Usermanual

Amacs Climate

Code No. 99-97-1572

Edition: 02/2014 GB (Version: 2.0.6)

These instructions are a translation of the original instructions!

Program version

The product described in this manual is computer-based, and most functions are realised by software. This manual corresponds to:

Software version: V2.0.6

Product- and Documentation changes:

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IMPORTANT

Notes concerning the alarm system

Where climatic control is used in livestock buildings, break-downs, malfunctions or faulty settings may cause substantial damage and financial losses. It is therefore **most important to install a separate, independent alarm system**, which monitors the house concurrently with climatic control. Please note that the product liability clause of **BIG DUTCHMAN**'s general terms and conditions of sale and delivery specifies that an alarm system **must be installed**.

We want to draw your attention to EU-directive No. 998 of 14/12-1993 concerning minimum requirements for domestic animals, which specifies that an alarm system must be installed in any house, which is mechanically ventilated. In addition to this, there must be a suitable emergency system.

1 Main screen

The climate can be individually controlled by **AMACS**. **AMACS** can be intuitively and easily operated using the visualised elements.

This first chapter deals primarily with the main screen of the climate module. The specific screens and additional setting possibilities are described in the following chapters.

	All screenshots depicted in the manuals may differ from what you see on your FarmController as the equipment may be different. The visible areas depend on the system configuration. To ensure a better overview, menus without a function are hidden.

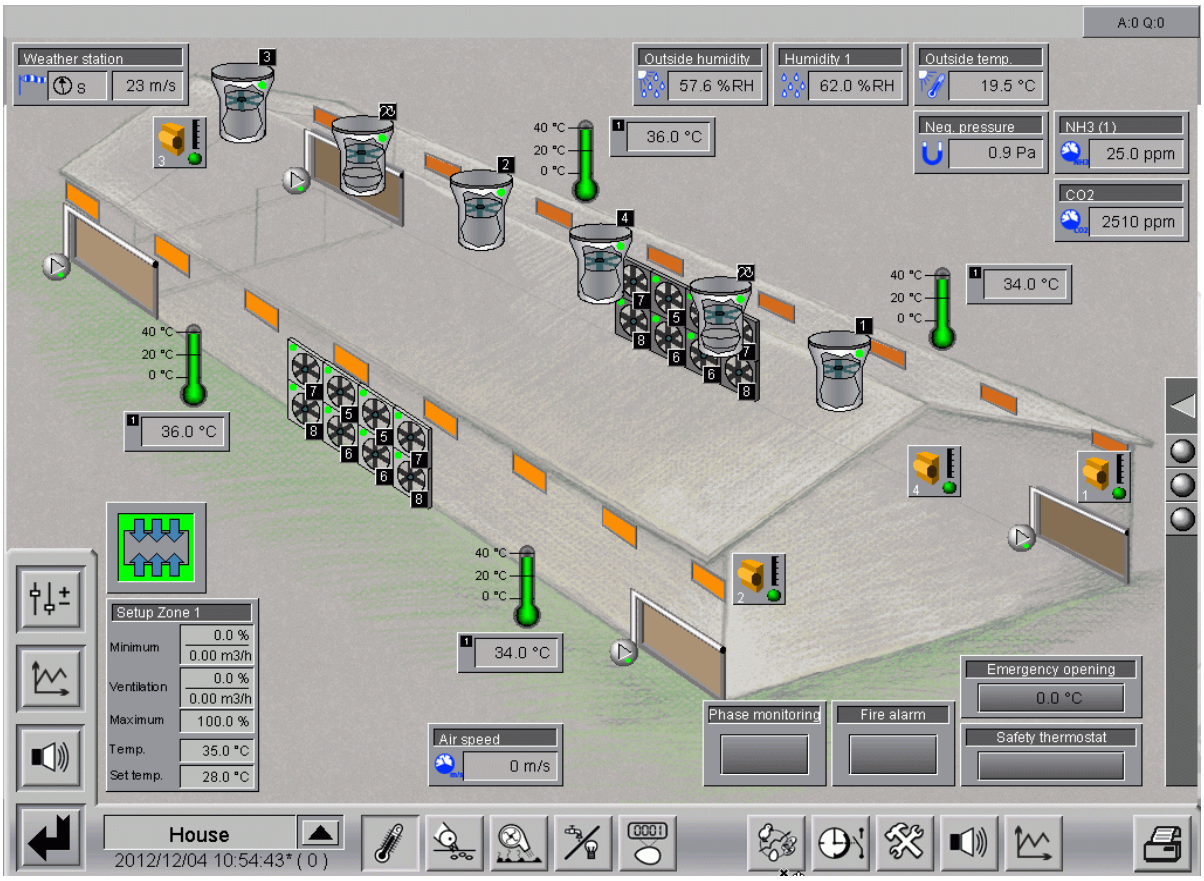


Figure 1-1: Overview: Main screen Climate

To access the overview screen Climate, click on the icon for climate control either in the house view or in the area selection which you can access by clicking on the shaded area in the lower right corner of the house view. If you have the required rights, you are now in the climate control overview screen.

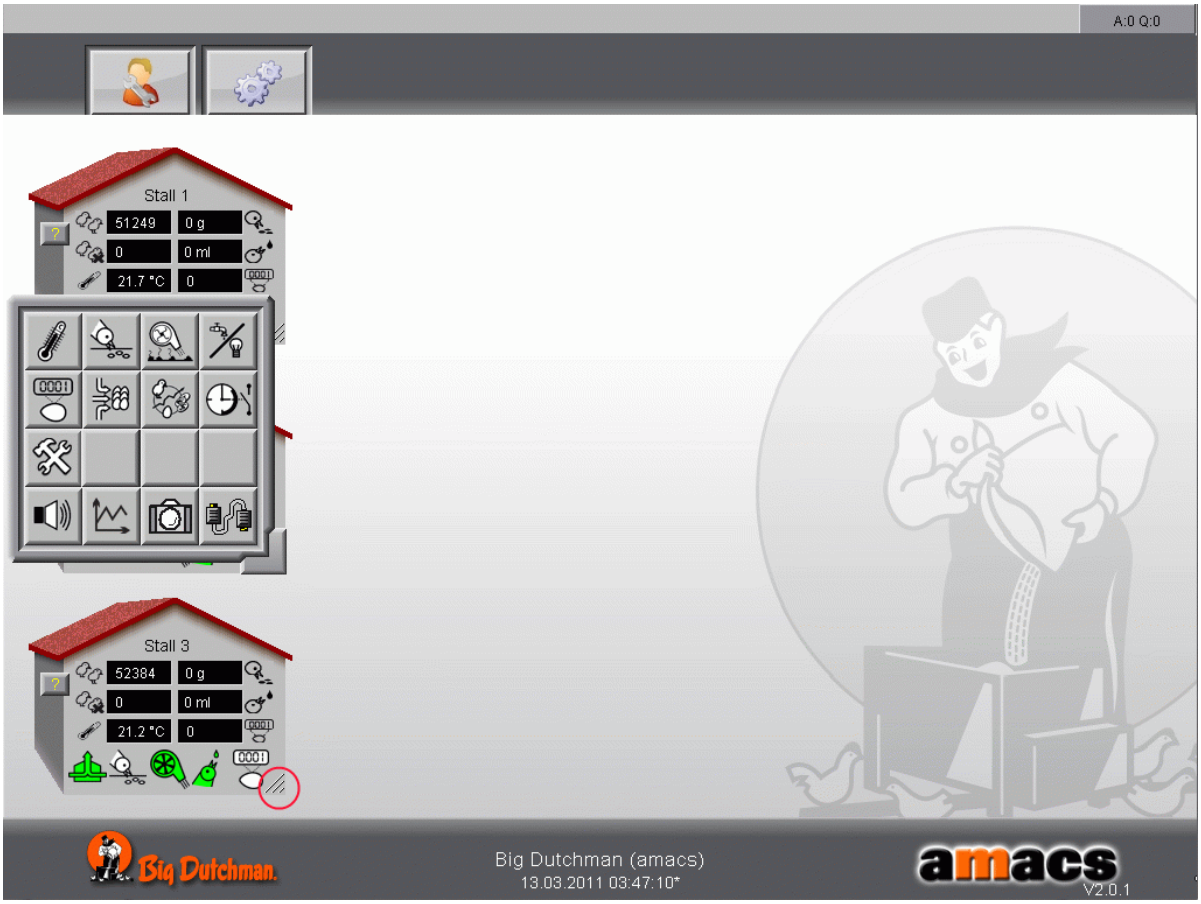


Figure 1-2: Open Climate

1.1 Overview of Climate objects

The following chapter lists all available climate objects and describes them shortly. Further functions can be found in the corresponding chapters.

1.1.1 Sensors

The Climate overview screen displays the currently measured value in the fields for each sensor. This value is transmitted directly and without delay from the house to the Climate main screen.

If one of the sensor fields lights up in red, the sensor is not working correctly. After an adjustable time period, an alarm is triggered if the unfiltered entry value does not change. If the end of the measuring range is reached, an alarm is triggered immediately. Both alarms appear as one log entry.

Sensor defective / cable break

The sensor displays react as follows in the case of an alarm:

- For cable breaks, the value flashes in red.
- For minimum or maximum alarms, the value is displayed in red but does not flash.

The program does no longer evaluate the measuring range for negative pressure, weather station, air speed and light intensity as the end of the measuring range can be reached even during normal operation for these sensors. An alarm for cable break is exclusively triggered depending on a signal change for these sensors.

A click on the sensor opens the corresponding curve diagram in a separate window. This curve shows the respective history data of the sensor within a coordinate system.

The time (date, hour, minute, second) is displayed on the X axis and the respective unit (°C, PA, %RH, m/s, ppm) the sensor is using for the measurement is displayed on the Y axis. The name of the sensor is indicated in each case on the top left.

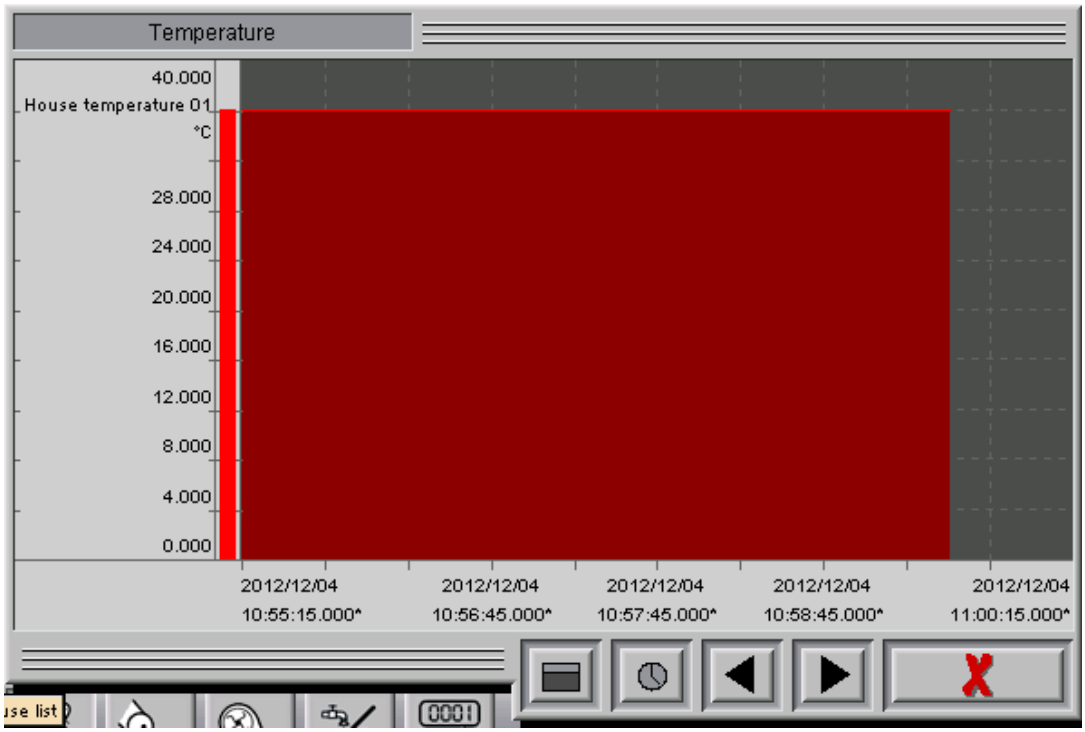
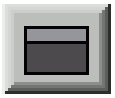


Figure 1-3: Sensor curve diagram

Various views can be displayed in the window of the curve diagram:



Display of the bar above the curve with further settings

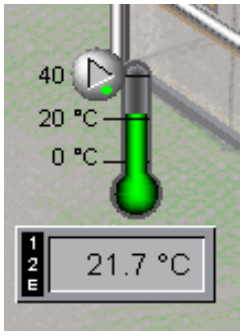
Setting the time

Time period forwards and backwards

Close

	The handling of the curve records in described in the **Amacs - User Manual**.

- **Temperature sensor**



The house temperature can be set individually and is of great importance. **Make sure to always keep track of it.**

If it is depicted in green as in the screenshot, this means everything is fine.

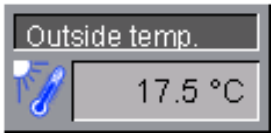
If the temperature is displayed in BLUE, the house is too cool. If it is displayed in RED, the house is too warm.

The colour changes depending on the alarm settings for the house temperature sensors [1-12] [too low/high].

On the left side, the zone in which the temperature sensor has been activated is displayed, **zone 1 and 2** in this case. The **E** indicates that **extra ventilation** is also activated. If an icon is hidden, it has been deactivated for the respective zone.

	Chapter describes how to activate and deactivate sensors.

- **Outside temperature sensor**



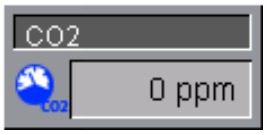
This sensor displays the currently measured outside temperature. The value shown is either measured at the house or, if the farm consists of several houses, by a central sensor.

- **Negative pressure sensor**

This sensor displays the currently measured negative pressure. If the air supply in the house is managed by an active negative pressure control, the main screen Climate indicates whether the control is active or if it is in "secure mode".

A small arrow displayed at the negative pressure sensor indicates the current mode in the overview. If the negative pressure control is active, the arrow is green. In the "secure mode", the arrow is red. If a negative pressure control has not been configured, the arrow is not displayed.

- **CO2 sensor**



This sensor displays the currently measured CO2 level.

- **NH3 sensor**

This sensor displays the currently measured NH^3 level.

- **Weather station**

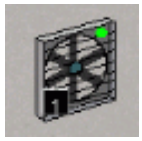
The weather station constantly displays the current wind velocity and direction. Wind velocity and direction can influence the air inlets.

- **Air speed sensor**

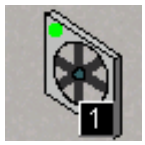
This sensor displays the currently measured air speed.

1.1.2 Fans

Roof fan

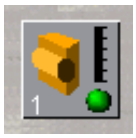


Wall fan
(front wall/back wall)

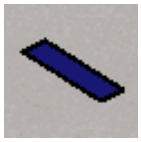


Wall fan
(left wall/right wall)

1.1.3 Intake air elements



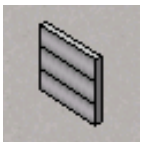
Motor for the operation of the intake air elements



Ceiling inlet

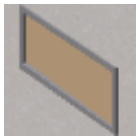
Wall inlet

Baffle



Shutters

Intake air chimney with fan



Tunnel inlet

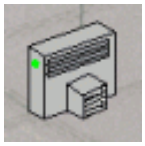
Intake air chimney

1.1.4 Heating

JetMaster

Recirculation fan

Radiant heater



Wall heating

Floor heating

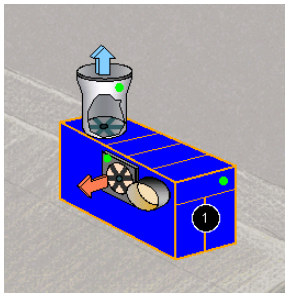
Heatmaster

1.1.5 Cooling

Spray cooling

Pad cooling

1.1.6 Heat exchanger Earny



Click on the blue casing. A menu is displayed which allows the manual control of the heat exchanger's set value. The intake and exhaust air fans are controlled in accordance with the set ratio curve.
Both fans can also be operated individually and manually.

1.1.7 Thermostats

The digital or analogue thermostats can be used for devices which have to be activated in addition to normal climate control. This might include, for example, mixed-air fans, recirculation fans, heating and additional cooling units.
The thermostats are shown in the lower right corner and, if available, in the house.

Thermostat is switched off

Thermostat is heating

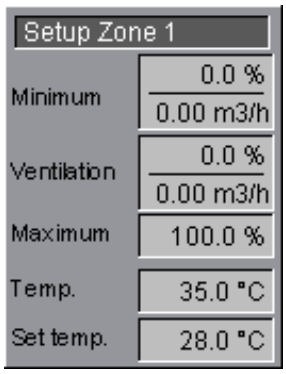
Thermostat is cooling

Figure 1-4: Thermostats

1.1.8 Ventilation mode

The individual icons for ventilation display the target and current value as well as information regarding the status.

1.1.8.1 Zone settings

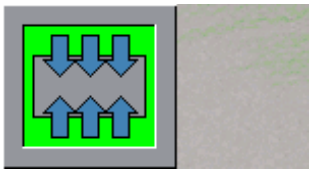


The zone settings show the current ventilation values as a function of the production day and the temperature. This includes minimum ventilation in percent and m³/h per bird, current ventilation in percent and m³/h per bird, maximum ventilation in percent as well as the house and set temperature. Clicking on the current value opens the corresponding set curve, which can be edited here.

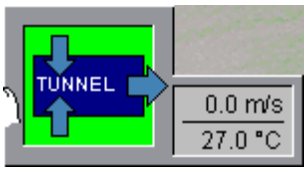
	Please check the **manual Amacs - Operation** on how to use the set curves.

1.1.8.2 Tunnel and CombiTunnel

The tunnel ventilation icon indicates the current mode of the ventilation (roof / side or tunnel). Clicking on the icon allows manual switching between side and tunnel ventilation. If the ventilation switches to tunnel mode, the calculated air speed in m/s and the windchill are displayed additionally.



Roof / side ventilation



Tunnel ventilation

1.1.9 External inputs

External inputs provide information about additionally installed safety measures. Messages shown here can only be deleted directly at the respective device.

1.1.9.1 Emergency opening

This field displays the set temperature for the emergency opening. These settings have to be checked during production and adjusted manually if necessary. The emergency opening temperature has to be between the alarm settings minimum and maximum above set temperature (e.g. minimum set temperature +4°C and maximum set temperature +6°C).

If the set value is not within the alarm settings, the field is marked in yellow and the following error message is displayed:

Setup Emergency opening Minimum/Maximum over Set temperature

The field is highlighted in red if the emergency opening has been triggered. In this case, the temperature measured by the emergency opening exceeds the temperature set at the opening. The following error message is displayed:

Emergency opening coming up

	The emergency opening temperature has to be checked during production and adjusted manually if necessary.

1.1.9.2 Safety thermostat

The safety thermostat hung in the house triggers and alarm when the temperature in the house overshoots or undershoots the set value.

	The minimum and maximum temperature of the safety thermostat has to be checked during production and adjusted manually if necessary.

1.1.9.3 Phase check

The phase monitoring checks the continuous power supply. If the phase monitoring detects an interruption, it generates an alarm which is shown as lightning here and in the main overview at the roof of the house. The power supply has to be checked in order to eliminate this error.

Warning
Risk of asphyxiation for humans and birds

If the connection to the control or the CAN is lost, it is possible that the house climate is no longer controlled. High concentrations of harmful gases may accumulate!

– Eliminate the error as soon as possible and turn the control on again or re-establish the connection!
– An adequate fresh air supply prevents the accumulation of harmful gases!
– Do not enter the house or use adequate protective gear in case harmful gases have accumulated!

1.1.9.4 Fire alarm

If a fire alarm system has been installed in the house for safety reasons and this system is equipped with an external output, **in case of a fire** the signal can be transmitted to **AMACS** .
A fire alarm is displayed as a flame here and in upper left corner of the main overview at the house's roof.

1.1.9.5 Free alarm

You can define free alarms to also transmit individual fault sensors to **AMACS**. These are displayed with a previously set alarm text.

A free alarm is queued when the background of the bell lights red.

Click on the bell to show/hide all free alarms together with their current statuses.

1.2 Drives

Each drive can be checked for its status in this screen and operated manually. The following explains what the colours mean and how to operate the drives.

1.2.1 Status

Symbols indicating whether the drive is set to automatic or manual operation (green or orange dot at the drive) or whether the drive is turned on (e.g. circulating fan, heating coloured red or display of the current position) are added to the drive icons.
The drives' colours and their meaning are explained here with the example of an analogue intake air element.

Colours:

Automatic "OFF"

Automatic "ON"

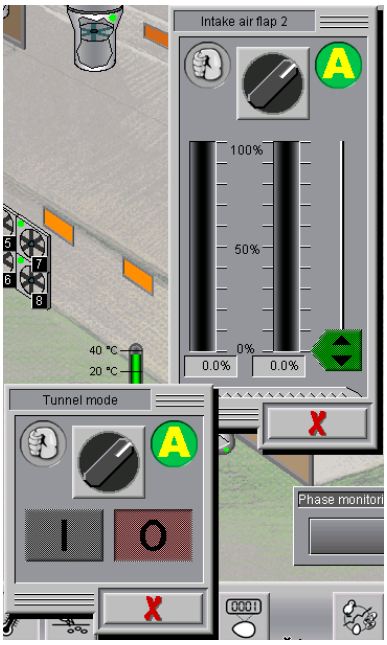
Manual "OFF"

Manual "ON"

Error

1.2.2 Manual mode

Click on a drive to open a control panel. Depending on whether it deals with a digital or analogue element, a switch will appear or a slider control with which the drive can be switched from manual to automatic mode respectively can be switched on or off.



To switch from automatic to manual operation of the drive, there is a rotary switch depicted in the upper part of the menu.
In the case of a digital drive, the drive can be turned on and off with the I/O buttons.
In the case of an analogue drive, the required position can either be reached using the orange slider or the set position can be entered via the entry field appearing below the set position.

⚠	**Attention!** Works on the drive or fans may be carried out when the protective switch is in OFF position. The drive units are activated without prior warning e.g. via the time switches. Local security advices and instructions are to be observed.

1.2.3 Operating hours

In order to determine service intervals it is helpful if the running times of the motors can be read off. If you click on the highlighted area, the respective time meter of a component will be opened.

The performed hours "today" and "total" are indicated here. The values can be reset to 0 via the reset button.

Figure 1-5: Operating hours

1.3 Settings

To access the settings, click on the icon **parameter setup**. Here you can set temperatures, etc., or enter and monitor production data.

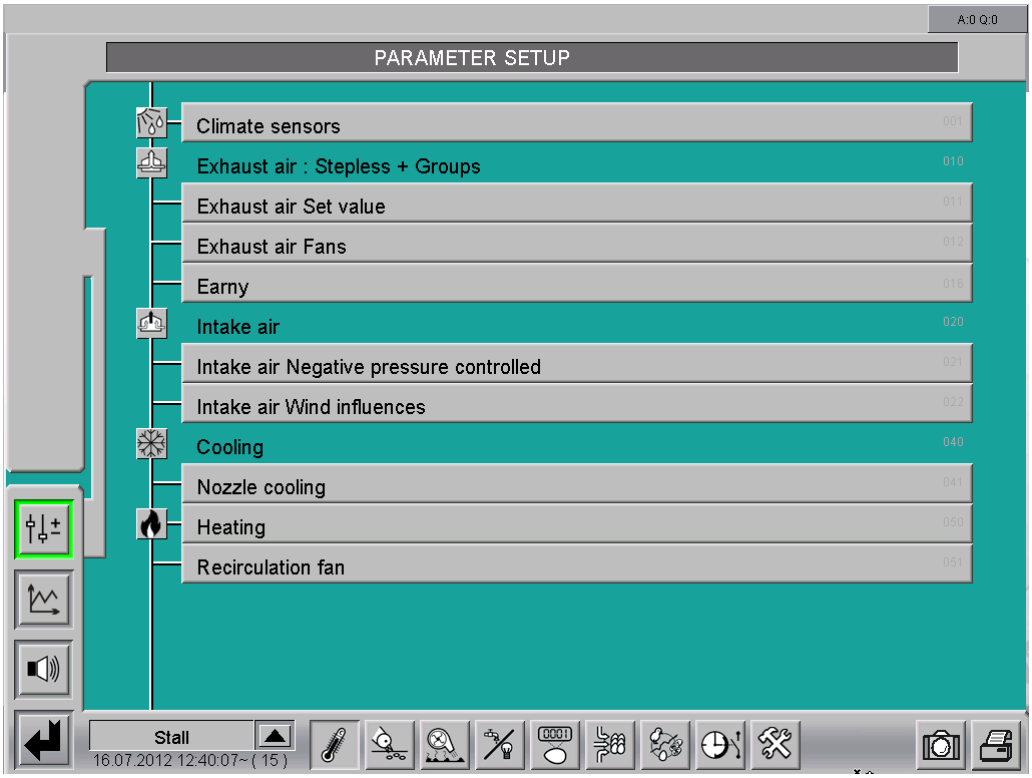


Figure 1-6: Setup

Clicking on one of the buttons in the menu takes you to the submenus where e.g. set temperatures, ventilation, etc. can be adjusted.

All shown settings only serve as examples. The appropriate settings are made during the initial operation and may then by optimized during operation.

If the submenu is divided into several pages, these pages can be accessed by clicking on the arrow keys in the upper right corner.

Figure 1-7: Switching between the screen pages

2 Climate sensors

Clicking on the button **Climate sensors** opens a menu in which you can enter information about the used climate sensors.

Figure 2-1: Climate sensors

Caution

The pre-set values for the measuring range of the sensors may not be changed at random, as a change might result in wrong readings. At initial operation the measuring ranges of the sensors are set.

All settings possible for the climate sensors can be found on two different screen pages:

1. Setting of 12 house temperature sensors and outside temperature sensors.

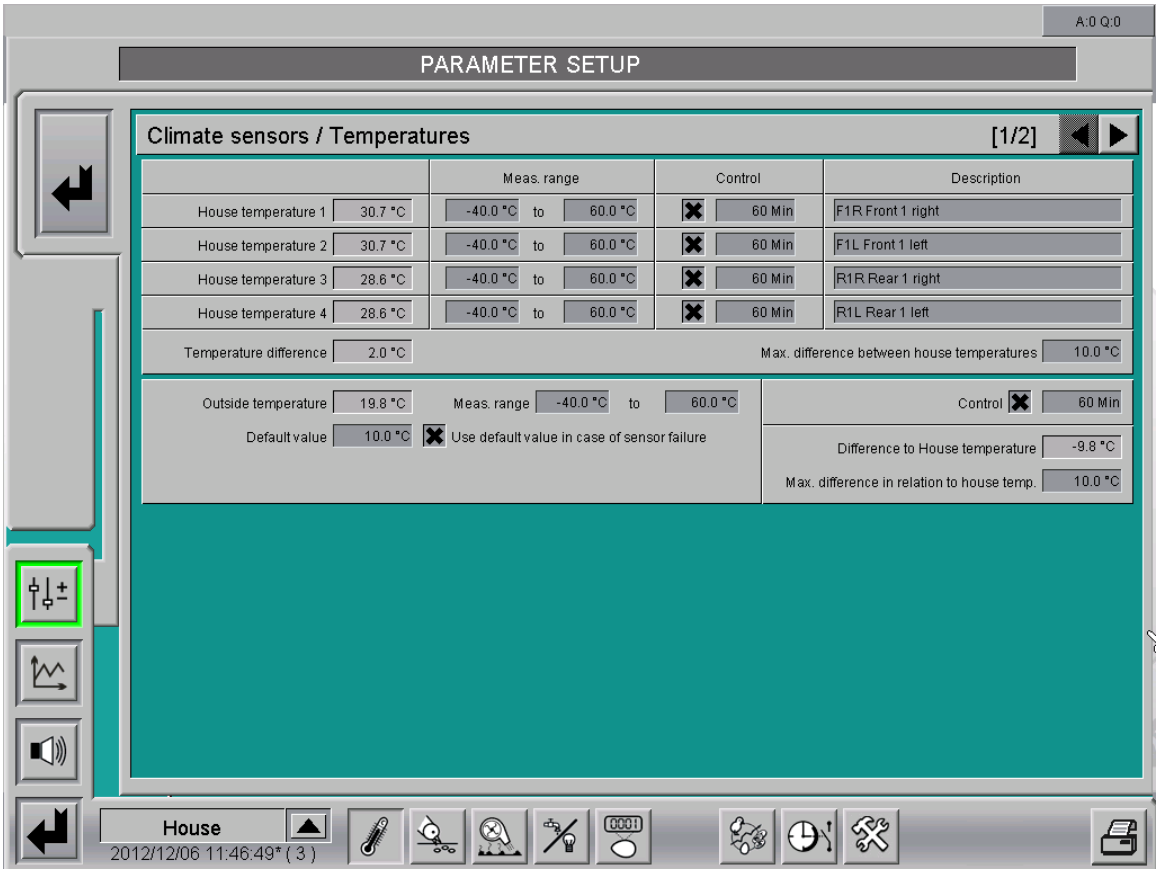


Figure 2-2: Climate sensors page 1

2. Setting of weather station, negative pressure sensor, two humidity sensors, outside humidity sensor, CO2 sensors, two NH3 sensors and air speed sensor.

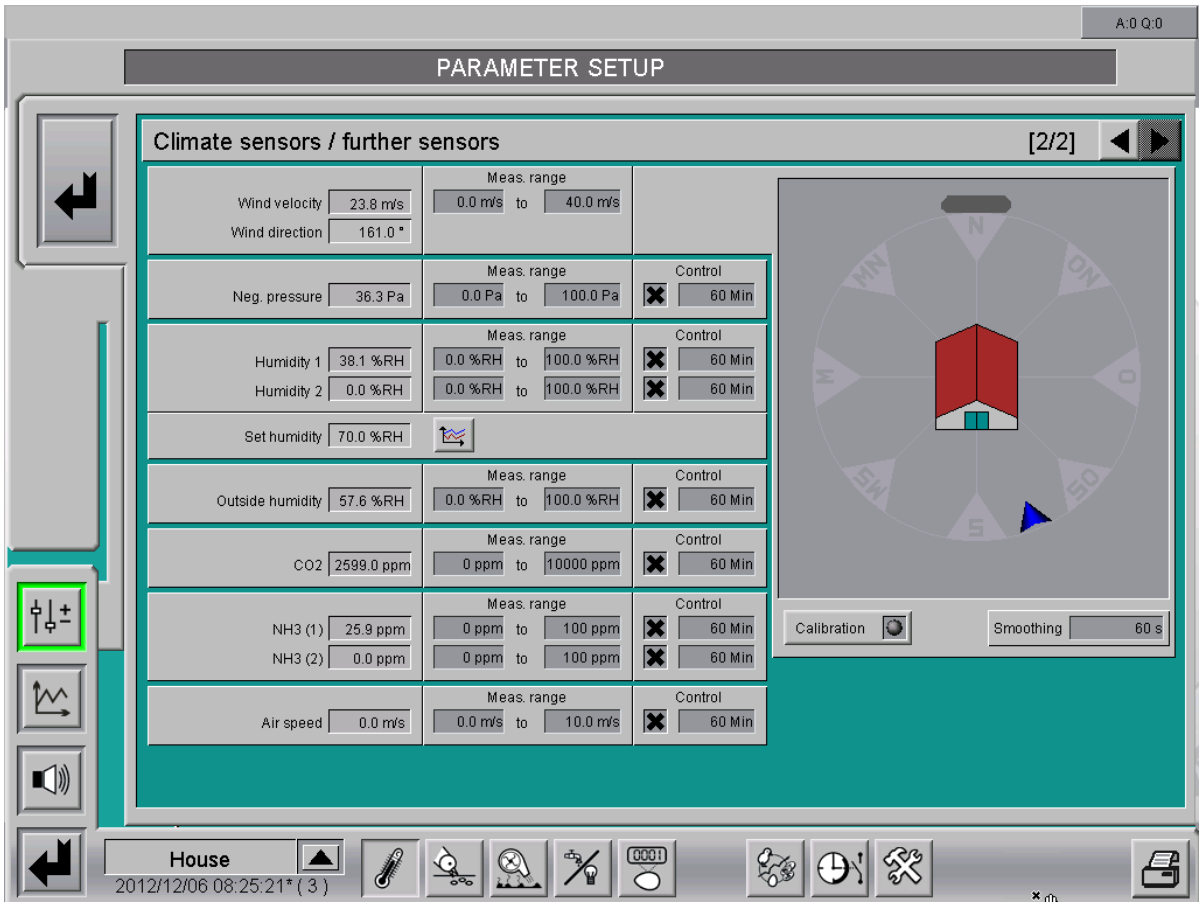


Figure 2-3: Climate sensors page 2

2.1 Alarm characteristics

An alarm is generated if the control time is exceeded without modification of the unfiltered input value. If the end of the measuring range is reached, an alarm is generated immediately. Both alarms show the following messages:

Sensor defective (cable break)

The message can be delayed in the alarm settings (initial value: 0). The delay should be set to 0 so that one can respond immediately to a cable break which occurs when the end of the measuring range is reached.

	The program does no longer evaluate the measuring range for negative pressure, weather station and air speed as the end of the measuring range can be reached even during normal operation for these sensors. An alarm for cable break is exclusively triggered depending on a signal change for these sensors.

The sensor displays react as follows in the case of an alarm:

- For cable breaks, the value flashes in red.
- For minimum or maximum alarms, the value is displayed in red continually.
- For temperature deviation alarms (comparison of house temperature sensors and between outside and house temperature), the shown values are displayed in red.

2.2 House temperature sensor

		Meas. range			Control		Description
House temperature 1	30.7 °C	-40.0 °C	to	60.0 °C	✖	60 Min	F1R Front 1 right
House temperature 2	30.7 °C	-40.0 °C	to	60.0 °C	✖	60 Min	F1L Front 1 left
House temperature 3	28.6 °C	-40.0 °C	to	60.0 °C	✖	60 Min	R1R Rear 1 right
House temperature 4	28.6 °C	-40.0 °C	to	60.0 °C	✖	60 Min	R1L Rear 1 left
Temperature difference	2.0 °C				Max. difference between house temperatures		10.0 °C

Figure 2-4: House temperature sensor

2.2.1 Setup

- **House temperature**

  The first column shows all currently measured values (up to twelve house temperature sensors). The display gives a quick overview of all current temperatures.
  No entries can be made here.

- **Measuring range**

  The measuring ranges of the sensors are entered in the second column. Big Dutchman uses PT 1000 or DOL 12 as standard measuring sensors. These sensors have a measuring range from -40°C to +60°C.

- **Control**

  A control of the input value can be activated at each probe and a monitoring time can be set during which the value must change. In case of an error, an alarm for cable break will be released which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

- **Description**

  The temperature sensors can each be given significant names, e.g. position-related names like "F1R Front 1 Right".

- **Temperature difference**

  Below the temperature sensors, the current temperature difference between the sensors is displayed.
  Next to this value, the **maximum difference between house temperatures** can be entered.

	This function ensures that a defective or incorrectly placed sensor does not affect the inside temperature over a longer period. If a value measured by the sensor deviates by e.g. 10°C from the house temperature, the alarm **Difference house temperatures exceeded** is generated.

2.2.2 Alarm characteristics

The reaction of the control must be defined especially for the temperature sensors in case they fail.

The temperature sensors are selected for the control at different locations (e.g. zone temperature, heating, thermostats, intake air flaps, etc.). The use of several temperature sensors already improves safety as a defective sensor is not included in the calculation for the average value. If all sensors fail or only one sensor is selected and this sensor fails (alarm message cable break), the system has to switch to a secure mode.

Failure	**Reaction**
Zone temperature x	Ventilation level zone x at 50 % Spray cooling off
Extra ventilation	Extra ventilation off
Temperature-controlled intake air flap x	Intake air flap x at 50 %
Temperature-controlled exhaust air flap x	Exhaust air flap x at 50 % (natural ventilation)
Heating x	Heating x OFF
Thermostat x	Thermostat x OFF

Table 2-1: Reaction in the case of a failure of all selected house temperature sensors

Moreover, the **tunnel mode** is deactivated if the house temperature cannot be determined. It is still possible to switch to tunnel mode via manual operation or the external release signal. If the tunnel mode was forced, it stays at a ventilation level of 50 %.

Natural ventilation is also deactivated if the house temperature cannot be determined. Switching to natural ventilation is possible via manual operation.

The fixed set values for the **temperature-controlled exhaust and intake air flaps** are still considered (roof, side, tunnel, natural, mechanic). This means that e.g. flaps which are used only for tunnel ventilation are closed during side ventilation and open at 50 % if tunnel mode is activated. Flaps only used for side ventilation are closed accordingly during tunnel mode. Minimum and maximum limits of each flap are also considered. All flaps can be operated manually.

2.3 Outside temperature sensor

The outside temperature sensor can be configured either as local sensor or as global farm sensor.

Outside temperature (local)

The house has its own outside temperature sensor.

Outside temperature (network)

A global outside temperature sensor is connected to one house (master). This sensor transmits the outside temperature to the other houses (clients) on the farm. In addition, the clients can have their own outside temperature sensor which they can use in case the master sensor fails.

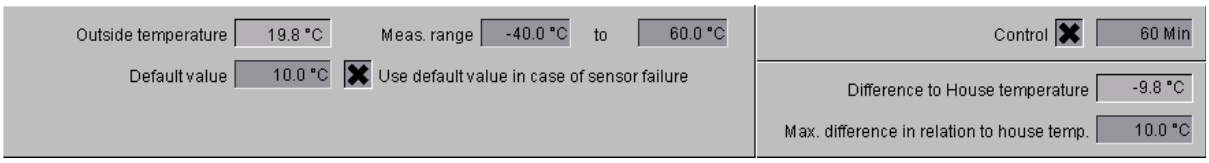


Figure 2-5: Outside temperature sensor

2.3.1 Settings

- **Outside temperature**

  The first field shows the outside temperature. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. Big Dutchman uses PT 1000 or DOL 12 as standard measuring sensors. These sensors have a measuring range from -40°C to +60°C.

- **Default value**

  If the outside temperature sensor fails, the control can instead use the default value.

  The default value is only used if the box **Use default value in case of sensor failure** is checked and a cable break is identified for the sensor. For all other alarms in connection with the outside temperature (min, max, difference house temperatures), the default value is not used.

	If the alarm for cable break of the outside temperature sensor has been deactivated in the alarm settings, the default value is not used.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

- **Difference to House temperature**

  Enter by how many °C the outside temperature may exceed the house temperature under "Maximum difference in relation to house temperature". The current deviation is displayed above the entry.
  Usually, a value of approx. 7°C should be entered here. This means that an alarm is generated if the house temperature amounts to 25°C and the outside temperature is higher than 32°C.

	**Caution!** This value serves as a means to recognize incorrectly positioned outside temperature sensors, which have e.g. been placed in front of the gable on a warm wall. Such sensors do not measure the current air temperature and may, if the measured values are incorrect, disrupt the normal reaction of the computer.

2.3.1.1 Outside temperature client with sensor

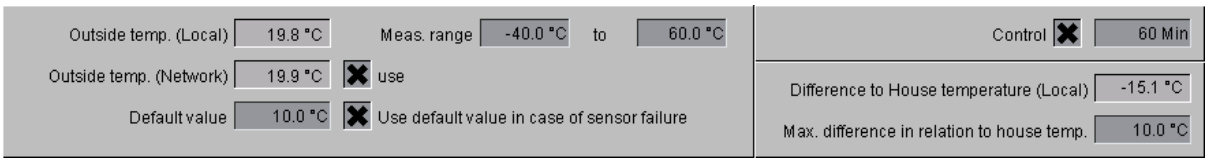


Figure 2-6: Outside temperature client with sensor

If an outside temperature client with sensor is used, the temperature of the master sensor (outside temperature (network)) is also displayed. Use the checkbox to determine whether the temperature of the master sensor should be used. If the sensor reports a cable break or if the house does not respond, the system switches to the local outside temperature sensor (outside temperature (local)). If this temperature neither changes within the monitoring time, the system switches to the default value if the checkbox **Use default value in case of sensor failure** is activated.

	The setting **Maximum difference in relation to house temperature** refers to the local outside temperature sensor.

