    Zone 6                                                  0.0 °C
```

Figure 33
Fixed additions in the time zones.

Time zone 1 – 6

Adjusting the fixed additions in the time zones. Regarding the ramp/speed for temperature change in each time zone, see Figure 55.

Light dependent addition per time zone 1 – 6

Adjusting the light dependent addition in each time zone.

```
Temperatur -> Fælles varme-temperatur -> Tidszone tillæg -> Lysafhængigt tillæg
    Zone 1                                                  0.0 °C
    Zone 2                                                  0.0 °C
    Zone 3                                                  0.0 °C
    Zone 4                                                  0.0 °C
    Zone 5                                                  0.0 °C
    Zone 6                                                  0.0 °C
```

Figure 34
Light dependent additions in the time zones.

Time zone 1 – 6

Adjusting the light dependent addition in each time zone.

```
Temperatur -> Fælles varme-temperatur -> Lysniveauer og ramper
    Start                                                   ->
    Fuldt                                                   ->
    TZ rampe                                                ->
    Rampe for stigning lystillæg                        6.0 °C/h
    Rampe for sænkning lystillæg                        1.5 °C/h
```

Figure 35
Menus and adjustments for the ramps.

Ramp for increase light addition

Adjusting the ramps (speed) for increasing the light addition by temperature addition caused by light.

Ramp for decrease light addition

Adjusting the ramps (speed) for decreasing the light addition by addition caused by light.

(LCC Completa, User, S. 69)

```
Temperatur -> Fælles varme-temperatur -> Lysniveauer og ramper -> Start
    Zone 1                                                    0.0 klx
    Zone 2                                                    0.0 klx
    Zone 3                                                    0.0 klx
    Zone 4                                                    0.0 klx
    Zone 5                                                    0.0 klx
    Zone 6                                                    0.0 klx
```

Figure 36
Start levels.

Time zone 1-6

Adjusting the light levels for starting the light dependent addition in each time zone.

```
Temperatur -> Fælles varme-temperatur -> Lysniveauer og ramper -> Fuldt
    Zone 1                                                   30.0 klx
    Zone 2                                                   30.0 klx
    Zone 3                                                   30.0 klx
    Zone 4                                                   30.0 klx
    Zone 5                                                   30.0 klx
    Zone 6                                                   30.0 klx
```

Figure 37
Settings for light levels for full addition in each time zone.

Time zone 1-6

Adjusting the light level for full light dependent addition in each time zone.

```
Temperatur -> Fælles varme-temperatur -> Lysniveauer og ramper -> TZ rampe
    Zone 1                                                   1.0 °C/h
    Zone 2                                                   1.0 °C/h
    Zone 3                                                   1.0 °C/h
    Zone 4                                                   1.0 °C/h
    Zone 5                                                   1.0 °C/h
    Zone 6                                                   1.0 °C/h
```

Figure 38
Time zone ramps.

Time zone 1-6

Adjusting how fast the temperature may change in each time zone.

0 » no ramp.

Average temperature control

```
Temperatur -> Middel temperatur kontrol
    Middeltemp.kontrol aktiv                              Nej    [Nej, Ja]
    Middeltemperatur krav                              20.0 °C
    Midlingsperiode                                   72:00:00
    Genvindingstid                                    24:00:00
    TZ gevind.-temp.grænser                                ->
    Genvindings-temperatur                             0.0 °C
    Middeltemperatur                                   0.0 °C
    Aktiv TZ                                                1
```

Figure 39
Settings for average temperature control.

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 temp. 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.

TZ recovery temp. limits
Adjusting the addition limits, min./max., in each time zone.

Recovery temp.
Reading the current temperature addition from the average temperature control.

Average temperature
Reading the current average temperature.

Active time zone
Indicates which time zone is currently active.

```
Temperatur -> Middel temperatur kontrol -> TZ gevind.-temp.grænser
    Maximum                                                ->
    Minimum                                                ->
```

Figure 40
Settings for min./max. addition limits in each time zone.

```
Temperatur -> Middel temperatur kontrol -> TZ gevind.-temp.grænser -> Maximum
    Zone 1                                                    2.0 °C
    Zone 2                                                    2.0 °C
    Zone 3                                                    2.0 °C
    Zone 4                                                    2.0 °C
    Zone 5                                                    2.0 °C
    Zone 6                                                    2.0 °C
```

Figure 41
Settings for max. limits for addition in each time zone.

Time zone 1-6

Adjusting the maximum limits for allowed temperature addition in the time zones.

```
Temperatur -> Middel temperatur kontrol -> TZ gevind.-temp.grænser -> Minimum
    Zone 1                                                   -2.0 °C
    Zone 2                                                   -2.0 °C
    Zone 3                                                   -2.0 °C
    Zone 4                                                   -2.0 °C
    Zone 5                                                   -2.0 °C
    Zone 6                                                   -2.0 °C
```

Figure 42
Settings for min. limits for addition in each time zone.

Time zone 1-6

Adjusting the minimum limits for allowed temperature addition in the time zones.

Negative DIF

```
Temperatur -> Negativ dif.
    Funktionsvælger                                          Fra   [Fra, Abs., rel.]
    Start periode 2 abs.tid                               05:30:00 1)
    Start periode 2 rel.tid                               00:00:00 2)
    Temp.tillæg per.1                                       0.0 °C
    Temp.tillæg per.2                                       0.0 °C
    Varighed periode 1                                    00:00:00
    Varighed periode 2                                    00:30:00
    Rampe stigende temperatur                             6.0 °C/h
    Rampe faldende temperatur                             6.0 °C/h
    Periode                                                      0
    Varmekrav                                               0.0 °C
```

Figure 43
Settings for Negative DIF.

1) Only visible when Temperature → Negative DIF → Function selector is on Abs.

2) Only visible when Temperature → Negative DIF → Function selector is on Rel.

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 sunrise called "drop time".

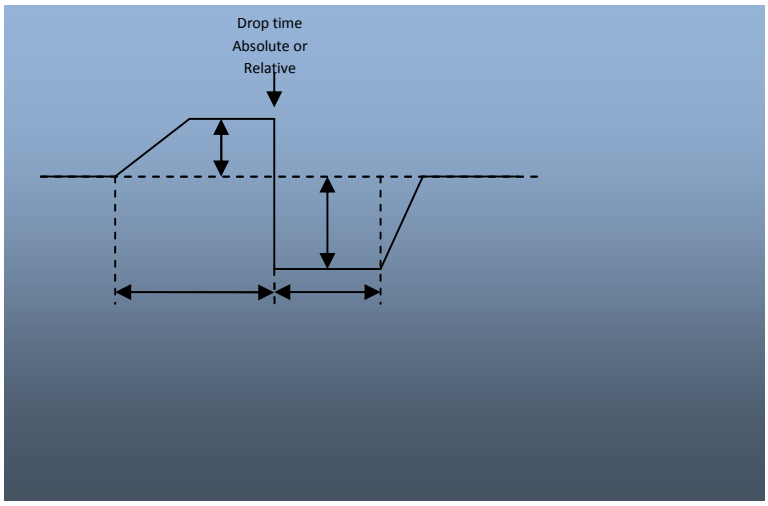


Figure 44
Sequence of Negative DIF.

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 Negative DIF.

0 » no ramp.

Ramp decreasing temperature

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

Heating demand

Reading the current temperature addition caused by Negative DIF.

Light sum night addition

```
Temperatur -> Lyssums nattillæg
    Lyssumstillæg TZ 5                                  0.0 °C
    Lyssumstillæg TZ 6                                  0.0 °C
    Lyssum for start tillæg                           0.0 klxh
    Lyssum for fuldt tillæg                        1000.0 klxh
    Lyssum                                            0.0 klxh
    Lyssumtillæg                                        0.0 °C
    TZ                                                        1
```

Figure 45
Settings for light sum night 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.

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.

The reading is always 0 °C in the day time. (Time zone 1-4)

Time zone

Indicates which time zone is currently active.

Common ventilation temperature

The common ventilation temperature can be used as "basic" 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.

```
Temperatur -> Fælles ventilationstemperatur
    Fælles ventilationssetup.                          Relativ   [Absolut, Relativ]
    Afst.til varme-temp. Krav                           2.0 °C 1)
    Ventilations-temperatur basis                      25.0 °C 2)
    Tidszone tillæg                                         ->
    Temp.tillæg ved lav fugt                                ->
    CO2 afh.temp.tillæg                                     ->
    CO2 afh.temp.tillæg                                 0.0 °C
    Lysafhængig                                         0.0 °C
    Vent. Krav                                          0.0 °C
    Aktiv TZ                                                 1
```

Figure 46
Settings for ventilation temperature and various additions.

1) Only visible when Temperature → Common ventilation temperature → Common ventilation setup is on **Relative**.
2) Only visible when Temperature → Common ventilation temperature → Common ventilation setup is on **Absolute**.

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 set points and is not depending on the heating temperature.

Relative: The ventilation temperature follows the heating temperature 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 heating temp. demand

Adjusting the addition/distance to the common heating temperature demand.

Only active and visible then the **common ventilation setpoint** is 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 additions 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 basis ventilation temperature.

Only active and visible when the **common ventilation setpoint** is on **Absolute**.

The final common ventilation temperature will be **ventilation temp. basis** 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.

Time zone addition

Adjusting the time zone addition.

Temp. addition by low humidity

Adjusting the temperature addition caused by low humidity.

CO_2 dependent temp. addition

Adjusting the temperature addition caused by the CO_2 level.

CO_2 dependent temp. addition

Reading the current CO_2 dependent addition for the ventilation temperature.

TODO hvordan kan man se at der er tale om en aflæsning?

Light dependent

Reading the current light dependent addition for the ventilation temperature.

Vent. demand

Reading the current ventilation temperature demand.

Active time zone

Indicates which time zone is currently active.

```
Temperatur -> Fælles ventilationstemperatur -> Tidszone tillæg
    Fast tillæg                                              ->
    Lysafhængigt tillæg                                      ->
```

Figure 47
Settings for time zone additions, ventilation.

```
Temperatur -> Fælles ventilationstemperatur -> Tidszone tillæg -> Fast tillæg
    Zone 1                                                  0.0 °C
    Zone 2                                                  0.0 °C
    Zone 3                                                  0.0 °C
    Zone 4                                                  0.0 °C
    Zone 5                                                  0.0 °C
    Zone 6                                                  0.0 °C
```

Figure 48
Settings for fixed time zone additions, ventilation.

Time zone 1-6

Adjusting the fixed ventilation temperature addition in the time zones.

```
Temperatur -> Fælles ventilationstemperatur -> Tidszone tillæg -> Lysafhængigt tillæg
    Zone 1                                                  0.0 °C
    Zone 2                                                  0.0 °C
    Zone 3                                                  0.0 °C
    Zone 4                                                  0.0 °C
    Zone 5                                                  0.0 °C
    Zone 6                                                  0.0 °C
```

Figure 49
Settings for light dependent time zone additions, ventilation.

Time zone 1-6

Adjusting the light dependent ventilation temperature addition in the time zones.

```
Temperatur -> Fælles ventilationstemperatur -> Temp.tillæg ved lav fugt
    Tidszone tillæg                                          ->
    P-bånd for fuld hævning                              2.0 g/kg 2)
    P-bånd for fuld hævning                              10.0 RH% 1)
    Temp.hævn.ved vent. Reduktion                          3.0 °C
    P-bånd annull.vent.reduktion                           2.0 °C
```

Figure 50
Settings for temperature additions by low humidity.

1) Only visible when **RH** is chosen as unit.
2) Only visible when **DX** is chosen as unit.

```
Setup + Service -> Installation setup -> Humidity control setup -> Humidity unit
```

Time zone addition

Adjusting the ventilation temperature addition by low humidity.

P-band for full addition

Adjusting the humidity P-band for full addition of the ventilation temperature demand and/or full lowering of the maximum vent position by low humidity. See Figure 68.

Temp. increase by vent. reduction

Adjusting the allowed increase of 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.

```
Temperatur -> Fælles ventilationstemperatur -> Temp.tillæg ved lav fugt -> Tidszone tillæg
    Temp.tillæg                                              ->
    Fugt for start temp.tillæg                               ->
```

Figure 51
Menus over time zone addition by low humidity.

```
Temperatur -> Fælles ventilationstemperatur -> Temp.tillæg ved lav fugt -> Tidszone tillæg -> Temp.tillæg
    Zone 1                                                   0.0 °C
    Zone 2                                                   0.0 °C
    Zone 3                                                   0.0 °C
    Zone 4                                                   0.0 °C
    Zone 5                                                   0.0 °C
    Zone 6                                                   0.0 °C
```

Figure 52
Settings for time zone addition by low humidity.

Time zone 1-6

Adjusting the addition for the ventilation temperature demand by low humidity in each time zone.

```
Temperatur -> Fælles ventilationstemperatur -> Temp.tillæg ved lav fugt -> Tidszone tillæg ->
Fugt for start temp.tillæg
    Zone 1                                                  60.0 RH%
    Zone 2                                                  60.0 RH%
    Zone 3                                                  60.0 RH%
    Zone 4                                                  60.0 RH%
    Zone 5                                                  60.0 RH%
    Zone 6                                                  60.0 RH%
```

```
Temperatur -> Fælles ventilationstemperatur -> Temp.tillæg ved lav fugt -> Tidszone tillæg ->
Fugt for start temp.tillæg
    Zone 1                                                 10.0 g/kg
    Zone 2                                                 10.0 g/kg
    Zone 3                                                 10.0 g/kg
    Zone 4                                                 10.0 g/kg
    Zone 5                                                 10.0 g/kg
    Zone 6                                                 10.0 g/kg
```

Figure 53
Settings for starting the addition in humidity in either RH% or DX.

Time zone 1-6

Adjusting the humidity for starting the increase of the ventilation temperature in each time zone and/or lowering the maximum vent position. See Figure 68.

```
Temperatur -> Fælles ventilationstemperatur -> CO2 afh.temp.tillæg
    CO2 afh.temp.tillæg                                      0.0 °C
    CO2 kons.for start tillæg                              300.0 ppm
    CO2 kons.for fuldt tillæg                             1200.0 ppm
```

Figure 54
Settings for CO_2 dependent temperature addition.

CO_2 dependent temperature addition

Adjusting the wanted increase of 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 CO_2 concentration for full increase of the ventilation temperature demand.

Heating temperature

```
Temperatur -> Varme-temperatur zone 1
    Temp.setpunkts-vælger                          Fælles   [Fælles, Lokal]
    Temp.afst.til fælles krav                       0.0 °C 1)
    Temperatur dag                                 18.0 °C 2)
    Temperatur nat                                 18.0 °C 2)
    Rampe stigende temp.krav                      0.0 °C/h
    Rampe faldende temp.krav                      0.0 °C/h
    Lys-afh.temp.-tillæg                            0.0 °C 2)
    Hævning temp.ved høj fugt.                      0.0 °C
```

Figure 55
Settings for the heating temperature in zone 1.

1) Only visible when Temperature → Heating temp. zone 1 → Temp. setpoint selector is on **Common**.
2) Only visible when Temperature → Heating temp. zone 1 → Temp. setpoint selector is on **Local**.

Temp. setpoint selector

Selecting the ”basic” heating temepeture setpoint.

Common: Heating zone 1/2 will use the common heating temperature as basic.
The heating zone can have following local additions:
Temp. distance to common demand.
Increase temp. by high humidity.

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

Temp. 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 ser here.

Temp. night

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

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.

Light dependent temp. 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 Heating Temp.

NB! When using Common Heating Temp., this local addition will be added to a possible addition in the Common Heating Temp.

Increase temp. by high humidity

Adjusting the wanted local increase of the heating temperature by high humidity.

The offset to maximum humidity and the P-band, see Figure 107.

```
Temperatur -> Varme-temperatur zone 2
    Temp.setpunkts-vælger                          Fælles   [Fælles, Lokal]
    Temp.afst.til fælles krav                       0.0 °C 1)
    Temperatur dag                                 18.0 °C 2)
    Temperatur nat                                 18.0 °C 2)
    Rampe stigende temp.krav                      0.0 °C/h
    Rampe faldende temp.krav                      0.0 °C/h
    Lys-afh.temp.-tillæg                            0.0 °C 2)
    Hævning temp.ved høj fugt.                      0.0 °C
```

Figure 56
Settings for temperature by heating, zone 2.

1) Only visible when Temperature → Heating temp. zone 2 → Temp. set point selector is on **Common**.
2) Only visible when Temperature → Heating temp. zone 2 → Temp. set point selector is on **Local**.

Zone 2 will possibly be used for soil sensor regulation. (Soil temperature)

For description of adjustments for zone 2, see Figure 55.

Heating valves

```
Temperatur -> Varmeventiler
    Varmeventil 1                                  Aut.   [Lukke, Aut., Åbne, Stop]
    Varmeventil 2                                  Aut.   [Lukke, Aut., Åbne, Stop]
```

Figure 57
Function selectors for the heating valves.

Heating valve 1-2

Close: The valve will close completely.
Aut.: The valve will automatically regulate the temperature in the greenhouse.
Open: The valve will open completely.
Stop: The valve will stop in the current position.

Primary heating valve controller 1

```
Temperatur -> Primær varmeventil controller 1
    Minimum frl.temp.dag                                10.0 °C
    Minimum frl.temp.nat                                10.0 °C
    Minimum frl.temp.ved max fugt                       10.0 °C
    Minimum frl.temp.ved ass.lys                        10.0 °C
    Minimum frl.temp.ved varme dump                      0.0 °C
    Reducer min.frl.temp.lysafh.                         0.0 °C
    Max. fremløbs temp                                 100.0 °C
    Prim.krav f. start parallel                        100.0 °C
    Sek.krav f. start parallel                         200.0 °C
    Prim.krav f. start sekundær                        200.0 °C
    Min. temperatur                                     10.0 °C
    Fremløbstemperatur                                   0.0 °C
```

Figure 58
Settings for limitations for the heating valves and how they affect each other.

Min. flow temp. day
Minimum flow temperature during the day.

Min. flow temp. night
Minimum flow temperature at night.

Min. flow temp. by max. humidity
Minimum flow temperature by too high humidity.

Min. flow temp. by suppl. light
Minimum flow temperature by active supplementary light. Can be used in connection with ventilation caused by surplus heating from the lamps and it thereby gets too cold down by the plants.

Min. flow temp. by heating dump
Adjusting the minimum flow temperature by heating dump demand from the boiler room control EMA Completa. The heating dump demand will be transmitted when the storage tank is almost full.
For further information please contact Senmatic A/S DGT.

Reduce min. flow temp. light dependent
Adjusting the reduction on the minimum flow temperature dependent on the light intensity. The value is **set negatively** for reduction. The light dependency follows the settings for Common Heating Temperature. Se **Fejl! Henvisningskilde ikke fundet.**

Max. flow temperature
Adjusting the maximum flow temperature.
When the flow temperature demand exceeds this setting, the surplus demand will be passed on to heating valve 2, if it is setup to be secondary heating valve.

Primary demand for start parallel
Adjusting the flow temperature demand on primary heating valve for start opening of secondary heating valve. The increasing demand will be split between the 2 valves with a fixed ratio (can be changed in service settings).

Secondary demand for start parallel
Adjusting the flow temperature demand on secondary heating valve for start opening the primary heating valve. This can be used after **Primary demand for start secondary**, which will stop primary heating valve.

Primary demand for start secondary
Adjusting the flow temperature on the primary heating valve for stopping primary heating valve and start opening secondary heating valve. The secondary heating valve will take over the heating contribution until it reaches maximum or **Secondary demand for start parallel**, then the primary heating valve will continue opening by increasing heating demand.

Readings

Min. temperature
Reading of the current minimum flow temperature demand.

Flow temperature
Reading of the measured flow temperature.

Secondary heating valve controller 1

```
Temperatur -> Sekundær varmeventil controller 1
    Minimum frl.temp.dag                                10.0 °C
    Minimum frl.temp.nat                                10.0 °C
    Minimum frl.temp.ved max fugt                       10.0 °C
    Reducer min.frl.temp.lysafh.                         0.0 °C
    Max. fremløbs temp                                 100.0 °C
    Min. temperatur                                     10.0 °C
    Fremløbstemperatur                                   0.0 °C
```

Figure 59
Settings for secondary heating valve controller 1.

For description see Figure 58.