2.3.1.2 Outside temperature client without sensor

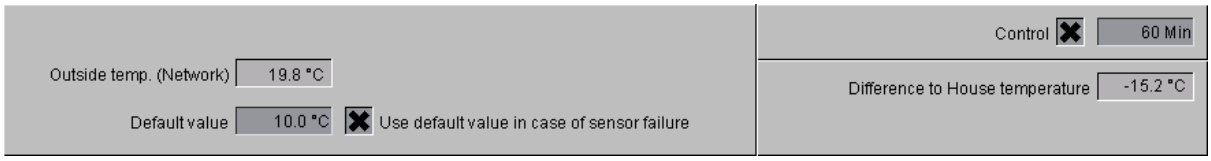


Figure 2-7: Outside temperature client without sensor

If an outside temperature client without sensor is used, the settings of the local sensor as well as those of the maximum difference in relation to the house temperature are hidden. If the house does not respond or the temperature does not change within the monitoring time, the system switches to the default value if the checkbox **Use default value in case of sensor failure** is activated.

2.3.2 Alarm characteristics

If an outside temperature sensor fails, the system switches to the master sensor or the adjustable default value.

2.4 Weather station

If a weather station is installed, the current wind velocity and direction are permanently displayed.

The intake air flaps can be opened or closed further, depending on their position (windward or leeward side). This function is described in more detail in the chapters regarding intake air.

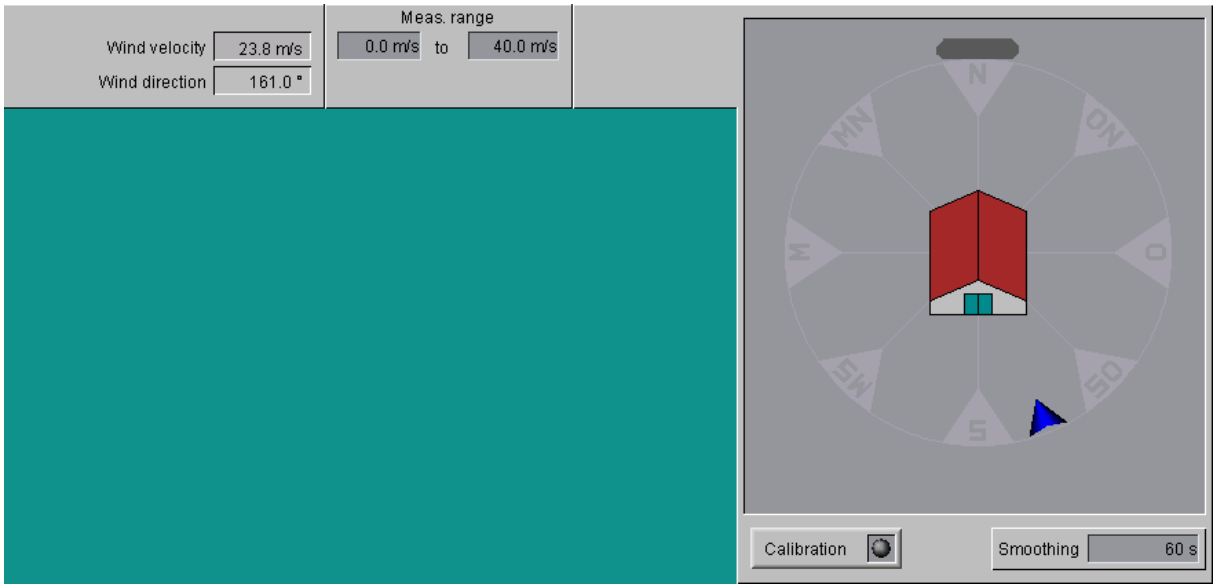


Figure 2-8: Weather station settings

2.4.1 Settings

- **Wind velocity**

  The first field shows the wind velocity (force). No entries can be made here.

  Usually, the wind force is indicated as follows:

Bft	m/s	km/h	Description
0	0.0 - <0.3	0 - 1	calm
1	0.3 - <1.6	2 - 5	light air
2	1.6 - <3.4	6 - 11	light breeze
3	3.4 - <5.5	12 - 19	gentle breeze
4	5.5 - <8.0	20 - 28	moderate breeze
5	8.0 - <10.8	29 - 38	fresh breeze
6	10.8 - <13.9	39 - 49	strong breeze
7	13.9 - <17.2	50 - 61	high wind
8	17.2 - <20.8	62 - 74	gale
9	20.8 - <24.5	75 - 88	strong gale
10	24.5 - <28.5	89 - 102	storm
11	28.5 - <32.7	103 - 117	violent storm
12	>32.7	>117	hurricane

Table 2-2: Wind force according to Beaufort

- **Measuring range of wind force**

  Depending on the weather station that is used, the measuring range for the respective device has to be entered. Big Dutchman normally uses devices with a measuring range of 0 - 30 m/s.

- **Wind direction**

  The wind direction is displayed below the wind velocity.

2.4.2 Calibrating the weather station

To determine the wind direction and the house's angle, see the menu "calibration of wind direction" in the following figure.

The weather station is calibrated during initial operation and should be checked **semi-annually**.

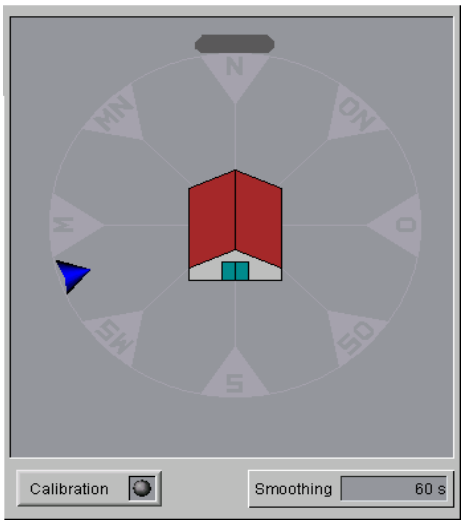


Figure 2-9: Calibrating the weather station

1. To define the wind direction correctly the first time, the wind vane must be fixed exactly in southerly direction. This means that the wind vane must be aligned as if the wind would be blowing from north to south. Only once the vane has been fixed in this position can the button **Calibration** be pressed.
   The North direction is now set and stored.
2. As the North direction has now been set exactly and stored for the vane, it is necessary to transmit to AMACS how the house is positioned vis-à-vis the North direction.

   (The front view of the house is displayed on the screen:)

   To do this, left-click on the wide grey bar at the cardinal direction "North". The house can now be turned when holding the left mousekey until the direction corresponds with the actual position of the house. Subsequently, the current wind direction from which the wind is blowing towards the house is displayed on the screen by means of the small blue compass needle.
3. As wind does not blow steadily like e.g. a fan, an average must be formed over a time of approx. 1 to 2 minutes to make a regulation possible. This is what "smoothing" is for. If a value of 60 seconds has been entered in the field **Smoothing**, an average is created from the values measured within these 60 seconds.

	The smoothed value is used to control the intake air flaps.

2.5 Negative pressure sensor

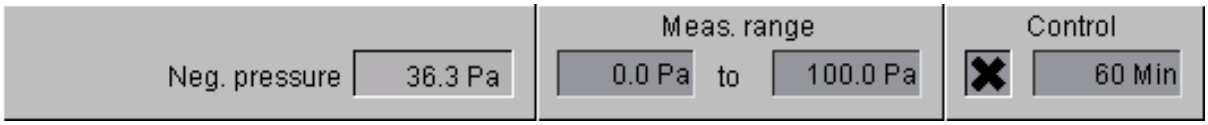


Figure 2-10: Negative pressure sensor

2.5.1 Settings

- **Negative pressure**

  The first field displays the negative pressure. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a standard, Big Dutchman uses a sensor with a measuring range from 0 Pa to 100 Pa.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. An alarm for cable break is generated in the case of errors.

2.5.2 Alarm characteristics

If a cable break alarm has been generated, the intake air flaps switch from the negative-pressure controlled mode to the ventilation-controlled (secure) mode.

2.6 Humidity sensor

Figure 2-11: Humidity sensor

2.6.1 Settings

- **Humidity 1 / 2**

  The first field shows the air humidity. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a standard, Big Dutchman uses a sensor with a measuring range from 0 % RH to 100 % RH.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

- **Set humidity**

  The current set humidity is displayed here. No entries can be made here. To adjust the desired set humidity in the house, click on the curve icon next to the set humidity.

Figure 2-12: Selection of humidity curves

This opens a new window. The set humidity for the production period can be entered here.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

Desired value humidity				
Day	**Broilers**	**Breeders**	**Layers**	**Turkeys**
1	50 %	50 %	50 %	50 %
7	50 %	50 %	50 %	50 %
14	60 %	60 %	60 %	60 %
21	70 %	70 %	70 %	70 %
28	75 %	75 %	75 %	75 %
35	<80 %	80 %	80 %	80 %
42	<80 %	<80 %	<80 %	<80 %
49	<80 %	<80 %	<80 %	<80 %
>50	<80 %	<80 %	<80 %	<80 %

Table 2-3: Desired humidity values for different animals

2.6.2 Alarm characteristics

In the case of a sensor failure (cable break):
De-humidifying by raising of the ventilation level is deactivated.

The blocking of the **cooling** due to excessive air humidity is stopped if a sensor fails.

Humidifying by spray cooling is blocked.

To calculate the windchill factor in the tunnel mode, the **chill factor** at 70 % relative humidity is used as default value.

2.7 Outside humidity

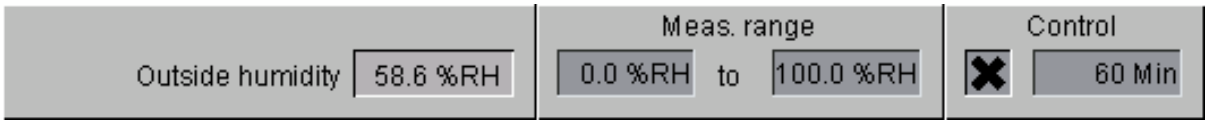


Figure 2-13: Outside humidity

- **Outside humidity**

  The first field shows the outside humidity. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a standard, Big Dutchman uses a sensor with a measuring range from 0 % RH to 100 % RH.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

2.8 CO2

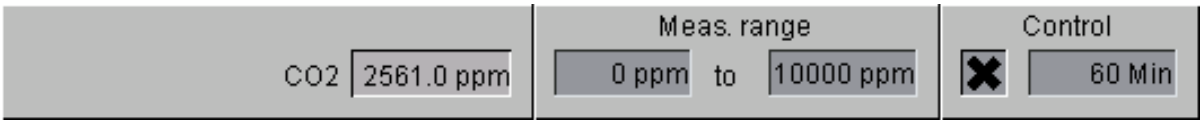


Figure 2-14: CO2

- **CO2**

  The first field shows the level of carbon dioxide in the air. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a a standard, Big Dutchman uses a sensor with a measuring range from 0 ppm to 10,000 ppm.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

2.8.1 Alarm characteristics

In the case of sensor failure (cable break), the correction of minimum ventilation is deactivated due to the CO2 level.

2.9 NH3

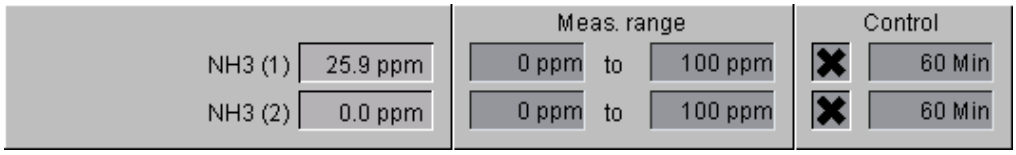


Figure 2-15: NH3

- **NH3 1 / 2**

  The first field shows the content of ammonia in the air. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a a standard, Big Dutchman uses a sensor with a measuring range from 0 ppm to 10,000 ppm.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

2.10 Air speed

Figure 2-16: Air speed

- **Air speed**

  The first field shows the air speed. No entries can be made here.

- **Measuring range**

  The sensor's measuring range can be entered in the second field. As a standard, Big Dutchman use a sensor with a measuring range from 0.0 m/s to 10.0 m/s.

- **Control**

  A control of the input value can be activated and a monitoring time can be set during which the value must change. An alarm for cable break is generated in the case of errors.

3 Set value exhaust air

Clicking on the button **Exhaust air set value** opens a menu in which the settings for the set temperature and ventilation as well as the assignment of the temperature sensors can be carried out.

Figure 3-1: Set value exhaust air

Warning!

Ensure a sufficient amount of fresh air in the house! An adequate amount of oxygen must enter the house even in the case of power failures, e.g. via an emergency opening of the chimneys and intake air flaps.

In addition, a “backup thermostat” has to provide for sufficient fresh air in the house in case the control system fails.

The settings possible for the set value exhaust air can be found on three screen pages.

1. The first page includes the main settings, e.g. set temperature, band width, minimum and maximum ventilation and manual correction.
2. The second page includes advanced settings which influence temperature and ventilation.
3. On the third page, temperature sensors can be assigned to a house zone or to extra ventilation.

3.1 Assigning climate sensors

As up to twelve temperature and two humidity sensors can be used in the house, you can set here which sensor is responsible for controlling and which sensor is only used for monitoring.

The climate sensors can be assigned on the third screen page.

- **Temperature**

  The temperature sensors can be assigned easily by checking a box for each sensor. Bear in mind the meaning of the descriptions, e.g. **F1R** and **R1L** mean **Front 1 Right** and **Rear 1 Left**, respectively. If groups were marked as extra ventilation, the sensors for extra ventilation also have to be activated.

  Temperatures listed below the zones are average temperatures of the selected sensors.

  The **current house temperature** displays the average temperature of all selected sensors. If a sensor has been activated in several zones, its information is only used once for the calculation.

- **Humidity**

  If two humidity sensors are installed in the house, you can select here which sensor shall actively control and which is only used for monitoring. The humidity sensors are selected like the temperature sensors, by checking the corresponding boxes.

  The humidity listed below the zones is the average humidity of the selected sensors.

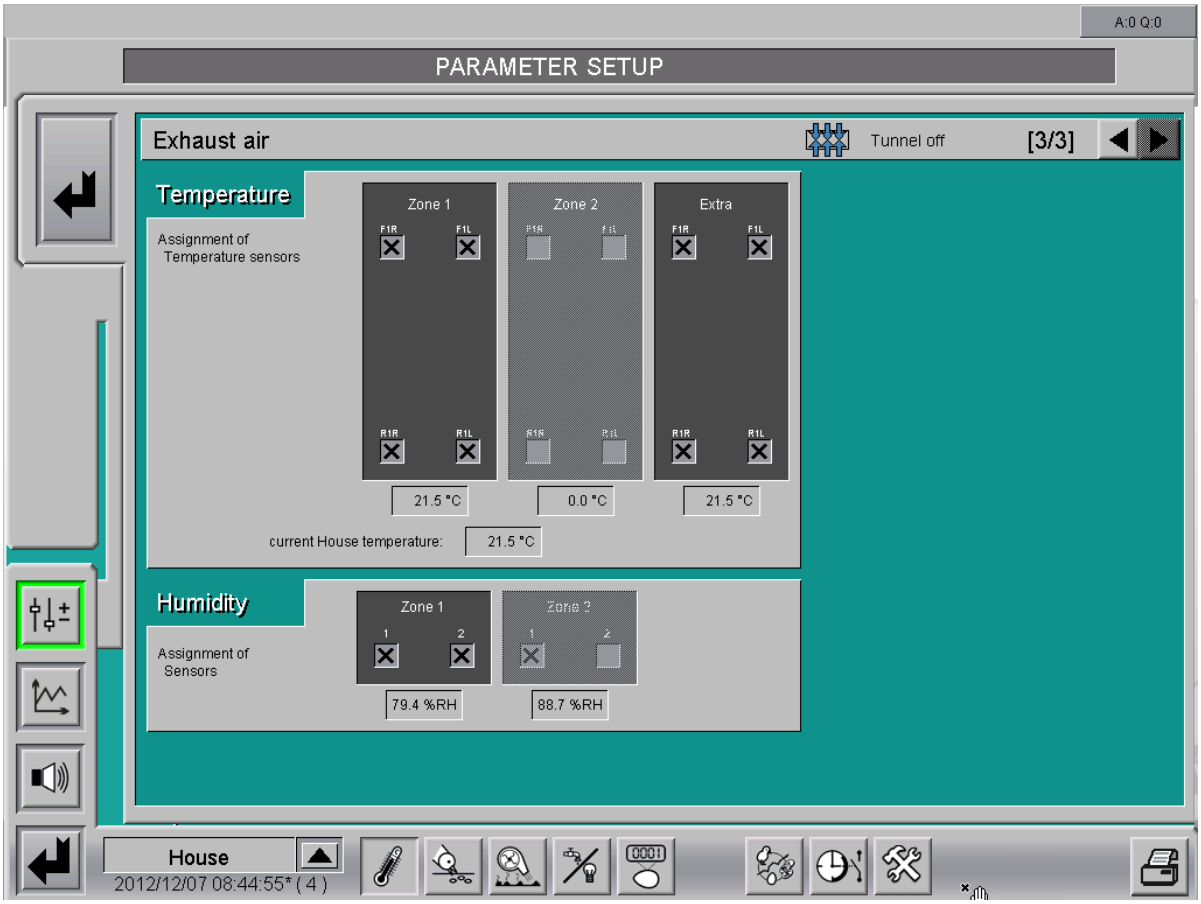


Figure 3-2: Assignment of temperature sensors

Caution!

Before carrying out any changes at the assignment of the sensors, make sure that the climate is not lastingly disturbed by these changes. It is important to also assign sensors to extra ventilation.

Making wrong entries can put your animals' life in danger.

Important!

If a temperature sensor reaches the end of its measuring range, e.g. when the sensor is defective, the alarm cable break is generated. This alarms causes the temperature sensor to be eliminated from the current control.

3.2 Selecting bandwidths or integrated control

The ventilation control can be selected on the second screen page.

Bandwidth control

The temperature in a laying hen house is usually controlled by the bandwidth. This allows easy increasing of the ventilation level proportional to the set band width. However, this requires a continuous deviation from the pre-set temperature.

Integrated control

For broiler houses, a very exact temperature in accordance with the set temperature is often desired. This is only possible with an integrated control which slowly adjusts the temperature by comparing the set and current value to come as closely as possible to the set value.

Important!

Switching the control during a batch is not recommended as it takes some time before the integrated control has been adjusted. A switch could lead to temperature variations.

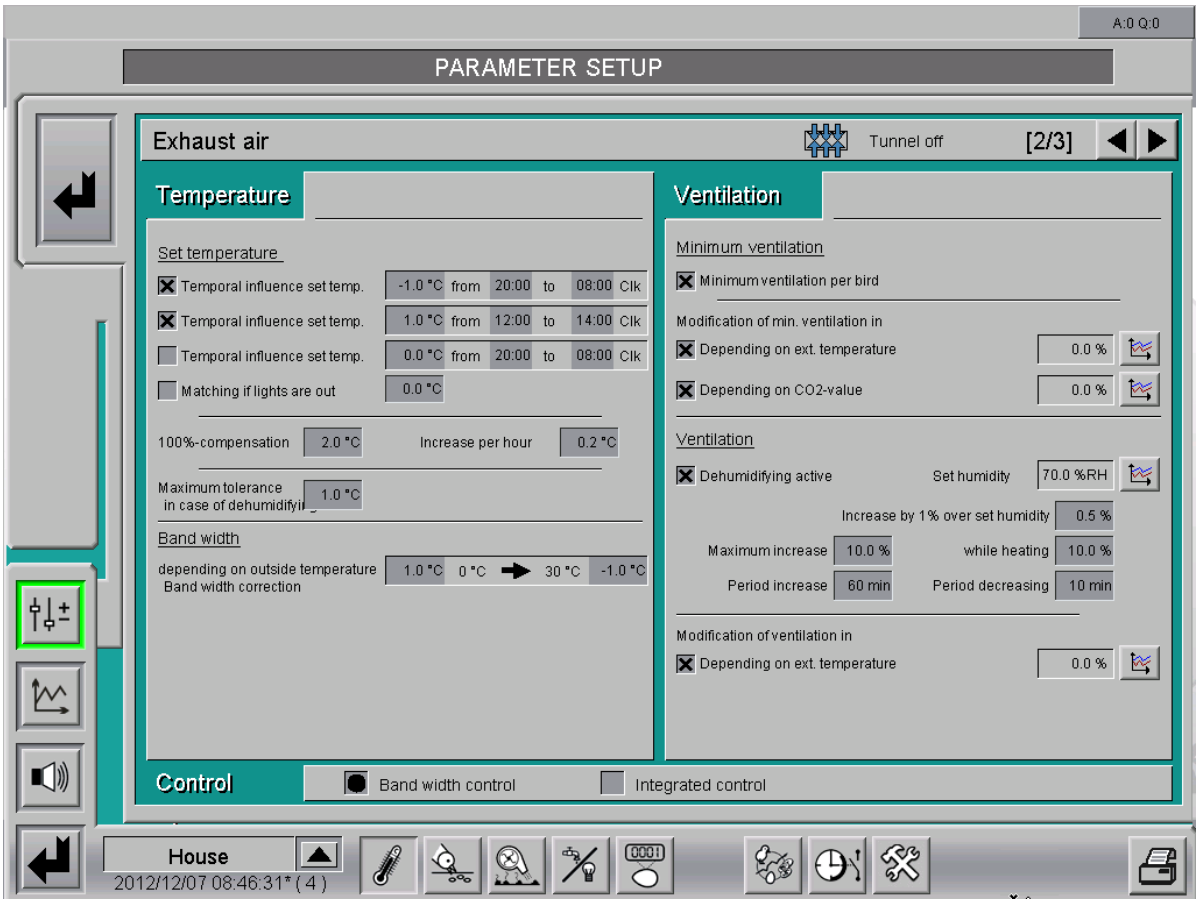


Figure 3-3: Band width or integrated control

3.3 Temperature settings

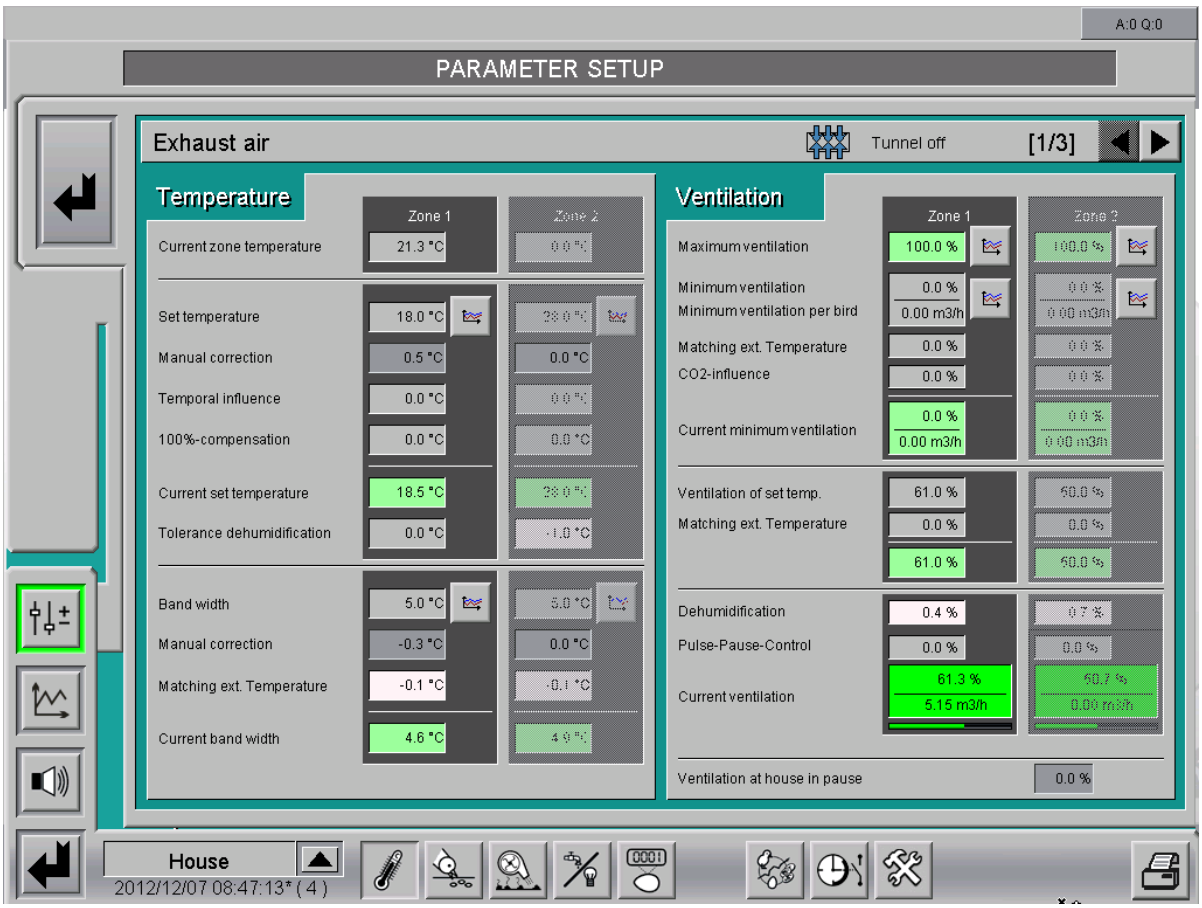


Figure 3-4: Overview temperature

3.3.1 Current zone temperature

The current zone temperature is displayed in the first part of the temperature settings exhaust air. This value is calculated based on the assignment of the temperature sensors.

Figure 3-5: Zone temperature

3.3.2 Set temperature

The set temperature and other influences are displayed and the manual correction can be set in the second part of the temperature settings exhaust air.

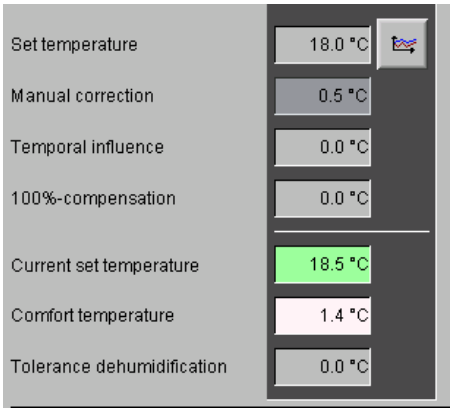


Figure 3-6: Set temperature

The advanced settings for the calculated set temperature can be found on the second page of the set value exhaust air.

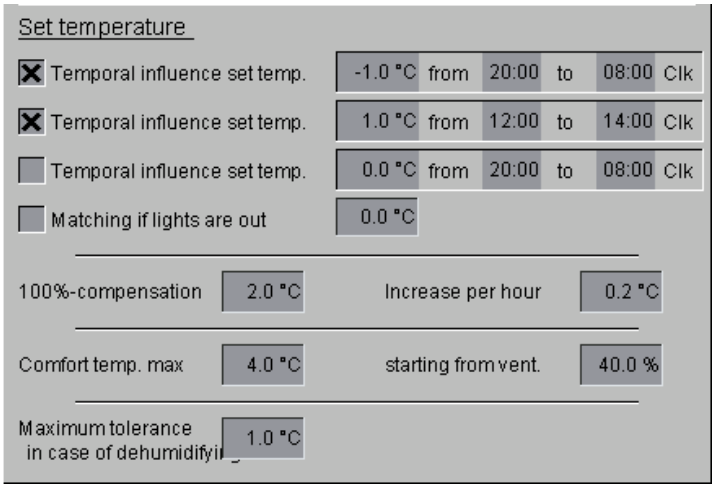


Figure 3-7: Settings set temperature

3.3.2.1 Set temperature

The set temperature is set as a curve over the time of the production cycle. It can thus be adjusted to the birds' age.

To change this value, open the set temperature curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

3.3.2.2 Manual correction

A manual correction of the curve can be set so that not all points have to be changed for small changes to the whole curve. Click into the entry field to do this.

The desired change can be carried out by entering the plus (+) and minus (-) values and confirming with **Enter**.

3.3.2.3 Temporal influence

To save energy, the natural behaviour of poultry can be used. At the end of the day, the animals look for their resting places and instinctively gather air under their feathers to prepare themselves for the cool night. They are therefore better insulated against the cold and the house temperature can be easily lowered. This lowering of the temperature can also have a positive effect on hygiene because germs are less likely to spread at low temperatures than at high ones.

You can carry out the required entries on the second page.

To keep the lowering of the temperature as flexible as possible, a temperature can be set and activated for up to three time periods.
Depending on whether the temperature is to be lowered or increased, a value like e.g. -1°C or +1°C is given. Additionally, the time period (from - to) in which the temperature change shall be active is given.

Furthermore, the set temperature can be adjusted according to the light by checking the box **Matching if lights are out**.

For this function, the status of all light groups (on/off) during automatic operation is checked. Manual operation of the light groups or the control light is not considered. The change becomes active when all light groups are turned off and operated automatically.

If the time periods overlap, the value with the highest negative adjustment is used. The calculated adjustment is displayed on the first page of the **set values exhaust air** menu when determining the current set temperature.

3.3.2.4 100 % compensation

As temperature fluctuations between day and night in a house should be avoided as far as possible, **AMACS** offers an option for temperature compensation.

You can carry out the required entries on the second page.

If you want to prevent **AMACS** from trying to reach the set temperature for a long time into the night following a hot summer day, e.g. the following values can be entered in the fields:

"100 % compensation" = 2°C
"Increase per hour" = 0.2°C

If ventilation is at 100 % for one hour, the current set temperature is increased by 0.2°C. If ventilation continues at 100 %, the set temperature is increased by another 0.2°C until a maximum of 2°C is reached.

As the set temperature has been increased artificially, AMACS will now reduce ventilation earlier. This means that high air speeds at bird level are reduced with the cooler evening air.

This temperature increase is reduced according to the same principle as before, i.e. as soon as ventilation is below 100 %, the set temperature is reduced by 0.2°C per hour.

3.3.2.5 Current set temperature

The current set temperature is the resulting temperature used for controlling the ventilation. The influences described above are included here.

3.3.2.6 Comfort temperature (only with integrated control)

Comfort temperature is a function which automatically increases the inside temperature to minimise possible draughts at high ventilation in the house.

If **AMACS** increases the ventilation on a hot day to keep the inside temperature low, the birds will experience the temperature to be lower than it actually is due to the higher air speed.

For example, 20°C feel warmer if there is no wind than 20°C with wind.

You can carry out the required entries on the second page.

To prevent the birds from cooling too much due to high air speeds, the set temperature is increased until the maximum comfort temperature is reached. Only then is the ventilation slowly increased until it reaches its maximum. The function "comfort temperature" is activated when the ventilation requirements are higher than the setting **starting from ventilation**.

3.3.2.7 Tolerance dehumidification (only with integrated control)

The tolerance dehumidification is used to keep the ventilation at its normal level up to a certain temperature during dehumidifying. This means that the set temperature is reduced to the value "maximum tolerance in case of dehumidifying" if the house temperature is lower than the set temperature due to dehumidifying. This ensures that the dehumidification is not neutralised by integrated ventilation which would lower the temperature in this case.

You can carry out the required entries on the second page.

3.3.3 Band width control

The bandwidth of the ventilation and the manual correction can be set and other influences are displayed in the third part of the temperature settings exhaust air if the band width control is activated. The band width determines how strong the ventilation is to react to a difference in temperature.

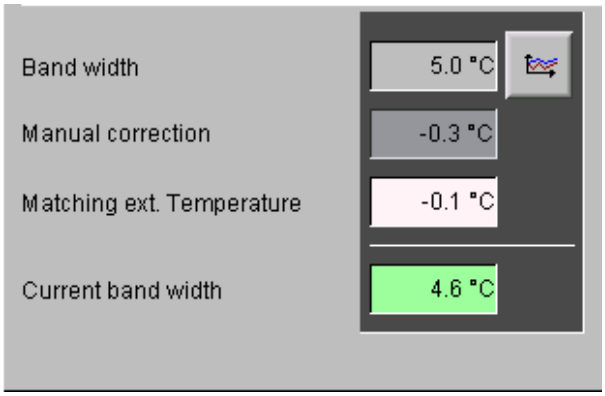


Figure 3-8: Band width

The advanced settings for the calculated band width can be found on the second page of the set value exhaust air.

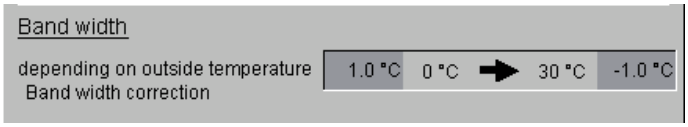


Figure 3-9: Settings band width

3.3.3.1 Band width

If the band width is e.g. 5°C, ventilation is at 0 % or minimum if the set and house temperature amounts to 20°C. If the house temperature increases to 22.5°C, the ventilation would increase proportionally to 50 %. Ventilation would be at 100 % for a house temperature of 25°C.

The setting should be between 4 and 6°C, depending on the overall house settings.
To change this value, the band width curve must be opened. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

3.3.3.2 Manual correction

A manual correction of the curve can be set so that not all points have to be changed for small changes to the whole curve. Click into the entry field to do this.

The desired change can be carried out by entering the plus (+) and minus (-) values and confirming with **Enter**.

3.3.3.3 Matching external temperature

As the band width may have to be changed automatically at different outside temperatures, the **band width correction depending on outside temperature** was integrated and will be explained in the following.

You can carry out the required entries on the second page.

A current value in relation with the outside temperature is created linearly from two points (0°C and 30°C). If the outside temperature amounts to 0°C and the correction is at +1°C, the band width is thus increased by 1°C.

The band width can also be reduced in this manner for high outside temperatures. To do this, enter the desired value into the field next to 30°C with a negative leading sign. The band width is now reduced by 1°C at an outside temperature of 30°C if e.g. -1°C is entered here.

3.3.3.4 Current band width

The current band width is the resulting band width used for controlling the ventilation. The influences described above are included here.

3.3.4 Integrated control

If the integrated control is activated, the band width settings are hidden. Instead, the control parameters for the integrated control are displayed on the second page of the set value exhaust air.

	**Caution** Even small changes to these settings can greatly affect the ventilation in the house.

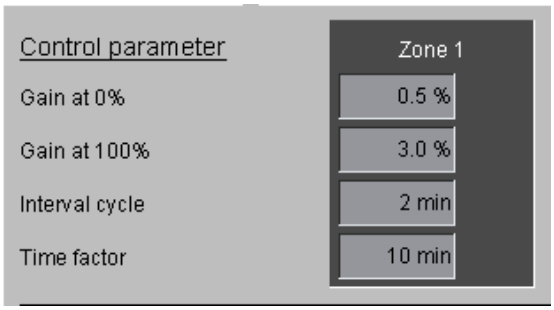


Figure 3-10: Settings integrated control

	The ventilation value which must be determined again after the interval cycle is calculated linearly depending on the current ventilation value between gain at 0 % and gain at 100 %.

- **Gain at 0 %**

  This parameter causes the ventilation in the lower area to react less strongly than in the upper area. If a faster reaction is also desired for the lower ventilation area, this value can be increased.
  Settings between 0.5 and 1.2 % have shown good results in practice, depending on the size of the house.

- **Gain at 100 %**

  This parameter causes greater changes in the ventilation in the upper area compared to the lower area. According to experience, values between 1.5 and 3.0 % lead to a steady control.
  If the house is equipped with CombiTunnel ventilation, the value can be increased to up to 3.0 % to accelerate the switch from side to tunnel ventilation.

- **Interval cycle**

  The interval cycle determines how often the current temperature and the set temperature are compared and how often the calculated ventilation value is re-calculated.

- **Time factor**

  The time factor determines how slow the control should react over a certain time period. It is important to note that a small time factor slows the control down while a greater time factor accelerates it.
  In practice, values between 10 and 22 minutes have been used.

3.4 Ventilation settings

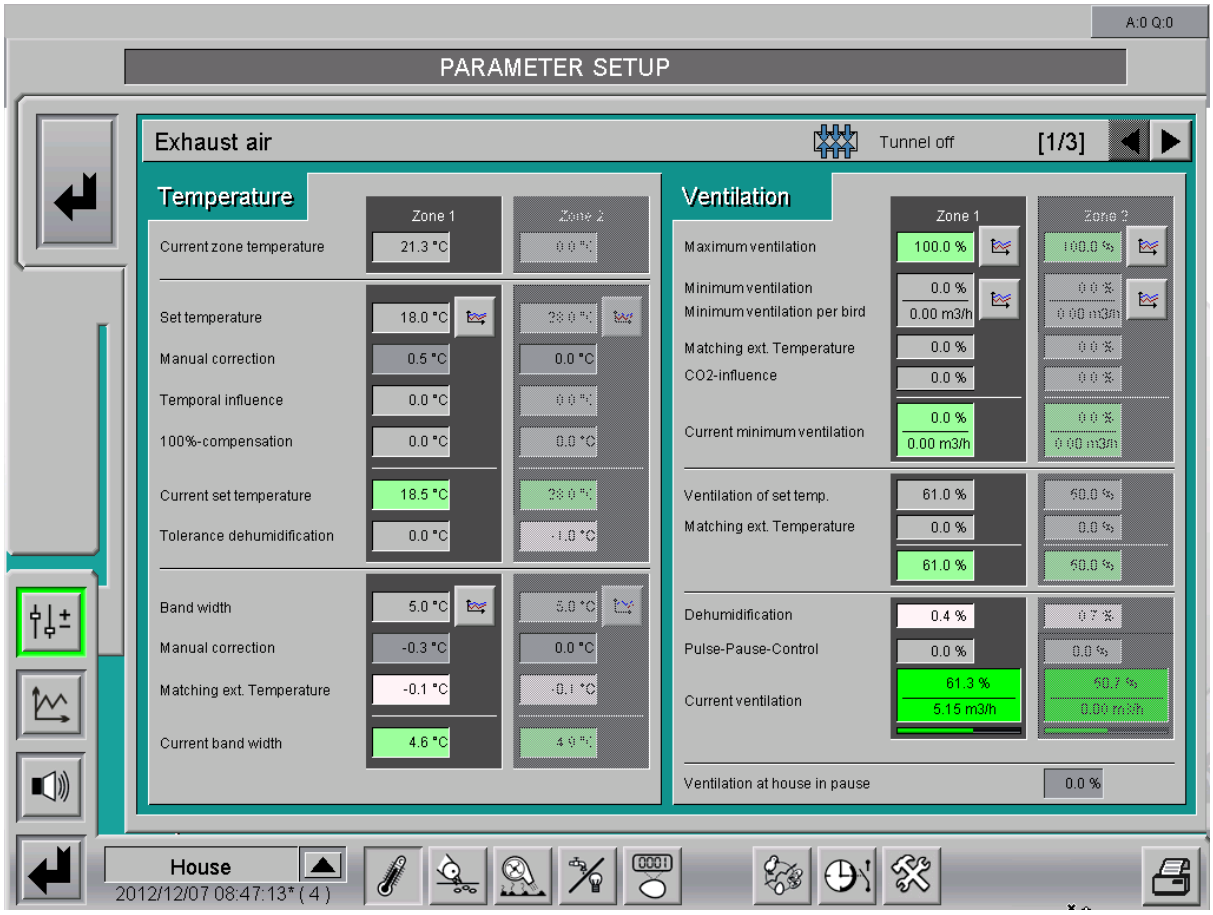


Figure 3-11: Overview ventilation

3.4.1 Maximum ventilation

The maximum ventilation is displayed in the ventilation settings exhaust air.

Figure 3-12: Maximum ventilation

The maximum ventilation is set as a curve over the time of the production cycle. It can thus be adjusted to the birds' age.The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

	**Caution!** Ventilation is not increased above the pre-set maximum ventilation even in case of excessive temperatures. Maximum ventilation should be seen as absolute limit restricting the ventilation level. Exceptions include minimum ventilation and pulse pause control. If these are set to a higher value than maximum ventilation, the set level is exceeded.

3.4.2 Minimum ventilation

The minimum ventilation can be adjusted in the second part of the ventilation settings exhaust air and further influences are displayed.

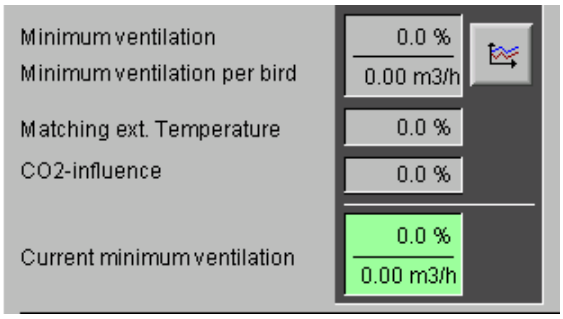


Figure 3-13: Minimum ventilation

The advanced settings for the current minimum ventilation can be found on the second page of the set value exhaust air.