```
Temperatur -> Primær varmeventil controller 2
    Minimum frl.temp.dag                                10.0 °C
    Minimum frl.temp.nat                                10.0 °C
    Minimum frl.temp.ved max fugt                       10.0 °C
    Reducer min.frl.temp.lysafh.                         0.0 °C
    Max. fremløbs temp                                 100.0 °C
    Prim.krav f. start parallel                        100.0 °C
    Sek.krav f. start parallel                         200.0 °C
    Prim.krav f. start sekundær                        200.0 °C
    Min. temperatur                                      0.0 °C
    Fremløbstemperatur                                   0.0 °C
```

Figure 60
Settings for primary heating valve controller 2.

For description see Figure 58.

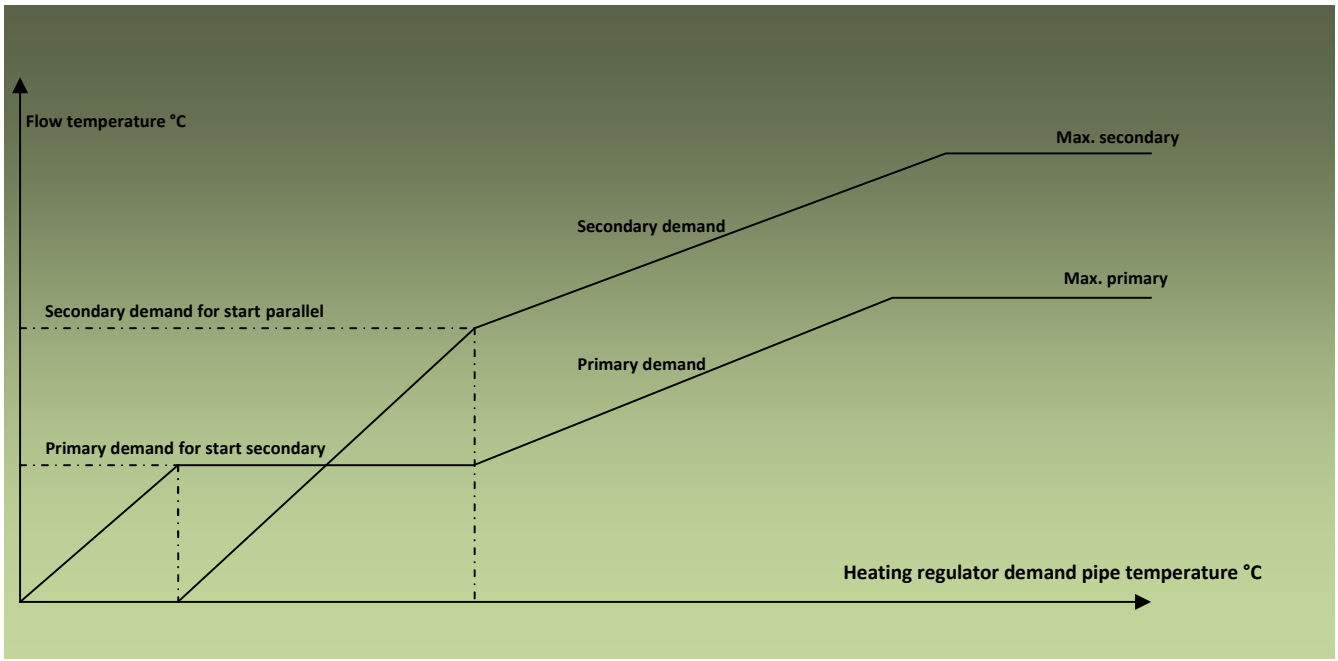


Figure 61
Cascade control of heating valves.

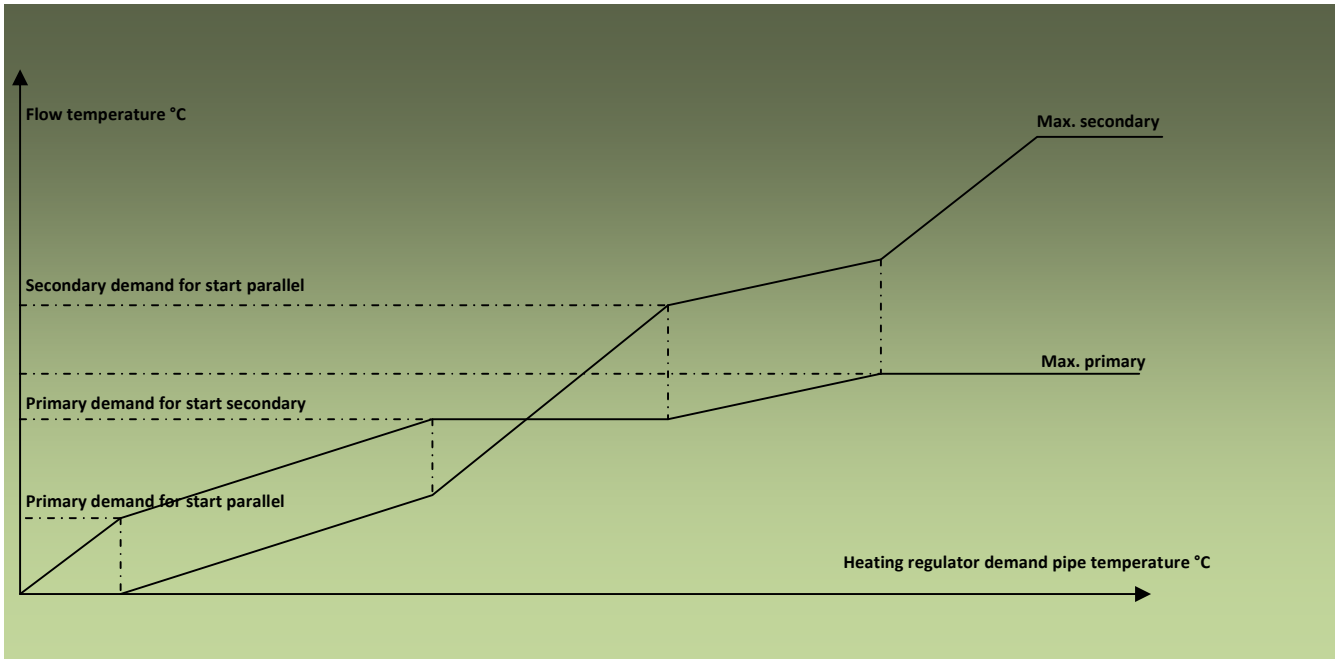


Figure 62
Cascade control with stop primary + parallel.

Heating step

```
Temperatur -> Varme step
    Afst.varmekrav step 1                          -1.0 °C
    Afst.varmekrav step 2                          -2.0 °C
    Fristilling varme-step                          0.5 °C
    Varme-step 1                                       Fra   [Fra, Til]
    Varme-step 2                                       Fra   [Fra, Til]
```

Figure 63
Settings for heating step.

Distance heating demand step 1

Adjusting the temperature distance for the heating temperature demand for starting heating step 1.
Example: By a heating demand at 18 °C and a step setting at -1,0 °C, the step will start below 17 °C.

Distance heating demand step 2

Adjusting the temperature distance for the heating temperature demand for starting heating step 2.

Heating step 1

Indicates whether or not heating step 1 is active.

Heating step 2

Indicates whether or not heating step 2 is active.

```
Temperatur -> Varme-step ved max.fugtighed
    Step 1 aktiv ved max fugt                                  Nej    [Nej, Ja]
    Step 2 aktiv ved max fugt                                  Nej    [Nej, Ja]
```

Figure 64
Selecting whether or not step should be active by humidity control.

Step 1 active by max. humidity

Selecting if heating step 1 should be active by maximum humidity.

Step 2 active by max. humidity

Selecting if heating step 2 should be active by maximum humidity.

Ventilation

```
Ventilation
    Ventilations setup                                          ->
    Ventilations begrænsninger                                  ->
    Ventilation specielt                                        ->
    Ventilations-step                                           ->
```

Figure 65
Settings for ventilation.

```
Ventilation -> Ventilations setup
    Funktionsvælger vindue 1                                    Aut.    [Lukke, Aut., Åbne, Stop]
    Funktionsvælger vindue 2                                    Aut.    [Lukke, Aut., Åbne, Stop]
    Læside valg                                                 Aut.    [Aut., 1, 2]
    Ude temp.frost-beskyttelse                                -5.0 °C
    Vindhastighed for storm                                  10.0 m/s
    Vindhastighed for orkan                                  15.0 m/s
```

Figure 66
Ventilation setup.

Function selector vent 1

Selecting the function for vent 1:

Function selector vent 2

Selecting the function for vent 2:

Close: The vents will close completely.

Aut.: The vents will operate depending on the ventilation demand from the ventilation controller.
Open: The vents will open completely.
Stop: The vents will stop and stay in the current position.

Leeside selection
Selecting if there should be an automatic leeside shift or if there should be a fixed leeside on vent 1 or 2.

Outdoor temp. frost protection
Adjusting the limit value for the outdoor temperature under which forced closure of vent 1+2 will happen.

Wind speed for gale
Adjusting the wind speed for indication of ”gale”, which will lower the maximum position of the vents.

Wind speed for storm
Adjusting the wind speed for indication of ”storm”, which will close the vent completely or open the leeside a little, if wanted. See Figure 67. Opening the leeside in connection with storm can possibly equalize the negative pressure so that the glass won’t be sucked out.

Ventilation limitations

```
Ventilation -> Ventilations begrænsninger
    Min.læside normal                                    0.0 %
    Min.læside ved høj fugt.                            20.0 %
    Min.læside ved orkan                                 5.0 %
    Max.læside normal                                  100.0 %
    Max.læside ved regn                                 50.0 %
    Max.læside ved storm                                30.0 %
    Min.vindside normal                                  0.0 %
    Min.vindside ved høj fugt                            0.0 %
    Max.vindside normal                                100.0 %
    Max.vindside ved regn                               50.0 %
    Max.vindside ved storm                               0.0 %
```

Figure 67
Limitations for the vents.

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

Min. leeside by high humidity
Adjusting the minimum position of the leeside for controller 1 by high humidity.

Min. leeside by storm
Adjusting the minimum position of the leeside for controller 1 by storm.
By opening the leeside a little in case of blasts of wind, damages on the greenhouse may be avoided.

Max. leeside normal
Adjusting the ”fixed” maximum position for the leeside.

Max. leeside by rain
Adjusting the maximum position of the leeside by rain.

Max. leeside by gale
Adjusting the maximum position of the leeside by gale/high wind speed.

NB! Max. position leeside can be reduced depending on low humidity.
NB! Max. position leeside can also be reduced depending on low outdoor temperature and high wind speed.

Min. windside normal
Adjusting the minimum windside for controller 1. That is **forced opening**, which however can be overruled by low outdoor temperature, high wind speed and low indoor temperature.

Min. windside by high humidity
Adjusting the minimum position of the wind side by high humidity.

Max. windside normal
Adjusting the ”fixed” maximum position of the windside.

Max. windside by rain
Adjusting the maximum position of the windside by rain.

Max. windside by gale
Adjusting the maximum position of the windside by gale/high wind speed.

NB! Max. position windside can be reduced depending on low humidity.
NB! Max. position windside can also be reduced depending on low outdoor temperature and high wind speed.

Ventilation special

```
Ventilation -> Ventilation specielt
    Max.læside ved lav fugt.                    100.0 %
    Max.vindside ved lav fugt.                  100.0 %
    Max.ved udendørs køling                      50.0 %
    Laveste reduc.faktor for max                    0.1
    Laveste reduc.faktor for min                    0.1
    Læside pos.for start parallel               100.0 %
    Vindside pos.for stop parallel                0.0 %
```

Figure 68
Special settings for ventilation.

Max. leeside by low humidity
Adjusting the leeside by low humidity. Maximum will be gradually reduced towards this setting at decreasing humidity, under minimum humidity.

Max. windside by low humidity
Adjusting the windside by low humidity. Maximum will be gradually reduced towards this setting at decreasing humidity, under minimum humidity.

Max. by outdoor cooling
Adjusting the maximum lee- and windside by active outdoor cooling. (external signal)

Lowest reduction factor for max.
Adjusting the lowest possible reduction of maximum lee- and windside. 0,1 means that maximum can be reduced to 10% of the original value.

Lowest reduction factor for min.
Adjusting the lowest possible reduction of minimum lee- and windside. 0,1 means that minimum can be reduced to 10% of the original value.

Leeside position for start parallel
Adjusting the position demand of the leeside for starting parallel operation on lee- and windside. When the ventilation demand exceeds this position, the extra demands will be split between lee- and windside with a fixed ratio (can be adjusted in service setting). 100% means parallel again.

Windside position for stop parallel
Adjusting the position demand of the windside for stop opening the windside, after parallel operation by starting the ventilation. E.g. if the adjustment is 10%, then both vents will open from start ventilation, until the windside reaches 10%, then only the leeside will open, until parallel operation is continued at leeside position for parallel start.

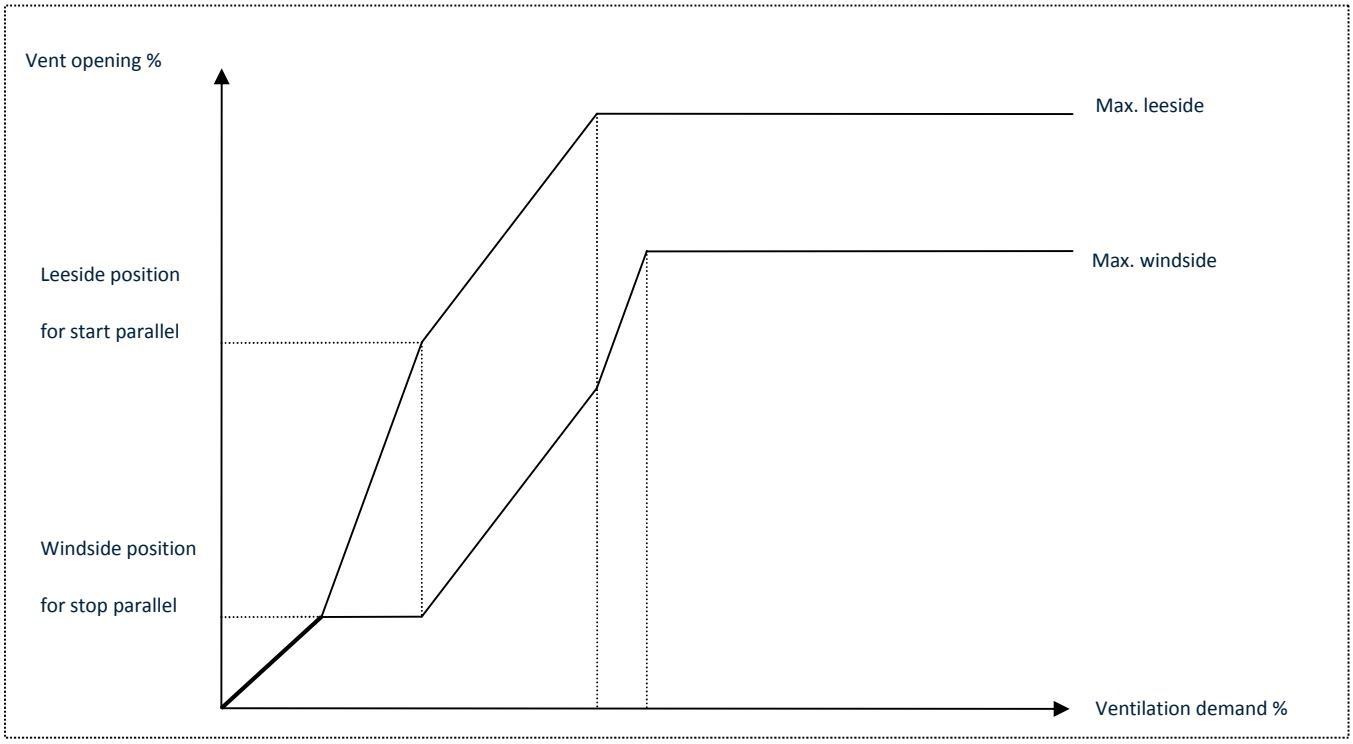


Figure 69
Cascade control of lee- and windside.

Function selector vent 1
Selecting the function for vent 1:

Function selector vent 2
Selecting the function for vent 2:

Close: The vents will close completely.
Aut.: The vents will operate depending on the ventilation demand from the ventilation controller.
Open: The vents will open completely.
Stop: The vents will stop and stay in the current position.

Leeside selection
Selecting if vent 1 or 2 should be fixed leeside or if the shift should happen automatically according to the wind direction sensor.

Outdoor temp. frost protection
Adjusting the limit for outdoor temperature under which forced closure of the vents will happen.

Wind speed for gale
Adjusting the wind speed for indication of ”gale”, which will lower the maximum position of the vents.

Wind speed for storm

Adjusting the wind speed for indication of ”storm”, which will close the vents completely or open the leeside a little, if wanted. See Figure 67. Opening the leeside in connection with storm can possibly equalize the negative pressure so that the glass won’t be sucked out.

Ventilation steps

```
Ventilation -> Ventilations-step
    Vent.-step ved max.fugt                              ->
    Afst.varmekrav step 1                              2.0 °C
    Afst.varmekrav step 2                              3.0 °C
    Fristilling ventilations-step                      0.5 °C
    Ventilationskrav for stop                           5.0 %
    Ventilation step 1                                    Fra   [Fra, Til]
    Ventilation step 2                                    Fra   [Fra, Til]
```

Figure 70
Settings for the ventilation steps.

Distance heating demand step 1

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

Distance heating demand step 2

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

Hysteresis ventilation step

Adjusting the hysteresis (on-off distance) on the ventilation step.
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 1

Reading if step 1 is active or not.

Ventilation step 2

Reading if step 2 is active or not.

Ventilation step at max. humidity

```
Ventilation -> Vent.-step ved max.fugt
    Step 1 aktiv ved max fugt                             Nej   [Nej, Ja]
    Step 2 aktiv ved max fugt                             Nej   [Nej, Ja]
    Afstand varmekrav for stop                         -3.0 °C
```

Figure 71
Settings for ventilation steps for humidity control.

Step 1 active at max. humidity

Selecting whether or not ventilation step 1 will be activated at max. humidity.

Step 2 active at max. humidity

Selecting whether or not ventilation step 2 will be activated at max. humidity.

Distance heating demand for stop

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

Screens

```
Gardiner
    Gardiner dag-nat                                    ->
    Gardin 1                                            ->
    Gardin 2                                            ->
```

Figure 72
Settings for the screens.

Screens day/night

```
Gardiner -> Gardiner dag-nat
    Funktionsvælger                                      Tid 1)
    Sol op/ned aktiv                                     Nej 2)  [Nej, Ja]
    Tidspunkt daggry                                  06:00:00 3)
    Tidspunkt skumring                                18:00:00 3)
    Daggry rel.til solopgang                          00:00:00 4)
    Skumring rel. til solnedgang                      00:00:00 4)
    Lysintensitet daggry                               0.3 klx 5)
    Lysintensitet skumring                             0.3 klx 5)
    Tillæg lysint. ved Ass.lys                         0.0 klx 5)
    Max.energi-niveau dag-nat                        30.0 W/m2 5)
```

Figure 73
Settings for the transition from day to night and reverse.

1) Can be set for [Time, Sun up/down, Light+sun up/down, Heating reg., Night, Day]
2) Only visible when screens → screens day/night → function selector is on **Time**, **Sun up/down** or **Light+sun up/down**.
3) Only visible when screens → screens day/night → function selector is on **time**.
4) Only visible when screens → screens day/night → function selector is on **sun up/down** or **Light+sun up down**.
5) Only visible when screens → screens day/night → function selector is on **sun up/down**.

Function selector

Selecting how the screens are changing between day and night:

Time:	The change is performed on fixed time.
Sun up/down:	The change is performed in relation to sun up and sun down.
Light+sun up/down:	The change is performed dependent on the light intensity and sun up/sun down.
Heating reg.:	The 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 for dawn
This time decides when the screens go off in the morning.

Time for dusk
This time decides when the screens go on in the evening.

Sun up/down
Dawn relative to sunrise
Screen off follows the sunrise with a time offset. As shown in the example, one hour before sunrise.

Dusk relative to sunset
Screen on follows the sunset with a time offset. As shown in the example, two hours after sunset.

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

Light + sun up/down
Sun up/down active
No: Light measurement and only light measurement controls the screens day/night change.
Yes: This setting provides a combination of light and sun up/down.
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. light intensity at suppl. light
Adjusting the increase of the light intensity level for changing the day/night mode, when the supplementary light is on. Only visible when the function selector is on **Light + sun up/down**.

Max. energy level day/night

Adjusting the allowed energy cost for opening the screens.
When the estimated costs is highter than allowed, the light intensitity level will be increased proportional. The set point **P-band energy cost** [W/m^2] and **Max. increase factor** can be adjusted in service. See Figure 184.

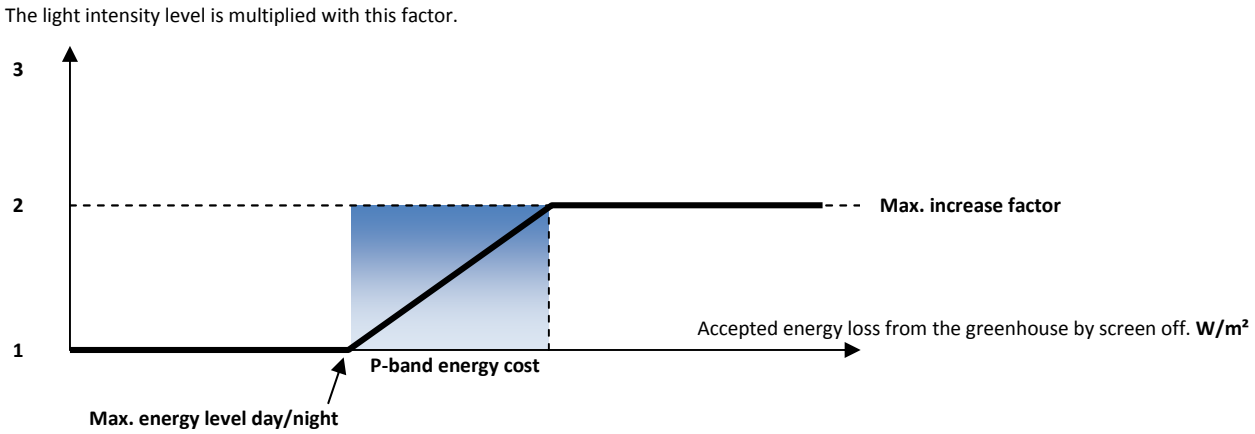


Figure 74
The more expensive the pulling back of the screens are, the more light is needed from the outside.

```
Gardiner -> Gardin 1
    Funktionsvælger                                  Fra   [Fra, Aut., På, Stop]
    Indstråling for gardin på                  500.0 W/m2
    Temp.over varmekrav for på                   5.0 °C
    Temp.under varmekrav for på                 -5.0 °C
    Udetemp.for gardin på                      -10.0 °C
    Udetemp.for gardin af om natten             50.0 °C
    Temp.rel.varmekrav f. begr.                  5.0 °C
    Ventilation for begrænsning                100.0 %
    Lysint.for på ved Ass.lys                    0.3 klx
    Udetemp.for trinvis åbning                   5.0 °C
    Pos.for stop trinvis åbning                 75.0 %
    Gardin 1 begrænsninger                       ->
    Mørklægning gardin 1                         -> 1)
    Daggry rel. til solopgang                 00:00:00 2)
    Skumring rel.til solnedgang               00:00:00 2)
```

Figure 75
Settings for screen 1.

1) Only visible when setup + service → installation setup → screen setup → Screen 1 setup → blackout is on **Yes**.
2) Only visible when setup + service → installation setup → screen setup → screen 1 setup → separate dawn-dusk is on **Yes**.

Function selector

Aut.: The screen is controlled automatically.

Off: The screen is permanently pulled back.
On: The screen is permanently closed.
Stop: The screen is frozen.

Radiation for screen on
Adjusting the sun intensity for automatic pulling of screen 1.

Temp. above heating demand on
Adjusting the **high** air temperature relative to the heating temperature demand for forcing the screen on.

Temp. below heating demand on
Adjusting the **low** air temperature relative to the heating temperature demand for forcing the screen on.

Outdoor temp. for screen on
Adjusting the **low** outdoor temperature for forcing the screen on.

Outdoor temp. for screen off at night
Adjusting the high outdoor temperature for forcing the screen off.
This is normally used in connection with energy saving screens only.

Temp. rel. heating demand for limit
Adjusting the high air temperature relative to heating temperature demand for limitation of the screen position to **Max. pos. high temp.** See Figure 76.
P-band for full limitation can be adjusted in service. See Figure 186.

Ventilation for limitation
Adjusting the ventilation demand for limitation of the screen position to **Max. pos. ventilation**.

Light intensity for on by suppl. light
Adjusting the outdoor light intensity under which the screen will be forced on, while the supplementary light is on.

Outdoor temp. for step opening
Adjusting the outdoor temperature under which the screen will open gradual until the position is below **Pos. for stop step opening**.

Pos. for stop step opening
Adjusting the screen position under which step opening will stop.

Screen 1 limitations
Menu

Blackout screen 1
Menu

Dawn relative to sunrise

If screen 1 and 2 should have different day/night night/day changing times, **separate dawn/dusk** should be selected for at least one of the screens. Ses Fejl! Henvisningskilde ikke fundet.**.** This set point and the following, **dusk relative to sunset**, are only used when **separate dawn/dusk** is selected.

Dusk relative to sunset

The time relative to sunset when **separate dawn/dusk** is selected.

Screen 1 limitations

```
Gardiner -> Gardin 1 -> Gardin 1 begrænsninger
    Max.pos.ved ventilation                              100.0 %
    Max.pos ved høj temperatur                           100.0 %
    Max.pos.ved høj fugtighed                            100.0 %
    Max.position dag                                     100.0 %
    Max.position nat                                     100.0 %
    Max.position ved sne                                 100.0 %
```

Figure 76
Screen 1 limitations.

Max. position by ventilation

Adjusting the maximum screen position by ventilation demand above **ventilation for limitation**. See Figure 75.

Max. position by high temperature

Adjusting the maximum screen position by air temperature above **temp. rel. heating demand for limit**. See Figure 75.

Max. position by high humidity

Adjusting the maximum screen position by high humidity.
The distance to **max. humidity** for starting the reduction of maximum screen position and P-band can be adjusted under **P-band temperature + leeside + screen**. See Figure 105.

Max. position day

Adjusting the maximum screen position during the day.

Max. position night

Adjusting the maximum screen position at night.

Max. position by snow

Adjusting the maximum screen position by detected snow. The warm air will go towards the roof and the snow will melt to avoid collapse.

Blackout should be selected under service if the following set points should be active. See Figure 141.

Blackout screen 1

```
Gardiner -> Gardin 1 -> Mørklægning gardin 1
    Mørklægning start tid                                00:00:00
    Mørklægning stop tid                                 00:00:00
    Begrænsning start rel.solnedg.                       04:00:00
    Begrænsning stop rel.solopg.                        -04:00:00
```

Figure 77
Settings for blackout screen 1.

Blackout start time
Adjusting the time for starting the blackout.

Blackout stop time
Adjusting the time for stopping the blackout.

Limitation start rel. sunset
Adjusting the time relative to sunset for **allowing** the limitations to be active, when the screen is **on** due to blackout. The reason for this is to avoid the "unintended" light to reach the plants inside the blackout period.

Limitation stop rel. sunrise
Adjusting the time relative to sunrise for **not allowing** the limitations to be active, when the screen is **on** due to blackout. The reason for this is to avoid "unintended" light to reach the plants inside the blackout period.

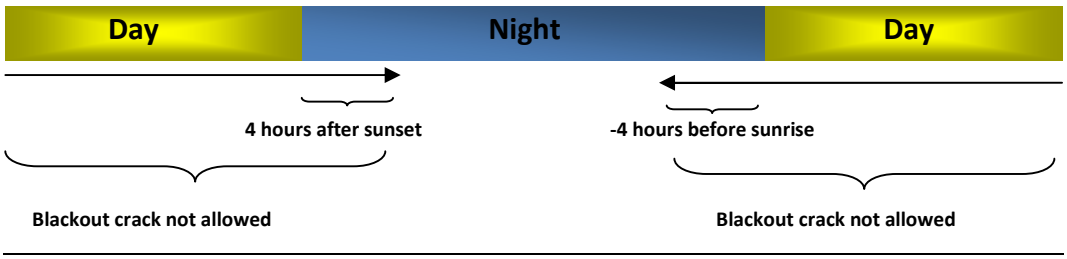


Figure 78
The periods at the beginning and in the end of the night,
where the blackout crack is not allowed to occur.

```
Gardiner -> Gardin 2
    Funktionsvælger                                  Fra   [Fra, Aut., På, Stop]
    Indstråling for gardin på                  500.0 W/m2
    Temp.over varmekrav for på                     5.0 °C
    Temp.under varmekrav for på                   -5.0 °C
    Udetemp.for gardin på                        -10.0 °C
    Udetemp.for gardin af om natten               50.0 °C
    Temp.rel.varmekrav f. begr.                    5.0 °C
    Ventilation for begrænsning                  100.0 %
    Lysint.for på ved Ass.lys                    0.3 klx
    Udetemp.for trinvis åbning                     5.0 °C
    Pos.for stop trinvis åbning                   75.0 %
    Gardin 2 begrænsninger                           ->
    Mørklægning gardin 2                             -> 1)
    Daggry rel. til solopgang                  00:00:00 2)
    Skumring rel.til solnedgang                00:00:00 2)
```

Figure 79
Settings for screen 2.

1) Only visible when Setup + Service → Installation setup → Screen setup → Screen 1 setup → Blackout is on **Yes**.
2) Only visible when Setup + Service → Installation setup → Screen setup → Screen 1 setup → Separate dawn-dusk is on **Yes**.

For description see Figure 75.

```
Gardiner -> Gardin 2 -> Gardin 2 begrænsninger
    Max.pos.ved ventilation                      100.0 %
    Max.pos ved høj temperatur                   100.0 %
    Max.pos.ved høj fugtighed                    100.0 %
    Max.position dag                             100.0 %
    Max.position nat                             100.0 %
    Max.position ved sne                         100.0 %
```

Figure 80
Screen 2 limitations.

For description see Figure 76.

```
Gardiner -> Gardin 2 -> Mørklægning gardin 2
    Mørklægning start tid                       00:00:00
    Mørklægning stop tid                        00:00:00
    Begrænsning start rel.solnedg.              04:00:00
    Begrænsning stop rel.solopg.               -04:00:00
```

Figure 81
Settings for blackout screen 2.

For description see Figure 77.

CO_2 + light

```
CO2 + Lys
    CO2 kontrol                                          ->
    Assimilationslys                                     ->
```

Figure 82
CO_2 menus.

```
CO2 + Lys -> CO2 kontrol
    Funktionsvælger                                      Fra   [Fra, Aut.]
    CO2 koncentration basis                          0.0 ppm
    Tidszone tillæg                                      ->
    Min.konc.ved ass.lys                           600.0 ppm
    Max.konc.ved ventilation                       300.0 ppm
    Vent.krav for reduc.CO2                            5.0 %
```

Figure 83
Settings for CO_2.

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 used time zones are the same as for the air temperature settings.

CO_2 concentration basic **TODO er teksten ændret?**

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

Time zone addition

Menu

Min. concentration by suppl. Light

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

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

1) **CO_2 concentration basic + 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.

Vent. demand for reducing CO_2

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

Time zone addition for CO_2

```
CO2 + Lys -> CO2 kontrol -> Tidszone tillæg
    Fast tillæg                                          ->
    Lysafhængigt tillæg                                  ->
```

Figure 84
Settings for CO_2 time zone addition.

```
CO2 + Lys -> CO2 kontrol -> Tidszone tillæg -> Fast tillæg
    Zone 1                                          600.0 ppm
    Zone 2                                          600.0 ppm
    Zone 3                                          600.0 ppm
    Zone 4                                          600.0 ppm
    Zone 5                                            0.0 ppm
    Zone 6                                            0.0 ppm
```

Figure 85
Fixed CO_2 time zone additions.

Time zone 1-6

Adjusting the addition in the time zones.

```
CO2 + Lys -> CO2 kontrol -> Tidszone tillæg -> Lysafhængigt tillæg
    Zone 1                                            0.0 ppm
    Zone 2                                            0.0 ppm
    Zone 3                                            0.0 ppm
    Zone 4                                            0.0 ppm
    Zone 5                                            0.0 ppm
    Zone 6                                            0.0 ppm
```

Figure 86
Light dependent CO_2 time zone additions.

Time zone 1-6

Adjusting the light dependent addition in the time zones.

NB! The light dependency follows the light addition for the heating temperature demand.

Supplementary light

```
CO2 + Lys -> Assimilationslys
    Funktionsvælger                                  Fra   [Fra, Abs., Rel., Tændt]
    Starttidspunkt 1                            18:00:00 1)
    Start 1 rel.til solop                       00:00:00 2)
    Stoptidspunkt 1                             23:59:00 1)
    Start 1 rel.til solned                      00:00:00 2)
    Funktionperiode 2                                Fra   [Fra, Aut.]
    Starttidspunkt 2                            00:00:00
    Stoptidspunkt 2                             00:00:00
    Lysintensitet start-stop                     5.0 klx
    Lyssum for stop periode 1                      500.0
    Lyssum starttid                             00:00:00
    Max.lysint.for lys-sum                     200.0 klx
```

Figure 87
Settings for supplementary light.

1) Only visible when CO_2 + light → Supplementary light → Function selector is on **Abs**.
2) Only visible when CO_2 + light → Supplementary light → Function selector is on **Rel**.

Function selector

Selecting the function for light.

Off: The supplementary light is not operating.

Abs.: The supplementary light is turned on and off on fixed times, if it is dark enough.

Rel.: The supplementary light is turned on and off on times relative to sunrise and sunset, if it is dark enough.

On: The supplementary light is operating.

Start time 1

Adjusting the start time for auto period 1.

Only active when **Abs**. has been selected in the function selector.

Start 1 relative to sunrise

Adjusting the start time relative to sunrise for auto period 1.

Only active when **Rel**. has been selected in the function selector.

Stop time 1

Adjusting the stop time for auto period 1.

Only active when **Abs**. has been selected in the function selector.

Stop 1 relative to sunset

Adjusting the stop time relative to sunset for auto period 1.

Only active when **Rel**. has been selected in the function selector.

Function period 2

Time interval where the supplementary light can be turned on and off on fixed times.

Off: Period 2 is not active.

Aut.: Period 2 is active.

Start time 2

Adjusting the start time for period 2.

Stop time 2

Adjusting the stop time for period 2.

Light intensity start-stop

Limiting value for the light measured outside, where the supplementary light turns on/turns off. Settings for hysteresis and delays can be found in service. See Figure 192.

Light sum stop period 1

Limiting value for the light sum. When this set point exceeds the light turns off. Though not in period 2, if this is active. A new light sum calculation period starts every day on a set time. See next setting.

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

Light sum start time

Adjusting the time for resetting the light sum. The summation starts from the beginning. This set point is common for all four light circles.

Max. light intensity for light sum

Only light from this set point is included in the light sum calculation. The remaining surplus will be cut.

Irrigation and misting

The irrigation controller has following functions:

1 irrigation valve.

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 up/down)

Manual start

Sun integrator overrun by auto period yes/no

Fixed interval overrun by auto period yes/no

24 hours program with 8 start times on fixed times

External start overrun by auto period

```
Vanding
    Vanding                                                    ->
    Overbrusning                                               ->
```

Figure 88
Menus for irrigation and misting.

```
Vanding -> Vanding
    Grundindstillinger                                         ->
    Solintegrator                                              ->
    Fast interval                                              ->
    Døgnprogram                                                ->
    Ekstern start                                              ->
    Ventiltid                                           00:00:00
```

Figure 89
Menus for irrigation and settings for valve times.

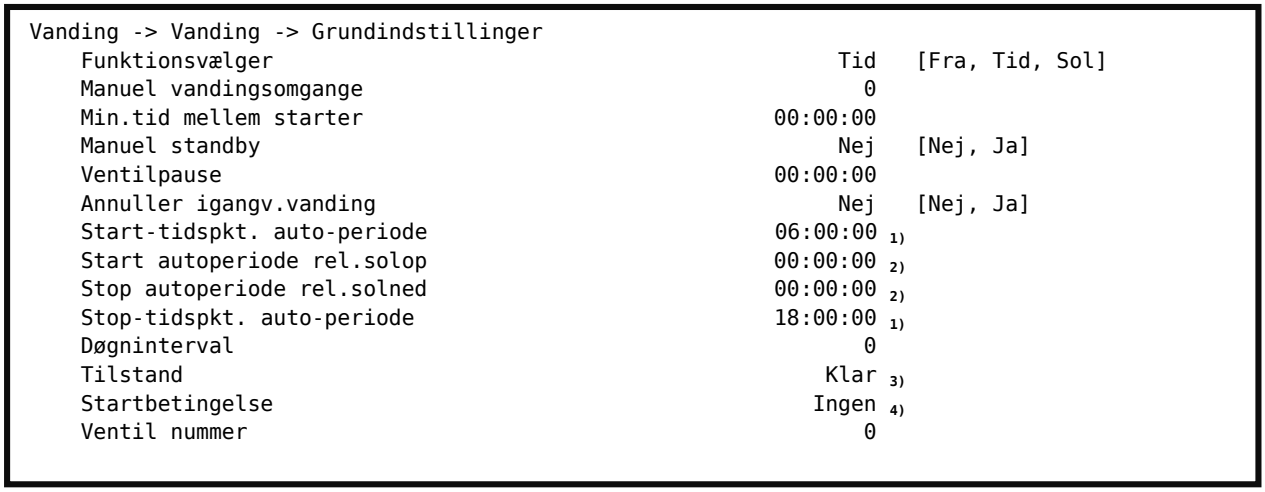


Figure 90
Basic settings for irrigation.

1) Only visible when Irrigation → Irrigation → Basic settings → Function selector is on **Time**.
2) Only visible when Irrigation → Irrigation → Basic settings → Function selector is on **Sun**.
3) Can indicate [Ready, -, -, Active, Standby, -, Valve pause, -]
4) Can indicate [None, Manual, Sun integrator, External, Fixed interval, 24 hours]

Function selector

Off: The irrigation controller is not active.

Time: The irrigation controller is active. The auto period starts and stops on fixed times.

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

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

Manual irrigation rounds

Adjusting the number of manual started irrigation rounds.

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

Min. time between starts

Adjusting the minimum time between the 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 irrigation controller in standby via an external signal.

Valve pause

Adjusting the wanted pause between the valves.

NB! If the pause is selected longer than '**local pump stop delay**', the pump will stop in the '**valve pause**'.

Cancel current irrigation

Selecting the current irrigation to be cancelled.

Start time auto period

Adjusting the start 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**.

Stop time auto period

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

24 hours interval

Adjusting the wanted 24 hours interval (skip)

0 = No interval. Irrigation every day.

1 = Irrigation every second day.

2 = Irrigation every third day.

The 24 hours interval overrules following start condicions:

Fixed interval

24 hours program

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 integrator**, **External**, **Fixed interval**, **24 hours**.

Valve number

Reading which valve number is currently active.

Sun integrator

```
Vanding -> Vanding -> Solintegrator
    Funktionsvælger                                  Nej   [Nej, Ja]
    Overstyres af autoperiode                         Ja   [Nej, Ja]
    Akkumuleret sol for start                 9999.0 Wh
    Nulstil udenfor auto-periode                      Ja   [Nej, Ja]
    Max.akk.vandinger sol-int.                        10
    Akk.sol siden sidste start                 0.0 Wh
    Resterende vandinger sol-int.                0 Wh
```

Figure 91
Settings for sun integrator.

Function selector

Off: Sun integrator is not active.

On: Sun integrator is active.

Overrun by auto period

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

Yes: Sun integrator is 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.

Reset outside auto period

No: Accumulated sun and remaining irrigation rounds are stored when stopping the auto period and used when starting the next auto period.

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

Max. acc. irrigation sun integrator

Adjusting the maximum allowed number 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**)

```
Vanding -> Vanding -> Fast interval
    Funktionsvælger                                  Nej   [Nej, Ja]
    Overstyres af autoperiode                        Nej   [Nej, Ja]
    Vandingsinterval                            01:00:00
    Tidspunkt for sidste start                  08:33:22
```

Figure 92
Settings for irrigation with fixed intervals.

Function selector

Off: Fixed interval is not active.

On: Fixed interval is active.

Overrun by auto period

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

Yes: Fixed interval is only active in the auto period.

NB! Fixed interval is overrun by 24 hours interval. See Figure 90.

Irrigation interval

Adjusting the interval between the irrigation starts.

Time for last start

Reading the time for last start.

24 hours program

```
Vanding -> Vanding -> Døgnprogram
    Funktionsvælger                                    Nej   [Nej, Ja]
    Start tidspunkt 1                               00:00:00
    Start tidspunkt 2                               00:00:00
    Start tidspunkt 3                               00:00:00
    Start tidspunkt 4                               00:00:00
    Start tidspunkt 5                               00:00:00
    Start tidspunkt 6                               00:00:00
    Start tidspunkt 7                               00:00:00
    Start tidspunkt 8                               00:00:00
```

Figure 93
Fixed times for irrigations are set here.

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.

The 24 hours program is overrun by the 24 hours interval. See Figure 90.