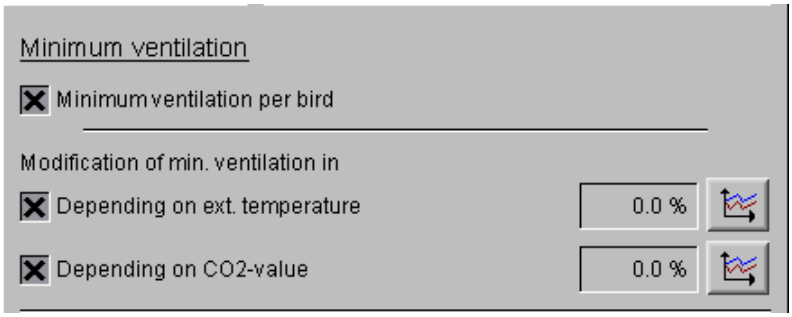


Figure 3-14: Settings minimum ventilation

3.4.2.1 Minimum ventilation

The minimum ventilation is set as a curve over the time of the production cycle. It can thus be adjusted to the birds' age. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

The minimum ventilation can be entered either in percent or in m³/bird. To enter the air volume in m³/bird, the checkbox **Minimum ventilation per bird** must be activated.

You can carry out the required entries on the second page.

Caution!

Minimum ventilation never falls below the set value, even if the house may be too cool. This is necessary in order to supply the animals with sufficient amounts of oxygen.

Broilers	**m³/h**	**Breeders**	**m³/h**	**Layers**	**m³/h**
0.050 kg	0.075				
0.100 kg	0.125	0.100 kg	0.100		
0.250 kg	0.250				
0.500 kg	0.420				
0.750 kg	0.580				
1.000 kg	0.720				
1.250 kg	0.840				
1.400 kg	0.900				
1.500 kg	0.960	1.500 kg	0.650	1.500 kg	0.650
1.800 kg	1.100	1.800 kg	0.750	1.800 kg	0.750
2.000 kg	1.180	2.000 kg	0.850	2.000 kg	0.850
2.200 kg	1.260	2.200 kg	0.950	2.200 kg	0.850
2.400 kg	1.350	3.500 kg	1.500		

Table 3-1: Set values for minimum ventilation

Caution!

When using CO^2 producing heaters, the values have to be increased accordingly. This can be an increase of up to 100% in the first days of chicks or long running times of the heater.

3.4.2.2 Matching external temperature

Minimum ventilation can be increased or decreased via a curve as a function of the outside temperature.

You can carry out the required entries on the second page.

To activate the matching of the outside temperature, check the box **Depending on external temperature**.
To change the value, the curve **Depending on external temperature** must be opened. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

3.4.2.3 CO^2 influence

The CO^2 minimum ventilation regulates the CO^2 level in the house air by increasing or decreasing the minimum ventilation in percent.

You can carry out the required entries on the second page.

To activate the CO^2 influence, check the box "Depending on CO^2 value".
To change the value, the curve "Depending on CO^2 value" must be opened. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

3.4.2.4 Current minimum ventilation

The value of the resulting minimum ventilation used by the control is displayed here in % and m^3/h/bird. The influences described above are included here.

3.4.3 Ventilation result

The calculated ventilation and its influences are displayed in the third part of the ventilation settings exhaust air.

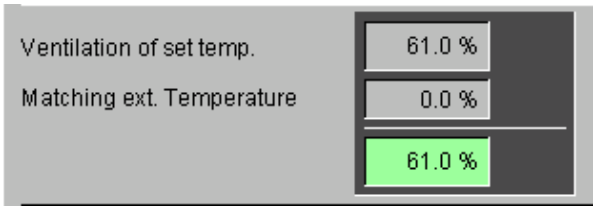


Figure 3-15: Ventilation result

The advanced settings for the calculated ventilation can be found on the second page of the exhaust air set value.

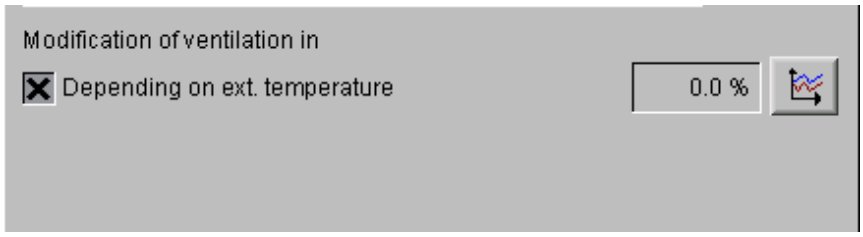


Figure 3-16: Settings further influences on ventilation

3.4.3.1 Ventilation according to set temperature

The ventilation according to the set temperature is displayed according to the current calculated ventilation level. The level is calculated either based on the currently valid band width (P) or the difference to the set temperature (PID) calculated within a certain time period depending on the type of control.

3.4.3.2 Matching external temperature (only with band width control)

To change the ventilation according to the set temperature depending on the outside temperature, the parameter **Matching external temperature** has been integrated. The following case: Up to an outside temperature of 18°C, the ventilation shall not be increased to 100 % as the intake air flaps will not open completely and cold air will reach the birds.

You can carry out the required entries on the second page.

To activate the decreasing of the outside temperature, check the box **Depending on external temperature**.
To change the value, the curve **Depending on external temperature** must be opened. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

3.4.3.3 Ventilation value (only with band width control)

The ventilation value is the sum of **Ventilation of set temperature** and **Matching external temperature**.

3.4.4 Current ventilation

The current ventilation and its influences are displayed in the fourth part of the ventilation settings exhaust air.

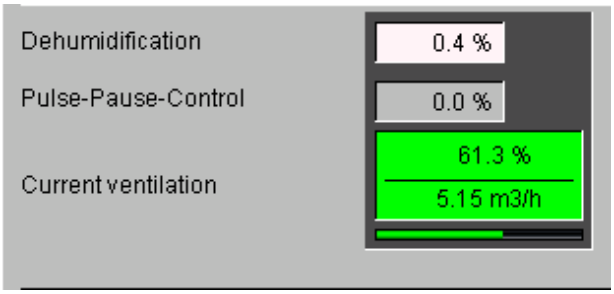


Figure 3-17: Current ventilation

The advanced settings for the current ventilation can be found on the second page of the exhaust air set value.

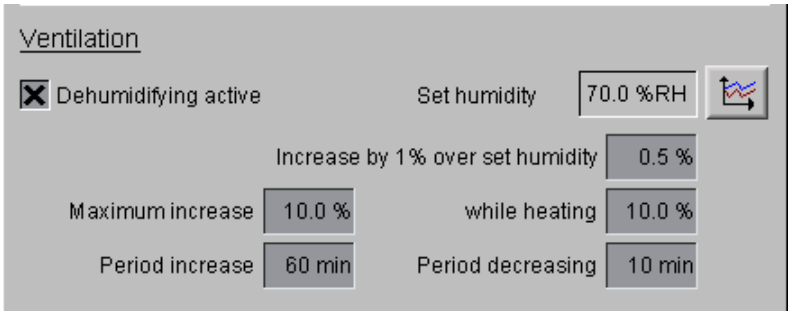


Figure 3-18: Settings further influences on current ventilation

3.4.4.1 Dehumidification

We created an option to actively influence the humidity especially for broiler and rearing houses.

You can carry out the required entries on the second page.

If an increased ventilation with the purpose of dehumidification has negative effects on the climate, several reactions are possible:

- Accepting the excessive humidity and changing the set humidity.
- Equating the **Maximum increase** with the **Maximum increase while heating**.
- Deactivating the active humidity control.
- **Activating dehumidification**

  To be able to actively react to the humidity, check the box **Dehumidifying active**.
- **Set humidity**

  The current set humidity is displayed here. To adjust the desired humidity in the house, the curve "set humidity" must be opened. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

Please find further information on the settings for set humidity in chapter

- **Increase by 1 % over set humidity**

  The desired increase in ventilation is defined in this box. If a value of 1.8 % here and for **Period increase** a value of 60 minutes is entered, ventilation is increased by 0.003 % (rounded 0.0 %) every 60 seconds as soon as the humidity is 1 % RH above the set humidity. At a humidity of 5 % RH, the ventilation shall be increased by 0.15 % (rounded 0.2 %) until either the value of **Maximum increase** or **Maximum increase while heating** is reached.
- **Maximum increase**

  The ventilation cannot be increased indefinitely if the humidity is too high. As soon as the temperature cannot be kept at the same level, the active humidity control will increase heating costs. For this reason, there is the option "Maximum increase", which limits the increase of the ventilation by dehumidifying.

- **Maximum increase while heating**

  To ensure that the warm air is not blown outside again immediately due to an active humidity control's increased ventilation, the setting "Maximum increase while heating" has been integrated. When the increase is reduced once the heating starts, the warm air stays in the house for a longer time and can thus absorb more humidity. Once the heating turns off again, the humidity control slowly increases the ventilation back to the value that was set without active heating.

- **Period increase**

  As the humidity in the house changes continuously, it is possible that there is no immediate reaction in case of excessive humidity. Instead, a new increase is calculated every 60 seconds so that an increase of 1 % RH above set humidity is reached after the period of increase. The time during which the ventilation should be increased slowly in the case of excessive humidity should be between 45 and 60 minutes.

- **Period decreasing**

  If the humidity has fallen below the target value, the ventilation increase should be decreased in a controlled manner but also as fast as possible to avoid overshooting. For this, the parameter **Period decreasing** has the effect that after the set humidity has been reached, ventilation is reduced within a shorter period – normally 10 to 15 minutes.

3.4.4.2 Pulse pause control

The parameter controlling the kind of incoming air (pulsing or continually) is the **pulse pause control**. This control is required if the house shall be aired with a powerful fresh air jet even at low ventilation.

The settings for the pulse pause control are described in chapter

3.4.4.3 Current ventilation

As described in the chapters above, the calculated ventilation is influenced by several parameters. The current, i.e. the actually active ventilation, is displayed in the parameter "Current ventilation". This value is the basis for the decision on roof, side or tunnel ventilation and on the operating level of each fan and intake air fan.

3.4.5 Ventilation at house in pause

If the production cycle has been completed, in many cases it is still necessary to not forgo ventilation. The setting ensuring this is **Ventilation at house in pause**. This value is responsible for reducing noxious gases and humidity caused by insufficient ventilation.

Figure 3-19: Ventilation at house in pause

To activate the **ventilation at house in pause**, production must be paused. The **AMACS Production** manual describes how to activate the pause mode.

Warning
Risk of asphyxiation for people and birds

If production is paused and there are still birds in the house, high concentrations of harmful gases can collect in the house.

– Make sure that harmful gases cannot collect in the house be providing sufficient fresh air circulation!
– If this should situation does occur, then do not enter the house or only with suitable breathing protection device!

3.5 Zone 2

AMACS can also be set in a way that two climate zones can be controlled individually in the house. To do this, the climate zones have to be separated from each other.

All of the settings described in this chapter can be carried out individually for each zone.

You can find out whether your system is configured as 2-zone system by checking if the menus in zone 2 are no longer grey, meaning that entries are possible.

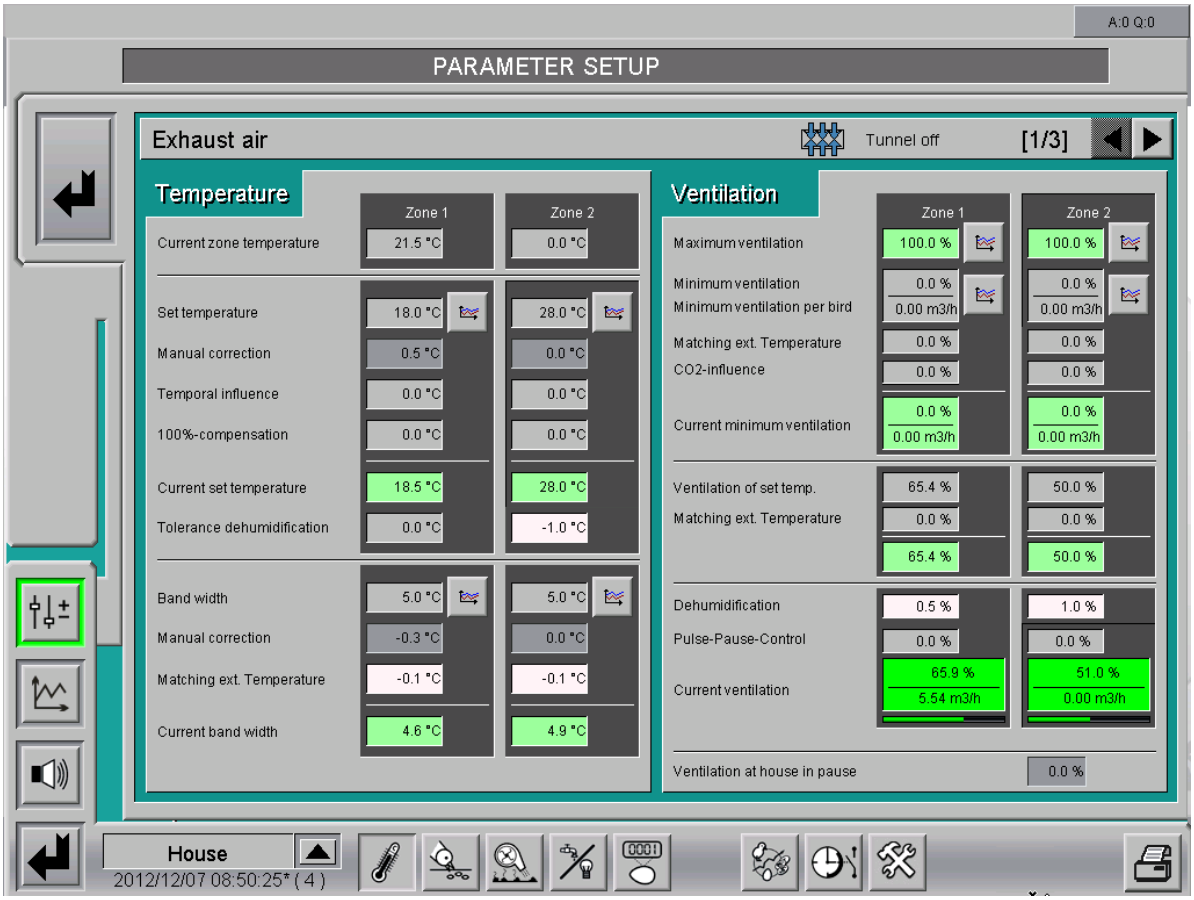


Figure 3-20: Settings in zone 2

The adjustments can be carried out in the same way as in zone 1, but they are only effective for those parts of ventilation, e.g. air inlets and exhaust air fans, that are part of that zone.

4 Exhaust air Fans

Clicking on the button **Exhaust air fans** opens a menu in which the features and assignment of the fans as well as the control of the setup parameters can be adjusted.

Figure 4-1: Exhaust air ventilation

	Caution! The performance of groups and their switch-on sequence should only be changed if absolutely necessary. This can negatively affect the house climate.

All settings possible for the exhaust air can be found on three different screen pages:

1. The first page is for the characteristics and assignment of the fans.
2. The second page deals with the control.
3. The third page determines the setup parameters for the fans.

	Caution! The service technician enters the number of groups into which the ventilation is divided during configuration of the system. This is already determined by the electric installation, as it establishes which and how many fans are to be connected to the individual relays. These relays are then put into operation, depending on the level of ventilation and the zone they belong to. The possibilities and settings are described in the following.

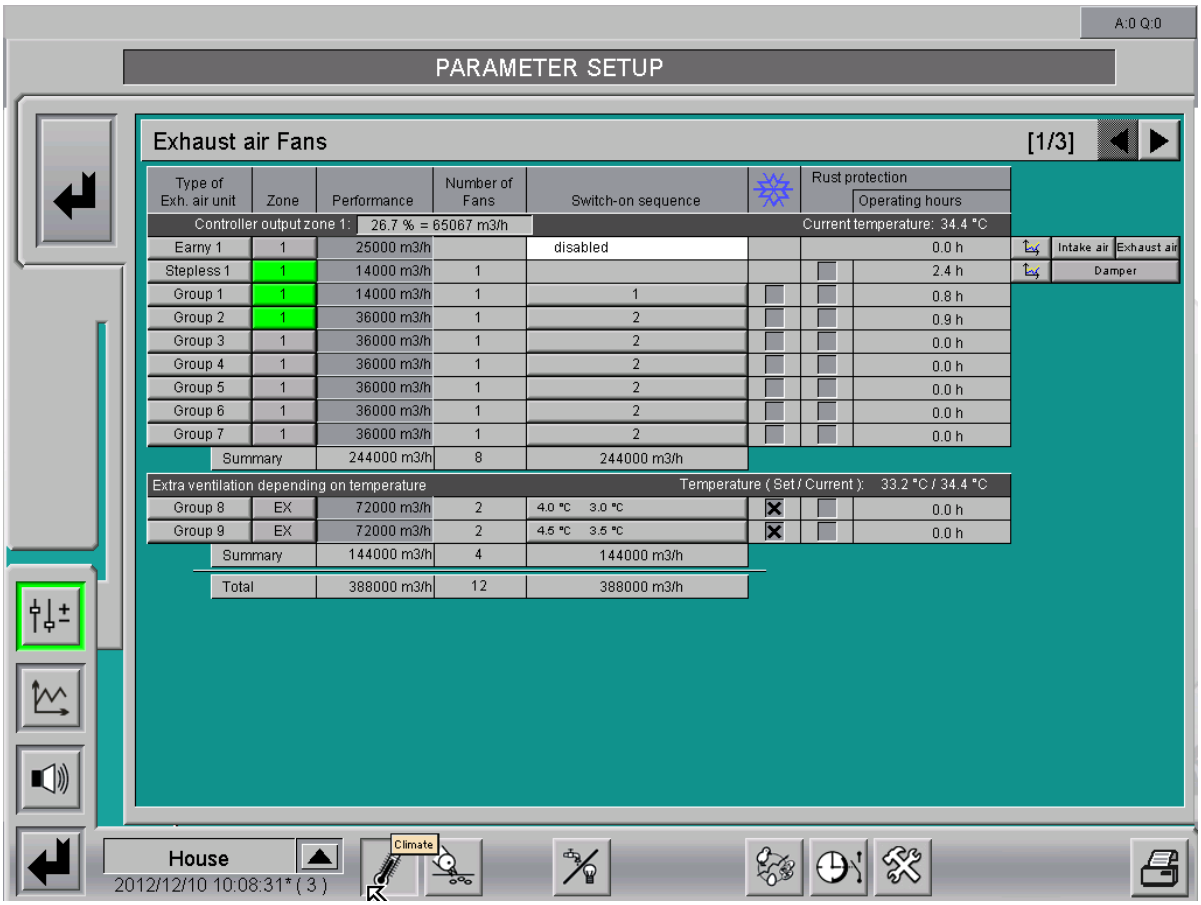


Figure 4-2: Characteristics and assignment of fans

4.1 Type of exhaust air unit

This field provides information on the control of the different fans. The exhaust air unit control is determined during configuration of the system.

There are four different types: **Step**, **Group**, **Stepless** and **Earny**.

Clicking on one of the drives opens a control panel. Depending on whether the element is digital (ON/OFF) or analogue, either a switch or a slider control are displayed. The drive can be turned on or off or the operation can be switched from manual to automatic using this element.
A relay switched to manual operation is immediately highlighted in orange.

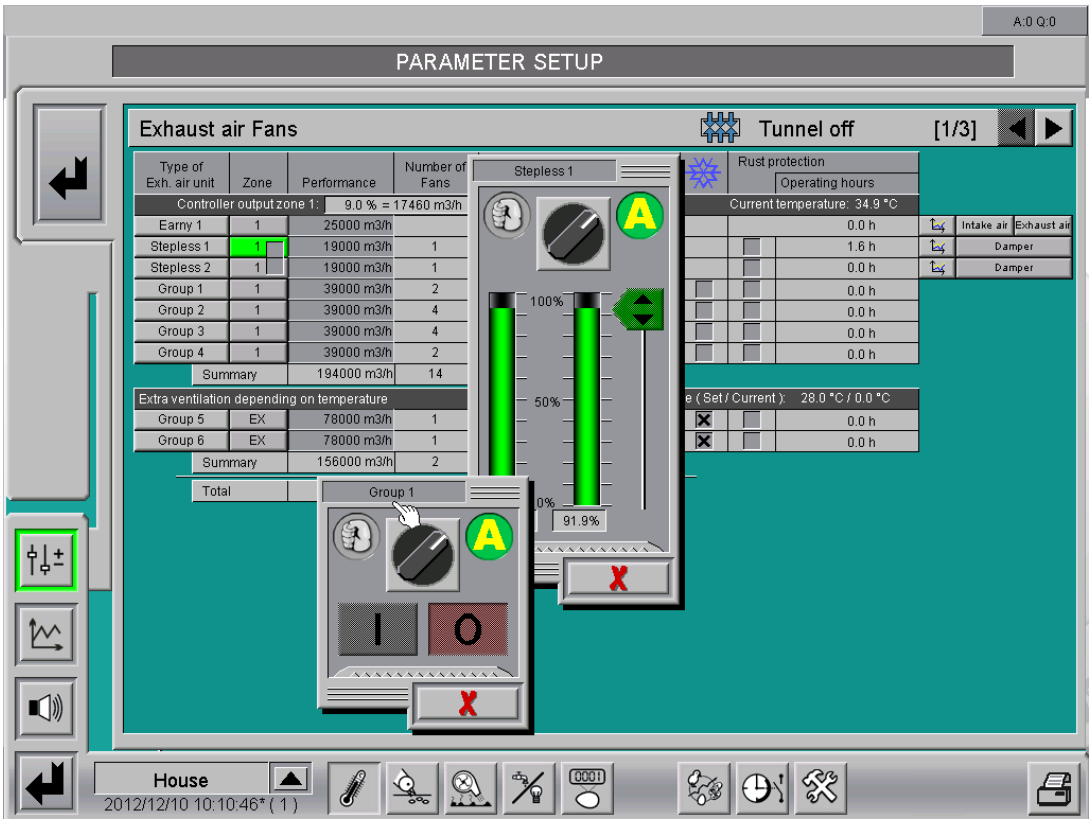


Figure 4-3: Manual automatic switch

	For information on how to operate the drives, please refer to chapter

	Maintenance or service works at drive units or fans may only be carried out if the protective switch is in the OFF position. The drive units can be activated without warning, e.g. by time switches. Observe local security signs and instructions!

4.1.1 Group ventilation

The group ventilation (**Group**) switches a fan group on or off, depending on the required air performance and switch-on sequence. If MS-Plus is activated, the switch-on sequence is considered subordinate. In this case, the computer automatically calculates fans in the zone which need to run so that the correct ventilation level can be achieved.

4.1.2 Step ventilation

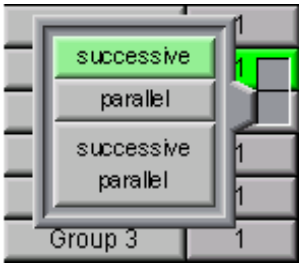
For the step ventilation (**Step**), the fans are activated one after the other by a step-up and step-down transformer. One step at a time is turned on. For each step, the air performance which can be achieved with this step has to be entered. In addition, the switch-on sequence of the steps must be set in ascending order according to their performance.

4.1.3 Stepless fans

The stepless ventilation (**Stepless**) allows to increase the ventilation level parallel to the temperature without performance leaps and without having to cope with the related temperature peaks.

The stepless fans can be set via the **Control**, the **ratio curve** fan/damper and the parameters of the **damper**.

4.1.3.1 Control



AMACS allows the piloting of up to three stepless fans. As can be seen here, it is possible to connect the fans as **successive**, **parallel** or **successive parallel** if more than one stepless fan is installed.

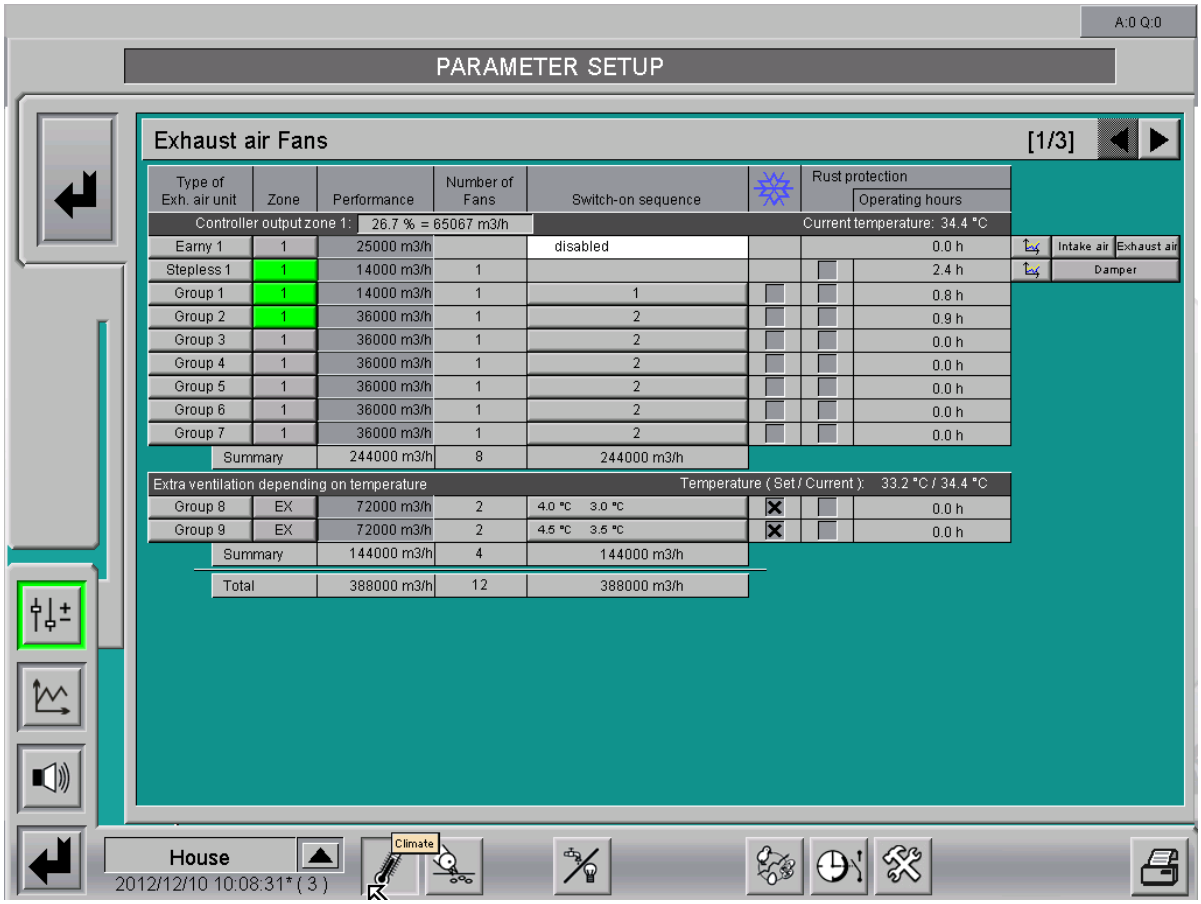


Figure 4-4: Control of two stepless fan groups

To open this menu, click into one of the boxes in the column **Zone**. If the boxes are connected, they run either **parallel** or **successively parallel**. If they are separated as in the following figure, they run **successively**.

- **Successive**

  If the fans are set to "successive", the first fan adjusts up to 100 %. If more ventilation is required, the next fans is adjusted up, depending on how many fans are installed.

- **Parallel**

  If the fans are set to "parallel", all installed fans are started at the same time. The required air performance is divided among two or three fans.

- **Successive parallel**

  If the fans are set to "successive parallel", the first fan adjusts up to 100 %.

  If more ventilation is required, the second fan is turned on and the required performance is divided among two fans.

  If a third fan is installed, this is also started as soon as the other two fans are at 100 % performance. The required performance is then divided among three fans.

4.1.3.2 Ratio curve

If a stepless exhaust air unit consists of a chimney, this chimney is normally provided with a flap, equipped with a servomotor that guarantees the correct amount of transported air.

To set the ratio curve between damper and fan, click on the curve symbol next to the damper button. Already existing reference curves of standard fans can also be loaded here.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

4.1.3.3 Damper

Clicking on the button "Damper" opens a window for operation and calibration.

The damper can be calibrated via the control panel and the move command can be adapted to each damper.

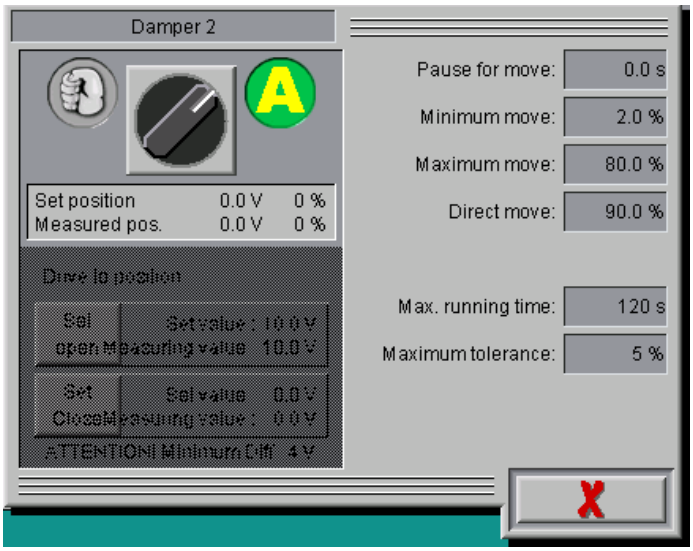


Figure 4-5: Damper

⚠	**Caution!** Maintenance or service works at drive units or fans may only be carried out if the protective switch is in the OFF position. The drive units can be activated without warning, e.g. by the time switches. Observe local security signs and instructions.

- **Calibrating**

  The damper of the stepless fan has to be calibrated. Calibrating means that AMACS determines the flap's open and closed position. This current position is stored permanently via the control signal or the feedback of the dampers after calibration. The damper drive can be piloted via a digital or analogue signal with feedback.

Important:

Before starting the calibration in the computer, the dampers and servomotor have to be opened and closed manually one time under supervision. The limit stops of the servomotor have to limit the maximum and minimum positions, otherwise, traction cables might break and moving parts might be damaged.

Local security signs and instructions in the manuals for the servomotors or intake air units have to be observed.

To calibrate the damper, the drive has to be put into calibration mode using the switch in the upper left corner of the menu. The field for calibration at 0 % and 100 % damper position is then released for use.

- **Digital damper**

  Calibration starts at 100 % damper position by activating the button **Opening**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save the position by clicking on the button **Set Open position: X V**.

  Calibration starts at 0 % damper position by activating the button **Closing**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save the position by clicking on the button **Set Closed position: X V**.

Figure 4-6: Digital damper

- **Analogue damper**

  For the calibration at 100 % damper position, a volt level must be entered in the field **Drive to position**, e.g. 10.0 V. If the damper is opened completely, the position has to be saved by clicking on the button **Set Open position: X V**.

  For the calibration at 0 % damper position, a volt level must be entered in the field **Drive to position**, e.g. 0.0 V. If the damper is closed completely, the position has to be saved by clicking on the button **Set Closed position: X V**.

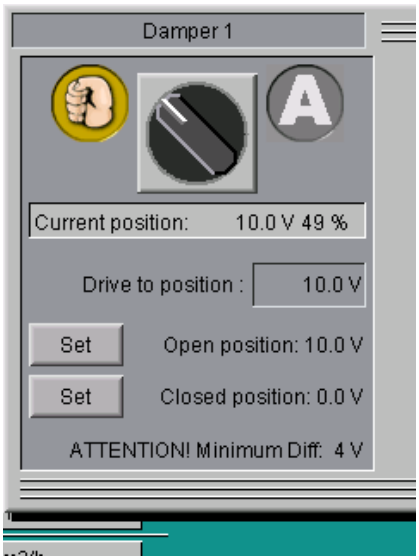


Figure 4-7: Analogue damper

- **Analogue damper with feedback**

  For the calibration at 100 % damper position, a volt level must be entered in the field **Drive to position**, e.g. 10.0 V. If the damper is opened completely, i.e. the **Measured position** does not change any more, the position has to be saved by clicking on the button **Set Open position: X V**.

  For the calibration at 0 % damper position, a volt level must be entered in the field **Drive to position**, e.g. 0.0 V. If the damper is closed completely, i.e. the **Measured position** does not change any more, the position has to be saved by clicking on the button **Set Open Position: X V**.

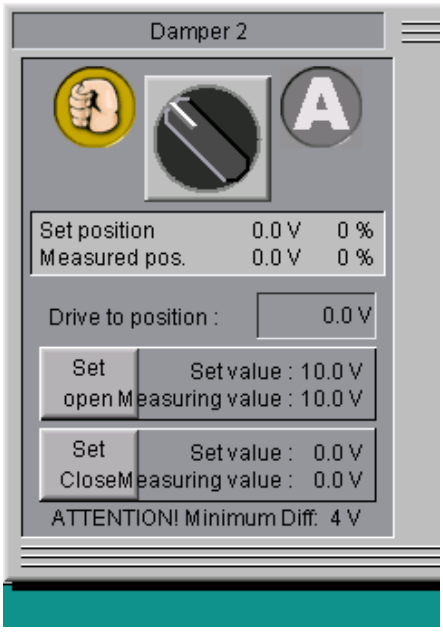


Figure 4-8: Analogue damper with feedback

Next, the damper must be switched back to automatic mode using the switch in the upper left corner of the menu.

Important: Minimum electrical spacing 4V

The difference between the two positions "closed" and "open" should also be at least 4V here for the analogue-controlled motors to ensure reasonable calibration. However, a minimum setting of 2V is also possible if necessary.

Important:

Correct calibration must be checked regularly and repeated if necessary!

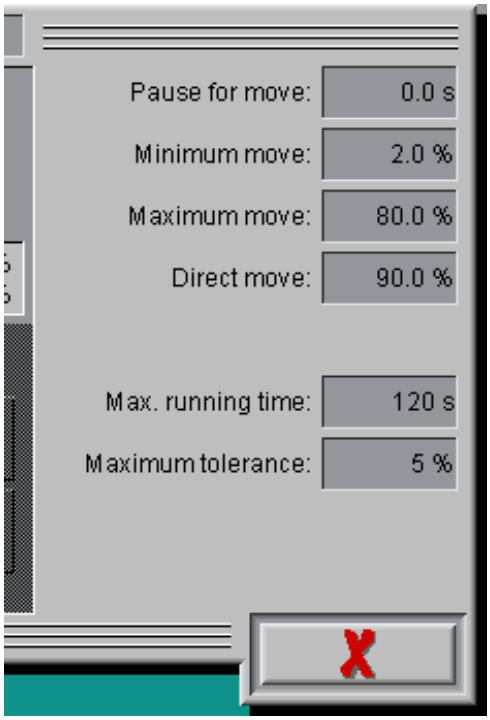


Figure 4-9: Settings damper

- **Pause for move**

  The time between two control commands is indicated here so that the damper does not switch as often. Enter a value of 0 seconds to ensure that the damper starts simultaneously with the fan.

- **Minimum move**

  This value Indicates how big a set value change has to be in order for a command to be carried out. It is also used to calm the damper. A value of 2 % should be entered here.

- **Maximum move**

  If the computer has calculated a control command for the damper of e.g. 85 %, this change is carried out in two cycles, as the maximum move only allows a change of 80 % per cycle. After the first change of 80 %, a pause of 0 seconds takes place, followed by a second change of 5 %.

  These setting can be customised for each system.

- **Direct move**

  If the damper shall be opened from 0 % to 100 %, this process would take a longer time as only 80 % steps followed by a pause are possible.

  The parameter “direct move” has been integrated for this reason. It allows for a direct opening of the flap if the command value is higher than e.g. 90 % (value can be changed).

- **Maximum running time (analogue damper)**

  If AMACS sends a control signal and the target value is not met within the time preset under "maximum running time", an alarm is triggered. A value of 120 seconds is acceptable for normal servomotors.

- **Maximum tolerance (analogue damper with feedback)**

  As the analogue damper with feedback does not correct its position if the measured and set position do not coincide, there is a maximum tolerance within which the position is considered reached. If the position is greater than the value of in this case 5 %, an alarm is triggered.

4.1.4 Earny

Earny can be assigned to a zone, similar to a stepless fan, to carry out the minimum ventilation and the dehumidification in this zone.

	Please find further information on the settings for the heat exchanger in chapter 6 ”Earny heat exchanger” .

The performance of the heat exchanger entered here is not included in the nominal overall performance of the fans as the heat exchanger takes away air performance from the normal ventilation. The set curves of the intake air flaps also consider the ventilation percentage taken away by the heat exchanger.
There is a field under the switch-on sequence displaying in text whether the heat exchanger is active or inactive and can thus not be used for ventilation.
If two Earny heat exchangers are released for the same function and active in the same zone, the ventilation value is divided equally among them. An automatic optimisation of operating hours of the two heat exchangers is not planned.

4.1.4.1 Ratio curve

As a general rule, intake and exhaust air fans run synchronously. However, a curve for piloting can be entered separately for both. The curve settings can be saved, loaded and used for other heat exchangers.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

4.1.4.2 Intake air / Exhaust air

The menu for manual operation of the heat exchanger can be opened by clicking on the button "Earny", similar to all other fans.

In addition, the intake and exhaust air fan can be operated individually and manually here.

	For information on how to operate the drives, please refer to chapter 1.2 ”Drives”

4.2 Zone

Each exhaust air unit can be assigned to a zone (1 or 2) or the extra ventilation.
The figure below contains a field in which no entries are possible.
This field displays the ventilation value of the zone as in every other menu. In a 2-zone system, the same window is automatically displayed for zone 2 as well. The window can be used for monitoring or to check at which percentage of ventilation e.g. relay 4 is to be added.

The current zone temperature is displayed on the right next to the corresponding ventilation level. For the extra ventilation, the current and set temperatures are displayed additionally. This simplifies monitoring of the temperature and exhaust air units.

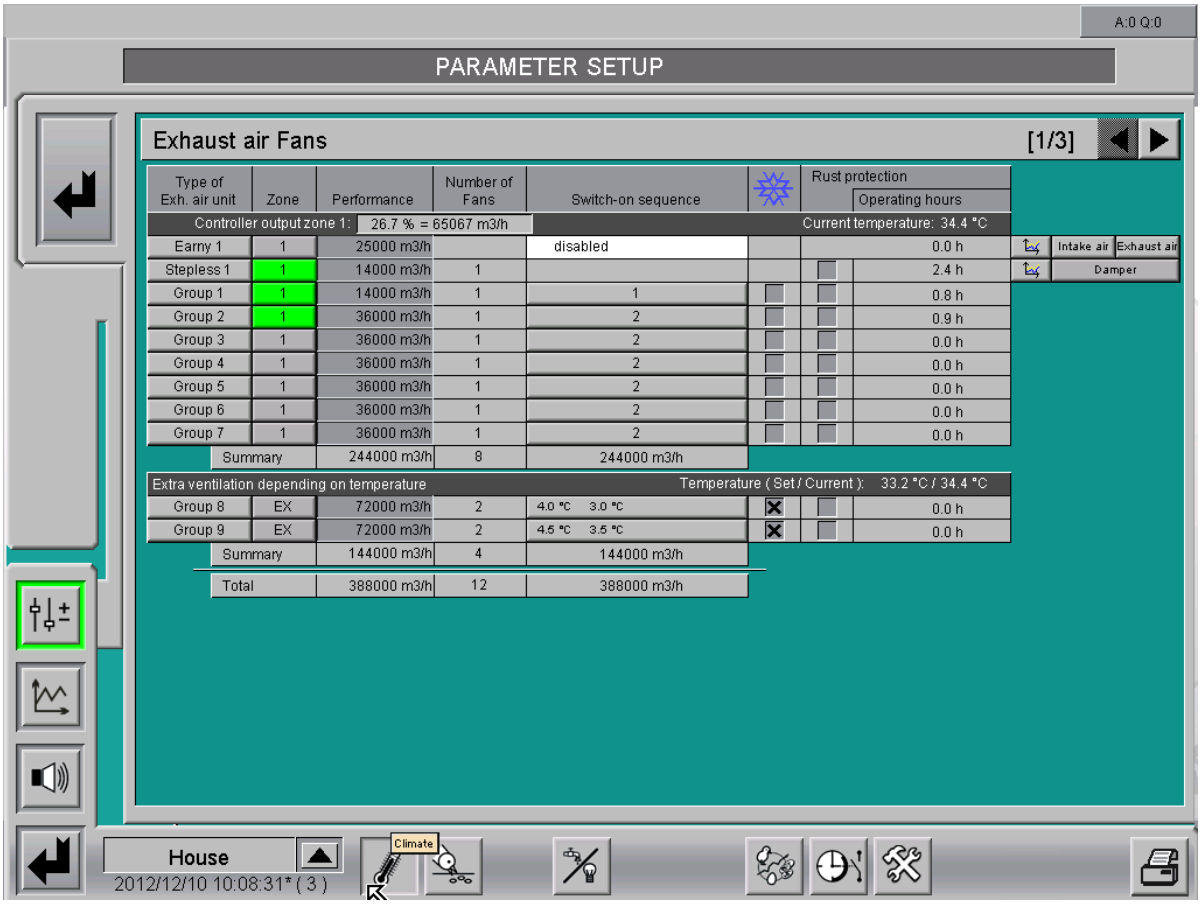
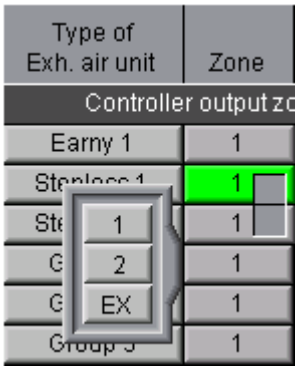


Figure 4-10: Zone

4.2.1 Assigning zones



The zone field determines to which zone the currently selected relay belongs. There are three possible settings: **Zone 1**, **Zone 2** and **Extra ventilation**.