```
Vanding -> Vanding -> Ekstern start
    Funktionsvælger                                    Nej   [Nej, Ja]
    Overstyres af autoperiode                          Nej   [Nej, Ja]
    Ekstern start aktiv                                Nej   [Nej, Ja]
```

Figure 94
Opportunity for starting the irrigation with an external start signal.

Function selector

Off: External start not active.

On: External start active.

Overruled by auto period

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

Yes: External start is only active in the auto period.

External start active
Reading whether or not there is an external start signal.

Irrigation, misting and cooling.

```
Vanding -> Overbrusning
    Overbrusning                                    ->
    Befugtning                                      ->
    Køling                                          ->
    Starttidspunkt                              06:00:00
    Stoptidspunkt                               18:00:00
    Længste interval                            00:05:00
    Korteste interval                           00:02:00
    Max.interval                                24:00:00
```

Figure 95
Menus for misting, humidification and cooling, and time settings.

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 start time for the auto period.

Stop time
Adjusting the stop time for the auto period.

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

```
Vanding -> Overbrusning
    Funktionsvælger                                    Fra    [Fra, Til, Aut.]
    Overbrusningsventiler 1                             ->
    Auto-periode                                       Nej    [Nej, Ja]
    Overbrusning aktiv                                 Nej    [Nej, Ja]
    Ventil nummer                                        0
    Intervaltid                                   00:00:00
    Befugtning On/Off                                  Fra    [Fra, Til]
```

Figure 96
Settings and readings for misting.

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.

Auto period

Reading whether or not the current time is inside the auto period.

Misting active

Reading if the misting is active or not.

Valve number

Reading the current active valve number. TODO, yderligere beskrivelse eller fjernes.

```
Vanding -> Overbrusning -> Overbrusning 1 -> Overbrusningsventiler 1
    Ventil                                                 00:00:05
```

Figure 97
Settings for irrigation time.

Humidification

```
Vanding -> Overbrusning -> Befugtning 1
    Funktionsvælger                                        Fra    [Fra, Til]
    Fugtighedssetpunkt                                  Absolut   [Absolut, Relativ]
    Minimum RH                                        40.0 RH% 1)
    Max.Delta X                                       8.0 g/kg 2)
    Max.Delta X relativ                               0.0 g/kg 2)
    Minimum RH relativ                                 0.0 RH% 1)
    P-bånd Delta X                                    1.0 g/kg 2)
    P-bånd RH                                            5.0 % 1)
    Fugtighed RH%                                      0.0 RH% 1)
    Fugtighed Delta X                                 0.0 g/kg 2)
    Minimum RH krav                                    0.0 RH% 1)
    Max.Delta X krav                                  0.0 g/kg 2)
    Befugtningsfaktor                                      0.0
    Befugtning aktiv                                       Nej    [Nej, Ja]
```

Figure 98
Settings for humidification.
Humidification can be selected as absolute or relative.

1) Only visible if **RH** is chosen as unit.
2) Only visible if **DX** is chosen as unit.

Setup + Service → Installation setup → Humidity control setup → Humidity unit

Function selector

Off: Humidification is not active.

On: Humidification is active.

Humidity setpoint

Absolute: Low humidity is fixed **Min. 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 52.

Min. RH%

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

Min. 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 humidify setpoint.

P-band

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

Humidity RH%

Reading the current humidity in the greenhouse.

Min. 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 active

Reading if the humidification is active or not.

Cooling

```
Vanding -> Overbrusning -> Køling 1
    Funktionsvælger                                    Fra   [Fra, Til]
    Temperatur setpunkt                            Absolut   [Absolut, Relativ]
    Kølingstemperatur basis                        30.0 °C
    Tidszone tillæg                                     ->
    P-bånd luft-temperatur                          2.0 °C
    Luft-temperatur                                 0.0 °C
    Kølingstemperatur                               0.0 °C
    Varmekrav                                       0.0 °C
    Kølings-faktor                                     0.0
```

Figure 99
Settings for cooling.

Function selector

Off: Cooling is not active.

On: Cooling is active.

Temperature setpoint

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

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

Cooling temperature basic

Adjusting the wanted basic cooling temperature.

The final cooling temperature = **Cooling temperature basic** + addition in the time zones.

Time zone addition – zone 1-6

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

P-band air temperature

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

Air temperature

Reading the current air temperature in the greenhouse.

Cooling temperature

Reading the current cooling temperature above which cooling will be activated.

Cooling factor

Reading the current cooling factor.

0.00 = no cooling.

0.01 = longest interval.

1.00 = shortest interval.

```
Vanding -> Overbrusning -> Køling 1 -> Tidszone tillæg
    Zone 1                                              0.0 °C
    Zone 2                                              0.0 °C
    Zone 3                                              0.0 °C
    Zone 4                                              0.0 °C
    Zone 5                                              0.0 °C
    Zone 6                                              0.0 °C
```

Figure 100
Settings for addition in the 6 time zones.

Humidity

```
Fugt
    Max.fugt indstillinger                              ->
    P-bånd temp+læside+gardin                           ->
    Botrvtis reduktion                                  ->
```

Figure 101
Menus over humidity.

```
Fugt -> Max.fugt indstillinger
    Funktionsvælger                                  Fra   [Fra, Til]
    Min.delta X basis                            2.0 g/kg 2)
    Max.fugt basis                               80.0 RH% 1)
    Tidszone tillæg min.DX                           -> 2)
    Tidszone tillæg max.fugt                         -> 1)
    Afst.fugt for start FAN                      1.0 g/kg 2)
    Afst.fugt for start FAN                      -5.0 RH% 1)
    Afst.vent.temp.for start FAN                  -2.0 °C
    Ventilationskrav for stop FAN                  10.0 %
```

Figure 102
Settings for max. humidity.

1) Only visible when **RH** is chosen as unit.

2) Only visible when **DX** is chosen as unit.

Setup + Service → Installation setup → Humidity control setup → Humidity unit

Function selector

The humidity control can be activated or deactivated.

Max. humidity basic

Adjusting the basic maximum humidity without addition.

Time zone add. max. humidity

Adjusting the addition for maximum humidity per time zone.

Dist. for start HAF

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

Typically this set point is set **negatively** for starting the HAF at a **lower** humidity.

Distance vent. temp. for start HAF

Adjusting the air temperature distance to ventilation temperature for starting the HAF fan.

Typically this set point is set **negatively** for starting the HAF at a **lower** temperature.

Ventilation demand for stop fan

Adjusting the ventilation demand (vent opening demand) for stopping the HAF fan.

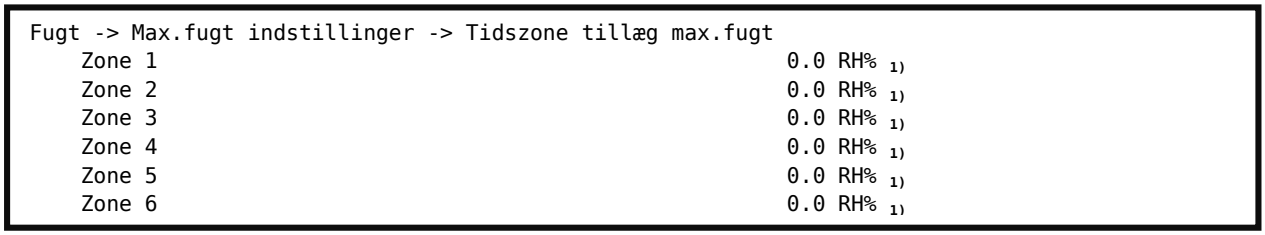


Figure 103
Time zone additions when relative humidity measurement is used.

1) Only visible when **RH** is chosen as unit.
2) Only visible when **DX** is chosen as unit.

Setup + Service → Installation setup → Humidity control setup → Humidity unit

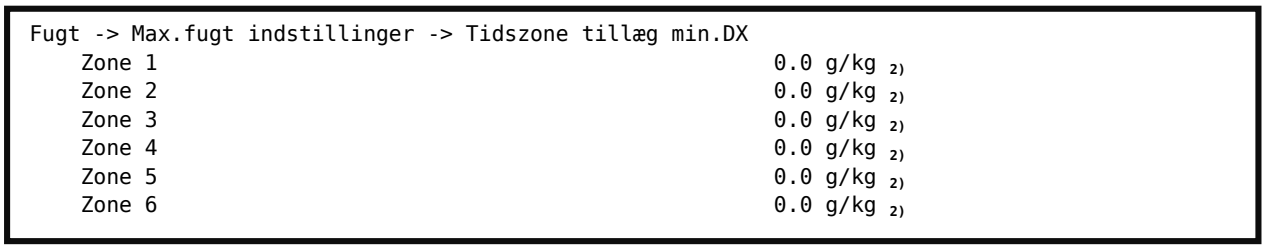


Figure 104
Time zone additions when DX is used as humidity measurement.

1) Only visible when **RH** is chosen as unit.
2) Only visible when **DX** is chosen as unit.

Setup + Service → Installation setup → Humidity control setup → Humidity unit

P-band temperature + leeside + screen

Fugt -> P-bånd temp+læside+gardin	
Afst.for hævn.freml.temp.	1.0 g/kg 2)
Afst.for hævn.freml.temp.	-5.0 RH% 1)
P-bånd for hævn.freml.temp.	1.0 g/kg 2)
P-bånd for hævn.freml.temp.	5.0 RH% 1)
Afst.for hævn.luft-temp.	-5.0 RH% 1)
Afst.for hævn.luft-temp.	1.0 g/kg 2)
P-bånd for hævn.luft-temp.	1.0 g/kg 2)
P-bånd for hævn.luft-temp.	5.0 RH% 1)
Afst.for hævn.min.læside	1.0 g/kg 2)
Afst.for hævn.min.læside	0.0 RH% 1)
P-bånd for hævn.min.læside	1.0 g/kg 2)
P-bånd for hævn.min.læside	5.0 RH% 1)
Afst.for begrænsn.gardinpos.	1.0 g/kg 2)
Afst.for begrænsn.gardinpos.	-5.0 RH% 1)
P-bånd for begrænsn.gardinpos.	1.0 g/kg 2)
P-bånd for begrænsn.gardinpos.	5.0 RH% 1)

Figure 105
P-band settings for humidity regulation.

1) Only visible when **RH** is chosen as unit.
2) Only visible when **DX** is chosen as unit.

Setup + Service → Installation setup → Humidity control setup → Humidity unit

It is possible to control the maximum humidity in 5 different ways, which can be combined:
Start of fans (HAF)
Increasing min. flow temperature: Can be used on both heating valves.
Increasing heating temperature demand: Can be used on common and/or local heating temperature demand.
Increasing min. position lee+windside vents.
Decreasing max. position screens: Can be used on both screens.

All distances and P-band is common for all controls, which use same action by high humidity.

Dist. for incr. flow temp.
Adjusting the distance to maximum humidity for start increasing the minimum flow temperature.
A negative distance will increase the minimum flow temperature before the maximum RH% has been achieved. (lower humidity)

P-band for incr. 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 has been achieved.

The P-band is defined to start at the distance from maximum humidity. This means that the P-band moves by changing the distance.

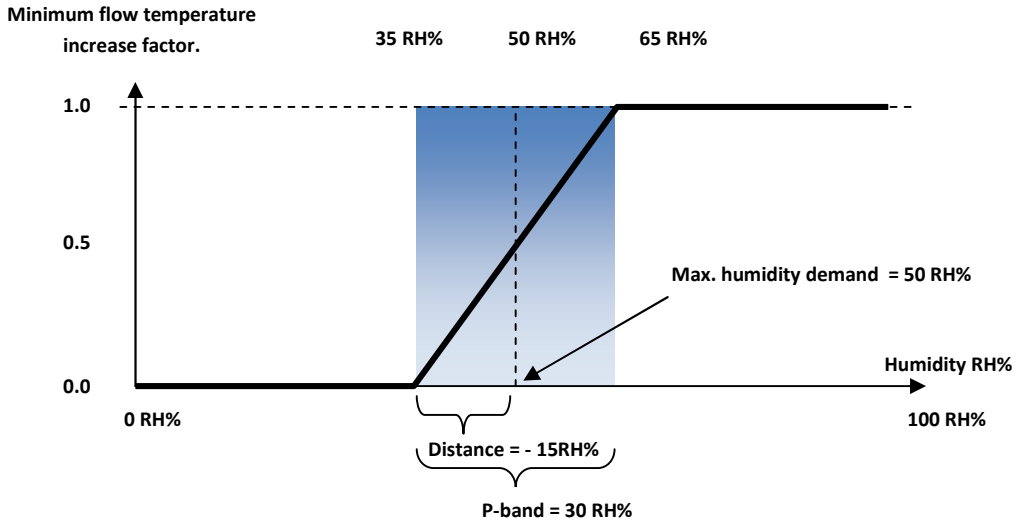


Figure 106
Increasing minimum flow temperature by high humidity.

Dist. for incr. air temp.

Adjusting the distance to maximum humidity for start increasing the air temperature.

A negative distance will increase the air temperature before the maximum RH% has been achieved. (lower humidity)

P-band for incr. air temp.

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 has been achieved.

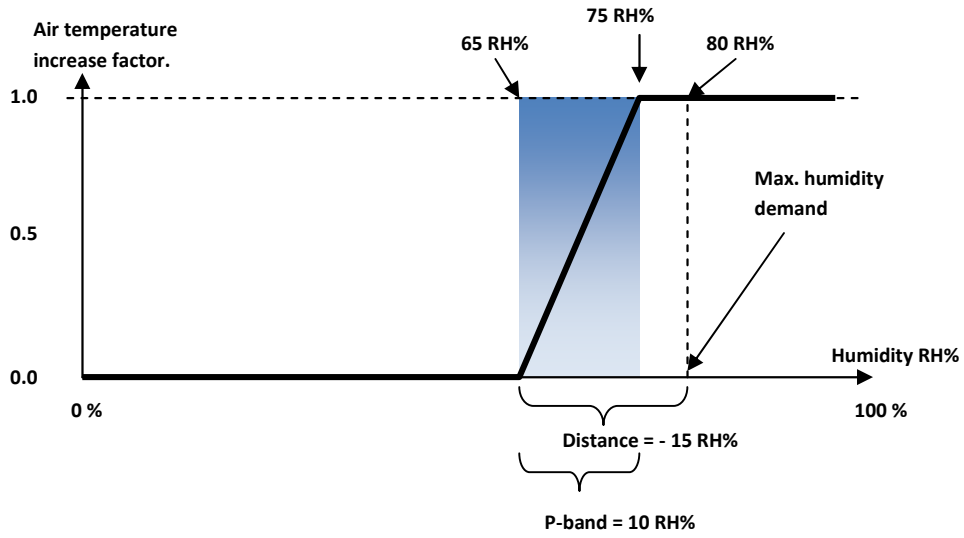


Figure 107
Increasing air temperature by high humidity.

Dist. for incr. min. leeside

Adjusting the distance to maximum humidity for start increasing the minimum leeside.
A positive distance will increase the minimum leeside after the maximum RH% has been achieved. (higher humidity)

P-band for incr. min. 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 has been achieved.

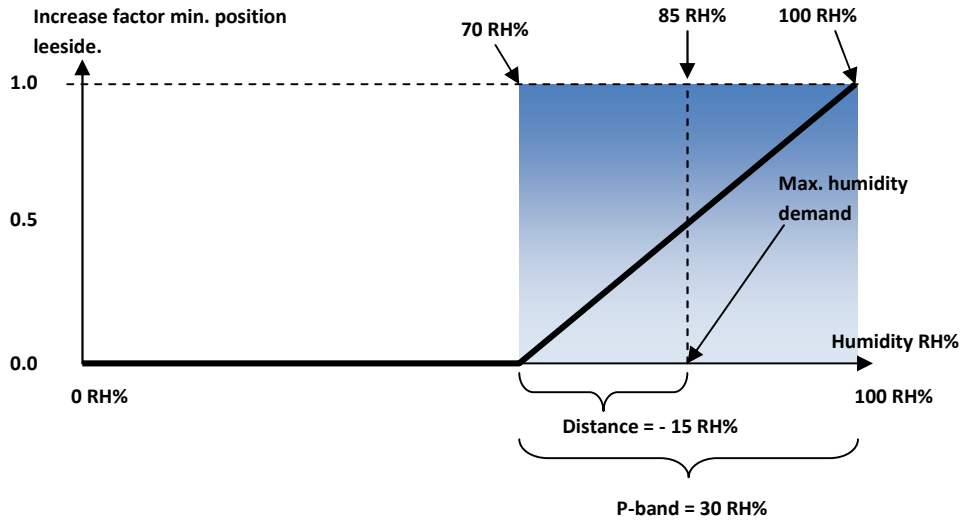


Figure 108
Strategy for leeside ventilation by increasing humidity.

Distance for limit screen position

Adjusting the distance to maximum humidity for start limitation of the screen position.

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

P-band for limit screen position

Adjusting the P-band for full limitation of the screen position.

A larger P-band will cause a higher increase in humidity before a full increase has been achieved.

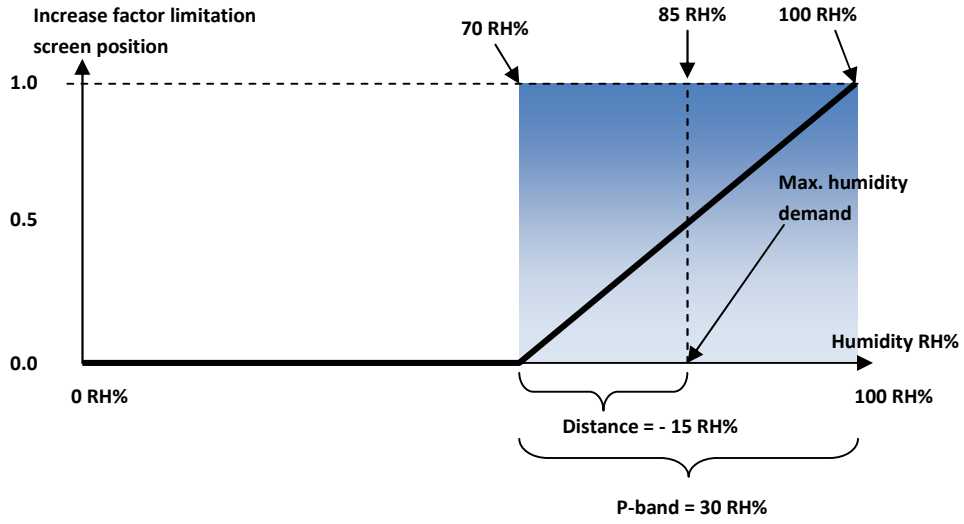


Figure 109
In this case the screen crack starts when the humidity exceeds 70 RH%.

Alarm setup

```
Alarm+opsætning
    Alarm liste                                          ->
    Alarm indstillinger                                  ->
```

Figure 110
Alarm menus.

```
Alarm+opsætning -> Alarm liste
    Sluk alarm-relæerne                                   0
    Aktive Alarmer                                       ->
```

Figure 111
Alarm settings.

Switch off alarm relays

TODO

Active alarms

```
Alarm+opsætning -> Alarm liste -> Aktive Alarmer
    Sensor fejl aflæsning                                   ->
    Lav absolut luft-temp.                                  Nej   [Nej, Ja]
    Lav relativ luft-temp.                                  Nej   [Nej, Ja]
    Høj absolut luft-temp.                                  Nej   [Nej, Ja]
    Høj relativ luft-temp.                                   Ja   [Ja, Nej]
    Lav jordtemperatur                                      Nej   [Nej, Ja]
    Høj jordtemperatur                                      Nej   [Nej, Ja]
    Lav fremløbstemperatur 1                                Nej   [Nej, Ja]
    Høj fremløbstemperatur 1                                Nej   [Nej, Ja]
    Lav fremløbstemperatur 2                                Nej   [Nej, Ja]
    Høj fremløbstemperatur 2                                Nej   [Nej, Ja]
    Lav absolut fugtighed                                   Nej   [Nej, Ja]
    Høj absolut fugtighed                                   Nej   [Nej, Ja]
    Høj relativ fugtighed                                   Nej   [Nej, Ja]
    Lav absolut CO2 konc.                                   Nej   [Nej, Ja]
    Lav relativ CO2 konc.                                   Nej   [Nej, Ja]
    Høj absolut CO2 konc.                                   Nej   [Nej, Ja]
    Cirkulations pumpe                                      Nej   [Nej, Ja]
    Ekstern 1                                               Nej   [Nej, Ja]
    Ekstern 2                                               Nej   [Nej, Ja]
    Følerfejl                                                 0
```

Figure 112
Readings of what may cause an alarm.

Only visible when active (**Yes**)

```
Setup + Service -> Installation setup -> Alarm setup -> Sensor fejl aflæsning
    Luft temperatur 1                                       Nej   [Nej, Ja]
    Humidity 1                                              Nej   [Nej, Ja]
    Flow temperatur 1                                       Nej   [Nej, Ja]
    Flow temperatur 2                                       Nej   [Nej, Ja]
    Lokal lys                                               Nej   [Nej, Ja]
    Lokal sol                                               Nej   [Nej, Ja]
    CO2                                                     Nej   [Nej, Ja]
    Soil temp.                                              Nej   [Nej, Ja]
```

Figure 113
Readings of possible failing sensors.

Alarm settings

```
Alarm+opsætning -> Alarm indstillinger
    Lufttemperaturalarm                                      ->
    Jordtemperatur alarm                                     ->
    Fugtighedsalarm                                          ->
    CO2 alarm                                                ->
    Fremløbstemp.alarm                                       ->
```

Figure 114
Menus for alarm settings.

```
Alarm+opsætning -> Alarm indstillinger -> Lufttemperaturalarm
    Abs.lav luft-temp.dag                                  12.0 °C
    Abs.høj luft-temp.dag                                  40.0 °C
    Abs.lav luft-temp.nat                                  12.0 °C
    Abs.høj luft-temp.nat                                  40.0 °C
    Rel.lav lufttemp.dag                                   -2.0 °C
    Rel.høj lufttemp.dag                                   10.0 °C
    Rel.lav lufttemp.nat                                   -2.0 °C
    Rel.høj lufttemp.nat                                   10.0 °C
```

Figure 115
Settings for air temperature alarms day and night.
Abs. = Absolute Rel. = Relative

Abs. low air temp. day
Fixed lower limiting value for air temperature during the day, which causes an alarm.

Abs. high air temp. day
Fixed upper limiting value for air temperature during the day, which causes an alarm.

Abs. low air temp. night
Fixed lower limiting value for air temperature at night, which causes an alarm.

Abs. high air temp. night
Fixed upper limiting value for air temperature at night, which causes an alarm.

Rel. low air temp. day
Alarm for deviation between current heating demand and the measured air temperature during the day. For instance, an adjustment at -2 °C and a heating demand at 20 °C will cause an alarm, if the temperature gets below 18 °C.
An adjustment of for instance -2 °C and a heating demand

Rel. high air temp. day
Alarm for deviation between current heating demand and the measured air temperature during the day. For instance, an adjustment at 10 °C and a heating demand at 20 °C will cause an alarm, if the temperature gets above 30 °C.

Rel. low air temp. night
Alarm for deviation between current heating demand and the measured air temperature at night. For instance, an adjustment at -2 °C and a heating demand at 20 °C will cause an alarm, if the temperature gets below 18 °C.

Rel. high air temp. night
Alarm for deviation between current heating demand and the measured air temperature at night. For instance, an adjustment at 10 °C and a heating demand at 20 °C will cause an alarm, if the temperature gets above 30 °C.

```
Alarm+opsætning -> Alarm indstillinger -> Jordtemperatur alarm
    Lav jordtemperatur                                    10.0 °C
    Høj jordtemperatur                                    30.0 °C
```

Figure 116
Alarm limits for soil temperature.

```
Alarm+opsætning -> Alarm indstillinger -> Fugtighedsalarm

    Abs.lav fugt.RH% dag                                  40.0 RH% 1)
    Abs.lav delta X dag                                    2.0 g/kg 2)
    Abs.høj fugt.RH% dag                                 100.0 RH% 1)
    Abs.høj delta X dag                                   20.0 g/kg 2)
    Abs.lav delta X nat                                    2.0 g/kg 2)
    Abs.lav fugt.RH% nat                                  40.0 RH% 1)
    Abs.høj fugt.RH% nat                                 100.0 RH% 1)
    Abs.høj delta X nat                                   20.0 g/kg 2)
    Rel.høj fugt.RH% dag                                  10.0 RH% 1)
    Rel.høj fugt.RH% nat                                  10.0 RH% 1)
```

Figure 117
Alarm settings for humidity.
Abs. = Absolute Rel. = Relative

```
Setup + Service → Installation setup → Humidity control setup → Humidity unit
```

The function for alarm settings for Absolute and Relative humidity is the same as under settings for air temperature alarm. See description under Figure 115.

```
Alarm+opsætning -> Alarm indstillinger -> CO2 alarm
    Min.CO2 konc.når aktiv                                300.0 ppm
    Rel.lav CO2 konc.når aktiv                           -200.0 ppm
    Max.CO2 konc.når aktiv                               1500.0 ppm
```

Figure 118
Settings for alarm limits for CO_2

The function for Absolute and Relative CO_2 is the same as under temperature alarm settings. See description under Figure 115. However, note that it only causes alarm if the CO_2 regulation is active.

```
Alarm+opsætning -> Alarm indstillinger -> Fremløbstemp.alarm
    Lav fremløbstemperatur 1                              10.0 °C
    Høj fremløbstemperatur 1                             100.0 °C
    Lav fremløbstemperatur 2                              10.0 °C
    Høj fremløbstemperatur 2                             100.0 °C
```

Figure 119
Settings for alarm limits for flow temperatures.

Setup + Service

```
Setup + Service
    Bruger setup                                          ->
    Installation setup                                    ->
    Service                                               ->
```

Figure 120
Service menus.

```
Setup + Service -> Bruger setup
    Tidszoner + dag-nat                                   ->
    Indstilling af tid                                    ->
    Alarm udgang setup                                    ->
    Høj-prioritets-alarm-valg                             ->
    Lav prioritets-alarm-valg                             ->
```

Figure 121
User setup.

Time zone settings

The time zones are used in connection with heating temperature, ventilation temperature, humidity control and CO_2. It is possible to set 4 day time zones and 2 night time zones.

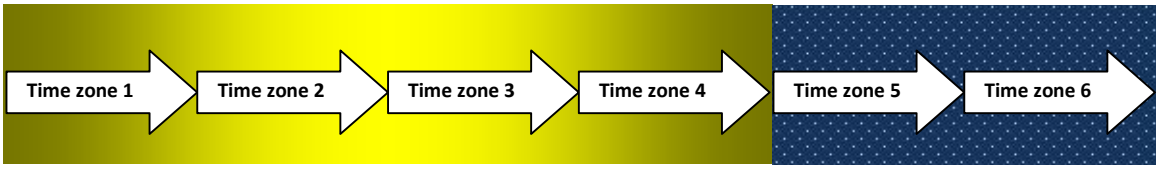


Figure 122
The 4 time zones during the day and the 2 during the night.

```
Setup + Service -> Bruger setup -> Tidszoner + dag-nat
    Tidszone 1/5=dag/nat skift                             Absolut   [Absolut, Relativ]
    Rel.start tidszone 1                                  00:00:00 1)
    Start tidszone 1                                      06:00:00 2)
    Start tidszone 5                                      18:00:00 2)
    Rel.start tidszone 5                                  00:00:00 1)
    Varighed tidszone 1                                   23:59:00
    Varighed tidszone 2                                   00:00:00
    Varighed tidszone 4                                   00:00:00
    Varighed tidszone 5                                   00:00:00
    Dag-nat lysafhængig                                         Ja   [Nej, Ja]
    Lysniveau nat->dag                                     0.3 klx
    Lysniveau dag->nat                                     0.3 klx
    Sol op                                                08:39:00
    Sol ned                                               17:30:00
    Tids-zone                                                    1
```

Figure 123
Settings for start time and duration of the time zones.
Relative time decides the start of time zone 1 and 5.
Relative to sunrise and sunset.

1) Only visible when:
   Setup + Service → User setup → Time zones + day-night → Time zone 1/5=day/night transition is on **Relative**.
2) Only visible when:
   Setup + Service → User setup → Time zones + day-night → Time zone 1/5=day/night transition is on **Absolute**.

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 5 = night will happen on fixed time.

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

Rel. 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 on **Relative**.

Start time zone 1

Selecting the fixed time for starting time zone 1.

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

Rel. 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 on **Relative**.

Duration time zone 1,2 and 4

Adjusting the duration of the first, second and 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 and until noon.

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

Sun up
Reading the time for sunrise.

Sun down
Reading the time for sunset.

Time zone
Indication of which time zone is currently valid.

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

Time and date

```
Setup + Service -> Bruger setup -> Indstilling af tid
    Dato og tid                              2011-06-21-13:08:55
    GMT                                                        1
    Sommertid                                                Nej   [Nej, Ja]
```

Figure 124
Settings for date and time as well as GMT and summer time.

Date and time
Example: To set the time type the following: 20110621130855 <Enter>
(Year, month, date, hours, minutes and seconds are typed in one long row – without spaces)

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.

Summer time
Selecting summer time.

Alarm output setup

```
Setup + Service -> Bruger setup -> Alarm udgang setup
    Start høj-prioritets-alarm                          00:00:00
    Stop høj-prioritets-alarm                           23:59:00
    Start lav-prioritets-alarm                          06:00:00
    Stop lav-prioritets-alarm                           18:00:00
    Forsink.høj-prioritets-alarm                        00:01:00
    Forsink.lav-prioritets-alarm                        00:01:00
```

Figure 125
Setting up periods during the day, where high and low priority alarms as well as delays for each measuring can occur.

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.

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 alarm to activate alarm output 1.

Start low priority alarm
Adjusting the start time for enabling the low priority alarm to activate alarm output 2.

Stop low priority alarm
Adjusting the stop time for enabling the low priority alarm 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**

```
Setup + Service -> Bruger setup -> Høj-prioritets-alarm-valg
    Lav absolut luft-temp.                                  Ja   [Nej, Ja]
    Lav relativ luft-temp.                                  Ja   [Nej, Ja]
    Høj absolut luft-temp.                                  Ja   [Nej, Ja]
    Høj relativ luft-temp.                                 Nej   [Nej, Ja]
    Lav jordtemperatur                                      Ja   [Nej, Ja]
    Høj jordtemperatur                                     Nej   [Nej, Ja]
    Lav fremløbstemperatur 1                               Nej   [Nej, Ja]
    Høj fremløbstemperatur 1                               Nej   [Nej, Ja]
    Lav fremløbstemperatur 2                               Nej   [Nej, Ja]
    Høj fremløbstemperatur 2                               Nej   [Nej, Ja]
    Lav absolut fugtighed                                  Nej   [Nej, Ja]
    Høj absolut fugtighed                                   Ja   [Nej, Ja]
    Høj relativ fugtighed                                   Ja   [Nej, Ja]
    Lav absolut CO2 konc.                                  Nej   [Nej, Ja]
    Lav relativ CO2 konc.                                  Nej   [Nej, Ja]
    Høj absolut CO2 konc.                                   Ja   [Nej, Ja]
    Cirkulations pumpe                                     Nej   [Nej, Ja]
    Vindues position                                       Nej   [Nej, Ja]
    Ekstern 1                                              Nej   [Nej, Ja]
    Ekstern 2                                              Nej   [Nej, Ja]
    Følerfejl                                               Ja   [Nej, Ja]
```

Figure 126
Selecting, which alarms should be directed to alarm output 1.

```
Setup + Service -> Bruger setup -> Lav prioritets-alarm-valg
    Lav absolut luft-temp.                                  Ja   [Nej, Ja]
    Lav relativ luft-temp.                                  Ja   [Nej, Ja]
    Høj absolut luft-temp.                                  Ja   [Nej, Ja]
    Høj relativ luft-temp.                                 Nej   [Nej, Ja]
    Lav jordtemperatur                                      Ja   [Nej, Ja]
    Høj jordtemperatur                                     Nej   [Nej, Ja]
    Lav fremløbstemperatur 1                               Nej   [Nej, Ja]
    Høj fremløbstemperatur 1                               Nej   [Nej, Ja]
    Lav fremløbstemperatur 2                               Nej   [Nej, Ja]
    Høj fremløbstemperatur 2                               Nej   [Nej, Ja]
    Lav absolut fugtighed                                  Nej   [Nej, Ja]
    Høj absolut fugtighed                                   Ja   [Nej, Ja]
    Høj relativ fugtighed                                   Ja   [Nej, Ja]
    Lav absolut CO2 konc.                                  Nej   [Nej, Ja]
    Lav relativ CO2 konc.                                  Nej   [Nej, Ja]
    Høj absolut CO2 konc.                                  Nej   [Nej, Ja]
    Cirkulations pumpe                                     Nej   [Nej, Ja]
    Ekstern 1                                              Nej   [Nej, Ja]
    Ekstern 2                                              Nej   [Nej, Ja]
    Følerfejl                                               Ja   [Nej, Ja]
```

Figure 127
Selecting, which alarms should be directed to alarm output 2.

Installation setup

```
Setup + Service -> Installation setup
    Unit setup                                          ->
    Boiler temp.demand setup                            ->
    Ethernet setup                                      ->
    Compartment setup                                   ->
    Sensor and sensor zone setup                        ->
    Heating setup                                       ->
    Ventilation setup                                   ->
    Screens setup                                       ->
    CO2 setup                                           ->
    Supplementary light setup                           ->
    Humidity control setup                              ->
    Misting setup                                       ->
    Alarm setup                                         ->
```

Figure 128
Menus for installation setup.

Longitude and latitude

```
Setup + Service -> Installation setup -> Unit setup
    Breddegrad                                        -12.57
    Længdegrad                                         55.68
    Inverted circl.pump outputs                          Nej   [Nej, Ja]
    Lys aflæsningsvalg                                   klx   [klx, W/m2]
```

Figure 129
Settings concerning the location on the planet.

Latitude
Adjusting the degree of latitude for the location of the nursery. South of equator is set negatively.

Longitude
Adjusting the degree of longitude for the location of the nursery. East for Greenwich is set negatively.

NB! The setpoint is adjusted in decimal degrees and not degrees + minutes.

Schedule with local information is shown here:

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 130
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 2.
The time zone is shown right.

Inverted circl. pump outputs

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 circl. pump outputs** can be used if the pumps should run with interrupted automatic action.

Selection of light reading

Selecting if the light measurement should be read in W/m^2 instead of klx.

Boiler temp. demand setup

Please contact Senmatic DGT for further information.