If zone 1 is selected for all relays, this means that at 100 % ventilation all steps which have been selected for zone 1 are turned on. If all buttons are green, as shown in the example, all groups have been turned on by the computer and create a ventilation at 100 %. If they are grey, the fans are not active.

	Normally, zone 1 or extra ventilation is selected for all exhaust air units. Only if a 2-zone house was planned during specifications the climate configuration at Big Dutchman may the exhaust air units be used for zone 2.

4.2.2 Extra ventilation

As mentioned before, there is a possibility to activate relays as extra ventilation. If, for example, group 5 and 6 have to be marked "EX", this can be done in the zone assignment.
The groups are deleted from normal ventilation so they do no longer belong to the nominal ventilation and are not turned on at 100 %.

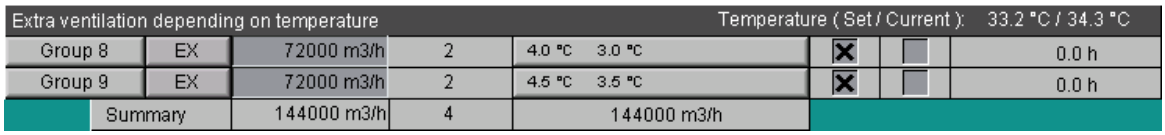


Figure 4-11: Extra ventilation

	**Caution!** It is important that temperature sensors are also selected for extra ventilation as they will not start otherwise.

The menu below the switch-on sequence can be used to determine the temperature for turning the respective exhaust air unit of the extra ventilation on and off. The set temperature for extra ventilation always refers to the **current set temperature** plus **comfort temperature** of zone 1.

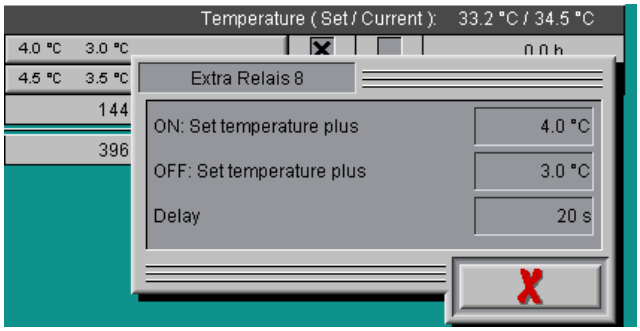


Figure 4-12: Extra ventilation

- **ON: Set temperature plus**

  In the upper line **ON: Set temperature plus**, enter the exceeding temperature from which the exhaust air unit shall turn on. The exceeding temperature always refers to the currently valid set temperature (in the upper right corner of the figure).

- **OFF: Set temperature plus**

  In the second line **OFF Set temperature plus**, enter the temperature at which the exhaust air unit shall turn off.

- **Delay**

  Enter a delay in seconds in the last line so that the exhaust air unit does not start immediately in case the temperature is only exceeded for a short time. If the switch-on temperature is exceeded, the step starts after the delay. It will run as long as the temperature is above the value set down in the menu **OFF: Set temperature plus**. If the temperature falls below this value, the extra group is turned off.

☞	Therefore, do not set starting and stopping points too close together, otherwise the relay is going to operate as a thermostat and the extra group is going to start / stop too often.

4.3 Performance

The field "performance" determines the performance of each exhaust air unit in m³/h. This is necessary to enable the computer to calculate the correct volume of exhaust air. The exhaust air performance of the fans can be found in the technical information.

	The sum of the exhaust air performance of an entire zone or the extra ventilation is displayed below the exhaust air units. The total exhaust air performance of the house can be found below the zones and extra ventilation.

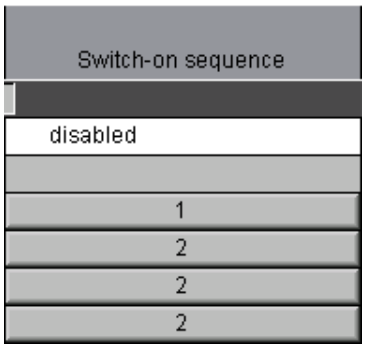
4.4 Number of fans

Number of Fans
67200 m3/h
1
1
1
1
1

The purpose of this field is merely informational. No entries can be made here. During the configuration of the system, the number of fans per exhaust air unit has to be determined here.

The sum of fans of an entire zone or the extra ventilation is displayed below the exhaust air units. The total number of houses can also be found below the zones and the extra ventilation.

4.5 Switch-on sequence



If the ventilation system also includes exhaust air units with the same performance, the switch-on sequence can be changed here.
The ventilation turns the exhaust air units on according to this sequence without MS-Plus. If MS-Plus is turned on, the switch-on sequence is subordinate. An operating hours optimisation is only carried out for the switch-on sequence.

	**Caution!** Only exhaust air rows with the same exhaust air performance can be grouped together.

	**Caution!** To ensure that the step ventilation can work correctly, each exhaust air unit has to be assigned to a separate switch-on unit.

As the switch-on sequence may be different between tunnel mode and cross ventilation, it is possible to enter a different switch-on sequence for the ventilation groups or to exclude them from control for tunnel mode.

	Please find further information on the settings for the tunnel mode in chapter 12 ”Tunnel mode” .

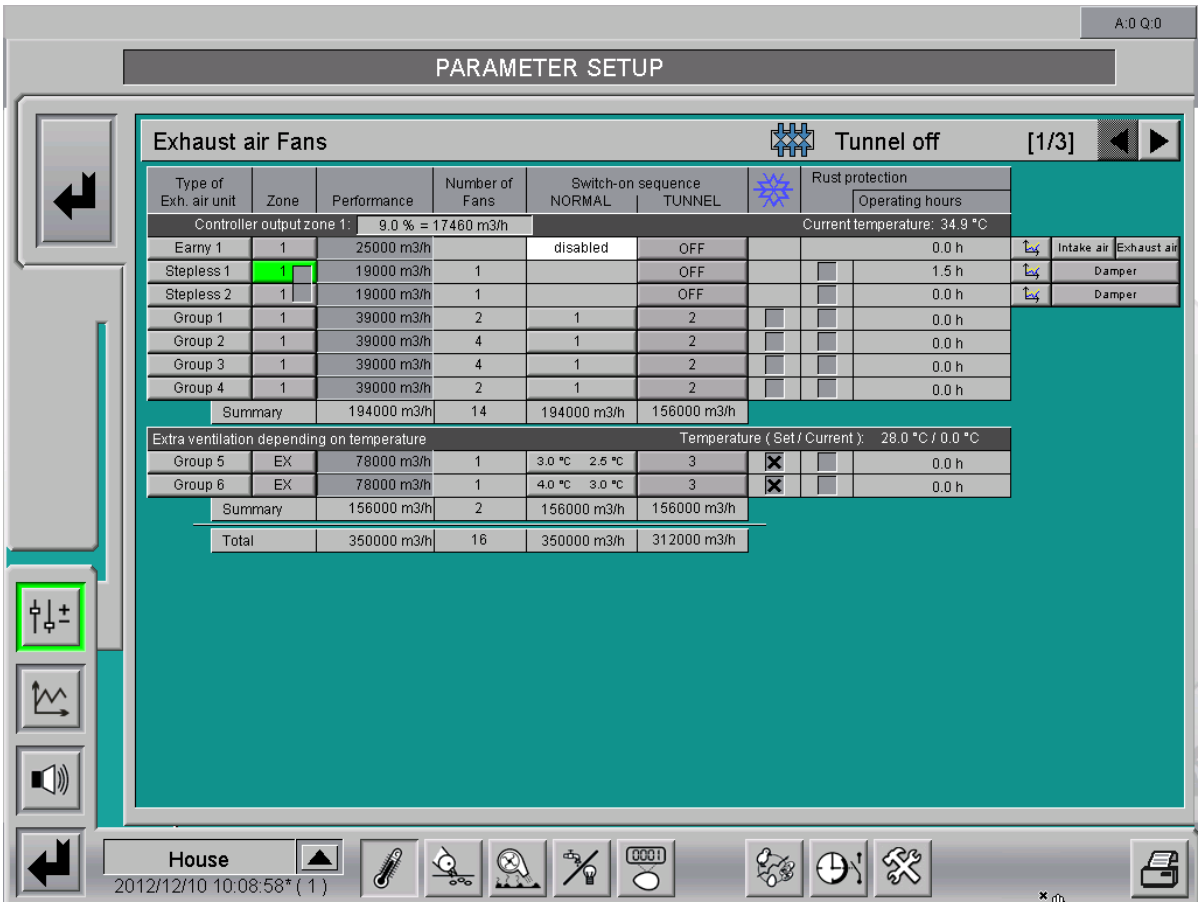


Figure 4-13: Switch-on sequence in tunnel mode

4.6 Sealed due to weather

Often, groups that are not used are remove from running operation (due to seasonal adjustments), i.e. they are sealed and must not be switched on.

These fans can be deleted from the control easily by checking the corresponding box.

In the climate overview screen, these fans are displayed as sealed and cannot be started manually. Even if the temperature increases and the sealed groups would normally start, AMACS will instead turn on another group.

If no other group is available but the performance is required or in case of exceeding temperatures, an alarm is triggered.

4.7 Rust protection

Rust protection	
	Operating hours
Current temperature: 34.3 °C	
	0.0 h
☐	2.3 h
☐	0.7 h
☐	0.9 h
☐	0.0 h
☐	0.0 h

Damage to bearings caused by rust or condensation water in the motor are possible if the fans have not been used for a longer time. The function described here can prevent this. For each step (relay), rust protection can be activated or deactivated. If a relay is activated, this group starts for e.g. one minute every 14 days, depending on the pre-set values.

Please find further information on the settings for the rust protection in chapter 4.10.5 ”Rust protection” .

4.8 Operating hours

Rust protection	
	Operating hours
Current temperature: 34.3 °C	
	0.0 h
☐	2.3 h
☐	0.7 h
☐	0.9 h
☐	0.0 h
☐	0.0 h

The field "Operating hours" provides information on the running times of each fan in hours. As AMACS records the individual running time of the groups, it makes sense to burden the same ventilation steps with the same number of working hours.

Please find further information on the settings for the operating hours in chapter 4.10.1.1 ”Release optimization of operating hours” .

4.9 Control

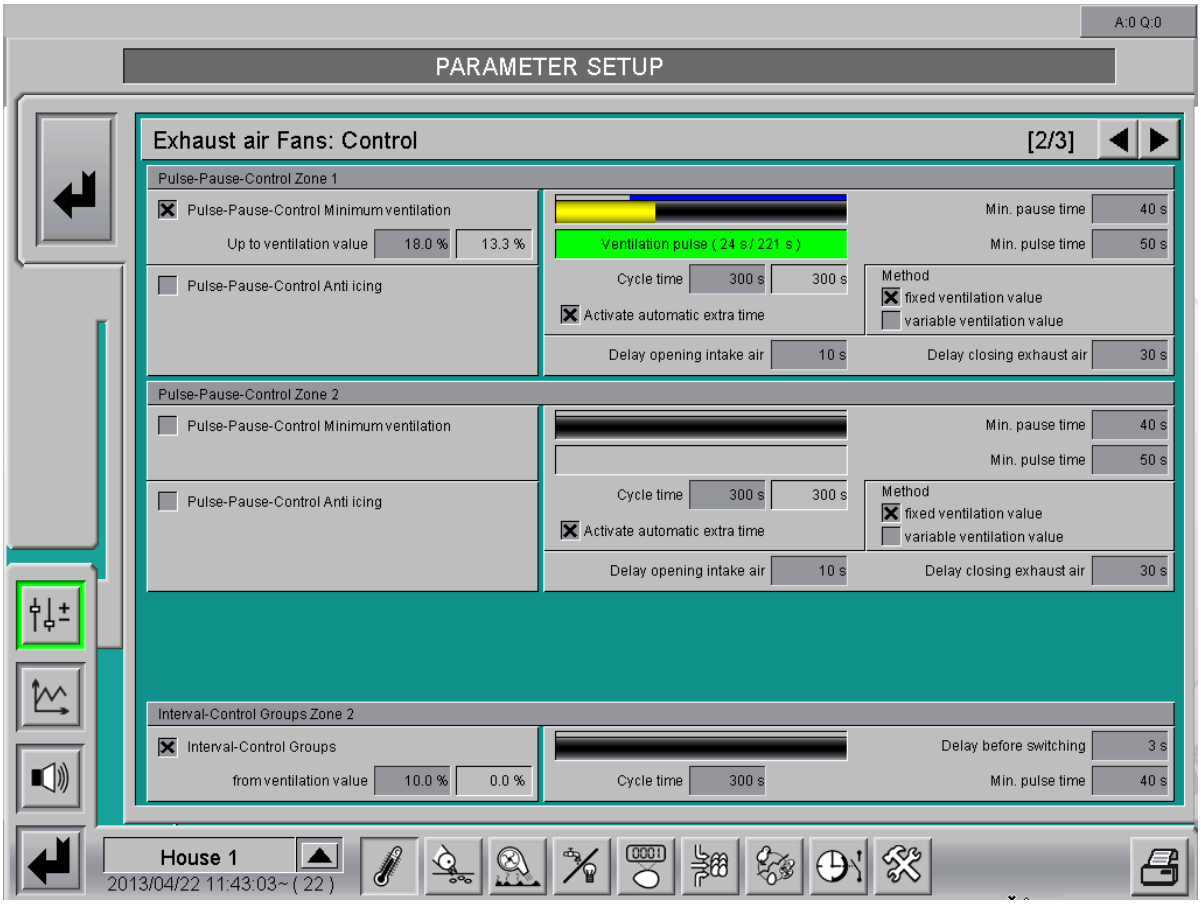


Figure 4-14: Ventilation principle

4.9.1 Pulse pause control Minimum ventilation

If the house shall be aired with a powerful fresh air jet even at low ventilation, this is made possible by the pulse pause control minimum ventilation. Under "Method", you can determine whether a **fixed ventilation value** or a **variable ventilation value** is used during pulse pause control. If the negative pressure control (if applicable) should run in secure ventilation-guided mode during pulse pause control, this can be set as described in chapter 4.10.2 ”Additional settings Pulse pause control” .
The required minimum ventilation of the intake air elements is set at pulse pause control. The system will then ventilate in an alternating rhythm.

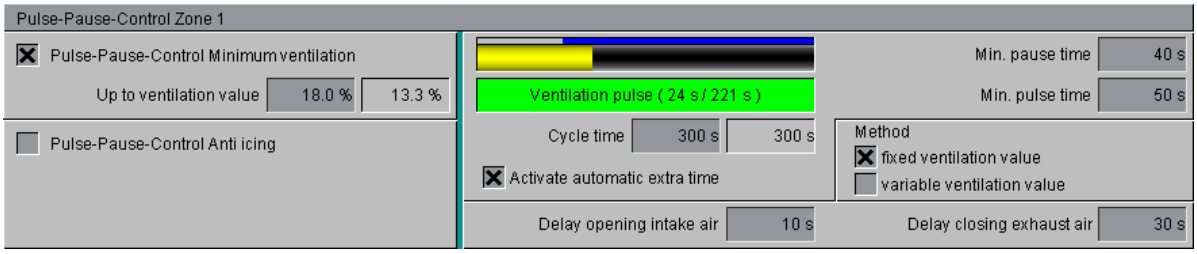


Figure 4-15: Pulse pause control Minimum ventilation

- **Activating the pulse pause control**

  Check the box next to **Pulse-Pause-Control Minimum ventilation** to activate the pulse pause control.

	The currently calculated ventilation value and the changes to settings for pulse pause are only adopted at the beginning of a cycle. If you want changes to become effective immediately, the current cycle can be stopped by deactivating the release for pulse pause. If the requirements for pulse pause operation have been met for 60 seconds by activating the release for pulse pause, a new cycle with the new settings is started. The delay for switching to pulse pause operation is programmed to 60 seconds. Cycles are always completed and at the end of each cycle, it is checked whether the requirements for pulse pause control are still met. Pulse pause operation is only interrupted if the release is deactivated or the currently calculated required ventilation level exceeds the double set value **up to ventilation value**.

- **Up to ventilation value**

  Pulse pause control is only desired up to a specific ventilation value. To ensure an even intake of fresh air at low ventilation, the maximum ventilation value for pulse pause control which guarantees a stable air flow into the house can be entered in this field. If this value is exceeded, the ventilation continues on without pulse pause control. The current ventilation value used for zone ventilation is displayed next to the entry field **up to ventilation value**.

- **Display cycle for pulse pause control**

  The current status of the pulse pause control cycle is displayed here. The blue bar above the yellow one displays the calculated duration of the current cycle in case of increased ventilation.

  The yellow bar, which continually shows the course of the cycles, displays the progress of the cycle.

  The lower bar of the cycle display also changes if pulse pause control is activated. There are a pause and a pulse time. The colour of the bar shows the current mode of the pulse pause control. In addition, this displays shows since when pulse or pause have been working and how long they will still be operating.

- **Cycle time**

  The cycle time determines how often the pulse pause control must be recalculated. Pulse and pause time are included in this calculation cycle. This calculation cycle should not be too long as this could cause temperature differences in the house.

- **Activate automatic extra time**

  The automatic extra time ensures that the cycle or pause time are extended (up to no more than 1200 seconds) if the minimum pulse time would lead to more fresh air in the house than calculated.

- **Method - fixed ventilation value**

  This is the traditional method for pulse pause control. With this method, the set value at **up to ventilation value** is used for ventilation until this value is reached and the pulse pause ratio is used to achieve the correct air quantity.
  The setting **up to ventilation value** usually refers to the ventilation value at which a good distribution of the incoming air is reached. The MS-Plus function can also be used during pulse pause control with this method. If stepless groups are available, these are used to achieve the exact ventilation level for the pulse. If no stepless groups are available, the correct air quantity can be achieved with the interval control.

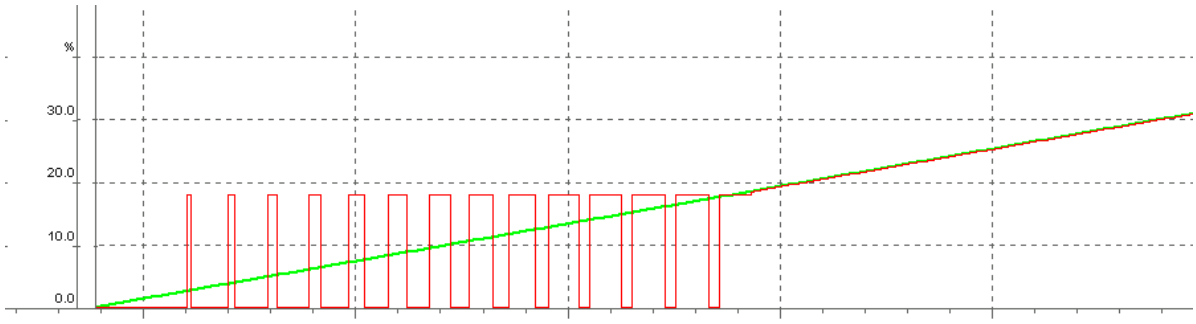


Figure 4-16: Method - fixed ventilation value

- **Method - variable ventilation value**

  This method for pulse pause control uses a ventilation value for the pulse, depending on the currently desired ventilation level. The MS-Plus function is deactivated during pulse pause control with this method so that the switch-on sequence is respected. The optimisation of operating hours within this switch-on sequence remains active. If stepless groups are available, these groups are used in a way that they are **OFF** or turned on at **100 %**. As ventilation is only carried out in entire steps for this method, the interval control is not used for pulse pause operation.

  The pulse pause control pulses with a ventilation step as small and adequate as possible. If this step means that the minimum pause time cannot be met, the next group is turned on.

  The maximum value for ventilation is the value set at **up to ventilation value**.

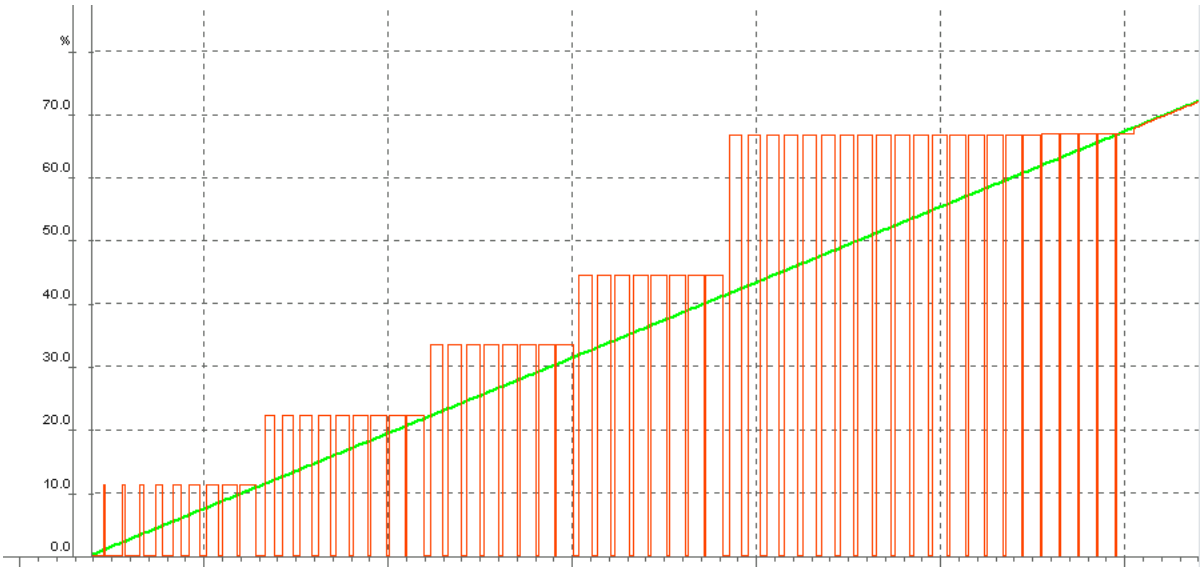


Figure 4-17: Method - variable ventilation value

- **Minimum pulse time**

  For a house width of approx. 20 meters, a minimum pulse time of 50 seconds is recommended. If this time is not met, it is possible that insufficient amounts of fresh air enter the house and thus sufficient air exchange cannot be guaranteed.

- **Minimum pause time**

  The value for minimum pause time should be similar to the value for the pulse time. This means that for a house width of approx. 20 meters the pause time should be no less than 40 seconds.

- **Delay closing intake air**

  This value sets the delay which the intake air elements use to reach their set position for the ventilation pulse in relation to the beginning of the pulse. The system controls the flaps individually based on this information, the current position, the set position and the flap speed.

- **Delay closing exhaust air**

  This value sets the delay after which the intake air elements close at the end of the pulse.

4.9.2 Pulse pause control Anti icing

The anti-icing function aims at slightly opening and closing the intake air elements in pulse pause in the case of extremely low outside temperatures. This prevents the elements from freezing due to cold incoming air.

For this purpose, the anti-icing function interrupts ventilation for the minimum pause time. The pulse is active for the maximum pulse time while ventilating with the currently calculated ventilation. The anti-icing function is not influenced by the "pulse pause up to ventilation value" setting under pulse pause control Minimum ventilation

The pulse pause control carries out all other settings or sets everything else as described above.

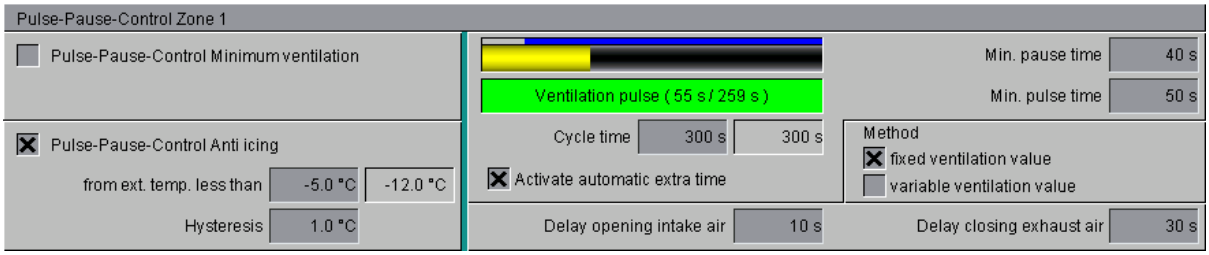


Figure 4-18: Pulse pause control Anti icing

- **Activating the anti icing**

  To activate the anti-icing function, check the box "Pulse-Pause-Control Anti icing" as shown in the figure above.

- **From external temperature less than**

  Under "From external temperature less than", you can enter a temperature value starting at which the anti-icing function will be activated.

  The example uses a temperature of -5°C.

  The currently measured external temperature is displayed next to the threshold of the external temperature.

- **Hysteresis**

  The hysteresis value displays the temperature from which the anti-icing function is deactivated again.

  Example: If the external temperature falls below -5°C, the anti-icing function becomes active. After the temperature has risen to -4°C (hysteresis = 1°C), the anti-icing function is turned off.

  This value ensures that the control is not turned on and off in intervals if the temperature fluctuates slightly (e.g. by 0.2°C) around a temperature of -5°C.

4.9.3 Interval control groups

The interval control groups ensure that the ventilation level is met even if no stepless fans are available.

Example:

A ventilation level of 42.5 % is required. The last fan group was turned on at 40 % and the next would turn on at 50 %. AMACS would use the following group (turning on at 50 %) for 1/4 of the calculation cycle time.

In numbers, this means that this group would only be active for 75 of 300 seconds (0.25 x 300 = 75).

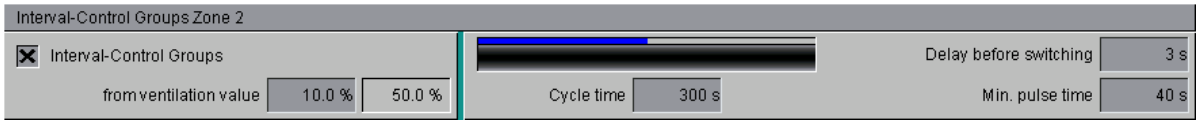


Figure 4-19: Interval control

- **Activating the interval control groups**

  To activate the interval control groups, check the box next to **Interval-Control Groups** in the above figure.

- **From ventilation value**

  To ensure that the climate does not start vacillating in the lower ventilation area, you may enter here a value from which the **Interval control group** can be activated.

  The current ventilation value used for zone ventilation is displayed next to the entry field **from ventilation value**.

- **Display cycle for interval control**

  The current status of the pulse pause cycle is displayed here. The blue bar above the yellow one displays the calculated duration of a cycle.

  The yellow bar, which continually shows the course of the cycles, displays the progress of the cycle.

- **Cycle time**

  The cycle time determines how often the interval control groups must be recalculated. Pulse and pause time are included in this cycle time.

- **Delay before switching**

  To prevent a short turning-on during the switches, a **delay before switching** of the fan can be entered here.

- **Minimum pulse time**

  The minimum pulse time should not be too short. The control would react violently if only a short impulse of a few seconds would be calculated and the intake air elements would open and close repeatedly.

4.10 Setting parameters

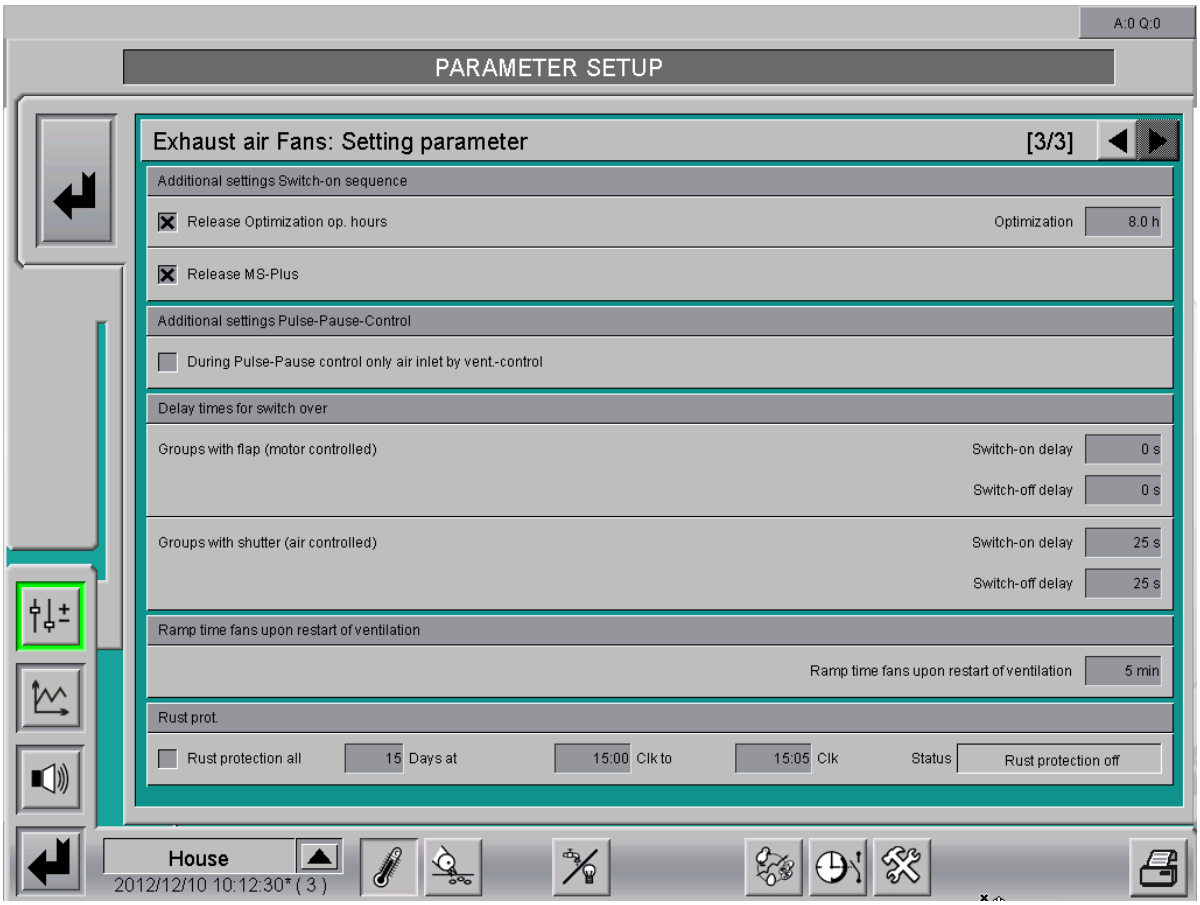


Figure 4-20: Switch-on principle

4.10.1 Additional settings switch-on sequence

Figure 4-21: Additional settings switch-on sequence

4.10.1.1 Release optimization of operating hours

As AMACS records the individual running time of the groups, it makes sense to burden the same exhaust air units with the same number of working hours. This can be done by setting the same switch-on sequence for similar exhaust air units. The AMACS running times can then be optimized. AMACS tries to use the exhaust air units in a manner that they are active for the same number of operating hours.

This function can be released by checking the box **Release Optimization operating hours**.

Additionally, you may enter a difference of X hours after which the relays switch directly. This setting ensures an even use of all groups with the same switch-on sequence.

4.10.1.2 Release MS-Plus

MS-Plus is a method for controlling of several exhaust air units which increases ventilation continuously to prevent leaps in the exhaust air performance. The computer controls up to three exhaust air units steplessly from 0 to 100 % while the relay-controlled groups of the exhaust air units are started as required and depending on their size.
The function can be released by checking the box **Release MS-Plus**.

4.10.2 Additional settings Pulse pause control

Figure 4-22: Additional settings Pulse pause control

In the case of negative-pressure controlled intake air, this intake air is also negative-pressure controlled in the pulse pause operation. If this is not desired, you can select the ventilation-controlled control for the pulse pause operation by activating the selection field **During Pulse-Pause control only air inlet by ventilation control**.

	The delay for the switch to negative-pressure controlled operation to secure mode and back to the negative-pressure controlled control only takes place in the second half of the ventilation pulse. The times are stopped during the pause and the first half of the pulse. During the pulse pause operation, there is no switch to secure mode in the pauses.

4.10.3 Delay times for switch over

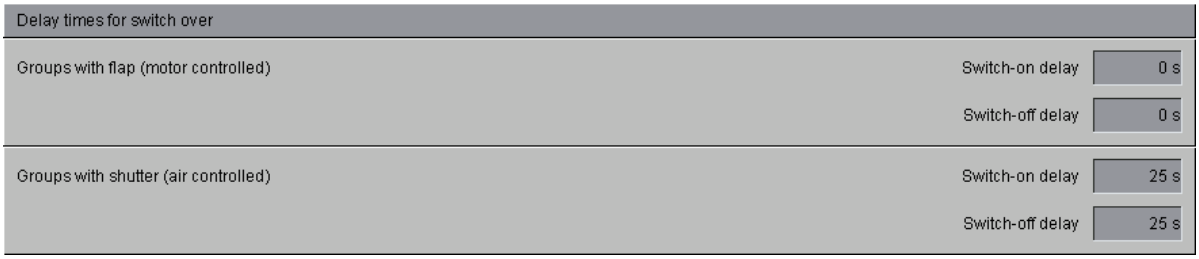


Figure 4-23: Delay times for switch over

Relay-controlled roof fans are usually controlled by a motor, i.e. they are not turned on and off directly. To turn the fans on, the flap of the chimney is piloted which in turn starts the fan at a flap opening of approx. 80 % via a limit switch (duration approx. 25 seconds). The flap closes and stops the fan at approx. 20 % flap opening (duration approx. 25 seconds). Relay-controlled wall fans are usually air controlled and start and stop directly. The fan opens a shutter.

In the case of a switch from motor-controlled roof chimneys to air-controlled wall fans without delay times, the wall fan starts immediately and the chimney lags behind for approx. 25 seconds until it is turned off via the flap position. This can cause unwanted pressure fluctuations with high negative pressure. In the inverted case (switching from a wall fan to a roof chimney without delay time), the wall fan stops immediately and the roof chimney starts only after approx. 25 seconds if it is turned on via the flap position. This can cause pressure fluctuations with little negative pressure.

To even this out, delay times for switching on and off can be set for motor- and air-controlled exhaust air groups. To do this, the exhaust air unit is configured during initial operation, depending on whether it is equipped with a shutter (air-controlled) or a flap (motor-controlled).

Switch over	Reaction
Roof > wall	Roof turns off after 0 s and lags behind by approx. 25 s. Wall turns on after 25 s.
Wall > roof	Roof turns on after 0 s and only starts after approx. 25 s. Wall turns off after 25 s.
Roof 1 > roof 2	Roof 1 turns off after 0 s and only starts after approx. 25 s. Roof 2 turns off after 0 s and lags behind by 25 s.
Wall 1 > wall 2	Wall 1 turns off after 25 s. Wall 2 turns on after 25 s.

Figure 4-24: Scenarios and reactions with standard settings

Delay times for switching on and off are not used in pulse pause operation.

4.10.4 Ramp time fans upon restart of ventilation

Figure 4-25: Ramp time fans upon restart of ventilation

Especially in large systems, it can be problematic if many fan groups turn on immediately after the control has been restarted. This happens if a high ventilation level is required and e.g. the generator is tested, including a restart of the controls.

The ramp time can be used to set the time in which the ventilation value is adjusted to the currently calculated required ventilation. The ventilation increases in absolute 5 % steps until it corresponds with the required ventilation. If the value influenced by the ramp function is smaller than minimum ventilation, minimum ventilation is used for ventilation.

4.10.5 Rust protection

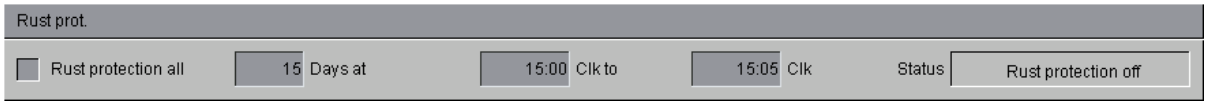


Figure 4-26: Rust protection

These settings only consider the exhaust air units for which rust protection was activated. See chapter 4 ”Exhaust air Fans”

The figure above shows the adjustable rust protection parameters for running times which are described in the following.

- **Activating rust protection**

  If the box is checked, the rust protection function is activated.

- **Rust protection all X days**

  Here you may enter the number of days after which a rust protection is to be carried out for the marked exhaust air units.

- **Rust protection from X to X o'clock**

  The running time for the fans can be determined here. The example uses 5 minutes as running time.

- **Status rust protection**

  This field shows whether rust protection is active.

Attention!
Works on the drive or fans may be carried out when the protective switch is in OFF position. The drive units are activated without prior warning e.g. via the time switches. Local security advices and instructions are to be observed.

5 Exhaust air Natural

Clicking on the button **Exhaust air Natural** opens a menu in which the exhaust air elements of the natural ventilation as well as the control and setting parameters can be set.

Figure 5-1: Exhaust air Natural

	Caution! The settings in this menu should only be changed if absolutely necessary as this can negatively affect the house climate.

The settings possible for **exhaust air** can be found on several screen pages:

1. The first pages are for the characteristics and assignment of the exhaust air elements.
2. The last page displays the control and the setting parameters of the natural ventilation.

	Caution! The ratio curves in this menu should not only be changed if absolutely necessary as this can negatively affect the house climate.

5.1 General settings

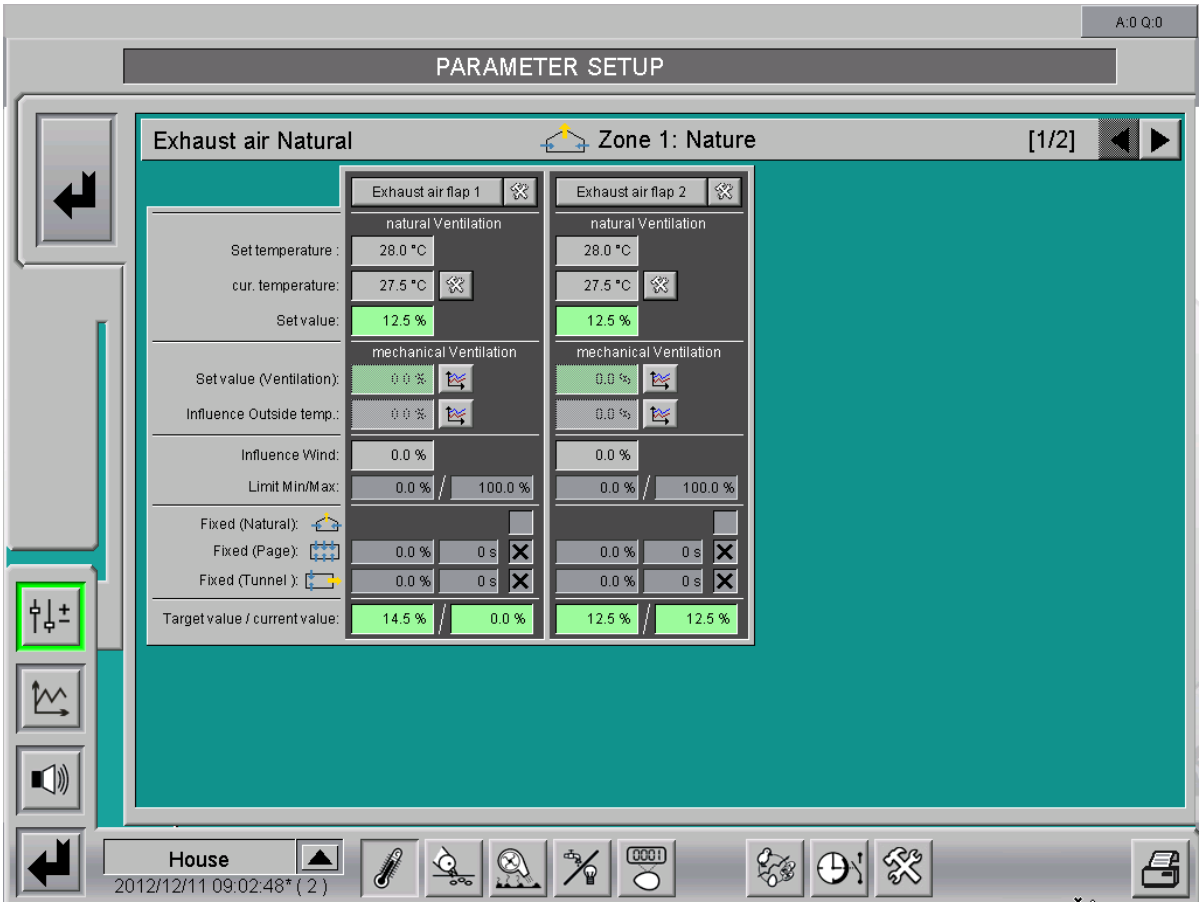


Figure 5-2: Characteristics and assignment of natural exhaust air elements

5.1.1 Operation

The head row of each exhaust air element includes a button for manual operation. Clicking on one of the drives opens a control panel. Depending on the type of the exhaust air element, either a switch or a slider control are displayed. The drive can be turned on or off or the operation can be switched from manual to automatic using this element. A drive switched to **manual** operation is highlighted in orange.