```
Setup + Service -> Installation setup -> Boiler temp.demand setup
    Max.ring main flow temp.                          100.0 °C
    Min.ring main flow temp.                           60.0 °C
    Offset ring main temp.demand                       10.0 °C
    Offset boiler temp.demand                          10.0 °C
    Gain for analog output                            0.1 V/°C
    Højeste forespurgte temp. krav                      0.0 °C
    Ring main temp.demand                               0.0 °C
    Boiler temp. demand                                 0.0 °C
    Spænding ud                                         0.0 V
```

Figure 131
Settings for Boiler temp. demand.

Max. ring main flow temp.
Adjusting the maximum flow temperature demand for the ring main mixing valve controller.

Min. ring main flow temp.
Adjusting the minimum flow temperature demand for the ring main mixing valve controller.

Offset ring main temp. demand
Adjusting the offset/addition to the highest ARC-net flow temperature demand for the demand on the ring main.

Offset boiler temp. demand
Adjusting the offset/addition to the ring main flow temperature demand for the demand on the boiler.

NB! The demand for the boiler temperature will be the highest demand + offset for ring main + offset for boiler.

Gain for analog output
Adjusting the gain for the analog output.

0.100 V/°C will give you 10V by 100 °C

NB! See the installation manual regarding the adjustment of the signal.
If necessary contact Senmatic DGT for further information.

Polled highest temp. demand
Reading the current highest flow temperature demand from the ARC-net

Ring main temp. demand
Reading the current flow temperature demand for the ring main.

Boiler temp. demand
Reading the current flow temperature demand for the boiler.

Voltage out
Reading the current voltage output.

Compartment setup

```
Setup + Service -> Installation setup -> Compartment setup
    House compass direction 1                          90 °
    Light sensor select                             Vejrst.   [Lokal, Vejrst.]
    Local light sensor type                            LF2   [LF2, Q20]
    House reduction factor light                       0.8
    Sun sensor select                                Lokal   [Fælles, Lokal]
    House reduction factor sun                         0.8
    Light addition logarithmic                         Nej   [Nej, Ja]
    Max. light level on light sum                  200.0 klx
```

Figure 132
Settings for the compartment.

TODO

Sensor and sensor zone setup

```
Setup + Service -> Installation setup -> Sensor and sensor zone setup
    Number of flow temp.sensors                        2
    Number of soil temp.sensors                        1
    Number of sensor zones                             1
    Air temp.sensor average control                    1
    Sensor select for sensor zones                    ->
```

Figure 133
Setting up the zones.

TODO

```
Setup + Service -> Installation setup -> Sensor and sensor zone setup -> Sensor select for sensor zones
    Air temp.sensor zone 1                        Sensor 1 1)
    Air temp.sensor zone 2                           Ingen 2)
```

Figure 134
Selection of sensor for the zones.

TODO

1) Can be placed on: [Sensor 1, Sensor 1, None, None ***** None, None, Soil temp.]
2) Can be placed on: [Sensor 1, Sensor 1, None, None ***** None, None, Soil temp.]

Heating setup

```
Setup + Service -> Installation setup -> Heating setup
    Number of heat valve controllers                          2
    Sensor zone selector heat PID 1                           1
    Sensor zone selector heat PID 2                           2
    Number of heating valves                                  3
    Heating controller 1 setup                               ->
    Heating controller 2 setup                               ->
    Heating valves setup                                     ->
```

Figure 135
Settings for the heatning.

Number of heating valve controllers

Selecting if 1 or 2 heating valve controllers should be used.

Each heating valve controller can control 2 heating valves. A primary and a secondary valve. TODO?

Sensor zone selector heating PID 1

Selecting the sensor zone to be used for heating PID regulator 1.

Sensor zone selector heating PID 2

Selecting the sensor zone to be used for heating PID regulator 2.

Number of heating valves

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

```
Setup + Service -> Installation setup -> Heating setup -> Heating controller 1 setup
    PID no.flow temp.demand input                                 1
    Hysteresis heating-venting                              0.5 °C
    Delay heating-venting                                00:05:00
    Heat-vent.interlock                                       Nej  [Nej, Ja]
    Heat-vent.status                                          Fri  [Fri, Varme, Ventilation]
```

Figure 136
Setup for heating controller 1.

TODO oversættes.

PID no. flow temp. demand input

Selecting which PID regulator output should control the **primary and secondary valve** in heating controller 1. Thereby also which sensor zone the heating valves should control. TODO?

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

Hysteresis heating/ventilation

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

Delay heating/ventilation

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

Heat.-vent interlock

Yes: Indicates only heating or ventilation.

No: Indicates simultaneously heating and ventilation. A more exact temperature can be achieved, but can possibly cost more energy.

Heat.-vent status

Reading the status on the heating-ventilation interlock.

Free: Independent heating and ventilation control.

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

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

```
Setup + Service -> Installation setup -> Heating setup -> Heating controller 2 setup
    PID no.flow temp.demand input                              2
    Heat-vent.interlock                                      Nej  [Nej, Ja]
    Heat-vent.status                                         Fri  [Fri, Varme, Ventilation]
```

Figure 137
Setup for heating controller 2.

For description see TODO

Heating valves setup

```
Setup + Service -> Installation setup -> Heating setup -> Heating valves setup
    Demand heating valve 1                                     1
    Demand heating valve 2                                     2
    Demand heating valve 3                                     3
    Demand heating valve 4                                     4
```

Figure 138
Settings for the heating valves.

Demand heating valve 1-4

Selecting the flow temperature demand for heating valve 1-4.

1 Primary heating valve controller 1

2 Secondary heating valve controller 1

3 Primary heating valve controller 2

4 Secondary heating valve controller 2

9 Boiler flow temperature demand.

Ventilation setup

```
Setup + Service -> Installation setup -> Ventilation setup
    Sensor zone valg                                        1
    Auto-adjust vents.by pots.                            Nej   [Nej, Ja]
    Auto-adjust pots.by midnight                           Ja   [Nej, Ja]
```

Figure 139
Settings for ventilation setup.

Sensor zone select

Selecting the sensor zone for the ventilation controller.

Auto adjust vents. by pots

Selecting it 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.

Screen setup

```
Setup + Service -> Installation setup -> Screens setup
    Number of screens                                       1
    Screen 1 setup                                         ->
    Screen 2 setup                                         ->
```

Figure 140
Selecting the number of screens and menus for the screen setup.

```
Setup + Service -> Installation setup -> Screens setup -> Screen 1 setup
    Sensor zone select                                      1
    Heating zone select                                     1
    Ventilation zone select                                 1
    Separate dawn-dusk                                    Nej   [Nej, Ja]
    Screen temp.sensor select                               1
    Force closing by low scr.temp.                        Nej   [Nej, Ja]
    Offset temp.for stop opening                       -2.0 °C
    Blackout                                              Nej   [Nej, Ja]
    Light reduction factor                                0.6
```

Figure 141
Settings for screen 1.

Sensor zone select

Selecting the sensor zone, which is covered by the screen.

The screen uses temperature and humidity control for calculation of the position.

Heating zone select

Selecting the local heating temperature demand, which is covered by the screen.

1 = heating zone 1
2 = heating zone 2

Ventilation zone select
Selecting the ventilation 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
Selecting if the screen has its own transition from day to night and vice versa, of if the common settings are valid. See **Fejl! Henvisningskilde ikke fundet.**.

Screen temp. sensor select
Selecting which temperature sensor to be used for the screen temperature measurement.
NB! Only one of the available temperature sensors can be selected. Check the number of selected sensors.
See **Fejl! Henvisningskilde ikke fundet.**.

Forced closing by low screen temp.
Selecting if the screen has to be forced closed (instead of pausing) if the screen temperature gets below **Offset temp. for stop opening**. See below.

Offset temp. for stop opening
Distance from the heating demand below which stepwise opening of the screen (in the morning) takes a break until the temperature increases again.

Blackout
No: The screen is both an isolation and a shade screen.
Yes: The screen is both an isolation and a shade screen as well as a blackout screen. The blackout screen will also be able to shade for the sun.

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

```
Setup + Service -> Installation setup -> Screens setup -> Screen 2 setup
    Sensor zone select                                        1
    Heating zone select                                       1
    Ventilation zone select                                   1
    Separate dawn-dusk                                      Nej   [Nej, Ja]
    Screen temp.sensor select                                 1
    Force closing by low scr.temp.                          Nej   [Nej, Ja]
    Offset temp.for stop opening                         -2.0 °C
    Blackout                                                Nej   [Nej, Ja]
    Light reduction factor                                  0.6
```

Figure 142
Settings for screen 2.

For description see Figure 141.

CO_2 setup

```
Setup + Service -> Installation setup -> CO2 setup
    CO2 on-off control                                    Fra   [Fra, Til]
    CO2 minimum dosing time                            00:01:00
    CO2 consumed pr.hour                                2.0 g/h
```

Figure 143
Service settings for CO_2.

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 the PI regulator.

CO_2 min. dosing time

Adjusting the minimum dosing time for the CO_2 control.

CO_2 consumption per hour

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

Supplementary light setup

```
Setup + Service -> Installation setup -> Supplementary light setup
    Suppl.light 1 setup                                     ->
```

Figure 144
Menus for supplementary light setup.

```
Setup + Service -> Installation setup -> Supplementary light setup -> Suppl.light 1 setup
    Light intensity step 1                              2.0 klx
    Light power step 1                                  30.0 kW
```

Figure 145
Service settings for supplementary light.

Light intensity

Adjusting how much light the lamps supply to the plants, measured in klux.

Light power

Adjusting how much power the lamps use, measured in kW.

Humidity unit DX of RH%

```
Setup + Service -> Installation setup -> Humidity control setup
    Humidity unit                                          RH    [RH, DX]
```

Figure 146
Selecting unit for humidity.

Humidity unit

Selecting the unit for humidity measurement/control.

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 saturation.

```
Setup + Service -> Installation setup -> Alarm setup
    Alarm on vent.position                                 Nej   [Nej, Ja]
    Alarm delay setup                                       ->
    Sensor alarm select                                     ->
    Alarm select                                            ->
```

Figure 147
Menus for alarm setup.

Alarm delay setup

```
Setup + Service -> Installation setup -> Alarm setup -> Alarm delay setup
    Temperature alarm delay                              00:01:00
    Fugtighed alarm forsinkelse                          00:05:00
    Flow temp.alarm delay                                00:01:00
    CO2 alarm delay                                      00:01:00
    Vent.pos alarm delay                                 00:05:00
```

Figure 148
Settings for alarm delays.

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. pos. alarm delay

Adjusting the delay on detecting any ventilation position alarm.

Sensor alarm select

```
Setup + Service -> Installation setup -> Alarm setup -> Sensor alarm select
    Air.temp. 1                                              Til   [Fra, Til]
    Flow temperatur 1                                        Til   [Fra, Til]
    Flow temperatur 2                                        Til   [Fra, Til]
    Humidity 1                                               Til   [Fra, Til]
    Local light                                              Fra   [Fra, Til]
    Local sun                                                Fra   [Fra, Til]
    CO2                                                      Fra   [Fra, Til]
    Soil temp.                                               Til   [Fra, Til]
```

Figure 149

Selecting if there should be an alarm for each sensor, if these fail to work.

```
Setup + Service -> Installation setup -> Alarm setup -> Alarm select
    Air.temp.                                                0.0 % TODO?
    Soil temp.                                               0.0 % TODO?
```

Figure 150

Alarm select.

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.

Service

```
Setup + Service -> Service
    Varme                                                   ->
    Fælles afdeling                                         ->
    Sensor justering                                        ->
    Middel temperatur kontrol                               ->
    Ventilation                                             ->
    Gardin setup                                            ->
    CO2 kontrol                                             ->
    Assimilationslys                                        ->
    Maksimal fugt                                           ->
    Misting setup                                           ->
```

Figure 151
Service settings.

Heating

```
Setup + Service -> Service -> Varme
    Varmeventil 1                                           ->
    Varmeventil 2                                           ->
    Energi balance model                                    ->
    Varme PID Regulator 1                                   ->
    Varme PID Regulator 2                                   ->
    Varme controller 1 setup                                ->
    Varme controller 2 setup                                ->
    Cirkulations pumpe                                      ->
```

Figure 152
Service settings for heating.

```
Setup + Service -> Service -> Varme -> Varmeventil 1
    Step faktor                                             5.0
    Pause faktor                                            5.0
    Minimum pause                                       00:00:10
    Minimum step                                        00:00:00
    Fejl faktor                                             1.0
    Dead band                                           0.0 °C
    D-faktor                                                1.0
    Flow temperatur krav                                0.0 °C
    Flow temperatur                                     0.0 °C
```

Figure 153
Service settings for heating valve 1.

Step factor

The open/closing pulse length is 0-40 seconds dependent on the regulation procedure. An adjustment at for instance 5 will result in 0-200 seconds. A valve, which is faster than normal should have a relative smaller step factor.

Pause factor

Adjusting the factor for the pause length between the pulses at the heating valve.
If the reaction time is long, it could be necessary to raise this set point.

Minimum pause

Adjusting the minimum pause between the steps.

Minimum step

Adjusting the minimum pulse length for the heating valve.

Error factor

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

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 mixing valve.

Dead band

Adjusting the dead band on the mixing valve flow temperature controller.
1.0 °C means ± 1 °C dead band. Within this band there will not be any step signals.

D-factor

Adjusting the sensitivity of the flow temperature controller to the flow temperature differential. For example this means that the opening speed of the heating valve will be increased, if the flow temperature falls drastically, where it was supposed to increase.

Flow temp. demand

Reading the current flow temperature demand.

Flow temperature

Reading the measured flow temperature.

```
Setup + Service -> Service -> Varme -> Varmeventil 2
    Step faktor                                          5.0
    Pause faktor                                         5.0
    Minimum pause                                   00:00:10
    Minimum step                                    00:00:00
    Fejl faktor                                          1.0
    Dead band                                        0.0 °C
    D-faktor                                             1.0
    Flow temperatur krav                             0.0 °C
    Flow temperatur                                  0.0 °C
```

Figure 154
Service settings for heating valve 2.

For description see Figure 153.

Energi balance model

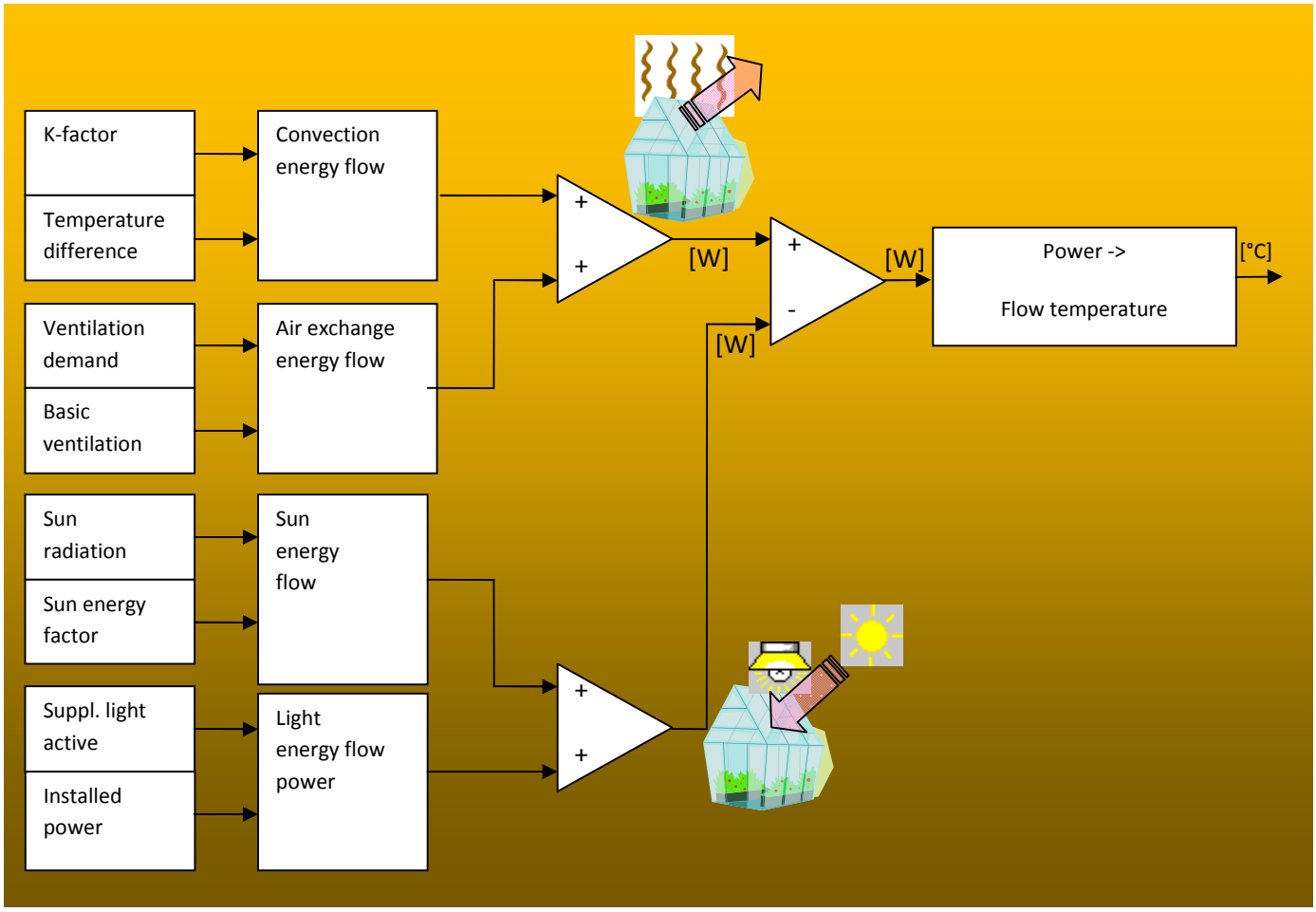


Figure155
Energi balance model.

```
Setup + Service -> Service -> Varme -> Energi balance model
    K-faktor drivhus                                    10.0
    K-faktor tillæg ved regn                             2.0
    K-faktor gardin 1                                   30.0
    K-faktor gardin 2                                   30.0
    Basis luft udskiftnings faktor                       1.0
    Luft udskiftningsfaktor                              1.0
    Vind-luft udskiftnings faktor                    0.2 m/s
    Effekt udskiftnings faktor                           0.1
    Sol effekt faktor                                    0.5
    Lys effekt installeret                              30.0
    Rør faktor                                   0.25 °C/W
    Rør udstrålings koefficent                           0.8
    Energi balance model aflæsninger                      ->
```

Figure 156
Settings for the energy balance model.

Activation of the energy balance model, see TODO

K-factor greenhouse
Adjusting the K-factor for the greenhouse in W/°C per m^2.
The K-factor is the heating conductivity of the construction.
10 W/°C means that it takes 10 W/m^2 to increase the temperature with 1 °C.

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

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

K-factor screen 2
Adjusting the K-factor for screen 2.

Basic air exchange factor
Adjusting the basic air exchange factor as simulated ventilation at closed cents and no wind.

Air exchange factor
Adjusting the factor for calculation of the air exchange depending on the ventilation %.

Wind air exchange factor
Adjusting the wind speed influence on the air exchange.
0.20 means that the calculated air exchange will be doubled by a wind speed on 5 m/s.

Power factor air exchange
Adjusting the power loss caused by the air exchange. [W/m^3] per hour.

Sun power factor
Adjusting the amount of the sun power, which is heating up the greenhouse.
0.5 means that ½ of the sun power is heating the greenhouse. The other ½ is lost, among other things by reflection.

Light power installed
Adjusting the power contribution when the supplementary light is activated.

Pipe factor
Adjusting the increase of the 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.
1.0 means the pipes emit all heating.
0.0 means the pipes emit no heating.

```
Setup + Service -> Service -> Varme -> Energi balance model -> Energi balance model aflæsninger
    K-faktor total                                          0.0 W/°C
    Luft udskiftning                                        0.0 m3/h
    Energi tabt pga. luft udskiftning                       0.0 W/m2
    Sol energi bidrag                                       0.0 W/m2
    Lys energi bidrag                                       0.0 W/m2
    Energi flowkrav                                         0.0 W/m2
    Model flow temperatur krav                                0.0 °C
```

Figure 157
Readings for the energy balance model.

K-factor total

Reading the final K-factor.

The total K-factor is the heating conductivity of the whole construction including screens.

The total K-factor is also depending on wind speed and rain.

10 W/°C means that it takes 10 W/m^2 to increase the temperature with 1 °C.

Air exchange

Reading the estimated air exchange per m^2.

Energy loss due to air exchange

Reading the estimated energy loss caused by air exchange.

Sun energy contribution

Reading the energy contribution from the sun radiation.

Light energy contribution

Reading the energy contribution from the supplementary light.

Energy flow demand

Reading the estimated energy flow demand calculated by the energy balance model.

Model flow temperature demand

Reading the increase on the flow temperature caused by the energy balance model.

Heating PID regulator

```
Setup + Service -> Service -> Varme -> Varme PID Regulator 1
    P-faktor uden model                                    10.0
    P-faktor med model                                      5.0
    I Tid                                                00:30:00
    D Tid                                                00:10:00
    Dog tail                                               5.0 °C
    Temp. fejl for reset integrale                         2.0 °C
    Integrale gain lav temp.                                1.0
    Integrale gain høj temp.                                1.0
    Exp. fejl faktor                                       10.0
    Integrale diff. faktor                                  0.0
    Min. sekundær påvirkning af integralet                  Nej   [Nej, Ja]
    Model aktiv                                             Nej   [Nej, Ja]
    Model faktor                                            1.0
    Max. model output                                    100.0 °C
    Diff. tids konstant                                  00:01:00
    Aflæsning varme PID regulator 1                         ->
```

Figure 158
Settings for heating PID regulator 1.

P-factor without model

Adjusting the P-factor used, when not using the energy balance model.

The P-factor gives a change in flow temperature proportional with the temperature error.

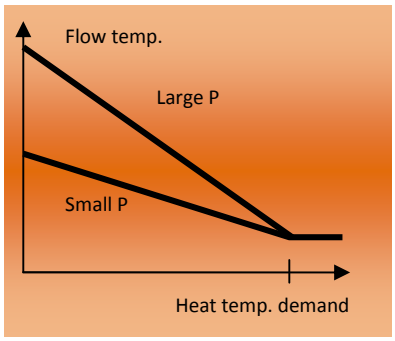
The P-factor is actually the sensitivity of the regulator.

A too high P-factor causes oscillations.

A too low P-factor causes a slow regulator.

An installation with many pipes per m^2 is more efficient and should have a lower P-factor.

An installation with few pipes per m^2 is less efficient and should have a higher P-factor.



P-factor with model

Adjusting the P-factor used, when not using the energy balance model.

When using the energy balance model, the P-factor can be set lower and then avoid oscillation.

I-time

Adjusting the I-time (time integral) for the PID regulator.

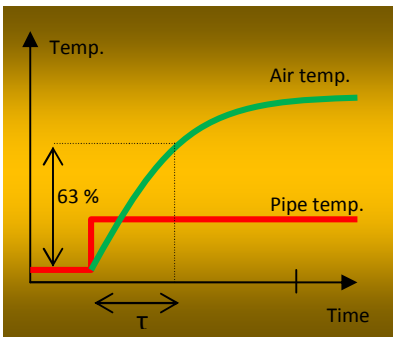
The I-time is the time to give a change in flow temperature as the P-part of the PID regulator with a constant temperature error.

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.



D-time

Adjusting the D-time (differential 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.

Dog tail

Adjusting the limits relative to the current flow temperature for stopping the integral. An adjustment at 5 °C will result in following:

If the flow temperature stops at 80 °C the integral demand will stop at 85 °C.

Temp. error for reset integral

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

Integral gain low temp.

Adjusting the gain of the temperature error by too **low** air temperature.

If this set point is higher than 1.0, the simulated error will be higher than the actual. This means that the integral function will act faster.

Integral gain high temp.

Adjusting the gain of the temperature error by too **high** air temperature.

If this set point is higher than 1.0, the simulated error will be higher than the actual. This means that the integral function will act faster.

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

Integral diff. factor
Adjusting the diff. factor for changing the temperature 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 minimum should have influence in 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.

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.

Model factor
Adjusting the multiplication factor for the energy balance model.

Max. model output
Adjusting the maximum allowed contribution from the energy balance model.

Diff. time constant
Adjusting the time constant of the air temperature differential calculation.