	For information on how to operate the drives, please refer to chapter 1.2 ”Drives”

	**Caution!** Maintenance or service works at drive units or fans may only be carried out if the protective switch is in the OFF position. The drive units can be activated without warning, e.g. by the time switches. Observe local security signs and instructions.

5.1.2 Calibrating

The smaller button next to "Operation" is used for further settings such as calibration, zone settings, running times, etc.

Calibrating means that the system determines the maximum open and closed flap positions. The positions are returned to the system via a feedback signal or a set value of the flaps and saved permanently after calibration.
The calibration process is nearly identical for all cases.

!	**Important: Minimum electrical spacing 4V** **The difference between the two positions "closed" and "open" should also be at least 4V here for the analogue-controlled motors to ensure reasonable calibration. However, a minimum setting of 2V is also possible if necessary.**

!	**Caution** **Before starting the calibration of the computer, the valves and servomotor have to be completely opened / closed manually one time under supervision. If adjustable, the limit stops of the servomotor have to limit the max. and min. positions, otherwise, traction cables might break and moving parts might be damaged. Observe local safety signs and instructions in the servomotor or air inlet manuals.**

5.1.2.1 Relay-controlled exhaust air flap

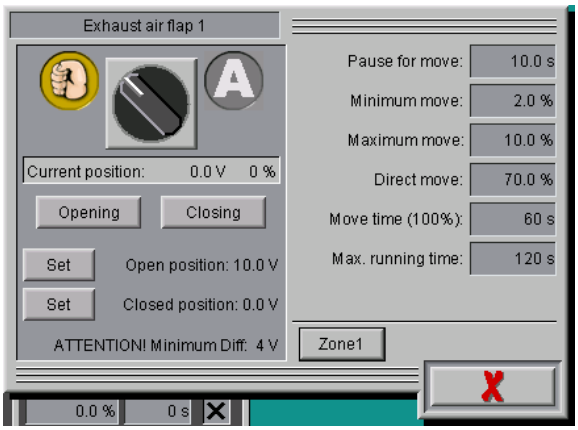


Figure 5-3: Relay-controlled exhaust air flap

- **Activating calibration**

  To calibrate the flaps, the switch must be moved to the depicted hand above it.

- **Calibrating position „open“**

  The flap is opened by clicking the button **Opening**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save this position by clicking on the button **Set Open position: X V**.

- **Calibrating position „closed“**

  The flap is closed by clicking the button **Closing**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save this position by clicking on the button **Set Closed position at X V**.

5.1.2.2 Analogue exhaust air flaps without feedback

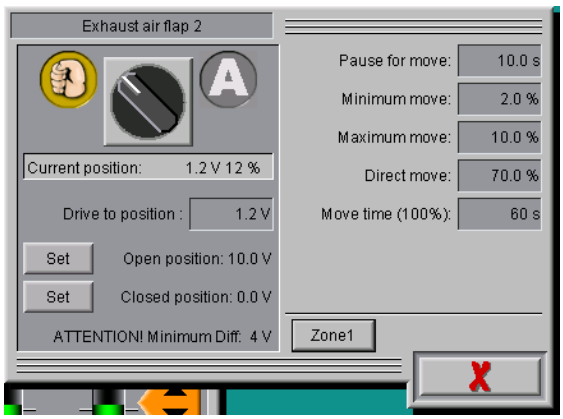


Figure 5-4: Analogue exhaust air flap without feedback

- **Activating calibration**

  To calibrate the flaps, the switch must be moved to the depicted hand above it.

- **Calibrating position „open“**

  To open the flap, the desired position is entered into the field **Drive to position** (usually 10.0 V). The flap moves until this value is reached and is displayed in the field **Current position**. Save this position by clicking on the button **Set Open position: X V**.

- **Calibrating position „closed“**

  To close the flap, the desired position is entered into the field **Drive to position** (usually 0.0 V). The flap moves until this value is reached and is displayed in the field **Current position**. Save this position by clicking on the button **Set Closed position at X V**.

5.1.2.3 Digital exhaust air flaps

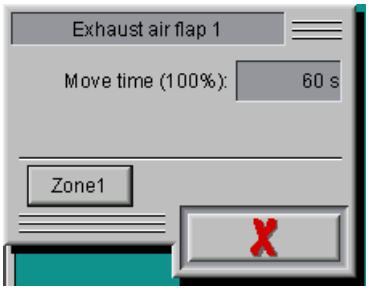


Figure 5-5: Digital exhaust air flap

	The digital exhaust air flap does not have to be calibrated as it only uses the positions "open" and "closed" and provides no feedback.

5.1.3 Setup

The smaller button next to "Operation" is used for further settings such as calibration, zone settings, running times, etc.

5.1.3.1 Commands for moving

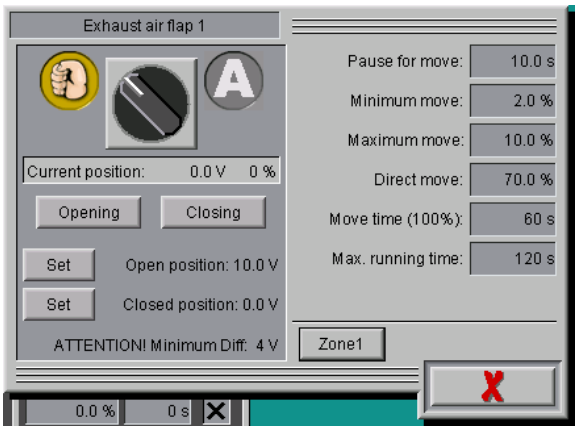


Figure 5-6: Analogue exhaust air flap with feedback

The displayed settings depend on the piloting of the flaps.

- **Pause for move**

  The time between two control commands is indicated here so that the damper does not switch as often. A common value would be 10 to 30 seconds but changes can still be carried out later on.

- **Minimum move**

  This value Indicates how big a set value change has to be in order for a command to be carried out. It is also used to calm the damper. Enter a value between 1 and 3 %.

- **Maximum move**

  If the computer has calculated a control command for the damper of e.g. 20 %, this change is carried out in two cycles, as the maximum move only allows a change of 10 % per cycle. After the first change of 10 %, a pause of 10 seconds takes place, followed by a second change of 10 %.

  These setting can be customised for each system.

- **Direct move**

  If the damper shall be opened from 10 % to 100 %, this process would take a longer time as only 10 % steps followed by a pause are possible.

  The parameter “direct move” has been integrated for this reason. It allows for a direct opening of the flap if the command value is higher than e.g. 70 % (value can be changed).

- **Move time (100 %)**

  To improve the visualisation of flaps without feedback, it is possible to set the duration a flap needs to change its position from 0 % to 100 %. With the aid of the setting "Move time (100 %)", a current value can be considered as position for analogue and digital flaps, even if they provide no feedback.

  The current position and the flap speed are used to position the exhaust air flaps in the pulse pause area.

- **Maximum running time (only flaps with feedback)**

  If AMACS sends a control signal and the target value is not met within the time pre-set under "maximum running time", an alarm is triggered. A value of 120 seconds is acceptable for normal servomotors.

- **Maximum tolerance (only analogue flaps with feedback)**

  For the analogue exhaust air flap with feedback, there is an additional setting, **Maximum tolerance**. These exhaust air flaps have an output and input signal which are both analysed during positioning. Using the settings for **Maximum running time** and **Maximum tolerance**, an alarm is triggered if the difference is too large.

5.1.3.2 Zone

Here, it is pre-set at initial operation which zone supplies the control values for the respective flap. For normal houses with one zone control, the number 1 must be entered for all flaps and **may in no event be changed during operation**.

If zone 2 is selected even if it is not available for the house, the button is marked red and thus indicates that the flap cannot be controlled and will be closed.
For houses with two zones, please carefully read the instructions in the corresponding chapters.

5.1.4 Influences

The influences affecting the set value for automatic operation are displayed here. These are the Influence Wind and Limit Min/Max.

The corrective influences are always relative and never absolutely affect the set value. The corrected set value consists of the sum of all corrections. If a value is corrected, this is indicated by white highlighting.

Figure 5-7: Influences

	If the uncorrected set value is higher than 90 %, all corrections are slowly taken back to set value 100 %, except for the limit min/max. This ensures that the whole position range of the flap can be used despite the corrections, especially for negative-pressure control.

- **Influence Wind**

  The current influence on each exhaust air flap is determined using the menu "Intake air Wind influences" (see chapter) and displayed here.
  The correction is deactivated in case of a failure of the weather station.

	A weather station must be available to use this function. The wind influence settings only show flaps for which weather-depending corrections have been configured.

- **Limit Min/Max**

  In addition to the determined set value, limit values restricting the opening of the exhaust air flaps can be entered here.

	The corrections do not exceeded or fall below the minimum and maximum limit.

5.1.5 Fixed set value

Depending on the configuration, there may be fixed values for natural ventilation, mechanical ventilation and tunnel ventilation. As usual, a value in % as well as a delay in seconds can be set for each fixed position. The field for activation displays the settings for a fixed set value in the corresponding mode. If no fixed set value is desired for a mode, the settings are hidden.
To show an active mode for which a fixed value has been set for a flap, the field is highlighted in white.

Figure 5-8: Fixed set value

5.1.6 Target value/current value

The last box shows the target and current value of the flap. These values may differ from the calculated set value. This depends on the flap and is caused by setting, e.g. a minimum move command.
If a flap is operated manually, the background for the target value switches from green to orange.

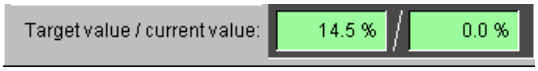


Figure 5-9: Target value/current value

5.2 Natural ventilation

Servomotors open the flaps, depending on the temperature and the sensor they are controlled by. This section explains all possible settings.

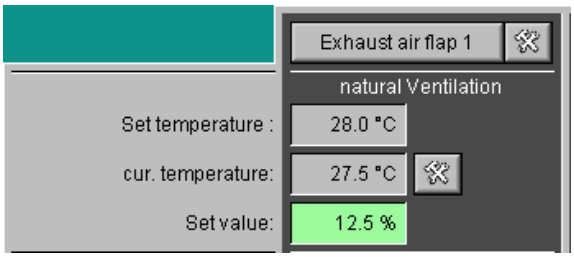


Figure 5-10: Natural ventilation

5.2.1 Set temperature

The set temperature of the respective intake air flap is copied from the assigned zone and displayed here.

5.2.2 Current temperature

The current temperature shows the control temperature calculated separately for each flap, supplied by the active sensors as a mean value. The settings for the temperature-controlled exhaust air can be selected next to the current temperature.

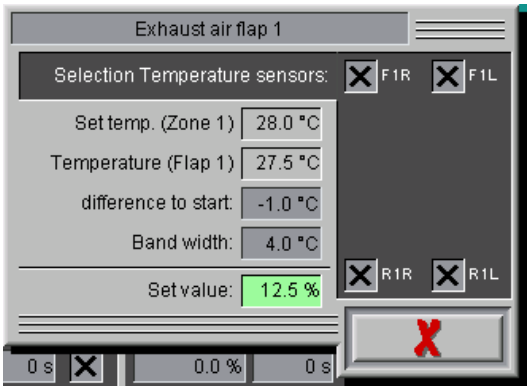


Figure 5-11: Temperature-controlled

For this function, each flap is assigned a temperature sensor. Their mean value is then displayed as **Temperature (Flap)**.The **Temperature (Flap)** is compared to the current temperature of the assigned **Set temperature (Zone)** and a set value is calculated based on the adjustable **Difference to start** and **Band width**.

	The set value is limited to a range of 0 to 100 %. If all temperature sensors assigned to this flap fail, the flap's set value is set at 50 %. A digital flap would open at a set value of 50 %.

5.2.3 Set value

The set value is calculated based on the set temperature and the settings under **Current temperature** and displayed here.

5.3 Mechanical ventilation

The following functions can be used to control the exhaust air not only via the temperature but also via the ventilation value.

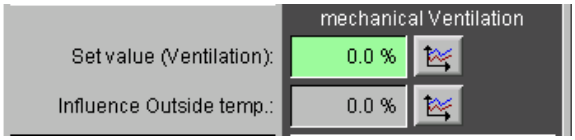


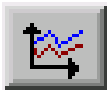
Figure 5-12: Mechanical ventilation

5.3.1 Set value (ventilation)

As the name of the menu explains, the exhaust air is ventilation-controlled in this case. A curve must be determined for how the flaps should open in relation with the ventilation. The flap would then open proportionally with the exhaust air values.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

5.3.2 Influence outside temperature



The set value can be influenced by an individual curve depending on the outside temperature. If no outside temperature sensor is available, the correction is hidden.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

5.4 Switch over to natural ventilation

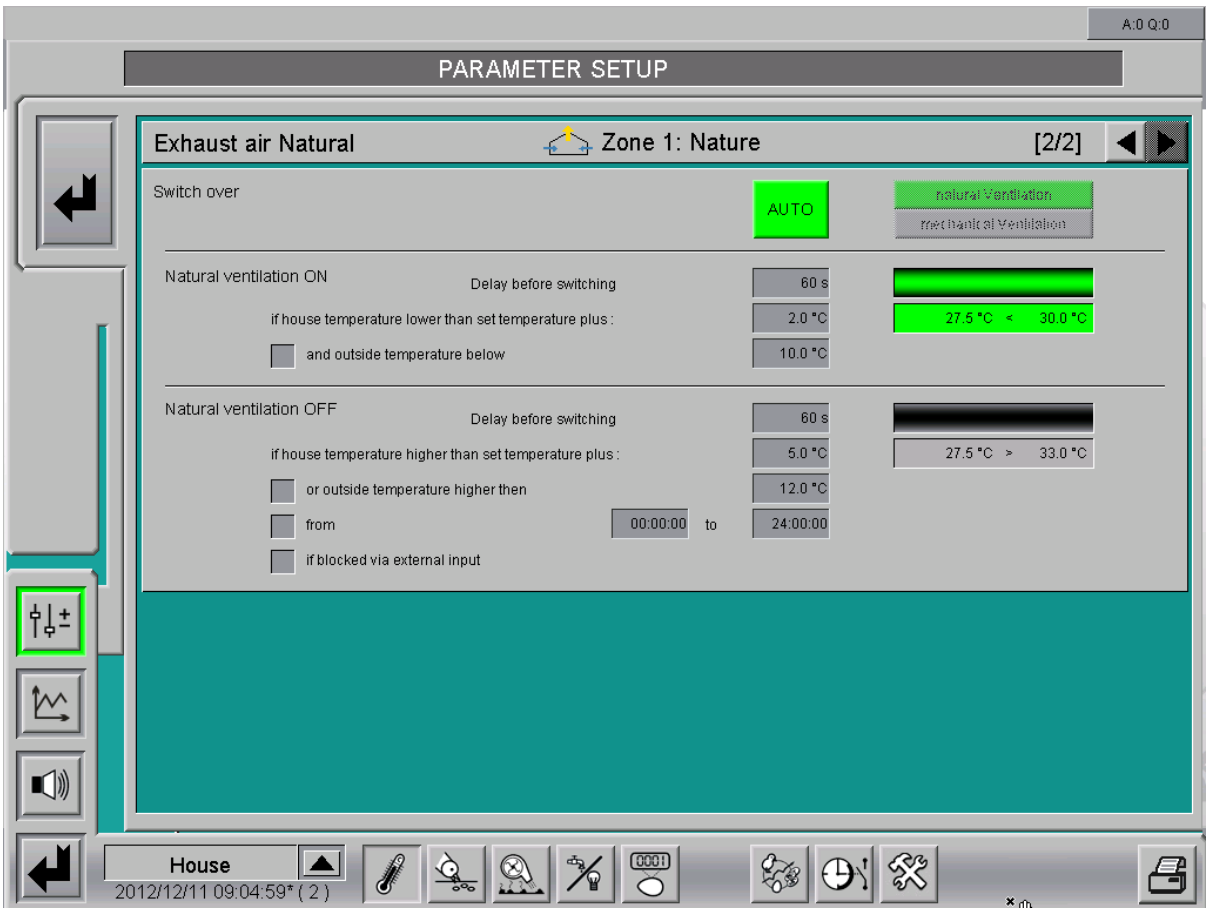


Figure 5-13: Switch over parameters Exhaust air Natural

	The parameter **Switch over to natural ventilation** can be found on the last page.

The **natural ventilation** can be switched to manual operation by clicking on the button **AUTO** in the upper part of the menu.

This function should only be used for testing purposes.

By default, the button must be **green** and display **Auto**.

5.4.1 Natural ventilation ON

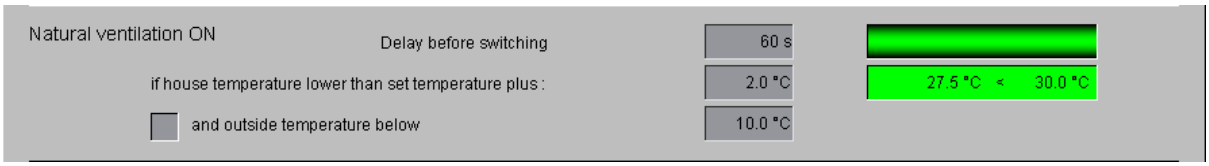


Figure 5-14: Natural ventilation ON

- **Delay before switching**

  The value that is entered here prevents that the system switches too fast to natural ventilation once all conditions described below are fulfilled. The green bar displays the current status of the running timer.

- **if house temperature lower than set temperature plus**

  The requirements for the start of natural ventilation are defined here. Set here that natural ventilation should turn on if the house temperature falls e.g. 2°C below the set temperature.

  The green status field below the bar displays the current temperature and the temperature at which natural ventilation turns on.

- **and outside temperature below**

  This field allows to turn on the natural ventilation depending on the outside temperature.
  Check the box for this.
  The prerequisite for the turning on of natural ventilation is that the outside temperature has fallen below the pre-set value (in the case of high temperatures, there is no thermal in the house).

5.4.2 Natural ventilation OFF

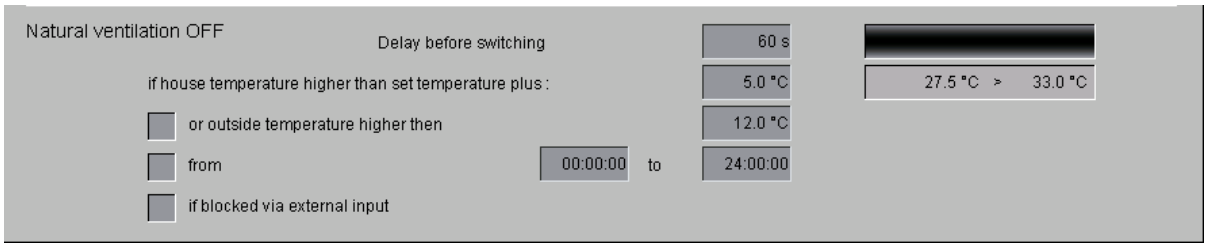


Figure 5-15: Natural ventilation OFF

- **Delay before switching**

  The value that is entered here prevents that the system switches natural ventilation off too fast once all conditions described below are fulfilled. The green bar displays the current status of the running timer.

- **if house temperature higher than set temperature plus**

  The requirements for the end of natural ventilation are defined here. Set here that the natural ventilation turns off if the temperature is higher than the set temperature plus e.g. 5°C.

  The green status field below the bar displays the current windchill and the temperature at which the natural ventilation turns off.

- **or outside temperature higher than**

  This field allows to turn off natural ventilation depending on the outside temperature.
  Check the box for this.
  The prerequisite for the turning off of natural ventilation is that the outside temperature has been exceeded by the pre-set value.

- **from - to**

  If specific times of the day make it necessary to turn off natural ventilation, a time for normal ventilation can be entered here.

- **if blocked via external input**

  If for example several houses stand next to each other, it may be necessary to prevent natural ventilation from turning on. Otherwise, already consumed air may be drawn in and interrupt a controlled fresh air supply.

6 Earny heat exchanger

Clicking on the button **Earny** opens a menu in which the settings for the heat exchangers can be carried out.

Figure 6-1: Earny

Earny can be operated and adjusted for exhaust air if you have the right for **Climate exhaust air**.

If two Earnys have been configured, the settings consist of two pages. The arrow keys in the upper right corner can be used to switch between the three screen pages.

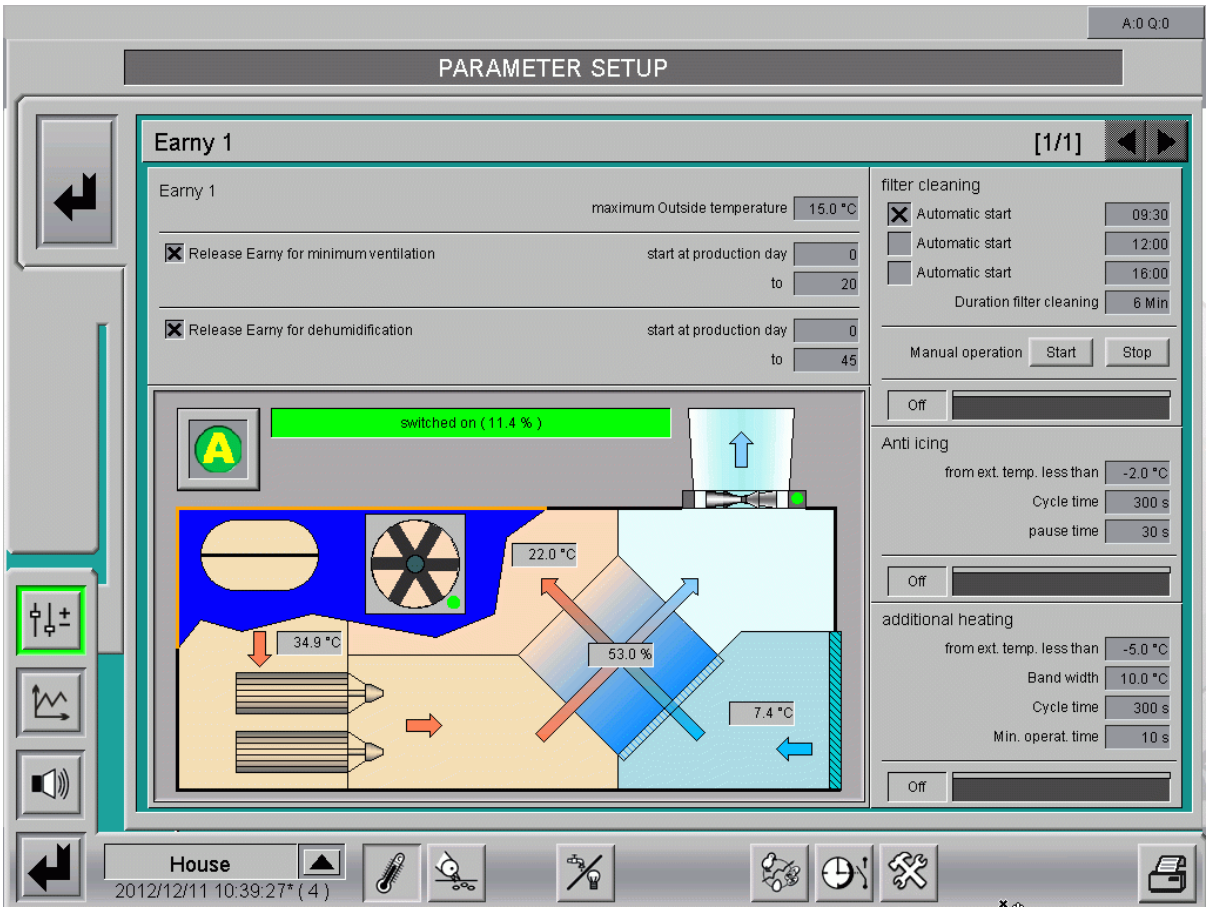


Figure 6-2: Settings for Earny

6.1 Principle of operation

For climate purposes, the Earny heat exchanger can be used for minimum ventilation and dehumidifying.

Minimum ventilation

The heat exchanger is automatically used for minimum ventilation when:

- the outside temperature is not too high;
- the function is activated in the settings (release, production day);
- the required ventilation calculated based on the temperature is smaller than minimum ventilation or the heating limits the ventilation to minimum ventilation.

If the heat exchanger's air performance is not sufficient for complete **minimum ventilation**, the heat exchanger only ventilates as much as it can. Normal ventilation is responsible for the remaining ventilation.

The ventilation value used by Earny is considered under **ventilation-controlled intake air flaps**. This means that the ventilation-controlled intake air elements are controlled based on the current ventilation value of 0.0 % if the heat exchanger completely takes over ventilation.

This also refers to the ventilation-controlled **secure mode** in the case of negative-pressure controlled intake air and thus to differentiated flap positions if the curves depending on the ventilation shall be considered for negative pressure operation.

Generally, the negative pressure will collapse if Earny is responsible for minimum ventilation as Earny uses a balanced pressure system (intake air and exhaust air fans are controlled synchronously).

The ventilation value used by Earny is considered for activation of the pulse pause control. This means that for turning on the pulse pause control of the intake air elements only the value which is not used by Earny is considered. If the heat exchanger completely takes over ventilation, the pulse pause operation does not become active and the intake air flaps remain closed. As a general rule, Earny does not function in pulse pause operation.

Dehumidification

The heat exchanger is automatically used for dehumidification when:

- the outside temperature is not too high;
- the function is activated in the settings (release, production day);
- a humidity sensor is available;
- increasing ventilation for dehumidifying is allowed (settings Exhaust air Set value, second page).

The heat exchanger increases ventilation for dehumidifying as far as his capacities allow. If the heat exchanger is already in use for minimum ventilation or its air performance is not sufficient, Earny only takes over as much as possible. Normal ventilation ensures the remaining ventilation requirements.

6.2 Status Earny

A cross section of the heat exchanger is displayed in the settings for a well-arranged view of its status.

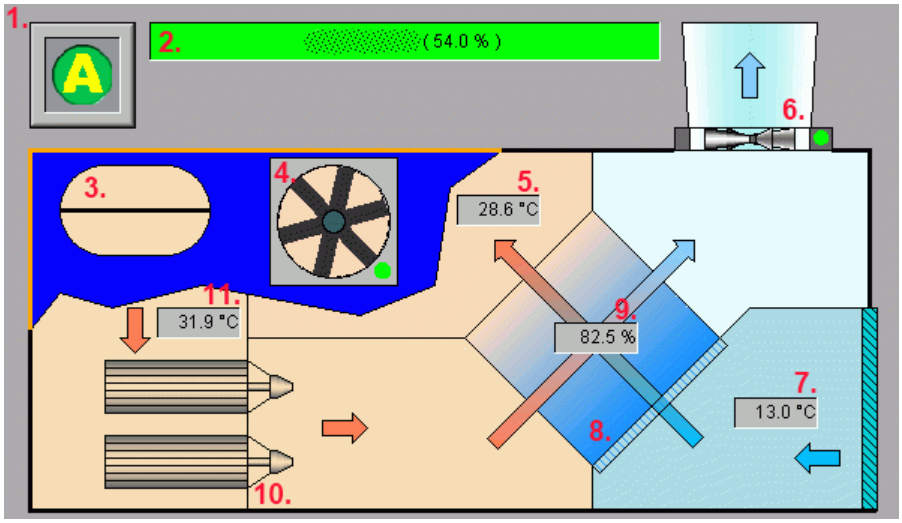


Figure 6-3: Visualisation status Earny

1. **Manual operation heat exchanger**

   Clicking on this button opens a menu for manual operation. The heat exchanger can be controlled manually with this menu. The intake and exhaust air fan is controlled according to the set ratio curve, which can be found in the settings **Exhaust air Ventilation**.

2. **Status bar**

   The current status is displayed in text in the status bar (deactivated, released, switched on, filter cleaning).

3. **Exhaust air flap**

   The exhaust air flap opens and closes with the exhaust air fan (even during manual operation). The current status is displayed by means of an open or closed flap.

4. **Air intake fan**

   Clicking on the air intake fan opens a menu for manual operation of the fan. A small green/orange point at the fan shows whether it is currently operated manually or automatically.

5. **Intake air temperature**

   The intake air temperature is determined by a separate sensor.

6. **Exhaust air fan**

   Clicking on the exhaust air fan opens a menu for manual operation of the fan. A small green/orange point at the fan shows whether it is currently operated manually or automatically.

7. **Outside temperature**

   Earny relies on the house's outside temperature. The heat exchanger is not equipped with its own outside temperature sensor.

8. **Additional heating**

   Additional heating is optional. If it is switched on, this is displayed by the element turning red.

9. **Efficiency**

   Thermal efficiency is calculated as long as the heat exchanger is used. It is based on the ratio of the intake air temperature, minus the outside temperature, to the temperature of the drawn-in house air, minus the outside temperature.

10. **Filters**

    The filters are shown in yellow while they are being cleaned.

11. **House temperature**

    The currently calculated zone temperature to which Earny is assigned is displayed as house temperature.

6.3 Switch-on parameters

Figure 6-4: Switch-on parameters

	The heat exchanger is completely deactivated if neither a release for minimum ventilation nor for dehumidification are activated. In this case, the filters are not cleaned and anti icing does not function either. Neither is the additional heating.

- **Maximum Outside temperature**

  If the outside temperature is too high, the heat exchanger is automatically deactivated due to this setting. It prevents an uneconomic operation of the heat exchanger. Earny is deactivated for minimum ventilation and dehumidification. The default setting is 15°C.

	A fixed hysteresis of +/- 0.5°C is set to ensure that Earny does not switch on and off repeatedly when reaching the threshold.

- **Release Earny for minimum ventilation**

  The use of the heat exchanger for minimum ventilation can be activated and deactivated by using the checkbox. Moreover, the function can be made dependent on production (from - to).

- **Release Earny for dehumidification**

  The use of the heat exchanger for dehumidification can be activated and deactivated by using the checkbox. Moreover, the function can be made dependent on production (from - to).

	If no humidity sensor is installed, these settings are hidden.

6.4 Filter cleaning

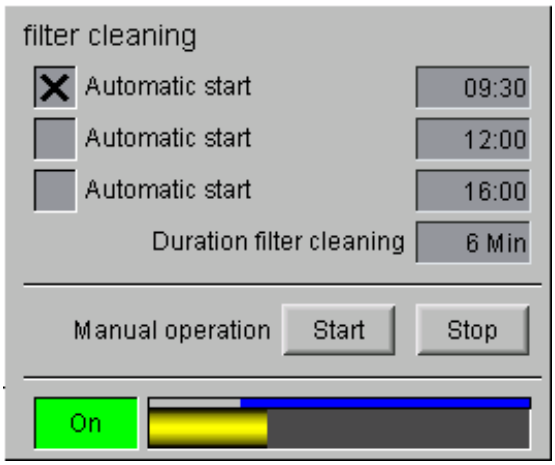


Figure 6-5: Filter cleaning Earny

- **Automatic start filter cleaning**

  The filters should be cleaned daily and can start automatically if the respective checkbox is activated and the desired times are entered (the default settings are 9:30, 12:00 and 16:00).

- **Duration filter cleaning**

  The duration of the filter cleaning is indicated in minutes (default: 6 min.).

	A time of two minutes is added to this duration, which is required for switching the fans off, for running-off time and to close the exhaust air flaps. This additional time is fixed in the program.

- **Manual operation filter cleaning**

  The filter cleaning can also be started manually by pressing the button "Start" at any time. This process can be stopped with the button "Stop". In this case, it is not significant whether the cleaning was started manually or automatically. A security query is included in these functions to prevent accidental activation.

- **Status bar filter cleaning**

  A status bar and an additional status field are available to display the current status of the filter cleaning. During cleaning of the filters, the yellow bar indicates the total operating time. The total operating time consists of the sum of the time for switching the fans off (2 min.) and the duration entered for filter cleaning. The time period for switching the ventilation off is displayed by the grey area above the bar. The time period during which the filters are cleaned is indicated by the blue area above the bar. The additional status filed turns green and the text changes to **On** if this output is used for filter cleaning.

- **Process of filter cleaning**

  - stopping of fans and closing of flaps (2 min. fixed in program)
  - setting of output filter cleaning for set duration (default 6 min.)
  - switching on of fans and opening of exhaust air flap

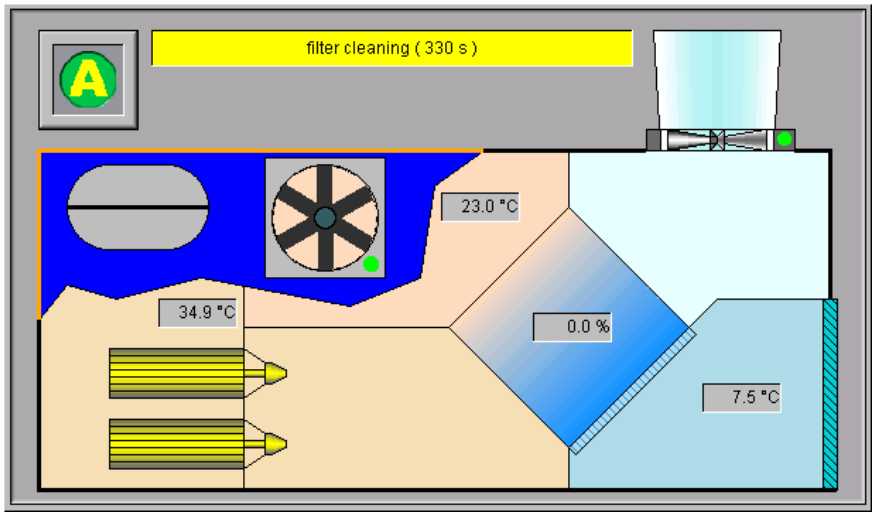


Figure 6-6: Visualisation filter cleaning

During the filter cleaning, normal exhaust air does not take over the current ventilation value of the heat exchanger.

The filters are cleaned automatically even if the heat exchanger is not active due to outside temperature, ventilation level or humidity when the cleaning starts.

However, the filters are not cleaned automatically if the release of Earny for minimum ventilation and dehumidification has been deactivated via the respective checkboxes or the production tier areas. In addition, the automatic filter cleaning function is turned off if production is not active.

The automatic filter cleaning can be started manually at any time.

6.5 Anti icing

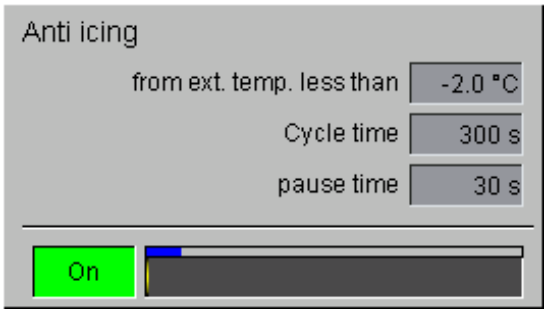


Figure 6-7: Anti-icing function Earny

To prevent freezing of the heat exchanger, the air intake fan is switched off cyclically as the outside temperature falls below a certain value. The warm exhaust air of the exchanger element can warm up during this time.

	A started cycle is always completed, even if the outside temperature exceeds the threshold within this time. Changes to the cycle and pause time are not included before the next cycle.

- **Anti icing from external temperature less than**

  The anti-icing function starts when the temperature falls below the threshold by 0.5°C for more than 10 seconds. The function ends when the current cycle is completed and the external temperature exceeds the threshold by 0.5°C.
  If the anti-icing function is not desired, the value can be set lower accordingly (default: 0°C).

	A fixed hysteresis of +/- 0.5°C is included in the threshold of the external temperature for active anti icing.

- **Cycle time anti icing**

  The cycle time of the anti-icing function can be set from 10 seconds to 10,000 seconds (default: 300 seconds).

- **Pause time anti icing**

  If the anti-icing function is active, the air intake fan is stopped for the set pause time at the beginning of the cycle. The pause time can be set from 1 second to 10,000 seconds (default: 30 seconds).

Caution!

If the set pause time is greater than or identical with the cycle time, the intake air fan is switched off permanently during anti icing.

- **Status bar anti icing**

  A status bar and an additional status field are available to display the current status of the anti-icing function. During anti-icing, the yellow bar indicates the current cycle. The total operating time corresponds with the set cycle time. The time period for switching the air intake fan off is displayed by the blue area above the bar.
  The additional status field turns green and the text changes to **On**, also if the air intake fan for anti icing is switched off.

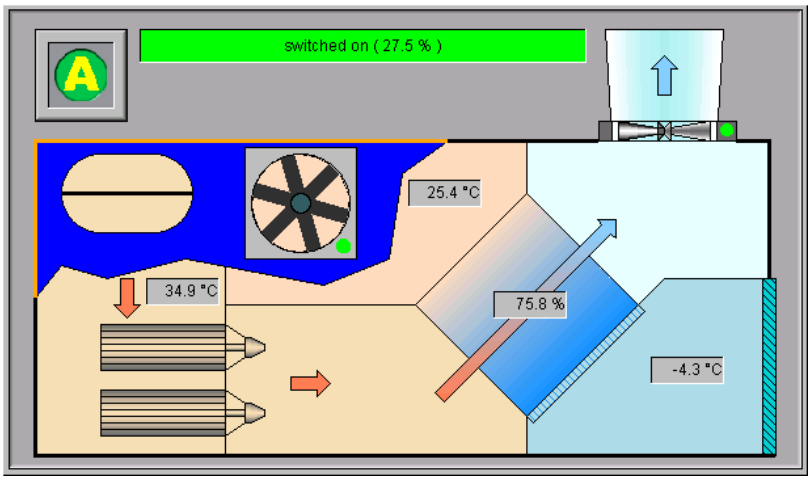


Figure 6-8: Visualisation anti-icing function

6.6 Additional heating

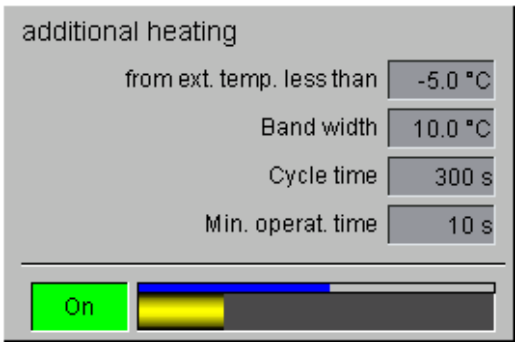


Figure 6-9: Additional heating Earny

The additional heating can be used in colder regions to prevent damage at the heat exchanger due to frost and to guarantee proper functioning. The additional heating is mounted at the side of the exchanger element where the air from the outside is drawn in by the air intake fan.

	A started cycle is always completed, even if the outside temperature exceeds the threshold within this time. Changes to the cycle time, the band width and the minimum operating time are not included before the next cycle. The additional heating only starts if the heat exchanger is active and an automatic set value has been determined for the air intake fan. If no additional heating has been configured, these settings are hidden.

- **Additional heating from external temperature less than**

  The additional heating starts when the temperature falls below the threshold by 0.5°C for more than 10 seconds. The function ends when the current cycle is completed and the external temperature exceeds the threshold by 0.5°C.
  If the anti-icing function is not desired, the value can be set lower accordingly (default -10 °C).

	A fixed hysteresis of +/- 0.5°C is included in the threshold of the external temperature for active anti icing.

- **Cycle time additional heating**

  The cycle time of the anti-icing function can be set from 10 seconds to 10,000 seconds (default: 300 seconds).

- **Band width additional heating**

  If the additional heating is active, the relay output is switched on for the beginning of the cycle. The switch-on time is pulse-width modulated, i.e. the switch-on time is longer the more the temperature falls below the threshold. If the outside temperature falls below the threshold by more than the band width, the additional heating is permanently active. The band width can be set from 1°C to 100°C (default: 10°C).

- **Minimum operating time additional heating**

  The minimum operating time for the control of the additional heating can be set from 1 second to 10,000 seconds (default: 10 seconds).

	**Caution!** If the set minimum operating time is greater than or identical with the cycle time, the additional heating is switched on permanently if the outside temperature falls below the threshold.

- **Status bar additional heating**

  A status bar and an additional status field are available to display the current status of the additional heating. During additional heating, the yellow bar indicates the current cycle. The total operating time corresponds with the set cycle time. The time period for switching the additional heating on is displayed by the blue area above the bar. The additional status field turns green and the text changes to **On** if the additional heating is switched on.

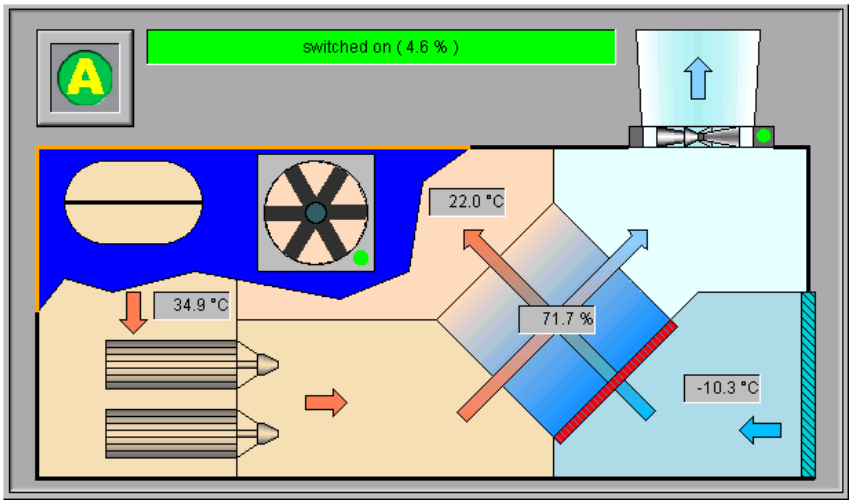


Figure 6-10: Visualisation additional heating

7 Intake air

Clicking on the button **Intake air** opens a menu in which the settings for the different intake air systems can be carried out.

Figure 7-1: Ventilation-controlled intake air

	Before initial operation of the system, the service technician enters how many intake air servomotors are available and how they are controlled. This is determined by the project planning of the ventilation, as it has already been decided during planning which motors are used for the roof and side intake air and which are used for additional openings common for e.g. tunnel ventilation. These servomotors are then controlled and switched on depending on the level of ventilation and the zone they belong to. The possibilities and settings are explained in the following.

The settings possible for **intake air** can be found on several screen pages:

1. The first pages are for the entering of set values and display current influences.
2. The last page allows the setting of special control parameters for the intake air systems.

	Caution! The ratio curves in this menu should not only be changed if absolutely necessary as this can negatively affect the house climate.

7.1 General settings

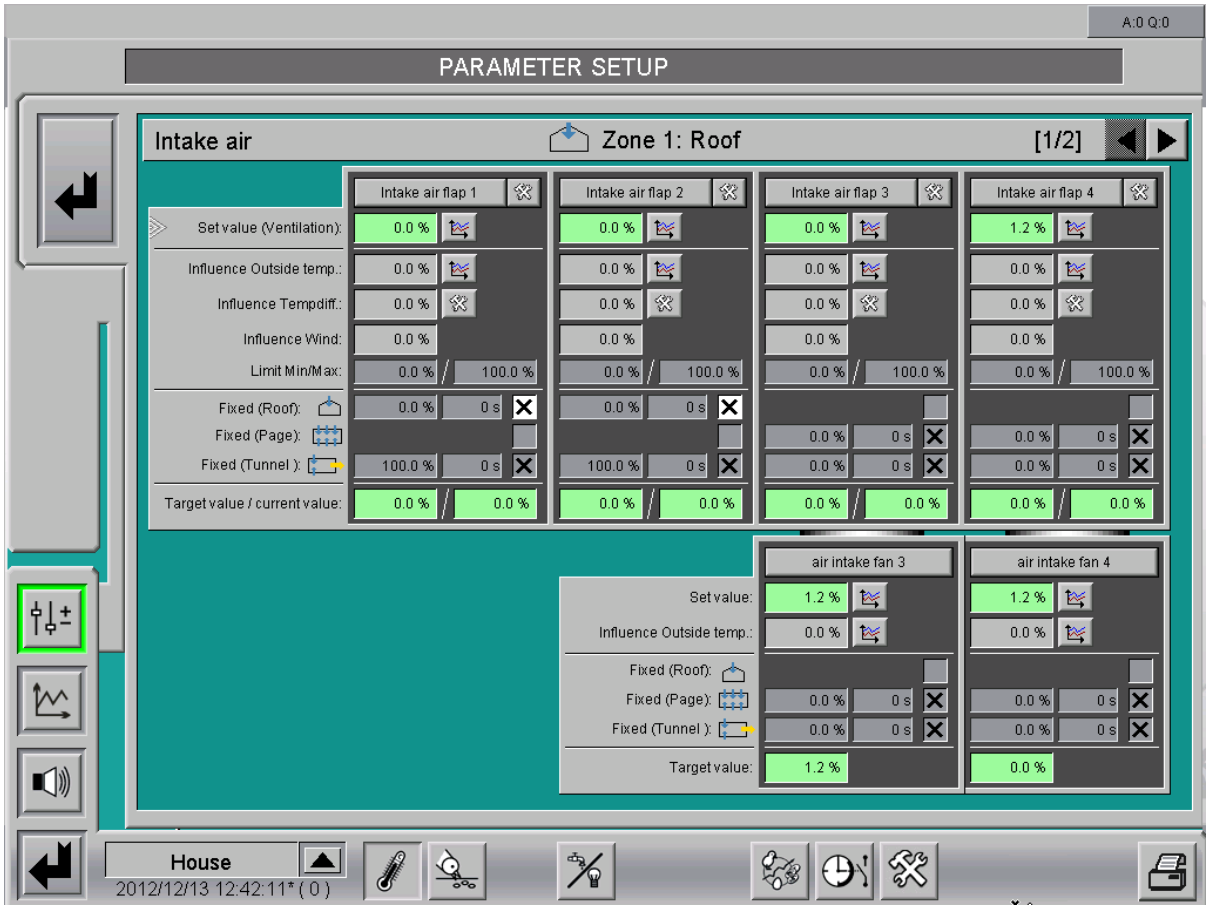


Figure 7-2: Settings ventilation-controlled intake air

7.1.1 Operation

The head row of each intake air element includes a button for manual operation. Clicking on one of the drives opens a control panel. Depending on the type of the exhaust air element, either a switch or a slider control are displayed. The drive can be turned on or off or the operation can be switched from manual to automatic using this element. A drive switched to **manual** operation is highlighted in orange.

For information on how to operate the drives, please refer to chapter

Caution!

Maintenance or service works at drive units or fans may only be carried out if the protective switch is in the OFF position. The drive units can be activated without warning, e.g. by the time switches. Observe local security signs and instructions.

7.1.2 Calibrating

The smaller button next to "Operation" is used for further settings such as calibration, zone settings, running times, etc.

Calibrating means that the system determines the maximum open and closed flap positions. The positions are returned to the system via a feedback signal or a set value of the flaps and saved permanently after calibration.
The calibration process is nearly identical for all cases.

!	**Important: Minimum electrical spacing 4V** **The difference between the two positions "closed" and "open" should also be at least 4V here for the analogue-controlled motors to ensure reasonable calibration. However, a minimum setting of 2V is also possible if necessary.**

!	**Caution** **Before starting the calibration of the computer, the valves and servomotor have to be completely opened / closed manually one time under supervision. If adjustable, the limit stops of the servomotor have to limit the max. and min. positions, otherwise, traction cables might break and moving parts might be damaged. Observe local safety signs and instructions in the servomotor or air inlet manuals.**

7.1.2.1 Relay-controlled intake air flaps

Figure 7-3: Relay-controlled intake air flaps

- **Activating calibration**

  To calibrate the flaps, the switch must be moved to the depicted hand above it.

- **Calibrating position „open“**

  The flap is opened by clicking the button **Opening**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save this position by clicking on the button **Set Open position: X V**.

- **Calibrating position „closed“**

  The flap is closed by clicking the button **Closing**. Keep the button pressed until no more changes can be registered in the field **Current position**. Save this position by clicking on the button **Set Closed position at X V**.

7.1.2.2 Analogue intake air flaps without feedback

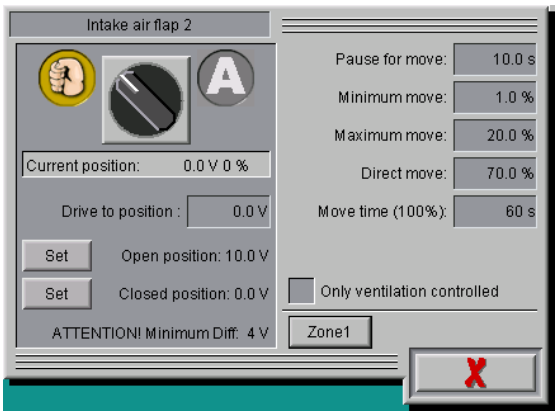


Figure 7-4: Analogue intake air flaps without feedback

- **Activating calibration**

  To calibrate the flaps, the switch must be moved to the depicted hand above it.

- **Calibrating position „open“**

  To open the flap, the desired position is entered into the field **Drive to position** (usually 10.0 V). The flap moves until this value is reached and is displayed in the field **Current position**. Save this position by clicking on the button **Set Open position: X V**.

- **Calibrating position „closed“**

  To close the flap, the desired position is entered into the field **Drive to position** (usually 0.0 V). The flap moves until this value is reached and is displayed in the field **Current position**. Save this position by clicking on the button **Set Closed position at X V**.

7.1.2.3 Analogue intake air flaps with feedback

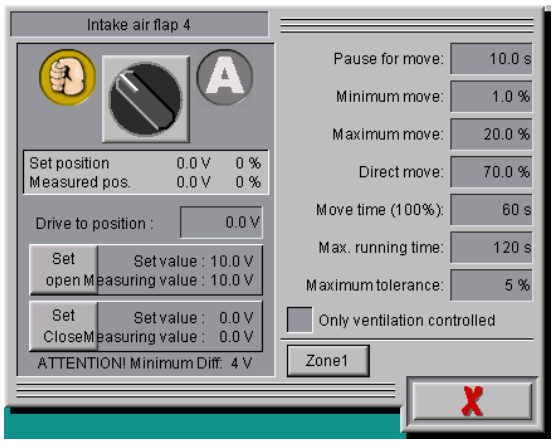


Figure 7-5: Analogue intake air flaps with feedback

- **Activating calibration**

  To calibrate the flaps, the switch must be moved to the depicted hand above it.

- **Calibrating position „open“**

  To open the flap, the desired position is entered into the field **Drive to position** (usually 10.0 V). The flap moves until the value has been reached or the field **Measured position** does no longer display any changes. Save this position by clicking on the button **Set Open position: X V**.

- **Calibrating position „closed“**

  To close the flap, the desired position is entered into the field **Drive to position** (usually 0.0 V). The flap moves until the value has been reached or the field **Measured position** does no longer display any changes. Save this position by clicking on the button **Set Closed position at X V**.

7.1.2.4 Digital intake air flaps

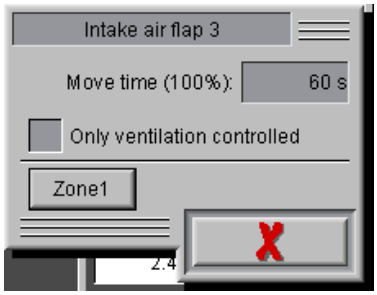


Figure 7-6: Digital intake air flaps

	The digital exhaust air flap does not have to be calibrated as it only uses the positions "open" and "closed" and provides no feedback.

7.1.3 Setup

The smaller button next to "Operation" is used for further settings such as calibration, zone settings, running times, etc.

7.1.3.1 Commands for moving

Figure 7-7: Analogue intake air flap with feedback

	The displayed settings depend on the piloting of the flaps.

- **Pause for move**

  The time between two control commands is indicated here so that the damper does not switch as often. A common value would be 10 to 30 seconds but changes can still be carried out later on.

- **Minimum move**

  This value Indicates how big a set value change has to be in order for a command to be carried out. It is also used to calm the damper. Enter a value between 1 and 3 %.

- **Maximum move**

  If the computer has calculated a control command for the damper of e.g. 20 %, this change is carried out in two cycles, as the maximum move only allows a change of 10 % per cycle. After the first change of 10 %, a pause of 10 seconds takes place, followed by a second change of 10 %.

  These setting can be customised for each system.

- **Direct move**

  If the damper shall be opened from 10 % to 100 %, this process would take a longer time as only 10 % steps followed by a pause are possible.

  The parameter “direct move” has been integrated for this reason. It allows for a direct opening of the flap if the command value is higher than e.g. 70 % (value can be changed).

- **Move time (100 %)**

  To improve the visualisation of flaps without feedback, it is possible to set the duration a flap needs to change its position from 0 % to 100 %. With the aid of the setting "Move time (100 %)", a current value can be considered as position for analogue and digital flaps, even if they provide no feedback.

  The current position and the flap speed are used to position the exhaust air flaps in the pulse pause area.

- **Maximum running time (only flaps with feedback)**

  If AMACS sends a control signal and the target value is not met within the time pre-set under "maximum running time", an alarm is triggered. A value of 120 seconds is acceptable for normal servomotors.

- **Maximum tolerance (only analogue flaps with feedback)**

  For the analogue exhaust air flap with feedback, there is an additional setting, **Maximum tolerance**. These exhaust air flaps have an output and input signal which are both analysed during positioning. Using the settings for **Maximum running time** and **Maximum tolerance**, an alarm is triggered if the difference is too large.

7.1.3.2 Only ventilation-controlled (intake air negative-pressure controlled)

It is necessary to have servomotors controlled by the current ventilation value while other flaps are controlled by negative pressure, especially after exhaust air towers have been installed.
For negative-pressure controlled intake air, this setting can be selected for individual servomotors so that the servomotor is **exclusively ventilation-controlled**.

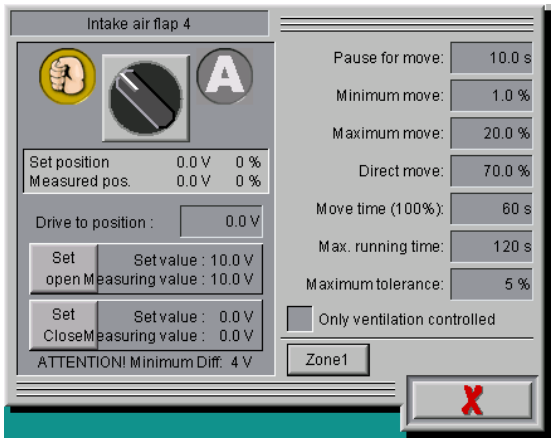


Figure 7-8: Analogue intake air flaps with feedback

7.1.3.3 Zone

Here, it is pre-set at initial operation which zone supplies the control values for the respective flap. For normal houses with one zone control, the number 1 must be entered for all flaps and **may in no event be changed during operation**.

If zone 2 is selected even if it is not available for the house, the button is marked red and thus indicates that the flap cannot be controlled and will be closed.
For houses with two zones, please carefully read the instructions in the corresponding chapters.

7.1.4 Ventilation value

You can select whether the ventilation-dependent curves should be displayed in % or m³/h on the left-hand side. Clicking into the shaded corner opens a menu selection via which this function can be chosen.

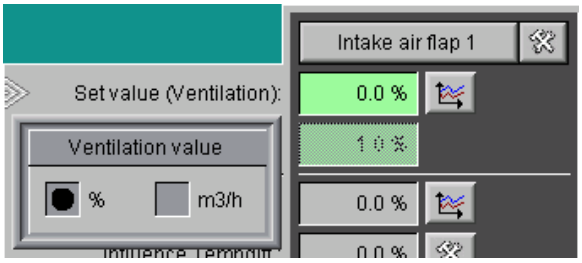


Figure 7-9: Ventilation value

	The selection is only possible if the intake air is regulated by **ventilation steps** or **negative pressure**. For **temperature-controlled** or **natural intake and exhaust air**, this selection is hidden.

7.1.5 Set value

The set value for automatic operation is determined depending on the principle of intake air control and is described in the chapters 7.2 ”Ventilation-controlled”, 7.3 ”Negative-pressure controlled” and 7.4 ”Temperature-controlled” .

If more than one ventilation concepts have been implemented in the house, these can be entered in the same curve display. Up to three curves are available for this, the set value for side ventilation, set value (tunnel) for tunnel ventilation and the set value (roof) for roof air intake. For information on how to switch between the ventilation modes, please refer to chapter and 7.2.2 ”Roof air intake” .

7.1.6 Influences

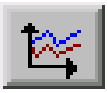
The influences affecting the set value for automatic operation are displayed here. These are the Influence outside temperature, temperature difference, wind and limit min/max.

The corrective influences are always relative and never absolutely affect the set value. The corrected set value consists of the sum of all corrections. If a value is corrected, this is indicated by white highlighting.

Figure 7-10: Influences

	If the uncorrected set value is higher than 90 %, all corrections are slowly taken back to set value 100 %, except for the limit min/max. This ensures that the whole position range of the flap can be used despite the corrections, especially for negative-pressure control.

- **Influence outside temperature**



The set value can be influenced by an individual curve depending on the outside temperature. If no outside temperature sensor is available, the correction is hidden.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Influence temperature difference**

A **temperature-dependent correction** can be set to even out temperature differences in the house.

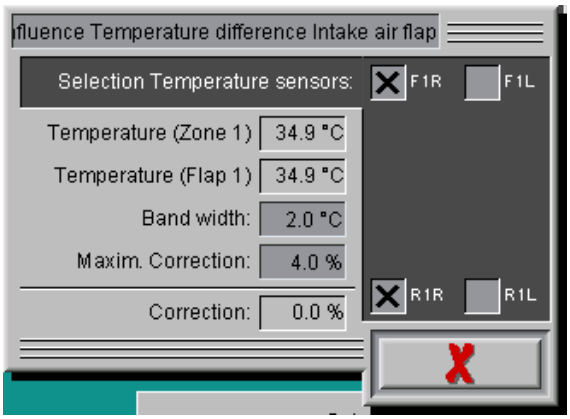


Figure 7-11: Influence temperature

For this function, each flap is assigned a temperature sensor. Their mean value is then displayed as **Temperature (Flap)**. The **Temperature (Flap)** is compared to the current temperature of the assigned **Temperature (Zone)** and the **Correction** is calculated based on the adjustable **Band width** and **Maximum Correction**.

The **correction** cannot be greater than the **Maximum Correction**. If this function is not to be used, the value for **Maximum Correction** can be set to 0 %. In the case of a failure of all temperature sensors assigned to this flap, the **correction** is deactivated.

	The selection is only possible if the intake air is regulated by ventilation steps or negative pressure. For temperature-controlled or natural intake and exhaust air, this selection is hidden. The selection is possible per servomotor so that the settings are only available for flaps for which this function is desired.

- **Influence Wind**

  The current influence on each exhaust air flap is determined using the menu "Intake air Wind influences" (see chapter) and displayed here.
  The correction is deactivated in case of a failure of the weather station.

	A weather station must be available to use this function. The wind influence settings only show flaps for which weather-depending corrections have been configured.

- **Limit Min/Max**

  In addition to the calculated set value, limit values which restrict the opening of the intake air flaps can be set here.

	The corrections do not exceeded or fall below the minimum and maximum limit.

7.1.7 Fixed set value

Depending on the configuration, fixed values for **roof intake air**, **side intake air**, **tunnel**, **natural ventilation** and **mechanical ventilation** are possible. As usual, a value in % as well as a delay in seconds can be set for each fixed position. The field for activation displays the settings for a fixed set value in the corresponding mode. If no fixed set value is desired for a mode, the settings are hidden.
To show an active mode for which a fixed value has been set for a flap, the field is highlighted in white.

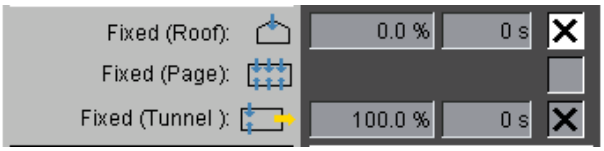


Figure 7-12: Fixed set value

	If only one mode is available in the house, no entries can be made for fixed values and the menu is displayed accordingly.

7.1.8 Target value/current value

The last box shows the target and current value of the flap. These values may differ from the calculated set value. This depends on the flap and is caused by setting, e.g. a minimum move command.
If a flap is operated manually, the background for the target value switches from green to orange.

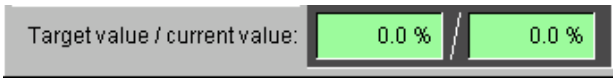
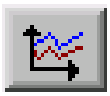


Figure 7-13: Target value/current value

7.2 Ventilation-controlled

Figure 7-14: Ventilation-controlled intake air

7.2.1 Set value



As the name of the menu explains, the exhaust air is ventilation-controlled in this case. A curve must be determined for how the flaps should open in relation with the ventilation.

The flap would then open proportionally with the exhaust air values. If the house is equipped with flaps with the same function, they have to have the same settings in reference to the ratio curve, as otherwise the house climate is not going to be uniform.

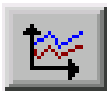
The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

7.2.2 Roof air intake

"Roof intake air" means air intake chimneys which guide the fresh air into the house via the roof by means of a damper and a fan.Please find further information on the settings for the air intake fans in chapter 7.5 ”Air intake fan” . The roof air intake is a good alternative, especially if:

- the intake air cannot be drawn in via the side walls or intermediate ceilings due to structural conditions (monoblock) or at the customer's request;
- the house is very wide and has a very low ceiling as well, meaning that an air jet via wall air inlets is not possible for the whole room;
- a balanced or negative pressure system is to be used due to e.g. leakage of the building.

7.2.2.1 Set value



The set value for the roof air intake is determined by the same curve display as for the side air intake.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

7.2.2.2 Switch-over parameters

	The switch-over parameters for roof and side air intake can be found on the last screen page.

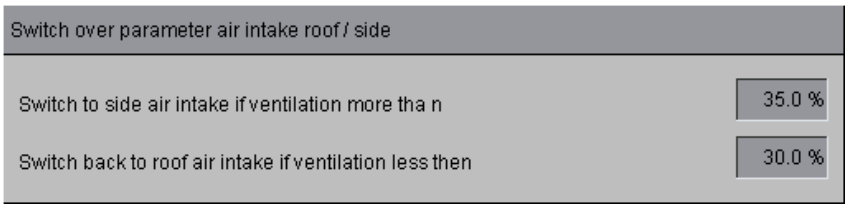


Figure 7-15: Switch-over parameters air intake roof/side

- **Switch to side air intake if ventilation more than**

  The program switches from **roof air intake** to **side air intake** starting with a ventilation value of 35 % if the ventilation rises to 40 %.

- **Switch back to roof air intake if ventilation less than**

  If the ventilation value falls from 40 % to less than 30 %, the intake air control switches back to **roof air intake**.

7.3 Negative-pressure controlled

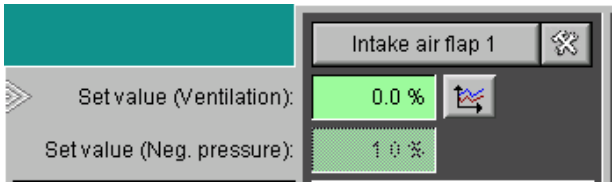


Figure 7-16: Intake air negative pressure

7.3.1 Set value

Both values are displayed as set values. The first set value is the value resulting from the ventilation level (see chapter 7.2 ”Ventilation-controlled”) and the second value is determined by the negative pressure control. The switch over between these values is carried out via parameters of the negative pressure control. The currently inactive value is shaded in grey. The corrections are considered for both cases.

7.3.2 Parameters negative pressure control

	The parameters for negative pressure control can be found on the last screen page.

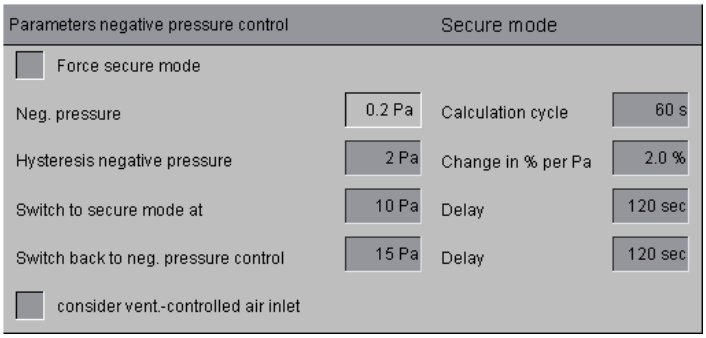


Figure 7-17: Parameters negative pressure control

- **Force secure mode**

  In the secure mode, the intake air elements are not controlled by negative pressure but by the ventilation level.
  Check this box if the intake air is to be controlled based only on ventilation, similar to a switch to secure mode.This may be necessary e.g. if the negative pressure sensor is defective.

- **Negative pressure**

  The value **negative pressure** is measured and displayed. This display always shows the current negative pressure which is then registered as measured value in the negative pressure curve.

- **Calculation cycle**

  The period of time during which a new value for negative pressure has to be calculated can be set here.
  This option is used to obtain a calm control so that short-term pressure fluctuations as caused by wind or opening of doors do not influence the calculation. Good results have been achieved with a value of 60 to 120 seconds.
  However, it is indispensable to check and set the control on-site during operation. If the control is not calm despite the mentioned values, the calculation cycle can be increased to up to 180 seconds.

- **Hysteresis negative pressure**

  In addition to the calculation cycle, a hysteresis can be set. As so-called deadband, this ensures that the negative pressure remains within the tolerance value of e.g. +/- 2 Pa if no changes to the intake air flap position are carried out. Servomotors may be used very often due to too low values, causing an unsettled control.

- **Change in % per Pa**

  Where the flap position has to be adjusted, the difference between target and current position is calculated and multiplied by the value entered here. The result is added to the current flap position.

- **Switch to secure mode at**

  Active negative pressure control can only operate effectively if the house is airtight, thus creating a stable negative pressure. In case of disturbances during negative pressure measurement (doors open or defective sensors), the intake air flaps would close.
  To prevent any risk to the birds' life, the computer switches to secure mode in the case of a longer period of low negative pressure of e.g. 10 Pa. This means that the intake air flaps are controlled in accordance with the values set in chapter 7.2 ”Ventilation-controlled” .

- **Activating delay for secure mode**

  The system only switches to secure mode after the delay time entered here has elapsed. This means that the negative pressure has to remain under 10 Pa for at least 120 seconds before the computer switches to secure mode.

- **Switch back to negative pressure control**

  If the computer has switched to secure mode, the active negative pressure control will only be activated again if the pressure is back at e.g. at least 15 Pa.

- **Deactivating delay for secure mode**

  As described above, the computer switches back to active negative pressure control as soon as the negative pressure is back to normal values. This is only the case if stable negative pressure values have been measured for a longer time. In our example, the negative pressure has to be greater than 15 Pa for at least 120 seconds before the computer switches back to active control.

Caution!

Make sure that the flap limitation or a lack of negative pressure do not inhibit the fresh air supply of the animals. Also keep in mind that harmful gases may accumulate if the empty house is not ventilated sufficiently. Under unfavourable conditions, high concentrations may have negative consequences.

7.3.3 Differentiated flap positions during negative pressure control

The set value for negative pressure can be found on the last screen page.

The negative pressure control of the intake air flaps optionally includes the curve settings of the flaps for ventilation-controlled flap control.Check the box **consider ventilation-controlled air inlet** to activate this option under the settings for negative pressure control. It is not activated by default.

Depending on the current mode (roof, side, tunnel), the respective curve settings for the current ventilation level are compared and considered for the calculation of the set value in negative-pressure controlled operation per flap.

Only those flaps which do not currently have a fixed set value in the active mode are included for the calculation of the ratio based on the curve settings.
Intake air flaps which have been set exclusively to ventilation-controlled are not considered. If a set value of 0.0 % was set for the current ventilation level in one curve setting, this remains closed.

7.3.4 Target value negative pressure

	The set value for negative pressure can be found on the last screen page.

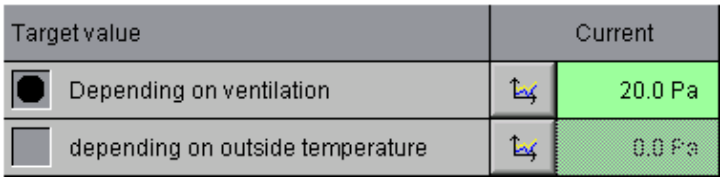
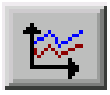


Figure 7-18: Target value negative pressure



As the air intake flaps are controlled by negative pressure, the negative pressure has to be entered in a curve either based on the outside temperature or on the respective ventilation level. The value not used is highlighted in grey under **Current**.

If the option **Depending on ventilation** has been selected, the negative pressure is based on the ventilation value. If the option **Depending on outside temperature** has been selected, the negative pressure is based on the outside temperature.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

If a negative pressure different from the normal ventilation mode is to be used in tunnel mode, separate curves can be entered under **Own set values for tunnel**.
The value not used is highlighted in grey under **Current**. The active mode (side or tunnel) is highlighted in green.
The corresponding curves are entered similarly to the negative pressure in side mode and can be based on the ventilation value or the outside temperature.

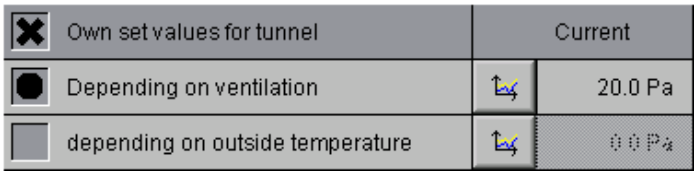


Figure 7-19: Set value negative pressure in tunnel mode

7.4 Temperature-controlled

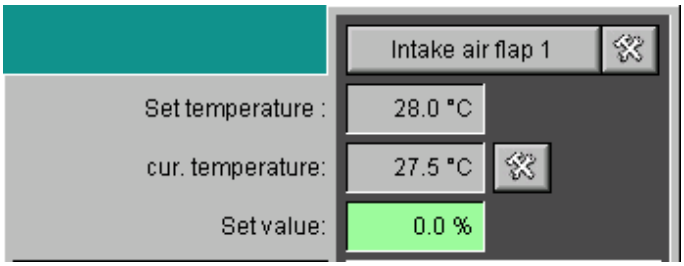


Figure 7-20: Temperature-controlled intake air

7.4.1 Set temperature

The set temperature of the respective intake air flap is copied from the assigned zone and displayed here.

7.4.2 Current temperature

The current temperature shows the control temperature calculated separately for each flap, supplied by the active sensors as a mean value. The settings for the temperature-controlled intake air can be found next to the current temperature.

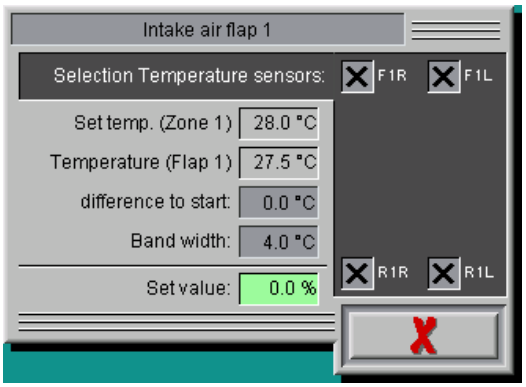


Figure 7-21: Temperature-controlled

For this function, each flap is assigned a temperature sensor. Their mean value is then displayed as **Temperature (Flap)**.The **Temperature (Flap)** is compared to the current temperature of the assigned **Set temperature (Zone)** and a set value is calculated based on the adjustable **Difference to start** and **Band width**.

	The set value is limited to a range of 0 to 100 %. If all temperature sensors assigned to this flap fail, the flap's set value is set at 50 %. A digital flap would open at a set value of 50 %.

7.4.3 Set value

The set value is calculated based on the set temperature and the settings under **Current temperature** and displayed here.

7.5 Air intake fan

It is possible to configure an air intake fan for each flap (except for natural ventilation). The settings are structured similarly to the flap settings.

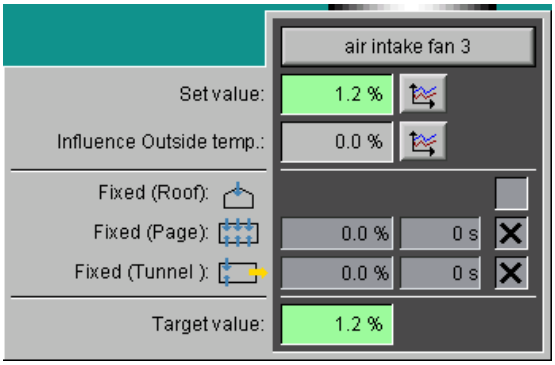


Figure 7-22: Air intake fan

An air intake fan always depends on the ventilation. Different curves can be set for each mode (roof, side, tunnel). Air intake fans do not use feedback as current value. This means that calibration and setup are not required. For digital intake air fans, the target value can only be 0 % or 100 %. If the threshold is greater than 50 %, the fan is switched on; if it is smaller, the fan is switched off.

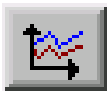
7.5.1 Operation

The head row of each intake air element includes a button for manual operation. Clicking on one of the drives opens a control panel. Depending on the type of the exhaust air element, either a switch or a slider control are displayed. The drive can be turned on or off or the operation can be switched from manual to automatic using this element. A drive switched to **manual** operation is highlighted in orange.

	For information on how to operate the drives, please refer to chapter 1.2 ”Drives”

	Caution! Maintenance or service works at drive units or fans may only be carried out if the protective switch is in the OFF position. The drive units can be activated without warning, e.g. by the time switches. Observe local security signs and instructions.

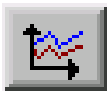
7.5.2 Set value



The set value for the intake air fans is determined in the same curve display as for the intake air flaps.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

7.5.3 Influence outside temperature



The set value can be influenced by an individual curve depending on the outside temperature. If no outside temperature sensor is available, the correction is hidden.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

7.5.4 Fixed set value

Depending on the configuration, fixed values for **roof intake air**, **side intake air**, **tunnel**, **natural ventilation** and **mechanical ventilation** are possible. As usual, a value in % as well as a delay in seconds can be set for each fixed position. The field for activation displays the settings for a fixed set value in the corresponding mode. If no fixed set value is desired for a mode, the settings are hidden.
To show an active mode for which a fixed value has been set for a flap, the field is highlighted in white.

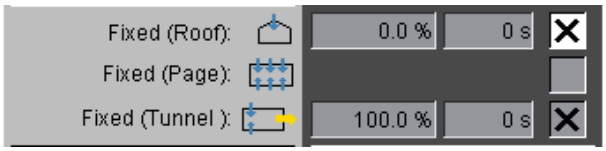


Figure 7-23: Fixed set value

If only one mode is available in the house, no entries can be made for fixed values and the menu is displayed accordingly.

7.5.5 Set value

The current set value of the fan is displayed at the bottom.
If a flap is operated manually, the background for the target value switches from green to orange.

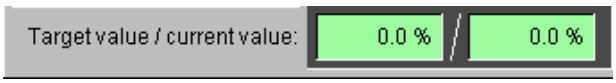


Figure 7-24: Target value/current value

7.6 Natural ventilation

There is a second or third set value for the flaps under natural ventilation. One is for mechanical ventilation, for tunnel ventilation, if applicable, and one is for natural ventilation. The mode currently active is shown in the upper line as an icon and in text.

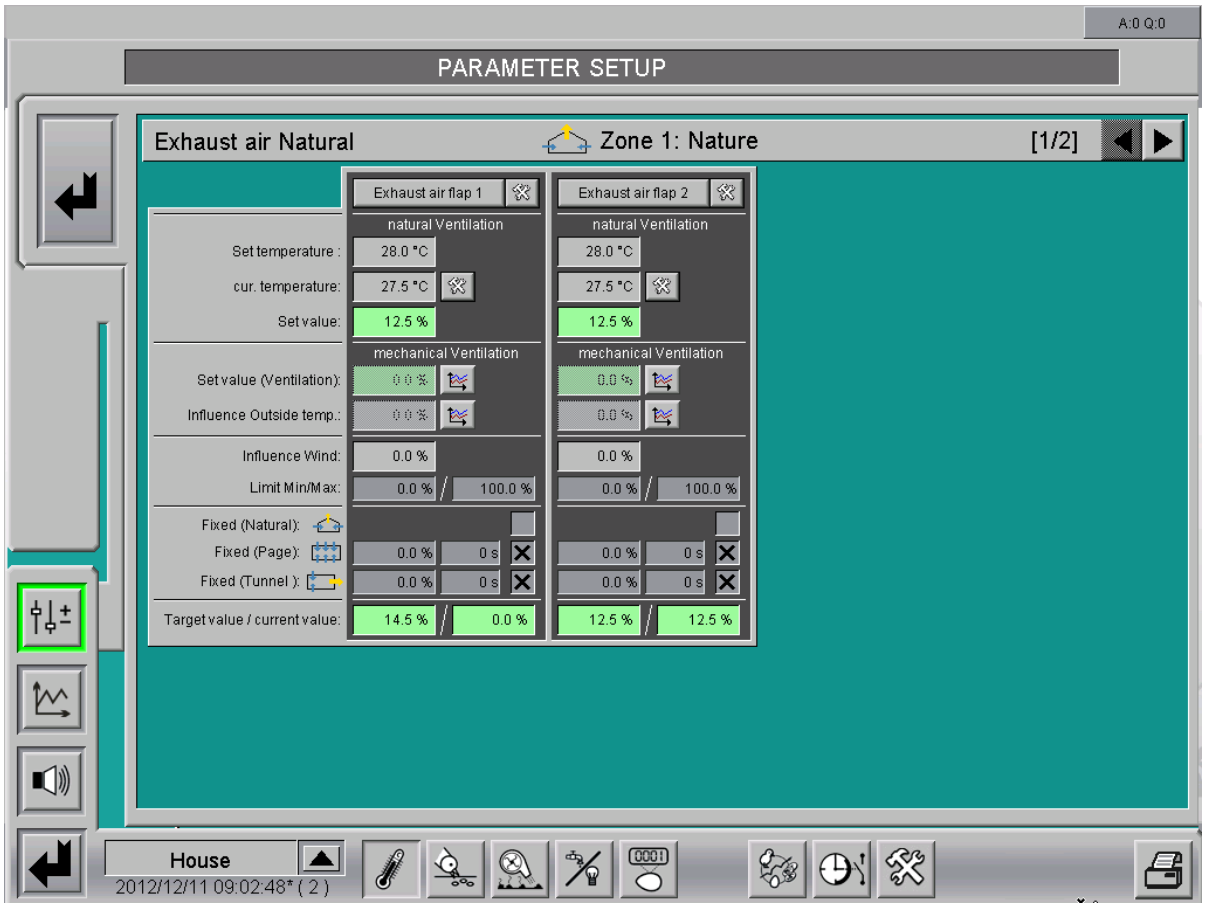


Figure 7-25: Natural ventilation

	Please find further information on the settings for natural ventilation in chapter 5 ”Exhaust air Natural” .

8 Wind influences

Clicking on the button "Intake air Wind influences" opens a menu in which the dependency between the intake air flaps and the wind direction can be set.

Figure 8-1: Intake air Wind influences

	This function can only be used if a weather station is available.

If more than eight intake air flaps have been configured, the settings are distributed over two screen pages.