```
Setup + Service -> Service -> Varme -> Varme PID Regulator 1 -> Aflæsning varme PID regulator 1
    Luft temperatur krav                                    0.0 °C
    Flow temperatur krav                                    0.0 °C
    Propotional krav                                        0.0 °C
    Integrale krav                                          0.0 °C
    Differentiale krav                                      0.0 °C
    Model krav                                                 Nej   [Ja, Nej]
    Temperatur fejl                                         0.0 °C
    Fejl forventet temperatur                               0.0 °C
```

Figure 159
Readings for heating PID regulator 1.

Air temperature demand
Reading the current air temperature demand for the 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

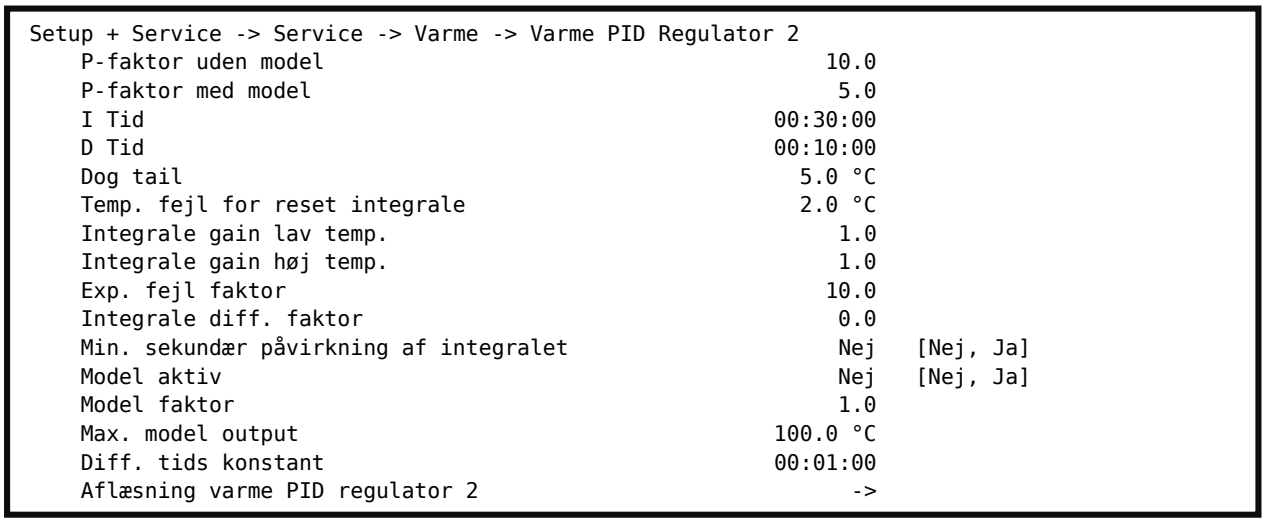
Reading the current flow temperature demand from the energy balance model.

Temperature error

Reading the current air temperature error.

Exponential temperature error

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



For description see Figure 158.

```
Setup + Service -> Service -> Varme -> Varme PID Regulator 2 -> Aflæsning varme PID regulator 2
    Luft temperatur krav                                    0.0 °C
    Flow temperatur krav                                    0.0 °C
    Propotional krav                                        0.0 °C
    Integrale krav                                          0.0 °C
    Differentiale krav                                      0.0 °C
    Model krav                                                  Ja   [Nej, Ja]
    Temperatur fejl                                         0.0 °C
    Fejl forventet temperatur                               0.0 °C
```

Figure 161
Readings for heating PID regulator 2.

For description see Figure 159.

Heating controller setup

```
Setup + Service -> Service -> Varme -> Varme controller 1 setup
    Rampestigning flow temp. primær                      0.0 °C/h
    Rampe fald flow temp. primær                         0.0 °C/h
    Rampestigning flow temp. sekundær                    0.0 °C/h
    Rampe fald flow temp. sekundær                       0.0 °C/h
    Laveste min. temperatur primær                         0.0 °C
    Laveste min. temperatur sekundærTODO tekstfejl i panel  0.0 °C
    Primær-sekundær forhold                                0.5
    Aflæsning varme controller 1                               ->
```

Figure 162
Settings for heating controller 1.

Ramp increase flow temp. primary

Adjusting the maximum rate/speed for increasing the primary flow temperature.

0 » no ramp.

Ramp decrease flow temp. primary

Adjusting the maximum rate/speed for decreasing the primary flow temperature.

0 » no ramp.

Ramp increase flow temp. 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 increse when running in parallel.
0.5 means 50 % on each.
0.6 means 60% on primary and 40 % on secondary.

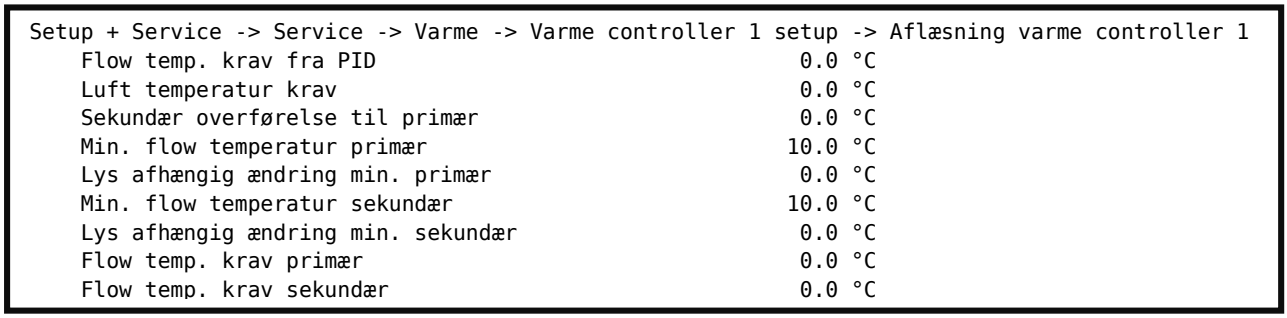


Figure 163
Readings for heating controller 1.

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 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 dependent change min. primary

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

Min. flow temperature secondary

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

Light depending change min. secondary

Reading the current change of minimum flow temperature on the secondary heating valve depending on

light intensity.
NB! The light intensity follows the same curve as the dependency on air temperature.

Flow temperature demand primary
Reading the current flow temperature demand on the primary heating valve.

Flow temperature demand secondary
Reading the current flow temperature demand on the secondary heating valve.

```
Setup + Service -> Service -> Varme -> Varme controller 2 setup
    Rampestigning flow temp. primær                    0.0 °C/h
    Rampe fald flow temp. primær                       0.0 °C/h
    Rampestigning flow temp. sekundær                  0.0 °C/h
    Rampe fald flow temp. sekundær                     0.0 °C/h
    Laveste min. temperatur primær                       0.0 °C
    Laveste min. temperatru sekundær                     0.0 °C
    Primær-sekundær ratio                                   0.5
    Aflæsning varme controller 2                             ->
```

Figure 164
Settings for heating controller 2.

For description see Figure 162.

```
Setup + Service -> Service -> Varme -> Varme controller 2 setup -> Aflæsning varme controller 2

    Flow temp. krav fra PID                              0.0 °C
    Luft temperatur krav                                 0.0 °C
    Sekundær overførelse til primær                      0.0 °C
    Min. flow temperatur primær                          0.0 °C
    Lys afhængig ændring min. primær                     0.0 °C
    Min. flow temperatur sekundær                        0.0 °C
    Lys afhængig ændring min. sekundær                   0.0 °C
    Flow temp. krav primær                               0.0 °C
    Flow temp. krav sekundær                             0.0 °C
```

Figure 165
Readings for heating controller 2.

For description see Figure 163.

Circulating pump setup

```
Setup + Service -> Service -> Varme -> Cirkulations pumpe
    Pumpe 1 offset flow temp. krav                       5.0 °C
    Pumpe 2 offset flow temp. krav                       5.0 °C
    Fælles stop forsinkelse                           00:15:00
```

Figure 166
Settings for the circulating pumps.

Pump 1 offset flow temp. demand

The pump starts when the flow temperature demand surpasses the heating temperature demand + this offset setting.

Pump 2 offset flow temp. demand

The pump starts when the flow temperature demand surpasses the heating temperature demand + this offset setting.

Common stop delay

The pump stops when the flow temperature gets below the heating temperature demand + the offset setting and this time setting is expired. This setting is used for all pumps.

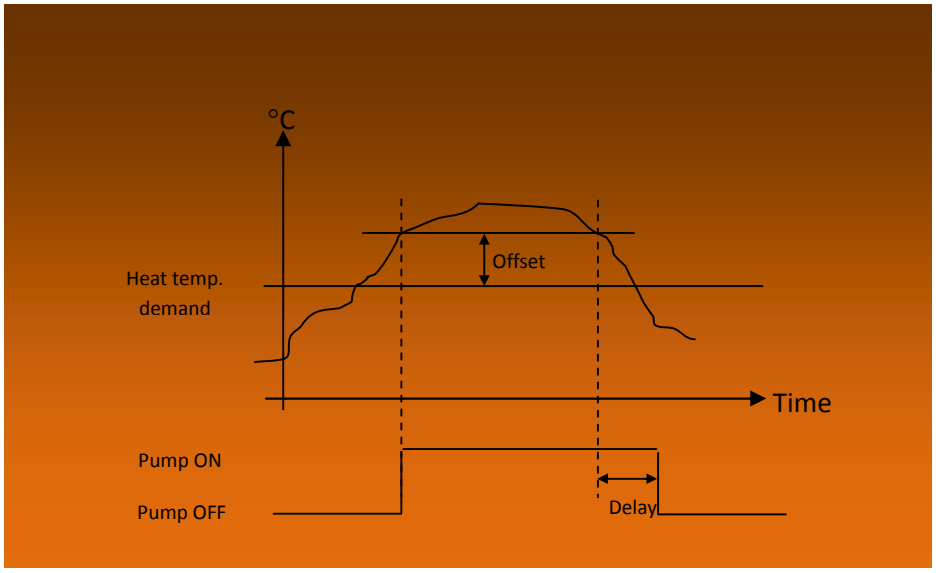


Figure 167
Start – stop of the pumps.

Common compartment

```
Setup + Service -> Service -> Fælles afdeling
    Rampe for stigning lystillæg                    6.0 °C/h
    Rampe fald ved lystillæg                        1.5 °C/h
    Gennemsnitstid temp.aflæsning                   00:00:30
    Gennemsnitstid fugtighedsaflæsning              00:03:00
    Gennemsnitstid solaflæsning                     00:05:00
    Gennemsnitstid lysaflæsning                     00:05:00
    Gennemsnitstid CO2 aflæsning                    00:00:00
    Forsink. daggry-skumring                        00:15:00
```

Figure 168
Settings for e.g. the average time for each sensor.

Ramp for increase light addition

Adjusting the rate/speed for increasing the **common heating temperature demand** caused by light intensity.

Ramp decrease light addition

Adjusting the rate/speed for decreasing the **common heating temperature demand** caused by light intensity.

Average time temperature reading

Adjusting the average time for the 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 changeover is made.

Sensor adjustment

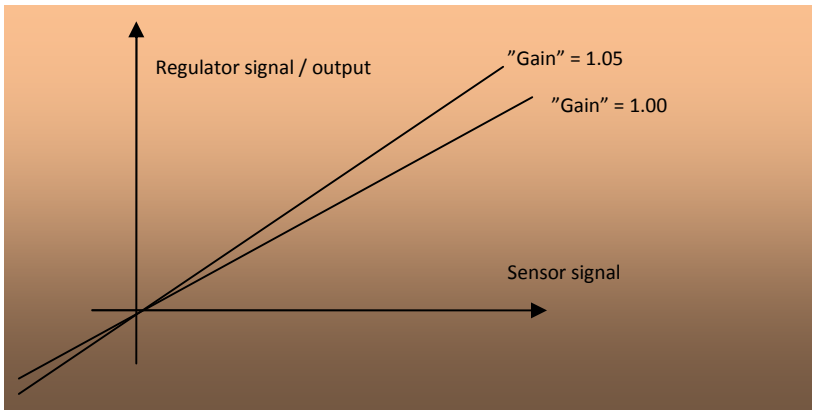
```
Setup + Service -> Service -> Sensor justering
    Luft temp. 1 Gain                                    1.0
    Luft temp. 1 Offset                                0.0 °C
    Luft temp. 1 Aflæsning                             0.0 °C
    Luft temp. 2 Gain                                    1.0
    Luft temp. 2 Offset                                0.0 °C
    Luft temp. 2 Aflæsning                             0.0 °C
    Fugtighed 1 Gain                                     1.0
    Fugtighed 1 Offset                               0.0 RH%
    Fugtighed 1 Aflæsning                            0.0 RH%
    CO2 Sensor Gain                                      1.0
    CO2 Sensor Offset                                0.0 ppm
    CO2 Sensor Aflæsning                                 0.0
    Lokal lys Gain                                       1.0
    Lokal lys Offset                                 0.0 klx
    Lokal lys Aflæsning                              0.0 klx
```

Figure 169
Sensor adjustment. Here a fine adjustment of each sensor can be made.

Air temp. 1 gain

Adjusting air temperature sensor 1.

”Gain” is added at the resizing, e.g. 1.010 will give an increase of 1 % on the entire scale.



Air temp. 1 offset

Adjusting the offset, which is added after the “gain” has tipped the curve.

Air temp. 1 reading

The readings show the results of the adjustments.

The principle is similar for the remaining sensors.

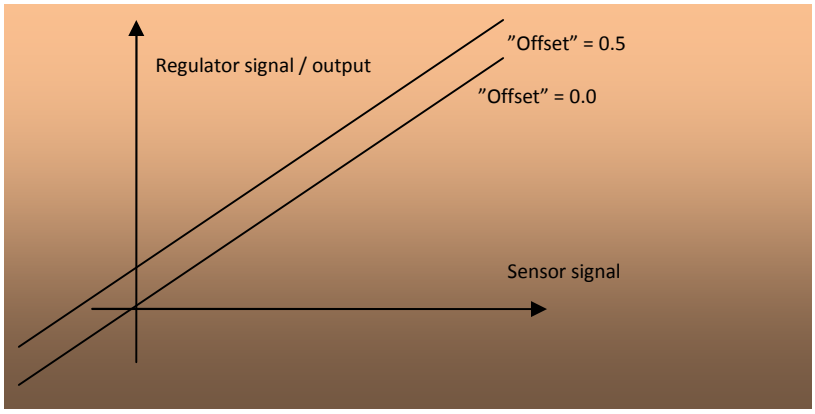


Figure 171
Offset shifts the sensor function.

```
Setup + Service -> Service -> Middel temperatur kontrol
    Max.middeltemperatur                                30.0 °C
    Min.middeltemperatur                                10.0 °C
    Max.middel fejl                                     10.0 °C
    Min.middel fejl                                    -10.0 °C
    Genvindings gain                                       2.5
    Middeltemperatur fejl                               0.0 °C
    Genvindingstemperatur                               0.0 °C
    Midlingsperiode Eller er det middeltemperatur?      0.0 °C TODO ????????
```

Figure 172
Settings for the average temperature control.

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 cultural preparation.

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

Min. average temperature
Adjusting the minimum temperature to be included 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 **TODO eller er det** `Midlingsperiode`
Reading the current average temperature in the calculating period.

Ventilation on time or pot

```
Setup + Service -> Service -> Ventilation
    Fælles ventilation                                    ->
    Ventilation Model                                     ->
    Ventilation PI Regulator 1                            ->
    Controller 1                                          ->
    Ventilation 1+2                                       ->
    Vent. på tid eller pot                               Tid   [Tid, Pot.]
    Ventil pot justering                                  ->
```

Figure 173
Service settings for ventilation and choice of method for vent regulation.

Vent. position on time or potentiometer

Selecting the wanted vent position indicator.

Time: The vent position is calculated on time, which is based on the settings for the total run time.

Potentiometer: A more accurate operation can be achieved by measuring the current position of the ventilation gear by means of potentiometer.

Common ventilation

```
Setup + Service -> Service -> Ventilation -> Fælles ventilation
    På forsinkelse orkan + storm                          00:00:05
    Fra forsinkelse orkan + storm                         00:05:00
    Vind vinkel for parallel                                10.0 °
    Forsink. læside skifte                                00:05:00
    Vindhastighed for læside skifte                        2.0 m/s
    Vent. justerings interval ved ingen ventilation       01:00:00
    Vent. justerings interval ved ventilation             06:00:00
    Ekstra justeringstid                                  00:01:00
    Ventilations krav for ingen justering                  200.0 %
```

Figure 174
Settings for ventilation.

On delay gale + storm

Adjusting the delay time 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 setpoint 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 angle for parallel

When the wind blows along the ridge, wind- and leeside will run parallel. This setpoint allows the wind direction to turn while the wind- and leeside are still running parallel. When the wind direction turns more than this setpoint, normal leeside regulation is performed again.

Delay leeside switch

Adjusting the time delay for shifting leeside after the wind direction has passed the gable direction.

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

In case of no position feedback in the form of potentiometer, the vents can get out of step with the climate computer control. That is why automatic calibration is possible. If this setpoint 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, e.g. 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 setpoint, no auto adjustment will take place.
Complete ventilation is 200 % - 100 % per vent.

Ventilation Model

```
Setup + Service -> Service -> Ventilation -> Ventilation Model
    Sol kompensering                                    0.0 %/W
    Sol rampe kompensering                            0.0 °C/h
    Sol ventilation reduceret Delta T afhængig        0.0 %/°C
    Delta T faktor                                         0.0
    Sol ventilations krav                                0.0 %
```

Figure 175
Settings for the ventilation model.

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 ventilation demand =

(Suppl. light power + Sun power – Delta T factor)*Sun comp./ (Delta T factor * Sun vent. reduc. Delta T dep. + 1)

[W] [W] W ⇨ % opening of vent. Factor depending of outdoor temp.

Ramp sun compensation

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

Sun vent. reduc. Delta T 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.

Ventilation PI Regulator

```
Setup + Service -> Service -> Ventilation -> Ventilation PI Regulator 1
    Basis P-faktor                                          3.0
    I Tid                                                00:15:00
    P-faktor delta T afhængig                            7.0 1/°C
    Sol ventilations faktor                                 0.0
    Dog tail                                               5.0 %
    Lav temperatur integrale gain                           1.0
    Høj temperatur integrale gain                           1.0
    Exp. fejl faktor                                       20.0
    P-faktor ventilations position                       0.0 °C/%
    Aflæsning Ventilation PI Regulator 1                      ->
```

Figure 176
Settings for ventilation PI regulator 1.

Basic P-factor

Adjusting the basic P-factor.
The P-factor gives a change in ventilation demand proportional to the temperature error.
The P-factor is actually the sensitivity of the regulator.
A too high P-factor will cause oscillation.
A too low P-factor will cause a slow regulation.
A greenhouse with large vents is more efficient and should have a lower P-factor.
A greenhouse with small vents is less efficient and should have a higher P-factor.

I time

Adjusting the I time of the PI regulator.
The I time is the time to give the same change in ventilation demand as the P part of the PI regulator with a constant temperature error.

Example:
Temperature error: +1.0 °C constant.
P-factor: 10 %/°C

I time: 00.15 hour
P contribution: 10 % change
I contribution: 10 % change after 15 minutes

Hint: The I time should be adjusted to the reaction time of the ventilation system of the greenhouse.

P-factor Delta T dependent
Adjusting how much the basic P-factor will be reduced, depending on the temperature difference inside and outside. A lower temperature outside will cause a lower P-factor. Less ventilation. Unit: %/°C

Sun vent. factor
Adjusting the factor for using the ventilation model.

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

Dog tail
Adjusting the limitation of the integral compared to the actual vent position. The integration stops at the current vent position +/- **dog tail**. If the vents stop at e.g. 80 %, the integral will stop at 85 %, if the **dog tail** is adjusted to 5 %.

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

Low temp. integral gain
Adjusting how much the integration should be “speeded up”, when it is 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
Adjusting how much the integration should be ”speeded up”, when it is 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 temperature 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 %.