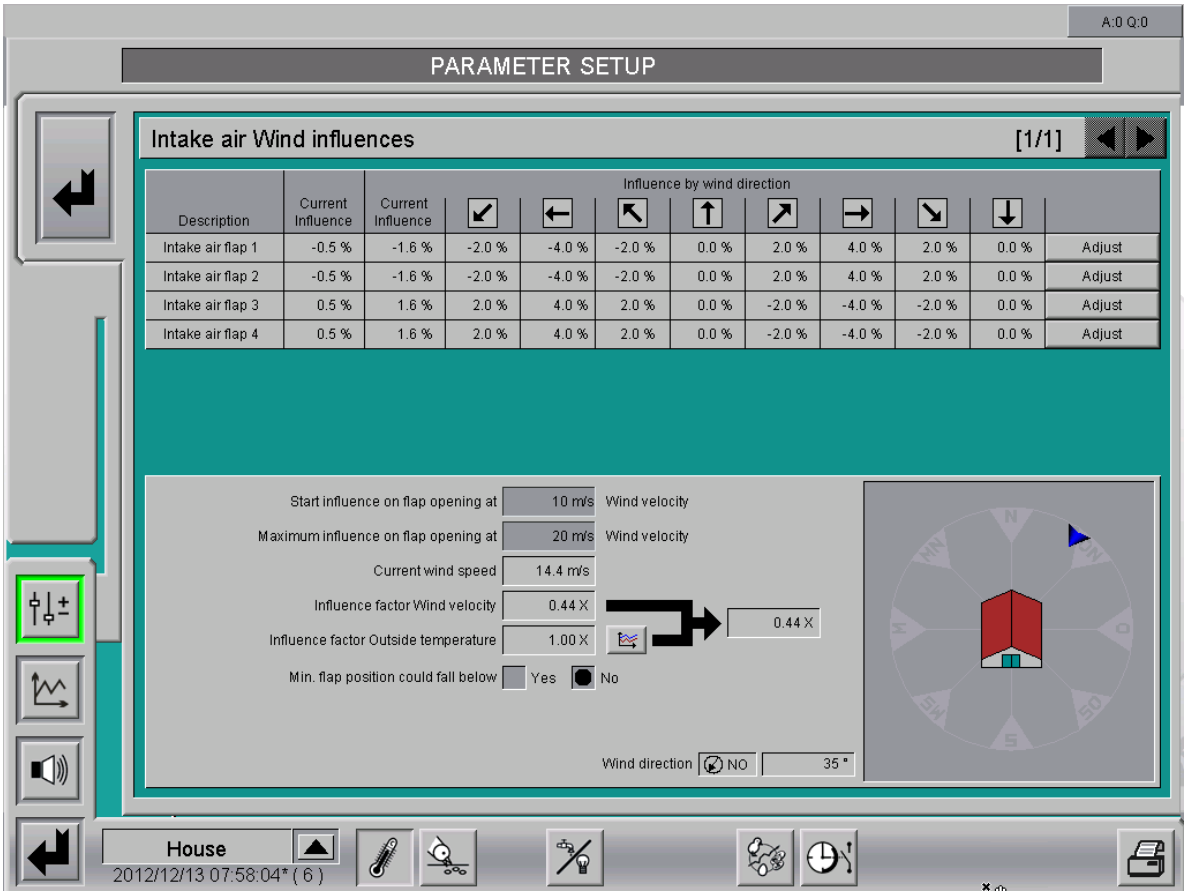


Figure 8-2: Settings wind influences

	Caution! The birds must always be provided with sufficient fresh air.

8.1 General settings

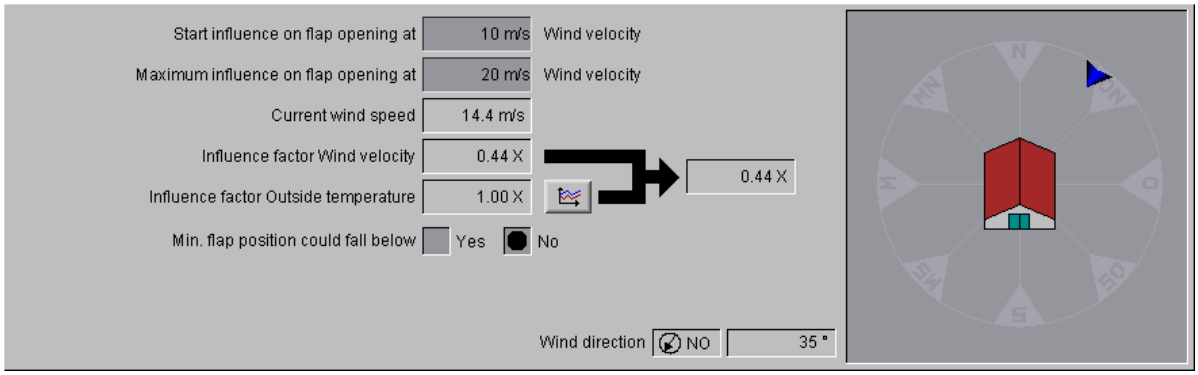


Figure 8-3: General settings

- **Start influence on flap opening**

  Here you can decide at which wind speed in m/s the influence on the servomotors is to begin.

- **Maximum influence on flap opening**

  The value which has to be entered here determines at which wind speed the maximum value that can be set under **Influence by wind direction** for different cardinal directions and per motor is reached.

- **Current wind speed**

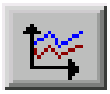
  The current wind speed is displayed here.

- **Influence factor wind speed**

  The factor for the influence of the wind on the intake air flaps which has been calculated by means of the current wind speed is displayed here.

- **Influence factor outside temperature**

  This factor prevents too much wind influence on the intake air flaps in the case of high outside temperatures, which would put at risk the fresh air supply.



A curve determines which factor is used at which temperature. It can be opened by clicking on the curve symbol.

The next figure is an example for such a curve.

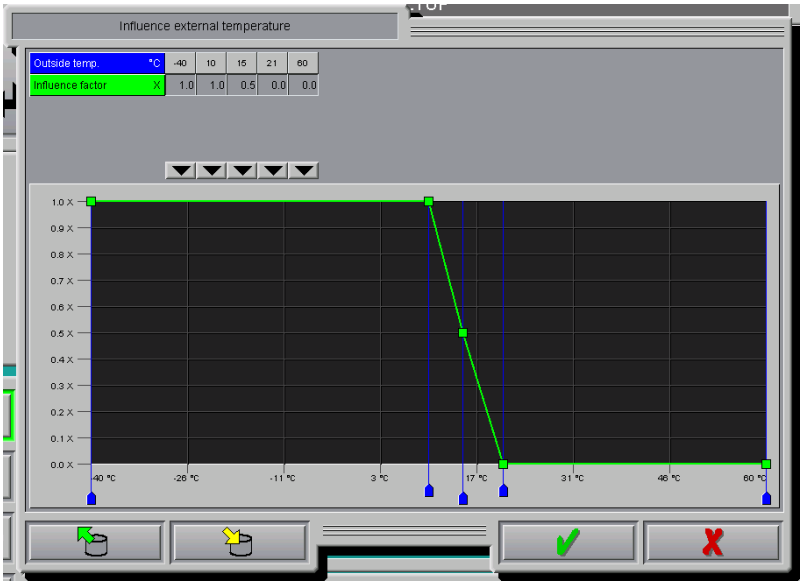


Figure 8-4: Influence factor outside temperature

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Current influence factor**

  The current influence factor is calculated by using the **Influence factor wind speed** and the **Influence factor outside temperature**. No entries can be made here.

- **Minimum flap position could fall below**

  If you activate the **Yes** button, the minimum flap position, which has been pre-set at a different place in the program, may remain under the set value at high air speeds.

Important:

Enabling "Yes" in **normal mode** may result in the temperature rising too high, which would endanger the life of the animals.

This function should only ever be used in case of storm warnings, etc.

- **Wind direction**

  The wind direction and the concerned houses are displayed here. No entries can be made here.

8.2 Flap-specific settings

As the intake air flaps have not all been mounted in the same wind direction, specific settings for each flap can determine whether and how much the influence factor can take effect.

Description	Current Influence	Current Influence	Influence by wind direction ↙	←	↖	↑	↗	→	↘	↓	
Intake air flap 1	-0.5 %	-1.6 %	-2.0 %	-4.0 %	-2.0 %	0.0 %	2.0 %	4.0 %	2.0 %	0.0 %	Adjust
Intake air flap 2	-0.5 %	-1.6 %	-2.0 %	-4.0 %	-2.0 %	0.0 %	2.0 %	4.0 %	2.0 %	0.0 %	Adjust
Intake air flap 3	0.5 %	1.6 %	2.0 %	4.0 %	2.0 %	0.0 %	-2.0 %	-4.0 %	-2.0 %	0.0 %	Adjust
Intake air flap 4	0.5 %	1.6 %	2.0 %	4.0 %	2.0 %	0.0 %	-2.0 %	-4.0 %	-2.0 %	0.0 %	Adjust

Figure 8-5: Flap-specific settings

- **Description**

  The name of the intake air flap is displayed here.

- **Current influence**

  The current influence is calculated based on the **Current influence factor** and the **Current influence**, which has been determined under **Influence by wind direction**.

- **Influence by wind direction**

  Clicking on one of the "Adjust" buttons opens a menu in which values for adjustment of flap position when it is windy can be entered per flap and cardinal direction. The settings have to be accepted by clicking on the green checkmark.

	The values can be entered with positive (+) as well as negative (-) signs.Thus it is theoretically possible to further open a flap even if it is on the lee side of the house.

The current wind speed, graphically displayed as a bar and including information on the wind force, is shown in the following figure.

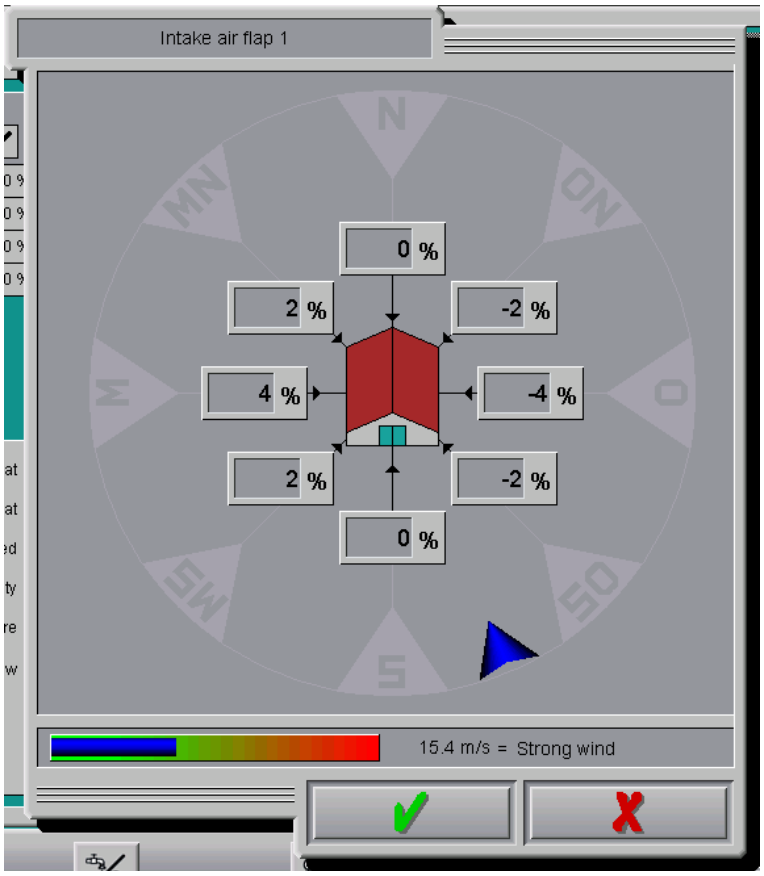


Figure 8-6: Setting intake air flap

The entered values are included in the intake air flap table and can thus be checked and compared.

The current influence **Influence by wind direction**, which results from the wind speed and the wind direction, is displayed in the table.

9 Heating

Clicking on the button **Heating** opens a menu in which the set temperature, the assignment of the temperature sensors and the special setting parameters for the individual heating systems can be set.

Figure 9-1: Heating

⚠	**Caution!** An important factor for heating control is that after heating has been turned off, the temperature may not exceed the set value of the inside temperature. If the temperature increases too much, the ventilation is also increased and the excessive warmth is ventilated out of the house. This is not economically sensible and can be prevented by means of the parameters explained in the following.

All settings possible for the heating can be found on three screen pages.

1. Only the main settings, such as set temperature, manual adjustment, the settings for minimum heating and heating for a house that is paused can be made on the first page.
2. All additional settings, such as zone selection of set temperature, assignment of temperature sensors of house zones, settings of the control parameters, as well as the pulse-pause control, can be made in the second page.
3. On the third page, special setting parameters are determined for the individual heating systems.

9.1 General settings

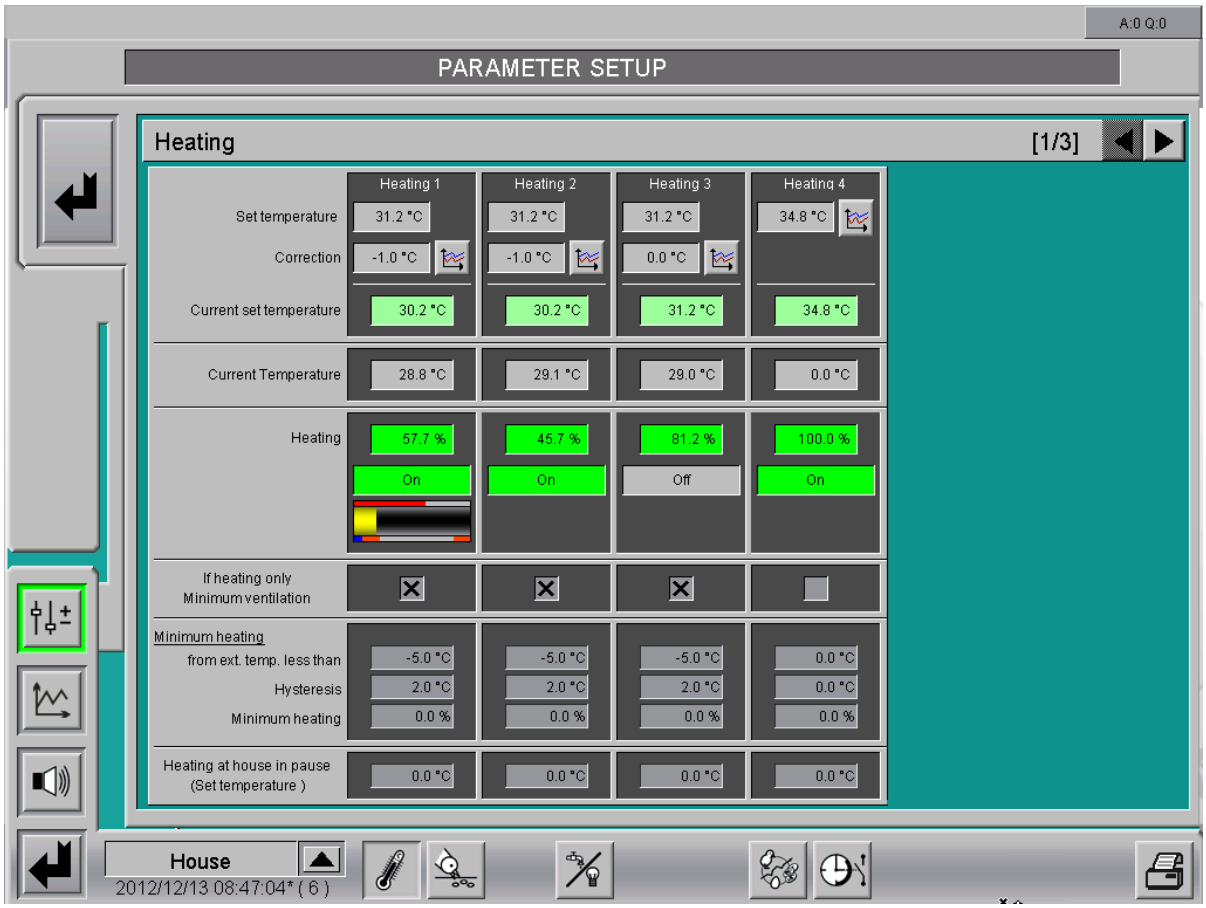


Figure 9-2: Settings heating

9.1.1 Set temperature

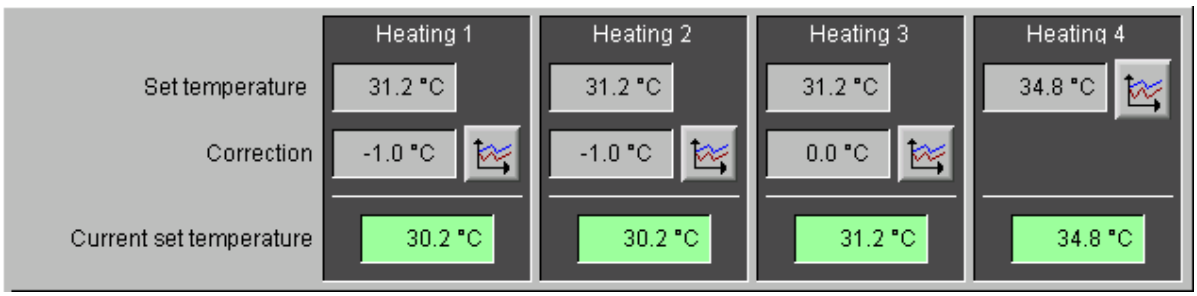


Figure 9-3: Settings set temperature

- **Set temperature**

  The set temperature of the respective heating system can be assigned to zone 1 or 2 or be calculated from the mean value of both zones. Apart from the selection of zone 1 and 2, **Free** is also an option. If this option is chosen, the activation of zone 1 and 2 is reset.

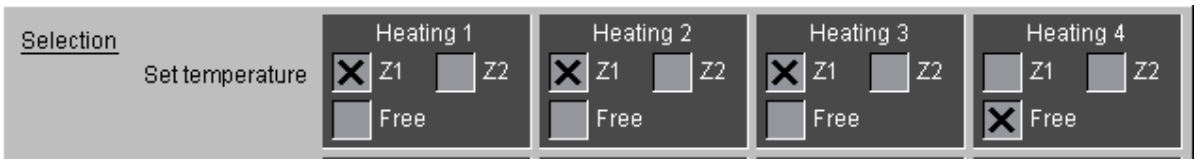
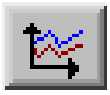


Figure 9-4: Settings set temperature on the second page

	The set temperature can be selected on the second screen page.

Moreover, the settings for displays and operation of the correction are hidden on the first page. Instead, a button for the curve settings of the set temperature as a function of the production day is displayed next to the set temperature.

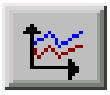


To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Correction (Z1 and Z2)**

  The corrective value depending on the production day can be used as a curve on the set temperature.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Current set temperature**

  The third line displays the currently valid set temperature. This is determined by the **set temperature** and the **correction**, if applicable.

9.1.2 Current temperature

Figure 9-5: Current temperature

The current temperature is determined based on the selected temperature sensors, which can be activated using the checkboxes on the second screen page. For the floor heating, the currently measured values of the floor heating sensors are displayed instead of the selected inside temperature sensors.

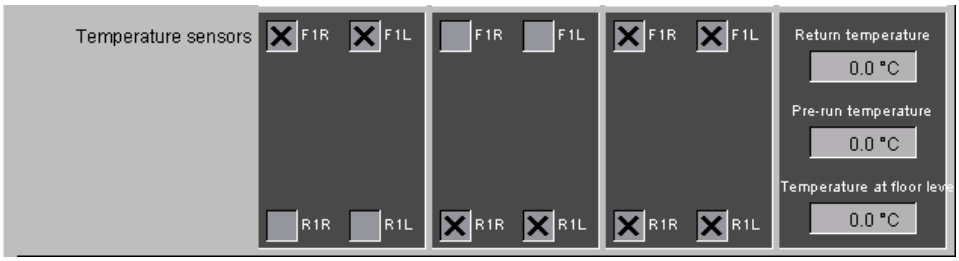


Figure 9-6: Settings temperature on the second page

The climate sensors can be assigned on the second screen page.

9.1.3 Status heating

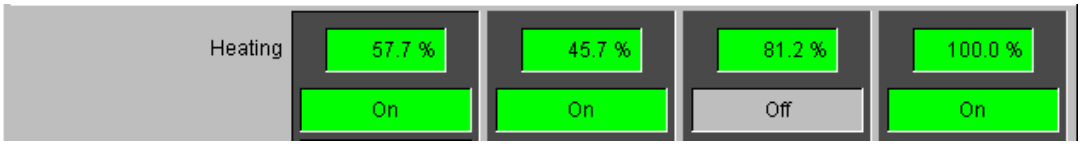


Figure 9-7: Status heating

9.1.3.1 Heating requirements

The heating requirements depends on the control parameters of the PI controller on the second screen page. They include the band width, the interval cycle and the time factor.

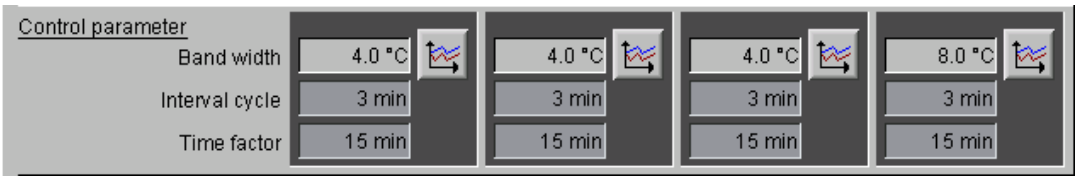
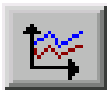


Figure 9-8: Control parameters

	The settings for the heating requirements can be found on the second screen page.

- **Band width**

  If the band width is set to e.g. 4°C, the house is not heated if the set temperature of heating and house temperature amount to 20°C. If the house temperature falls to 19°C, the proportional value of the basic heating control would increase proportionally to 25 %. The proportional value would increase to 100 % if the house temperature would be at 16°C.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

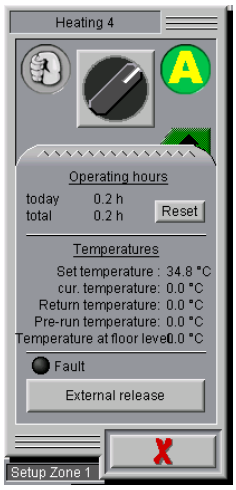
- **Interval cycle**

  The interval cycle determines how often the computer compares the current temperature with the set one.

- **Time factor**

  The time factor determines the integrating level of the controller over a longer time period.

9.1.3.2 Status display



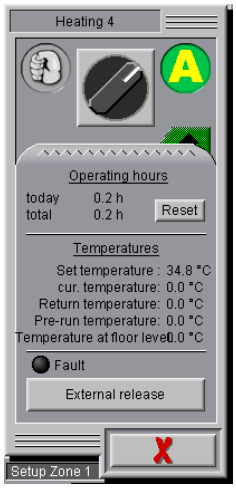
The status display indicates whether the heating is switched on or if it is working in automatic or manual mode.

Clicking on the status button opens a menu for manual operation.

In addition to the normal operating hours, the current set and control temperatures of the heating elements as well as the option for external release are displayed here.

	For information on how to operate the drives, please refer to chapter

9.1.3.3 Displaying faults and external release



If an input for a fault message of the heating has been configured for the heating groups, an output is generated automatically and allows to acknowledge the message via external release by using the visualisation. The external release can be found in the manual operation menu. In case of a fault, the heating group flashes in red in the overview in addition to the alarm message. If the alarm is deactivated in the alarm settings, no fault is displayed.

	The corresponding display and control elements are only shown for heating groups for which a fault message has been configured.

9.1.4 If heating only minimum ventilation

As a general rule, only minimum ventilation is used when the house is heated to ensure that the warm air is not blown out of the house. If the heating system does not allows this, e.g. floor heating, as these systems work continuously in some cases, the checkmark can be deleted to switch the ventilation on at all times.

Figure 9-9: If heating only minimum ventilation

9.1.5 Minimum heating

To prevent ice build-up in the fresh air inlets, the function "minimum heating" may be used under certain circumstances. This is an alternative to starting the heating system during cold or wet weather.

Caution!

When minimum heating is activated, the heating group starts as soon as the outside temperature is below X°C, independent of the house temperature.

The minimum heating is only deactivated when "external temperature less than" + "hysteresis" are increasing. This function does not check whether the inside temperature exceeds the set temperature.

Minimum heating does not restrict ventilation to minimum ventilation (irrespective of whether the setting is activated or not)!

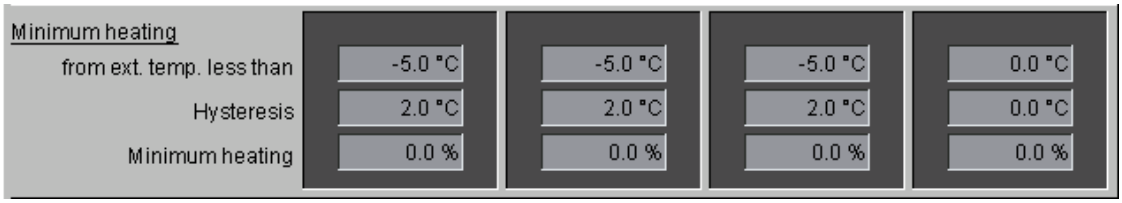


Figure 9-10: Minimum heating

- **From external temperature less than**

  If the outside temperature falls below **external temperature less than**, minimum heating is activated.

- **Hysteresis**

  To prevent permanent switching ON and OFF of minimum heating, a hysteresis value can be entered here.

  If the outside temperature is higher than "external temperature less than" + "hysteresis", minimum heating is deactivated.

- **Minimum heating**

  The required heat in % to be used by minimum heating can be entered here. If 0 % is entered, minimum heating is deactivated.

9.1.6 Heating at house in break

Even if the laying period has been completed and production has been stopped, sufficient heating is in many cases still necessary. The field ensuring this is **Heating at house in pause**.

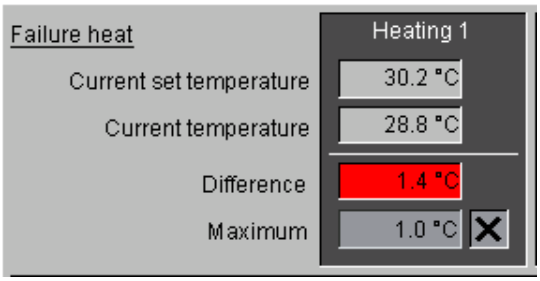
This value ensures that the house (house) does not cool down, causing the lines to freeze.

9.1.7 Failure heat

If the temperature falls below the current set temperature by a certain temperature difference despite heating, the corrections can be reset to minimum ventilation.

	Additions to minimum ventilation can be caused by the outside temperature, dehumidification and the CO^2 level. The influences of the outside temperature and the CO^2 level are only reset if minimum ventilation is increased. The influence remains if minimum ventilation is reduced.

	The settings for **Failure heat** can be found on the third screen page.



The function can be set per heating group. It compares the **current set temperature** of the respective heating group with the **current temperature** of this group. The **Difference** is displayed.

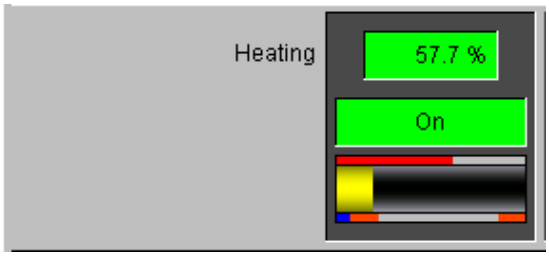
If the difference is larger than the set **Maximum** value "Failure heat" and the function is activated (**checkbox**), the additions to minimum ventilation are reset in both zones. In this case, the field with the displayed difference is highlighted in red. An alarm is not indicated.

If the difference is returns to an acceptable level or the function is deactivated, the additions are considered again.

	Dehumidification is reset directly. If the **Failure heat** has been acknowledged, dehumidification is released with a starting value of 0.0 %. During resetting of the influences due to CO^2 and outside temperature, the influence is slowly reduced to zero using a ramp. The influence is then slowly activated again if the **Failure heat** has been acknowledged.

Failure heat only affects minimum ventilation. The correction of the ventilation via outside temperature (during band width control) is not affected.

9.2 Digital heating



For digital heating, status information about the current cycle is displayed on the first page.

The wide yellow bar in the middle displays the cycle time. The minimum running time is displayed in orange on the left below the cycle time. The minimum pause time is displayed in orange on the right and the pre-running time is depicted by the blue bar on the left. The small bar graph above the cycle time displays the current calculation cycle.

	The settings for the digital heating can be found on the second screen page.

9.2.1 Pulse pause control

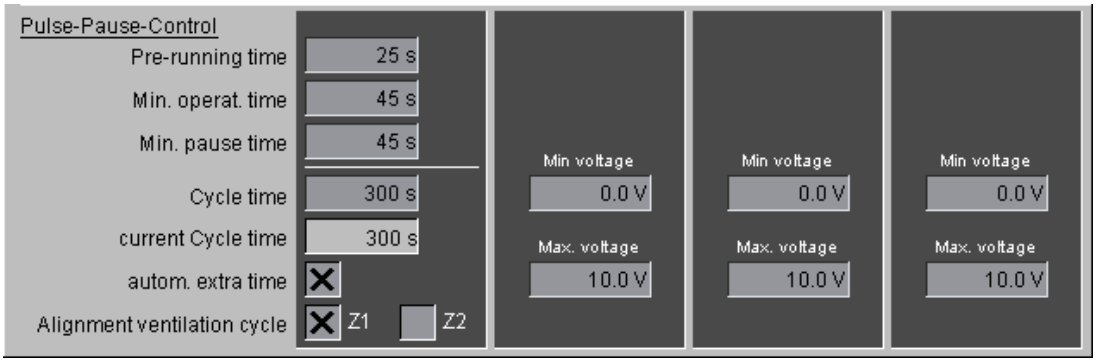


Figure 9-11: Pulse pause control

- **Pre-running time**

  This function shows the time the heating needs to start / ignite.

- **Minimum operating time**

  To prevent short switching on of the heating, a value for minimum operating time is given. This value has to be set so that the heating system warms up and can heat.

- **Minimum pause time**

  The minimum pause time is used to ensure that consumed air can escape the combustion chamber during the pause time if the heating is not running at 100 %.

- **Cycle time**

  The digital heating is not simply controlled by an on/off principle, but calculated depending on the deviation from the set temperature using a band width control and a cycle time. Heating needs are controlled more evenly like this.

9.2.2 Automatic extra time for cycle

It is possible to automatically extend the cycle time for the digital heating (similar to the pulse pause control). This extension is used if the heating needs are lower than the **Minimum operating time** of the heating.

The settings for the digital heating include a selection field **Automatic extra time** below the cycle time. If this box is checked, the cycle time is extended automatically if the calculated heating needs are lower than the minimum operating time of the heating. The operating time corresponds with the minimum operating time and the cycle time is increased so that the pulse pause ratio matches the required heating needs. The extra time is always calculated at the beginning of a cycle.

The cycle time can be extended by no more than 1200 seconds.

The **current cycle time** is displayed. It can deviate from the **set cycle time** if:

- the automatic extra time is active;
- the cycle time is adapted to the ventilation cycle of another zone with a different cycle time;
- the cycle time has been changed but the program has not yet completed the last cycle.

If the **Alignment ventilation cycle** has been activated, the extension of the cycle time only becomes valid where the ventilation is not working in pulse pause operation as this is subject to the ventilation cycle.

9.2.3 Alignment with pulse pause ventilation

A digital heating works according to the pulse pause principle. In each cycle, it starts with a heating impulse and then makes a pause. The heating is usually only active if the house is too cold, i.e. the ventilation is reduced to minimum (optionally also with locks for **if heating only minimum ventilation**) and is thus also working in pulse pause operation. If the ventilation is working in pulse pause operation, the digital heating can synchronise with the ventilation cycle. This means that the cycle time of the heating is aligned with the ventilation. The heating cycle is aligned in a way that the heating impulse is in the middle of the ventilation pause.
The advantage of this is that the heat does not immediately leave the house and the heating influences the air flow of the side flaps as little as possible.

Using the selection fields **Z1** (Zone 1) and **Z2** (Zone 2), a heating element can be synchronised with a zone's ventilation if this is operating under pulse pause control. A heating element cannot be aligned with both zones. If no selection field is activated, the heating is not aligned.

	The functions work independently from each other as long as the heating is switched on without the ventilation operating under pulse pause control or the ventilation is in pulse pause operation and the heating is switched off.

Heating is synchronised in the following two cases:

1st case: Heating is switched on while the ventilation is already in pulse pause

The heating program calculates a time frame in which it can start based on the pulse pause ventilation cycle. If the pre-running time and the minimum operating time cannot be adhered to, the heating does not start with the current ventilation cycle and waits for the next time frame.

2nd case: Ventilation switches to pulse pause operation while heating is already running

The new heating cycle is always calculated at the beginning / the end of a heating cycle. In this case, the current heating cycle is completed and a time frame for alignment with the ventilation cycle is calculated. If the ventilation cycle has already been running for too long, i.e. the pre-running time and the minimum operating time of the heating cannot be adhered to, it does not start but waits for the next ventilation cycle.

9.3 Analogue heating

The analogue heating requirements are calculated based on the control parameters, similar to the digital heating. These requirements are transmitted to the heating device by an analogue signal.

For the analogue heating, a **minimum** and a **maximum voltage** can be set. Within these limits, the heating capacity can be depicted one to one and controlled exactly.

This means that a minimum voltage of 6 volts can be entered here if the input and the capacity of the analogue heating element start at 6 volts or 60 %. In this case, the system would divide the required heating capacity of 0 to 100 % between 6 and 10 volts.

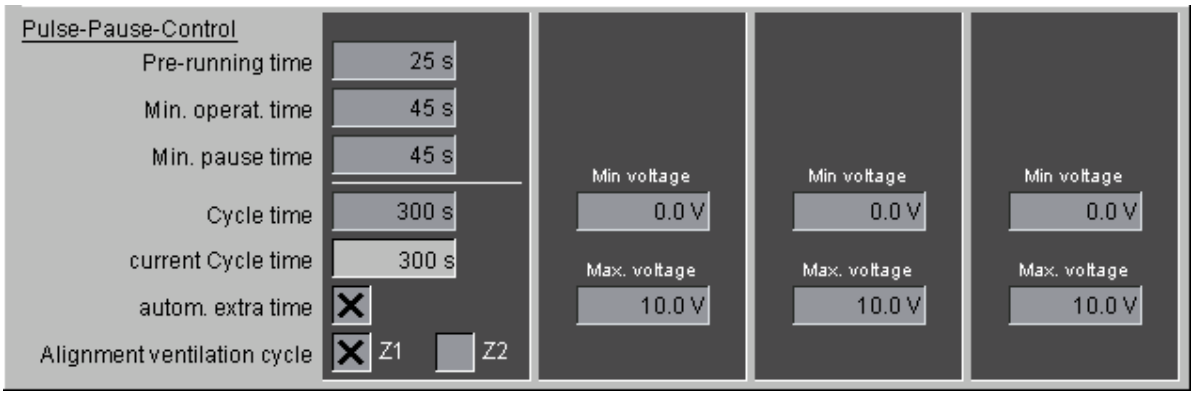
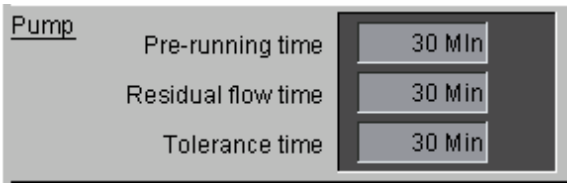


Figure 9-12: Analogue heating

9.4 Heat Master

To control hot-water heaters, especially the Heat Master, s specific heating control has been integrated. The Heat Master consists of three main components which have to be controlled (pump, mixer, fan).

The Heat Master settings differ from the analogue heating settings as they include three additional options on the third page.



To ensure that the heating does not immediately start the fans when being switched on, thus guiding cold air to the birds, it is possible to switch on the pump and the fan separately. The control of the heating capacity is carried out by the mixer.

The pre-running time, the residual flow time and the tolerance time can be set per system here.

- **Pre-running time**

  The pre-running time ensures that the pump and the mixer are piloted first and exclusively so that the radiators are heated. The fans are started after this pre-running time.

	During the pre-running time, the ventilation is restricted to a minimum, if the corresponding function **If heating only minimum ventilation** on the first page has been activated. The residual flow time does not restrict the ventilation to a minimum.

- **Residual flow time**

  The fan is turned off if no further heating is required. However, the pump and the mixer are still active for the set residual flow times. This ensures that the fan can be switched on again immediately after short pauses as the radiators remain warm. After the end of the residual flow time, pump and mixer are turned off.

	If the heating requirements decrease to zero during the pre-running time, there is no delay for pump and mixer.

- **Tolerance time**

  The set tolerance time starts after the pump has been switched off. If the house has to be heated again during this tolerance time, the fan switches on immediately as the radiators and pipes are still warm enough.

Changes to the pre-running, residual flow and tolerance times do not affect the current cycle.

9.5 Floor heating

There are no changes on the first page if floor heating is used. On the second page, the currently measured values of the floor heating temperature sensors are displayed instead of the selected inside temperature sensors.

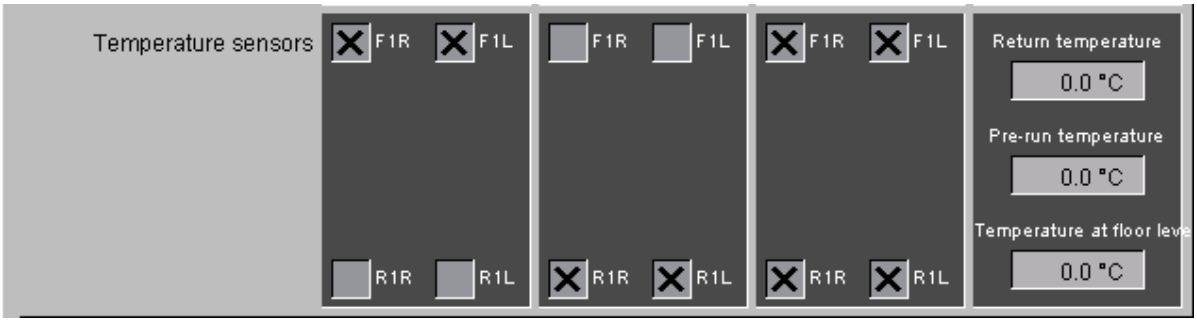


Figure 9-13: Floor heating

- **Return temperature**

  The main difference to a normal heating system lies in the fact that the floor heating is not controlled by the house temperatures, but by the return temperature.

- **Pre-run temperature (optional)**

  It may also be necessary to limit the pre-run temperature (40°C by default) under certain circumstances to not overheat the floor.

!	If a red exclamation mark is displayed next to the pre-run temperature, this means that the limit for pre-running temperature is active.

- **Temperature at floor level (optional)**

  The maximum difference of the pre-run temperature can also be limited when using an additional floor temperature sensor, e.g. to prevent the floor from heating up too fast if it is very cold.

☞	The options for pre-run temperature and temperature at floor level is only displayed if it has been configured.

9.5.1 Control

On the third page, a control of the input value can be activated individually for each sensor and the monitoring time, within which the value has to change, can be set. In the case of an error, an alarm for cable break will be released, which involves the signal change control and also controls whether the input signal has reached the end of the measuring range (short circuit or open).

Figure 9-14: Settings temperature on the third page

Failure	**Reaction**
Return temperature sensor	Heating in automatic mode **OFF** (manual operation possible)
Pre-run temperature sensor	Heating controls the automatic mode up to a **maximum of 50 %** (manual operation possible)
Floor temperature sensor	Difference to floor temperature not included for limit of pre-run temperature

Table 9-1: Reaction in case of failed sensors

9.5.2 Limit pre-run temperature

The pre-run temperature limits are displayed in the lower part of the third page.

Figure 9-15: Limit pre-run temperature

- **Maximum**

  The field **Maximum** stands for the maximally allowed absolute pre-run temperature.

- **Maximum difference to temperature at floor**

  The **maximum difference to temperature at floor** displays the maximally tolerated difference between pre-run temperature and floor temperature.

These values (if applicable) are considered for the pre-run temperature limit. The control signal is limited to the analogue output of the heating. The temperature is limited by means of a PI controller. Its amplification factor and adjust time can be set correspondingly in accordance with the control system's inertia.

- **Amplification factor**

  The amplification factor is the proportional component of the controller. For each °C of deviations, the analogue output is corrected by the value set here.

- **Adjust time**

  The adjust time is responsible for the integral component of the controller. For a constant temperature difference, the analogue output signal is corrected by the proportional component in addition to the proportional component during this time.

10 Recirculation fan

Clicking on the button **Recirculation fan** opens a menu in which the settings for the recirculation fans can be carried out.

Figure 10-1: Recirculation fan

The recirculation fan improves the circulation of the heated air and thus guarantees a uniform house temperature.

Caution!

As the recirculation fans depend on the heating system, they also react to heaters at the system switched on manually.