```
Setup + Service -> Service -> Ventilation -> Ventilation PI Regulator 1 -> Aflæsning Ventilation PI Regulator
1
    Ventilations temp.krav                                  0.0 °C
    Ventilations krav                                        0.0 %
    Propotional krav                                         0.0 %
    Integrale krav                                           0.0 %
    Endlig P faktor                                            0.0
    Temperatur fejl                                        0.0 °C
```

Figure 177
Readings for ventilation PI regulator.

Ventilation temperature 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 final P-factor after any reduction because of great difference between inside and outside temperature. **See P-factor Delta T dependent**. **Fejl! Henvisningskilde ikke fundet.**.

Temperature error

Reading the current air temperature error.

Temperature exp. error

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

Ventilation Controller

```
Setup + Service -> Service -> Ventilation -> Controller 1
    Dist. ude temp. start reduktion max                   -10.0 °C
    P-bånd ude temp for reduktion max                      10.0 °C
    Vindhastighed for start reduktion max                 10.0 m/s
    P-bånd vind for fuld reduktion max                    10.0 m/s
    Rampe ændre reduktion af max                           10.0 °C
    Dist. ude temp.start reduktion min                    -10.0 °C
    P-bånd ude temp. for reduktion min                     10.0 °C
    Vindhastighed for start reduktion min                  5.0 m/s
    P-Bånd vind for fuld reduktion min.                    5.0 m/s
    Dist. luft temp.start reduktion min                    -2.0 °C
    P-bånd luft temp. for reduktion min                     2.0 °C
    Rampe ændre reduktion af min                           10.0 s
    Læ-vindside forhold                                       0.5
```

Figure 178
Settings for ventilation controller.

Dist. out temp. for start redu. max

Adjusting the difference between the ventilation temperature demand and the outdoor temperature, below which a reduction of maximum ventilation position will take place. – 10 °C means that if the temperature outside has dropped 10 °C **below** the ventilation temperature demand the reduction will start. Should the temperature continue to fall, reduce further according to the following set point.

P-band out temp. for redu. max

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

Wind speed for start redu. max

Adjusting the wind speed, above which a reduction of maximum ventilation position will take place.

P-band wind for full redu. max

Adjusting the P-band on wind speed for full reduction of maximum ventilation position.

Ramp cancel reduction of max

Adjusting the maximum rate/speed for changing the factor of maximum ventilation position.

Dist. out temp. start redu. min

Adjusting the difference between the heating temperature demand and the outdoor temperature, below which a reduction of minimum ventilation position will take place. I.e. if it is more than 10 °C colder outside (-10) compared to the heating temperature demand.

P-band out temp. for redu. min

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

Wind speed for start redu. min

Adjusting the wind speed, above which a reduction of minimum ventilation position will take place.

P-band wind for full redu. min

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

Dist. air temp. for start redu. min

Adjusting the difference between the heating temperature demand of air temperature in the greenhouse, below which the reduction of minimum ventilation position will take place. I.e. if it is more than 2 °C colder (-2) compared to the heating temperature demand.

P-band air temp. for redu. min

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

Ramp cancel reduction of min

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

Leeside – windside ratio

Adjusting the ratio between the leeside and windside, when running in parallel.
0.5 means 50 % on each

0.6 means 60% on leeside and 40% on windside.

Staircase vent position

```
Setup + Service -> Service -> Ventilation -> Ventilation 1+2
    Staircase ventilations position                          5.0 %
    Staircase forsinkelse på ventilations position        00:05:00
    Åbne-tid                                              00:05:00
    Lukketid                                              00:05:00
    Dead band                                                1.0 %
    Hysterese                                                0.2 %
```

Figure 179
Settings for ventilation 1 and 2.

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**.

Open time
Running time for the vents is set here.

Closing time
Running time for the vents is set here.

If time control is selected:

Here one can adjust the current running times for the vent gears. One can choose to measure with e.g. a stop watch. Elapsed time from completely closed until completely open, open time. Elapsed time from completely open until completely closed, closing time.

Dead band
Adjusting the dead band for the running of the vents.

Hysteresis
Adjusting the hysteresis for the running of the vents.

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.

```
Setup + Service -> Service -> Ventilation -> Ventil pot justering
    Vent 1                                                    ->
    Vent 2                                                    ->
```

Figure 180
Menus that lead to vent potentiometer adjustments.

If potentiometer control is selected:

```
Setup + Service -> Service -> Ventilation -> Ventil pot justering -> Vent 1 TODO dumt ord.
    Manuel                                                  Aut.   [Lukke, Aut., Åbne]
    Auto                                                     Nej   [Nej, Ja]
    Åben                                                 500.0 Ohm
    Lukket                                                 0.0 Ohm
    Nuværende                                              0.0 Ohm
```

Figure 181
Vent potentiometer adjustment for vent 1.

Example for calibrating the gear potentiometer:

I. Change ”Manual” setting to ”Closed”.
II. Wait until the vent gear has closed the vent completely.
III. While the vent gear is completely closed, the setting is changed to ”Open”. The ohm value for closed position is now being saved and the gear begins to open the vent. Wait until the vent gear has opened the vent completely.
IV. While the vent is completely open, the setting is changed to ”Aut.”. The ohm value for the open position is now being saved and the gear begins to operate normally again.

The saved ohm values for the particular positions of the gear (100% and 0%) can be read in the display under Open and Closed as well as the current value.

Auto

Yes, indicates that the ohm value for closed will be saved each midnight. Continuous auto adjustment.

```
Setup + Service -> Service -> Ventilation -> Ventil pot justering -> Vent 2
    Manuel                                                  Aut.   [Lukke, Aut., Åbne]
    Auto                                                      Ja   [Ja, Nej]
    Åben                                                 500.0 Ohm
    Lukket                                                 0.0 Ohm
    Nuværende                                              0.0 Ohm
```

Figure 182
Vent potentiometer adjustment for vent 2.

For description see Figure 181.

Screen setup

```
Setup + Service -> Service -> Gardin setup
    Fælles gardiner                                          ->
    Aflæsning fælles gardiner                                ->
    Gardin 1                                                 ->
    Aflæsning gardin 1                                       ->
    Gardin 2                                                 ->
    Aflæsning gardin 2                                       ->
    Antal Gardiner                                            1
```

Figure 183
Menus for screen setup.

Number of screens

Selecting if 1 or 2 screens should be controlled.

```
Setup + Service -> Service -> Gardin setup -> Fælles gardiner
    Skumring forsinkelse                                  00:10:00
    Daggry forsinkelse                                    00:10:00
    Daggry skumring lys hysterese                          0.1 klx
    P-bånd energi kost                                   20.0 W/m2
    Max.stignings faktor                                       2.0
    Temperatur kontrol hysterese                             1.0 °C
    Hysterese lys tændt af assimilationslys TODO Tvangspåkørselshysterese ved
assimilationslys tændt              0.1 klx
    Forsink. af max gardin ved ventilation                00:00:10
    K-faktor ændring ved gardin på/af                     2.5 W/°C
```

Figure 184
Common settings for both screens.

Dusk delay

Adjusting the delay for switching from day to night.

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

Dawn delay

Adjusting the delay for switching from night to day.

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

Dawn-dusk light hysteresis

Adjusting the hysteresis in light for switching between night and day and back.

P-band energy cost

Adjusting the extra W/m^2 above the setting **Max. energy level day-night** to give full increase in light level for night-day and day-night changeover. See Figure 74.

Max. increase factor

Adjusting the maximum allowed increase in light level for night-day and day-night changeover caused by **Max. energy level day-night**. See Figure 74.

Temperature control hysteresis

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

Hysteresis light on by suppl. light

Adjusting the hysteresis in light, when forcing the screens on by active supplementary light.
Regarding the adjustment for the low light level, see Figure 75.

Delay of max screen by ventilation

Adjusting the delay for limiting the screen position by ventilation.

K-factor change screen on-off

Adjusting the insulating property of the screen.

```
Setup + Service -> Service -> Gardin setup -> Aflæsning fælles gardiner
    Dag-nat skygning                                        Nej   [Nej, Ja]
    Energi kost                                       0.0 W/m2
    Energi kost-faktor                                     0.0
```

Figure 185
Common readings for both screens.

Day-night shading

Reading the day-night condition of the screen.

Energy cost

Reading the energy cost by opening the screen.

Energy cost factor

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

```
Setup + Service -> Service -> Gardin setup -> Gardin 1
    Lys reduktions faktor gardin                              0.6
    Gardin nummer der skal ventes på ved åbning                 0
    Manual add. sol indstråling for gardin på           0.0 W/m2
    Gardin på forsinkelse                               00:10:00
    Gardin af forsinkelse                               00:10:00
    P-bånd temperatur for fuld reduktion af max gardin    2.0 °C
    Åbne step ved lav ude temperatur                      5.0 %
    Åbne step stignings faktor                            0.1 %
    Åbne step interval                                  00:03:00
    Staircase positions krav                              5.0 %
    Staircase forsinkelse                               00:05:00
    Åbne-tid                                            00:05:00
    Lukket  TODO Tekstforslag: Lukke-tid                00:05:00
    Dead band                                             1.0
    Hysterese                                             0.1
```

Figure 186
Service settings for screen 1.

Light reduction factor screen
Adjusting the screen reduction factor for visible light.
0.6 means 60% of the visible light is transmitted/passed through the screen.

Screen no. to wait for by opening
Selecting the screen to wait for when opening the screens.
The opening will take place, when the position of the selected screen is lower than 5 %.
0 = no screen to wait for.

Man. add. sun rad. 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 pulling the screen on, by day condition.

Screen off delay
Adjusting the delay for pulling the screen off, by day condition.

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

Opening step by low outdoor temp.
Adjusting the length of the first step, by step opening caused by low outdoor temperature.

Opening step increase factor
Adjusting the increase of the opening steps caused by low outdoor temperature.
This factor will be the amount of increase per % opening.
0.1 means that the step will be doubled by 10 % opening and tripled by 20 % opening.
The steps will be: Opening step * (1+ opening * **opening step increase factor**)

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

Staircase position demand
Adjusting the minimum change in position demand for immediate movement.
A smaller change will be made after the delay **Staircase delay**.

Staircase delay
Adjusting the delay for change in position demand smaller than **Staircase position demand**.

Open time
The total running time measured with e.g. a stop watch from completely closed to completely open.

Closing time
The total running time measured with e.g. a stop watch from completely open to completely closed.

Dead band

The distance between the position demand and the position in which the screen does not move.

The gear **starts** 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 does not move.

The gear **stops** when the position comes inside the hysteresis with reference to the position demand.

```
Setup + Service -> Service -> Gardin setup -> Aflæsning gardin 1
    Nuværende positions krav                              0.0 %
    Endelig positionskrav                                 0.0 %
    Gardin status on-off                                    Fra   [Fra, Til]
```

Figure 187
Service readings for screen 1.

Current position demand

Reading the current position demand for the screens.

Final position demand

Reading the final position demand for the screens.

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

Indicating whether the concerned screen is on or not.

```
Setup + Service -> Service -> Gardin setup -> Gardin 2
    Lys reduktions faktor gardin                              0.6
    Gardin nummer der skal ventes på ved åbning                 0
    Manual add. sol indstråling for gardin på           0.0 W/m2
    Gardin på forsinkelse                               00:10:00
    Gardin af forsinkelse                               00:10:00
    P-bånd temperatur for fuld reduktion af max gardin    2.0 °C
    Åbne step ved lav ude temperatur                      5.0 %
    Åbne step stignings faktor                            0.1 %
    Åbne step interval                                  00:03:00
    Staircase positions krav                              5.0 %
    Staircase forsinkelse                               00:05:00
    Åbne-tid                                            00:05:00
    Lukket                                              00:05:00
    Dead band                                             1.0
    Hysterese                                             0.1
```

Figure 188
Service settings for screen 2.

For description see Figure 186.

```
Setup + Service -> Service -> Gardin setup -> Aflæsning gardin 2
    Nuværende positions krav                              0.0 %
    Endelig positionskrav                                 0.0 %
    Gardin status on-off                                    Fra   [Fra, Til]
```

Figure 189
Service readings for screen 2.

For description see Figure 187.

CO_2 control

```
Setup + Service -> Service -> CO2 kontrol
    P-faktor                                             0.1 s/ppm
    Integrale faktor TODO. Tekstforslag:I-tid         00:00:10
    Fejl for reset-integrale                           1000.0 ppm
    Doserings interval                                   00:05:00
    Forsink. af CO2 reduktion af  high Ventilation       00:02:00
    Hysterese ved on/off                                   50 ppm
    CO2 fejl                                              0.0 ppm
    Integrale doserings tid                              00:00:00
    Total doserings tid                                  00:00:00
    CO2 dosering aktiv                                        Nej   [Nej, Ja]
```

Figure 190
Service indstillinger for CO_2.

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

I-time
Adjusting the integral factor on the PI regulator for the variable pulse.
An adjustment of 10.0 seconds will increase the pulse with 10 seconds 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 CO2 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 CO_2 dosing output.

Supplementary light setup

```
Setup + Service -> Service -> Assimilationslys
    Fælles assimilationslys                                  ->
    Aflæsning fælles assimilationslys                        ->
    Assimilationslys 1                                       ->
    Aflæsning ass.lys 1                                      ->
```

Figure 191
Service menus for supplementary light.

```
Setup + Service -> Service -> Assimilationslys -> Fælles assimilationslys TODO Fælles?
    Lampe tændes forsinkelse                              00:05:00
    Lampe slukkes forsinkelse                             00:05:00
    Hysterese lys start/stop                               1.0 klx
    Tidspunkt for reset af lys sum                        00:00:00
```

Figure 192
Settings for supplementary light.

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 on the outdoor light intensity.

Time for reset light sum

Adjusting the time for resetting the light sum.

```
Setup + Service -> Service -> Assimilationslys -> Aflæsning fælles assimilationslys
    Assimilationslys 1 aktiv           TODO er der tre trin?  Fra   [Fra, 1, 1+2, 1+2+3]
    Assimilationslys 1 intensitet                              0 klx
    Total effekt lys aktiv                                   0.0 kw/m2
```

Figure 193
Readings for supplementary light.

Supplementary light active
Indicates whether the supplementary light is on or not.

Supplementary light intensity
Reading the light intensity from the supplementary light.

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

```
Setup + Service -> Service -> Assimilationslys -> Assimilationslys 1
    Minut hvor lyset må tænde                                    0 s
    Lys niv. for start-stop 1                                  5.0 klx
    Lys add. for start-stop 2                                 -1.0 klx
    Lys add. for start-stop 3                                 -1.0 klx
    Max.light level on light sum                             200.0 klx
```

Figure 194
Service settings for supplementary light.

Minute for light on
Adjusting the minute of time when the light is allowed to be activated.
0 means all minutes.
1 means e.g. 12:0**1**, 12:1**1**, 12:2**1**…….
2 means e.g. 02:0**2**, 02:1**2**, 02:2**2**…….
10 means e.g. 15:0**0**, 15:1**0**, 15:2**0**…….
This setting makes it possible to distribute the inrush currents, over time, relative to light sources in other compartments.

Light level for start-stop
Limiting value for the light measured outside. Below this setting the light will be turned on. Above this setting the light will be turned off again. There is furthermore a hysteresis as well as a start-stop delay. The hysteresis works both below and above the limiting value. Regarding the hysteresis adjustment, see Figure 192.

Light add. for start-stop 2
Adjusting the light level offset for step 2 relative to the level of step 1.
NB! The value must be negative. (Darker)

Light add. for start-stop 3

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

NB! The value must be negative and larger than the **Light add. for start-stop 2**.

Max. light level on light sum

Adjusting the highest light level for calculating the light sum.

Light intensity above this level will be used as this level.

```
Setup + Service -> Service -> Assimilationslys -> Aflæsning ass.lys 1
    Auto periode lys kontrol                                  Nej   [Nej, Ja]
    Aktiv enable                                              Nej   [Nej, Ja]
    Start enable                                              Nej   [Nej, Ja]
    Aktiv step      TODO er der tre trin?                     Fra   [Fra, 1, 1+2, 1+2+3]
    Assimilationslys intensitet                             0 klx
```

Figure 195
Service readings for supplementary light.

Auto period light control

Reading the state of the light.

No: Not in auto period. (The light must not be turned on)

Yes: In auto period. (The light must be turned on, if it is dark enough)

Active enable

Reading whether the light must be turned on or not.

The following can allow that the light is on or may/may not be turned on:

The function selector is selected to **on**. The light will be on.

The time is inside the auto period. The light can be turned on.

Light sum obtained. Light turned off.

Start enable

Reading if the time matches the setting **Minute for light on** or not.

Supplementary light intensity

Reading the light intensity by the plants.

Max. humidity setup

```
Setup + Service -> Service -> Maksimal fugt
    Hysterese max RH%                                    1.0 RH%
    Hysterese min DX                                   0.1 g/kg
    Hysterese HAF RH%                                    1.0 RH%
    Hysterese HAF DX                                   0.1 g/kg
    Hysterese HAF temp.                                  1.0 °C
    Hysterese HAF vent.                                  2.0 °C
    Start forsinkelse HAF                             00:05:00
    Rampe RH krav                                     10.0 %/h
    Rampe DX krav                                      1.0 g/kg
    Pulstid varme                                     00:01:00
    Periodetid Varme                                  00:05:00
```

Figure 196
Service settings for max. humidity.

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 HAF fan when using DX as humidity unit.

Hysteresis HAF temp.

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

Hysteresis HAF vent.

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 e.g. time zone addition.

Ramp DX demand

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

Misting setup

```
Setup + Service -> Service -> Overbrusning setup
    Ventil pause                                    00:00:00
    Pumpe prestart                                         0
    Lokal pumpe stop forsinkelse                    00:00:03
    Hysterese ON/OFF overbrusning                  0.10 g/kg 2)
    Hysterese ON/OFF overbrusning                    2.0 RH% 1)
```

Figure 197
Service settings for misting.

```
Setup + Service -> Installation setup -> Humidity control setup -> Humidity unit
```

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.

Hysteresis ON/OFF misting

Adjusting the hysteresis for ON/OFF misting control.

An adjustment at 2.0 % results in a dead band at ± 2.0 %.