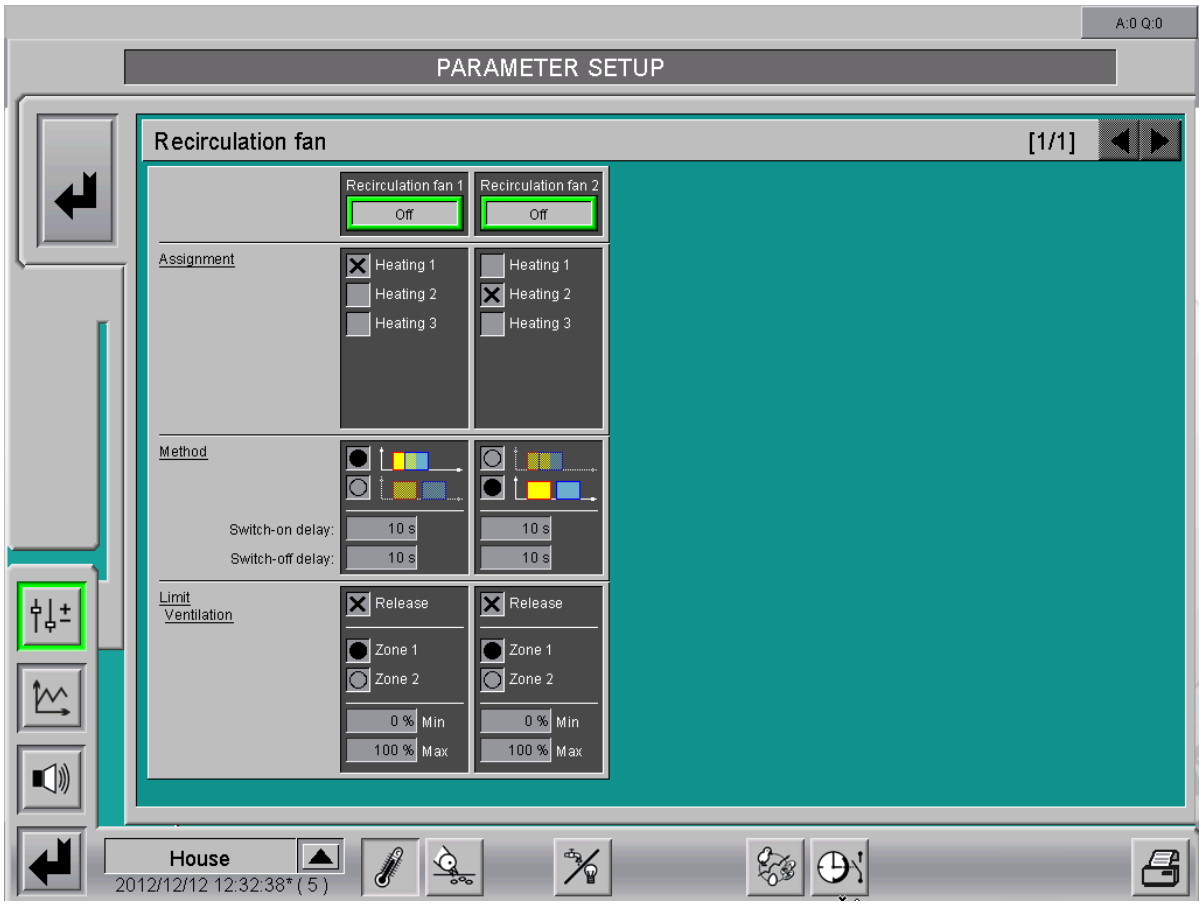


Figure 10-2: Settings recirculation fan

The upper part shows the name and the current status of the fan group. The **green** frame indicates automatic operation. It turns to **orange** for manual operation.
Within the frame, the output signal is displayed in text and shown as switching colour (**On = green** / **Off = grey**).

Clicking on the status button opens a menu for manual operation.

For information on how to operate the drives, please refer to chapter

10.1 Assignment

You can select here which heating element is assigned to this recirculation fan. All configured heating elements (maximum of 6) are available for selection.

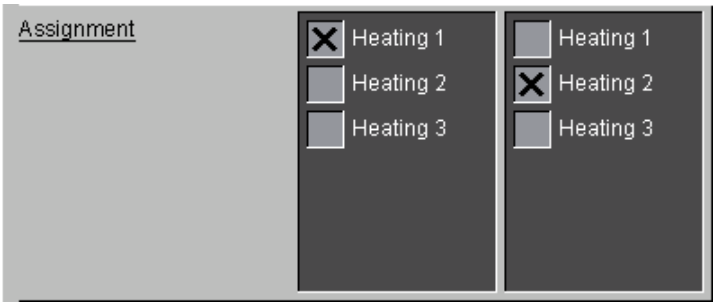


Figure 10-3: Assignment

	At least one heating element must be selected. It is also possible to select several heating elements. In this case, the recirculation fan reacts to all selected heaters.

10.2 Method

You can set here how the fan should react to the heating. There are two methods available, depicted as symbols.
The method not selected is shaded.

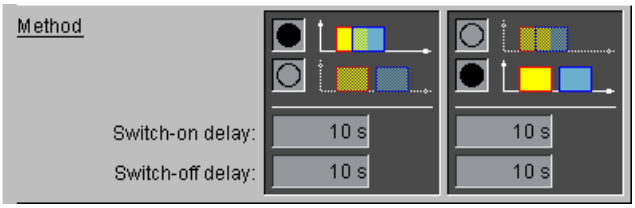


Figure 10-4: Method

- **Method combined**

  The recirculation fans are switched on with an adjustable **Switch-on delay** after the heating is switched on. The recirculation fans are switched off **after the heating has switched off** according to an adjustable **Switch-off delay**.

	If the heating switches off within the switch-on delay, the recirculation fan remains **inactive**. If the heating switches on within the switch-off delay, the recirculation fan remains **active**.

- **Method separated**

  The recirculation fans are switched on with an adjustable **Switch-on delay** after the heating has switched off. The recirculation fans are switched off again **after they have been switched on** after an adjustable **Switch-off delay** as running time.

	If the heating turns on again during the switch-on delay, the recirculation fan remains **inactive**. If the heating turns on again during the switch-off delay, the recirculation fan is **switched off**. The recirculation fan remains inactive in the case of a switch-off delay of 0 seconds.

The times for the switch-on and switch-off delay can be set between 0 and 10,000 seconds for both methods.
If the method is changed, the current recirculation cycle is reset and the fan switched off for the moment. Changes to the switch-on and switch-off delay are not included before the next cycle.

10.3 Limit ventilation

Figure 10-5: Limit ventilation

- **Release**

  In the lower part of the settings for each recirculation fan, the fan can be restricted according to the ventilation value by activating the checkbox "Release".

- **Zone**

  Furthermore, the **Zone** (1 or 2) whose ventilation value shall be analysed can be selected.

- **Min max limit**

  The **minimum** and **maximum** values of the ventilation can also be set. The recirculation fan will only become active if the current ventilation value lies within the values set here.

11 Nozzle cooling

Clicking on the button **Nozzle cooling** opens the menu in which the settings for spray cooling, humidification and soaking can be carried out.

Figure 11-1: Cooling

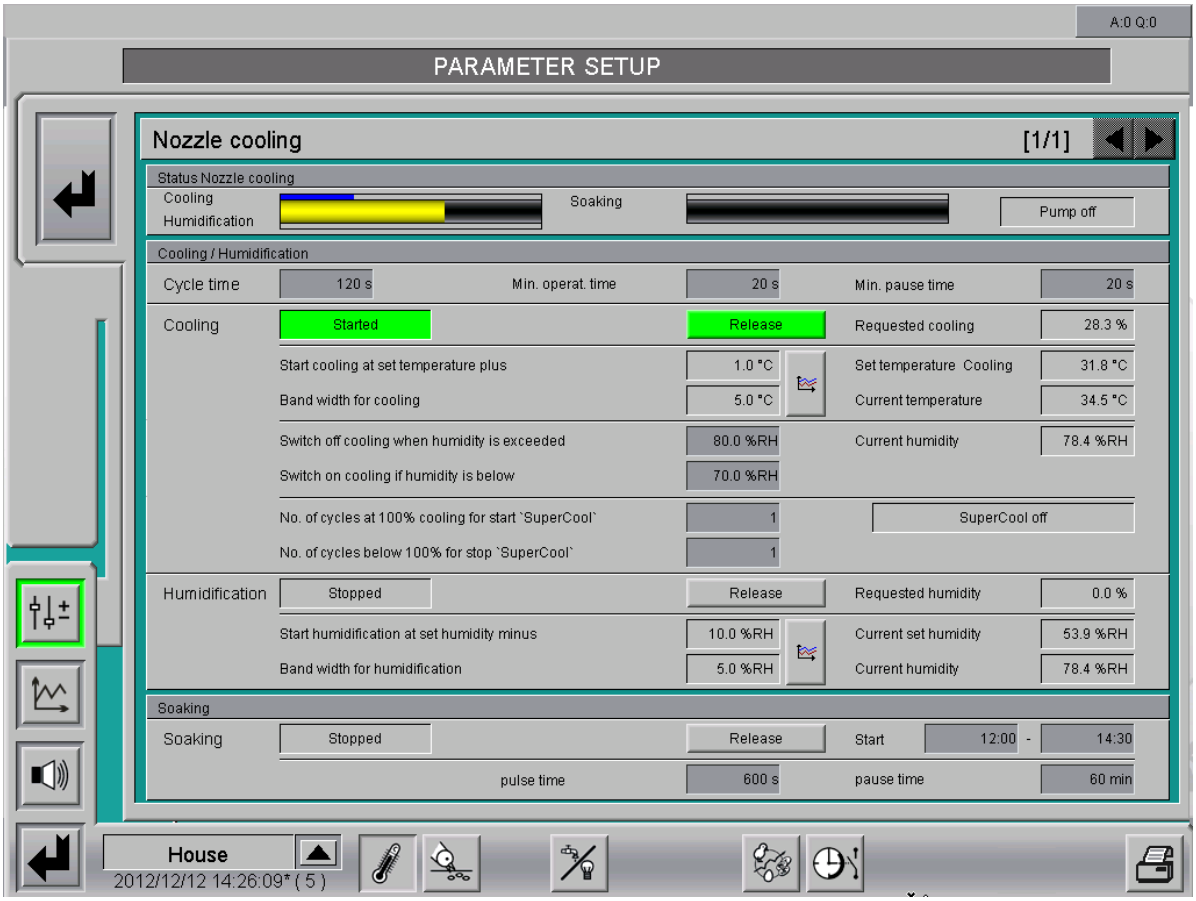


Figure 11-2: Settings cooling

11.1 Status Nozzle cooling

The figure below shows the status of the current cooling / humidification cycle and the soaking cycle. The right-hand side of the menu displays the current status of the pump (**Pump off** or **Pump on**).

Figure 11-3: Status display

Cooling / humidification

The course of a cycle can be followed with the big yellow bar, which continuously shows the course of the cycles.

If the pump is turned on, the calculated duration of the cooling process is depicted for this current cycle as a blue bar above the yellow one. If there is a need for humidification, a blue bar is displayed below the yellow one.

Soaking

The course of a cycle can be followed with by the big yellow bar graph, which continuously shows the course of the soaking cycles.
If the pump is turned on, the calculated duration of the soaking process is depicted for this current cycle as a blue bar above the yellow one.

11.2 Cooling / humidification

Figure 11-4: Cycle

- **Cycle time**

  The cooling / humidification is not simply controlled by an on/off principle, but calculated depending on the deviation from the set temperature using a band width control and a cycle time. Cooling and humidification needs are controlled more evenly like this.
  A value between 120 and 180 seconds is recommended.

- **Minimum operating time**

  To prevent short switching on of the pump, a value, usually between 20 and 45 seconds, is pre-set as minimum operating time. The value has to be this great to allow the pump to create full pressure in the pipe system.

	The value may not be too great to prevent too much water as fog coming into the house. If the value is set too high, the water particles would fall onto the birds instead of evaporating. The feathers (down) of the birds would get wet unnecessarily.

- **Minimum pause time**

  The minimum pause time is required to distribute the wet air evenly in the house. The best results are usually achieved with a value of 20 to 45 seconds.

11.2.1 Cooling

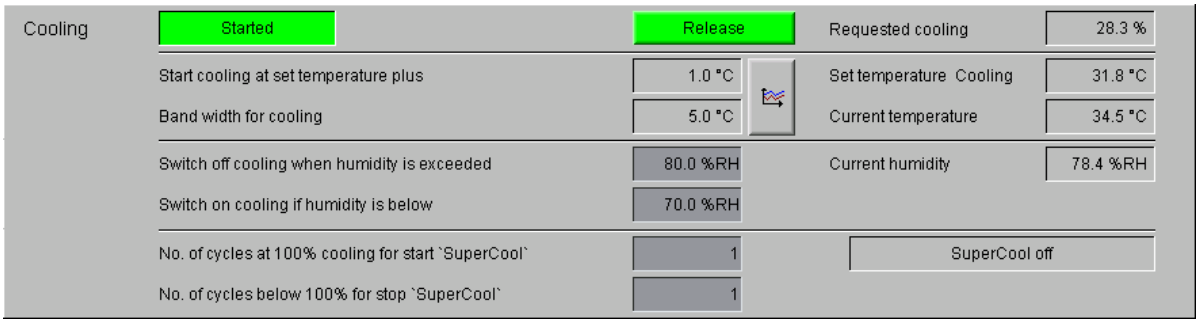


Figure 11-5: Settings cooling

11.2.1.1 Status

- **Status cooling**

  The cooling status field displays if there is a need for cooling. If the window is green and shows **Started**, the cooling has been started via the cycle. If the window is grey and shows **Stopped**, there is no need for cooling.

- **Release**

  The field **Release** has to be green to allow for the cooling to be started.

⚠	**Caution!** It must be possible to start the cooling system in emergencies. This means that the system should be checked for correct functioning after it has not been used for some time. A failure of the cooling system puts the birds' life at risk.

- **Requested cooling**

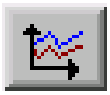
  The required cooling is displayed in % here.

11.2.1.2 Temperature

- **Curve start of cooling and band width**

  The values that are pre-set in the curve determine by how much the set temperature value has to be exceeded to start cooling. In addition, the curve also pre-sets the deviation of the set temperature before cooling runs at 100 %.

  The currently valid temperature for the start is displayed in the field **Start cooling at set temperature plus**. The band width is shown in the field **Band width for cooling**.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Set temperature**

  The currently set temperature is displayed here. It is determined by the curve's set temperature, the manual correction and the comfort temperature.

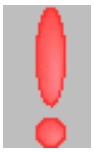
- **Current temperature**

  The current house temperature, measured by the active temperature sensors, is displayed here.

11.2.1.3 Humidity

- **Switch off cooling when humidity is exceeded**

  For safety reasons, it is necessary to turn off cooling if the air humidity is too high. This value should be adjusted to the region's climate. As a general rule, it should be set to approx. 85 % RH.



If the value is exceeded, a red exclamation mark appears behind the parameter. This indicates that the humidity in the house is too high.

If the humidity sensor reports a failure, **Switch off cooling when humidity is exceeded** is deactivated.

- **Switch on cooling if humidity is below**

  If the cooling has been switched off due to too high humidity, it cannot start before the humidity has not fallen to an acceptable value. A humidity of approx. 75 % RH should be entered here, so that the system is not switched on and off too often.

Caution!

Do not switch, e.g. via manual control, cooling to continuous operation on warm and humid summer days, as the humidity might increase to dangerously high levels.

- **Current air humidity**

  The current air humidity is displayed here.

11.2.1.4 SuperCool

In dependence of the first pump, a second pump can be connected using the function **SuperCool**.

- **Number of cycles at 100 % cooling for start "SuperCool"**

  For the system to know when the pump for SuperCool may be switched on, enter for how many cycles the cooling must have been operating at 100 % cooling needs under **Number of cycles at 100 % cooling for start SuperCool** to turn on the second pump.

- **Number of cycles below 100 % cooling for stop "SuperCool"**

  To switch the pump off, enter for how many cycles the pumps must have been operating below 100 % under **Number of cycles below 100 % cooling for stop SuperCool**.

- **Status SuperCool**

  The status field "SuperCool" displays whether additional cooling is needed. If the window is green and shows **SuperCool on**, the additional cooling has been started via the cycle. If the window is grey and shows **SuperCool off**, there is no need for additional cooling.

11.2.2 Humidification

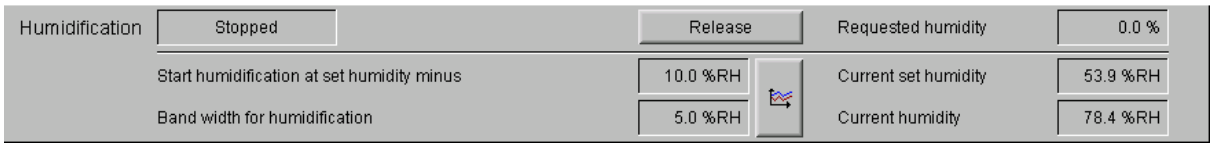


Figure 11-6: Settings humidification

- **Status humidification**

  The humidification status field displays if there is a need for humidification. If the window is green and shows **Started**, the humidification has been started via the cycle. If the window is grey and shows **Stopped**, there is no need for additional humidification.

- **Release**

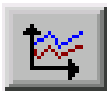
  The field **Release** has to be green to allow for the humidification to be started.

	Humidification should be switched off if no air humidification is required by the system.

- **Curve start of humidification and band width**

  The values that are pre-set in the curve determine by how much the humidification has to fall below the set humidity value to start cooling. In addition, the curve also pre-sets the deviation of the set humidification before humidification runs at 100 %.

  The currently valid humidity for the start is displayed in the field **Start humidification at set humidity minus**. The band width is displayed in the field **Band width for humidification**.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Requested humidification**

  The required humidification is displayed in % here.

- **Current set humidity**

  The current set humidity is displayed here.

If the humidity sensor reports a failure, **humidification** is deactivated.

- **Current humidity**

  The current air humidity is displayed here.

11.3 Soaking

Figure 11-7: Settings soaking

- **Status soaking**

  The soaking status field shows whether the pump is switched on. If the window is green and shows **Started**, the soaking has been started via the cycle.

- **Release**

  The field "Release" has to be green to allow for the soaking to be started.

⚠	**Caution!** Soaking should be turned off if production has started and birds are in the house.

- **Start and stop time**

  Enter here in which time period soaking should be active.

  If no production cycle is started, the release for soaking is deactivated after this time. If a starting time of 00:00 and a stop time of 24:00 are entered, the house is soaked continuously.

- **Pulse and pause time**

  To ensure that not too much water is pumped into the house, soaking the house too much, it is necessary to enter pulse and pause times. These times determine for how long the pumps should operate.

12 Tunnel mode

Clicking on the button **Tunnel parameter** opens the menu in which all required entries for controlling a house in tunnel mode can be carried out.

Figure 12-1: Tunnel mode

	This menu will only be available if the service technician configured the ventilation system as a tunnel or Combi Tunnel system during initial operation.

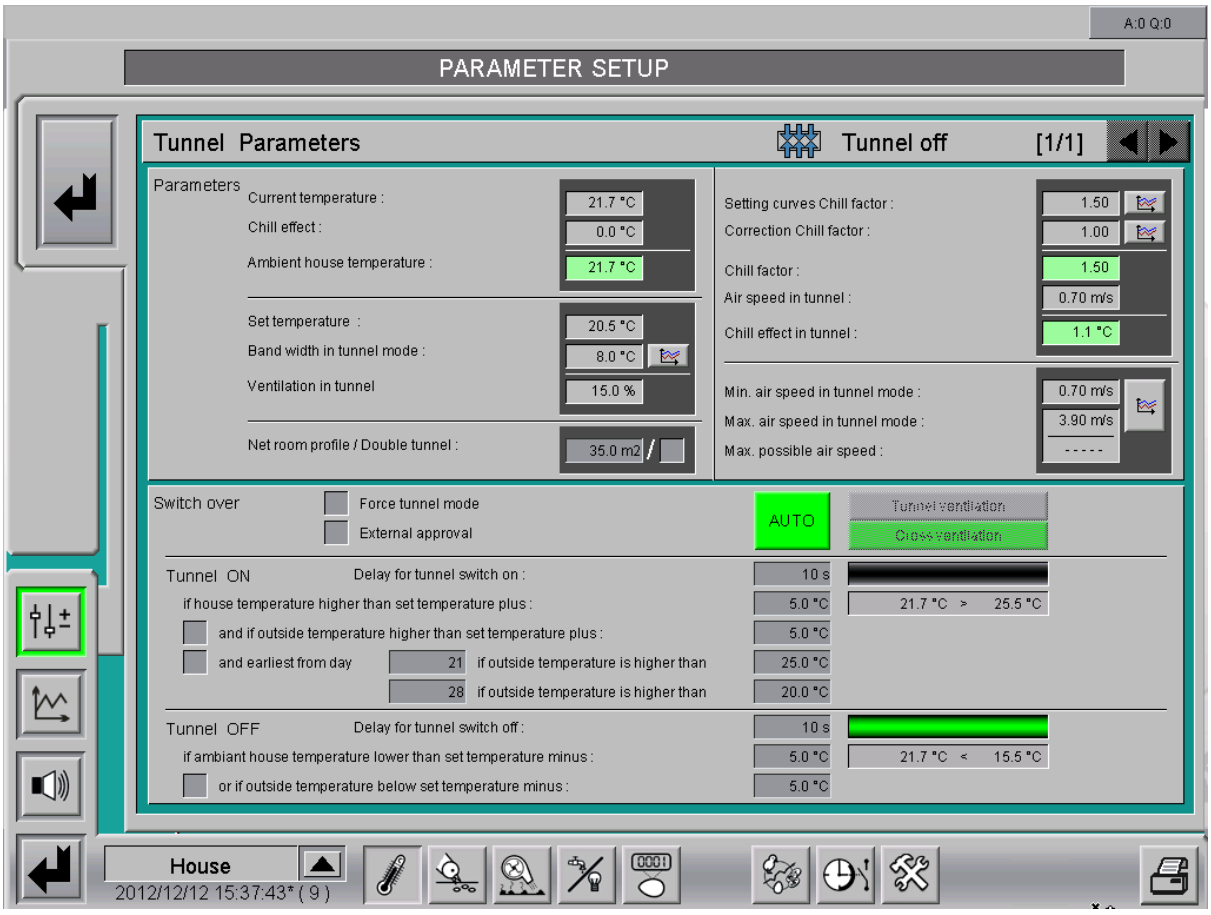


Figure 12-2: Settings tunnel mode

12.1 Parameters

The set temperature, band width, properties, chill effect and the possible air speed are defined by the parameters.

12.1.1 Current temperature

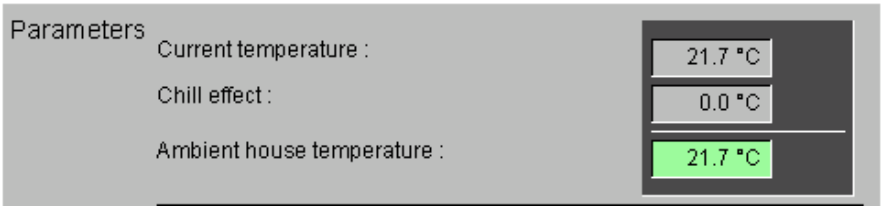


Figure 12-3: Current temperature

- **Current temperature**

  The current temperature displays the average temperature of all selected temperature sensors in the house.

- **Chill effect**

  The difference of the temperature experienced by the birds compared to the "real" temperature is displayed here in °C. The experienced temperature (windchill) is calculated based on the chill factor and the air speed.

- **Ambient house temperature**

  The house temperature as experienced by the birds is displayed here.

12.1.2 Set temperature

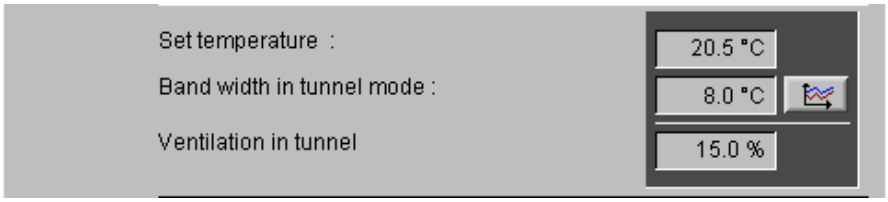


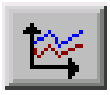
Figure 12-4: Set temperature

- **Set temperature**

  The current set temperature of the first zone is used as value for the set temperature.

- **Band width in tunnel mode**

  As the birds feel that the temperature after the switch to tunnel mode is lower due to the created air speed, it is possible to determine the band width of the tunnel mode here.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

By default, the band width is increased in the tunnel mode. This increase reduces the output of the ventilation system, otherwise the cooling effect would be too high.

- **Ventilation in tunnel**

  The ventilation in tunnel mode is calculated using the set temperature as a function of the windchill in the house and the band width in tunnel mode.
  If the band width is e.g. 8°C, ventilation amounts to 0 % or minimum ventilation if the set temperature and the windchill factor in the house amount to 20°C. If the windchill in the house increases to 24°C, the ventilation would increase proportionally to 50 %. Ventilation would be at 100 % for a house temperature of 28 °C.

12.1.3 Room profile / Double tunnel

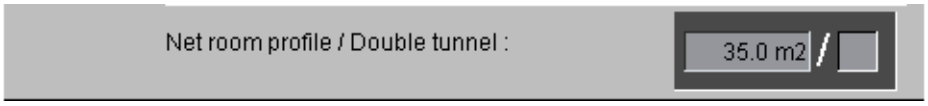


Figure 12-5: Properties

- **Net room profile**

  The net profile of the room is entered here, i.e. the profile area of the rows must be subtracted from the gross room profile.

  The system uses this value to determine and display the current air speed in tunnel mode. The value entered here must be correct.

- **Double tunnel**

  The used ventilation principle, either **double tunnel** or **single tunnel**, is set here.

  Double tunnel means that the exhaust air system is placed in the middle of the house and the intake air units (pads) are installed at the gables.

!	**Important!** The value entered during initial operation may only be changed in certain cases (e.g. structural changes), otherwise, the air speed will not be calculated correctly. A faulty calculation can cause serious consequences for the birds.

12.1.4 Chill effect

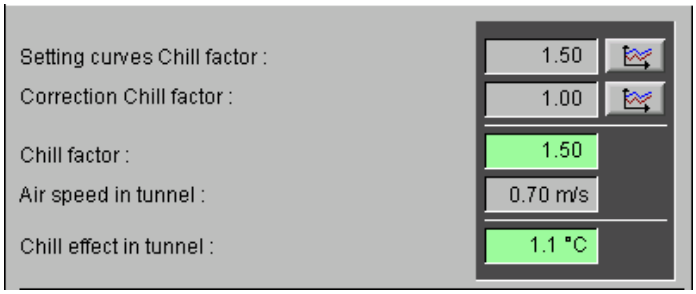


Figure 12-6: Chill effect

- **Setting curve chill factor**

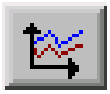
  The following figure shows a setting curve and a table with windchill values for layering hens, as recommended by many experts.

Windchill factor in °C at x m/s

Current temperature		Relative humidity		Air speed in m/sec					
Fahrenheit F	Celsius C	50%	70%	0	0,5	1	1,5	2	2,5
95		*		95	90	80	76	74	72
	35	*		35	32,2	26,6	24,4	23,3	22,2
95			*	101	96	87	84	79	76
	35		*	38,3	35,5	30,5	28,8	26,1	24,4
90		*		90	85	78	75	73	70
	32,2	*		32,2	26,6	24,4	22,8	21,1	20
90			*	96	91	84	81	78	74
	32,2		*	35,5	32,7	28,8	27,2	25,5	23,3
85		*		85	80	76	73	70	68
	29,4	*		29,4	26,6	24,4	22,8	21,1	20
85			*	89	86	81	78	76	74
	29,4		*	31,6	30	27,2	25,5	24,4	23,3
80		*		80	76	72	70	66	65
	26,6	*		26,6	24,4	22,2	21,1	18,9	18,3
80			*	83	79	76	74	69	67
	26,6		*	28,3	26,1	24,4	23,3	20,5	19,4
75		*		75	73	70	68	64	62
	23,9	*		23,9	22,8	21,1	20	17,7	16,6
75			*	78	76	74	72	68	66
	23,9		*	25,5	24,4	23,3	22,2	20	18,8
70		*		70	66	65	64	62	61
	21,1	*		21,1	18,9	18,3	17,7	16,6	16,1
70			*	74	69	67	66	65	63
	21,1		*	23,3	20,5	19,4	18,8	18,3	17,2

Figure 12-7: windchill factor

To create a curve, values for windchill at 50 % RH and 70 % RH may be entered. AMACS always calculates the valid chill factor based on the current air speed and humidity.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

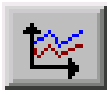
	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

	The values entered here must correspond with the birds' age and breed. The breeder can usually provide you with approximate values.

- **Correction chill factor**

  The corrective value by which the chill effect is reduced at high air speeds can be set in this curve. If the air temperature increases, the chill factor is reduced by the air speed.

  The calculated value is displayed and included in the calculation of the windchill.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

	The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Chill factor**

  The chill factor stands for the windchill as calculated using the air humidity, the temperature and the correction.

	The age of the birds plays an important role in rearing and broiler houses.

- **Air speed in tunnel**

  The current air speed in tunnel mode is always displayed here. This value is calculated using the profile of the house and the number of currently active tunnel fans.

- **Chill effect in tunnel**

  The difference of the temperature experienced by the birds compared to the "real" temperature is displayed here in °C. The experienced temperature (windchill) is calculated based on the chill factor and the air speed.

12.1.5 Air speed

In case of tunnel ventilation, this is a displacement ventilation. This means that the air is driven ("pushed") through the house. However, this procedure must not last too long as otherwise there would be a too dramatic increase in the temperature along the whole length of the house.

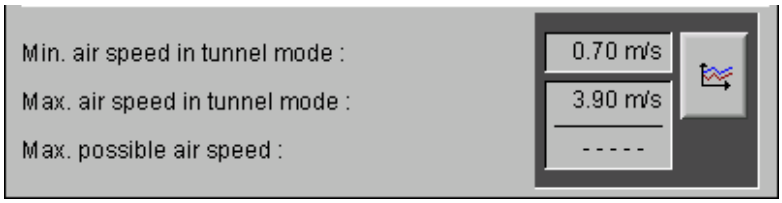


Figure 12-8: Air speed

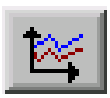
- **Minimum / maximum air speed in tunnel mode**

  In tunnel mode, the air speed may never fall below the **minimum air speed**. In practice, these values are between 0.6 m/s to 0.8 m/s.

  Similar to the minimum air speed, the **maximum air speed**, which may be reached at the respective bird age, is pre-set in a curve.

	These values have to be determined and adjusted individually for every house, as other factors such as air-tightness and the insulation of the building also play an important role. They can be entered in a curve and can therefore, in case of a rearing or broiler house, also be adjusted to the animals' age.

	There are no limits in a **layer house**, as these birds are well-feathered and the cooling effect is always the same. In a **rearing house**, observe the breeder's recommendations and increase the air speed slowly in accordance with the bird age.



To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Maximum possible air speed**

  The system can calculate the maximally possible air speed using the profile section in m² and the installed air performance for tunnel mode.

12.2 Switch over

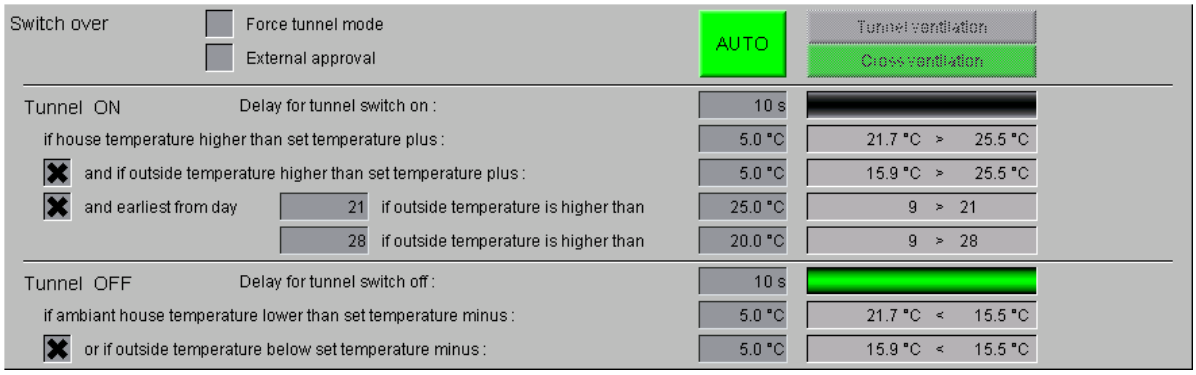


Figure 12-9: Switch over

12.2.1 Force tunnel mode

If the house's ventilation system is configured purely as a **tunnel system**, all parameters leading to a switch to side ventilation can be hidden by activating the checkbox **Force tunnel mode**.

Figure 12-10: Force tunnel mode

⚠	**Caution!** If the house is built as **only tunnel system**, the setting **Force tunnel mode** may under no circumstances be changed while the system is operating.

12.2.2 External approval

If the external approval is active due to the marked checkbox, the tunnel mode is turned on and off via the signal. All houses on the farm can thus be locked together to prevent consumed air from other houses from being drawn in.
All parameters leading to a switch to side mode are hidden.

Figure 12-11: External approval

12.2.3 Manual switch over

The switch to tunnel mode can be set to manual by using the green button **AUTO**. Clicking on it turns the button orange. The text **MANUAL** is displayed. The cross or tunnel ventilation can now be activated manually.

By default, the button must be green and display **AUTO**.

Figure 12-12: Manual switch over

12.2.4 Automatic switch over

Normally, the tunnel mode should be switched on and off via the automatic switch over. Enter here when the system should switch to tunnel mode and at which temperature the cross ventilation should start again.

12.2.4.1 Tunnel ON

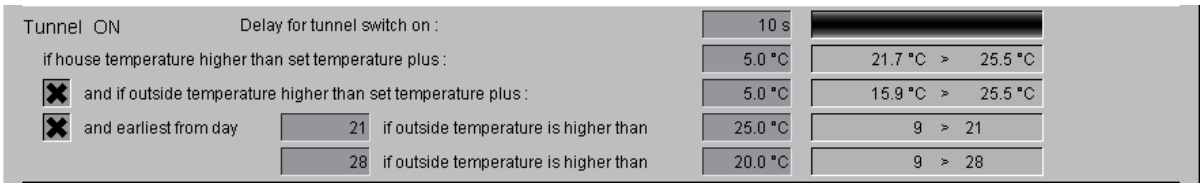


Figure 12-13: Tunnel ON

- **Delay for tunnel switch on**

  The value that is entered here avoids that the system switches too fast to tunnel mode once all conditions are fulfilled. The green bar displays the current status of the running timer.

- **If house temperature higher than set temperature plus**

  The requirements for the start of the tunnel mode are defined here. It can be selected that the system switches to tunnel mode once the set temperature is plus e.g. 5°C. The green status field behind this display shows the current temperature and the pre-set temperature for activation of the tunnel mode.

- **and if outside temperature higher than set temperature plus**

  This field allows to switch on the tunnel mode depending on the outside temperature. Check the box for this. The prerequisite for the activation of the tunnel mode is that the outside temperature has been exceeded by the pre-set value. The green status field behind this display shows the current temperature and the pre-set temperature for activation of the tunnel mode.

	This function activates and deactivates the setting **or if outside temperature below set temperature minus**.

- **And earliest from day**

  To ensure that there is no switch to tunnel mode at low outside temperatures if young birds are moved into the house, these fields allow the determination of two specific production days for the activation of the tunnel mode. If the outside temperature is higher than X degrees on these days, the tunnel mode is switched on if the checkbox is active. The green status field behind this display shows the current temperature and the pre-set temperature for activation of the tunnel mode.

12.2.4.2 Tunnel OFF

Figure 12-14: Tunnel OFF

- **Delay for tunnel switch off**

  The value that is entered here avoids that the system switches the tunnel mode off too fast once all conditions are fulfilled.
  The green bar shows the current status of the running timer.

- **If ambient house temperature lower than set temperature minus**

  The requirements for the end of the tunnel mode are defined here. It can be selected that the system switches off tunnel mode once the windchill is lower than the set temperature minus e.g. 5°C.

  The green bar next to this display shows the current windchill and the pre-set temperature for activation of side ventilation.

  If the conditions for a switch to cross ventilation have been met but the stopping of the chill effect would cause a switch back to tunnel mode, there is a delay until the tunnel mode can be turned off safely. A red exclamation mark is displayed in this case.

- **or if outside temperature below set temperature minus**

  This field allows to switch off the tunnel mode depending on the outside temperature.

  Check the box for this. The prerequisite for the deactivation of the tunnel mode is the temperature falling below outside temperature by the pre-set value.

  The green bar next to this display shows the current outside temperature and the set temperature for activation of the cross ventilation.

This function activates and deactivates the setting **and if outside temperature higher than set temperature plus**.

13 Pad cooling

Clicking on the button "Pad cooling" opens a menu in which the settings for pad cooling can be carried out.

Figure 13-1: Pad cooling

	This menu will only be available if the service technician configured the ventilation system as tunnel or Combi Tunnel system with pad cooling during initial operation.

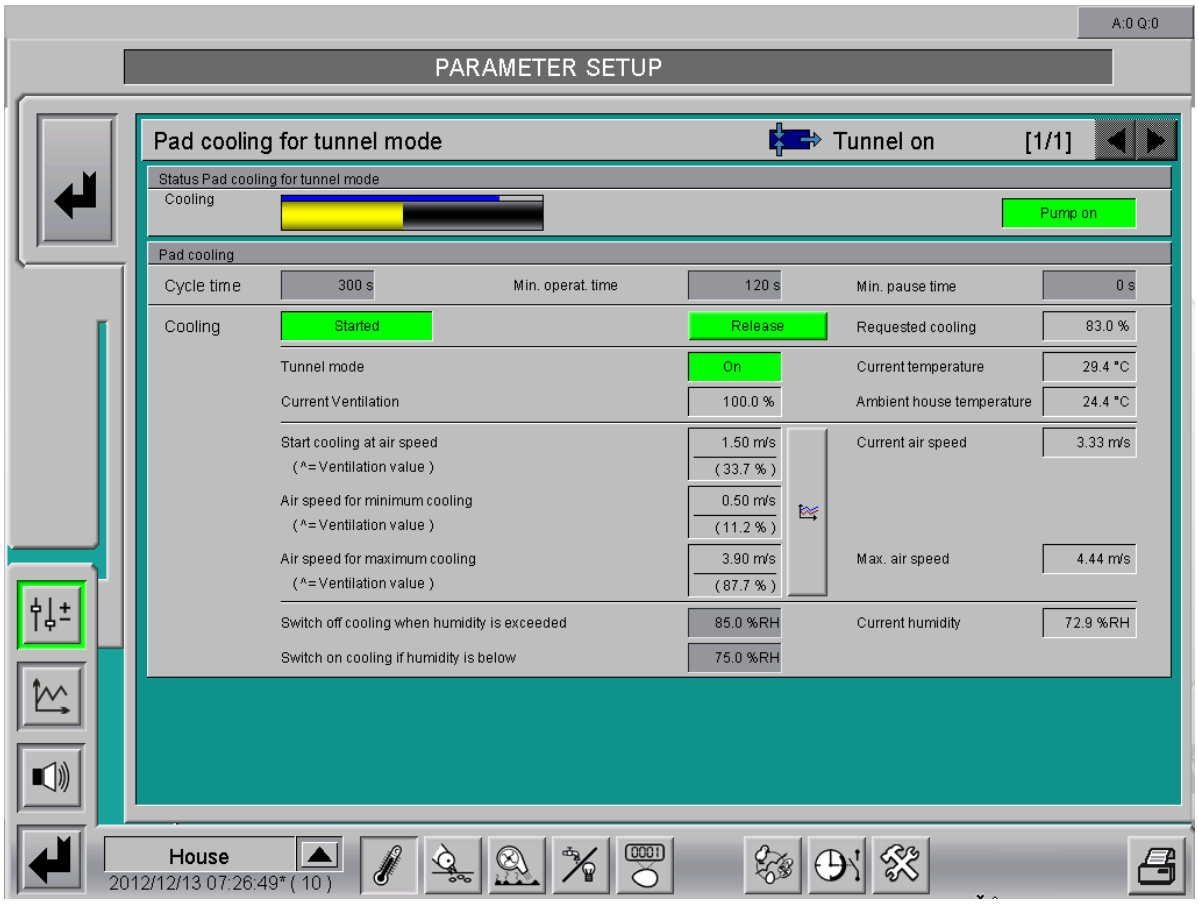


Figure 13-2: Settings pad cooling

13.1 Status pad cooling

The figure below shows the status of the current pad cooling cycle. The right-hand side of the menu displays the current status of the pump (**Pump off** or **Pump on**).

Figure 13-3: Status display

The course of a cycle can be followed by the big yellow bar, which continuously shows the course of the cycles.

If the pump is turned on, the calculated duration of the cooling process is depicted for this current cycle as a blue bar above the yellow one.

13.2 Cycle pad cooling

Figure 13-4: Cycle

- **Cycle time**

  The cooling is not simply controlled by an On/Off principle but is calculated depending on the in-house air speed.

  The required values can be found in a curve. A variable operating time is calculated depending on the air speed in the house, so that the cooling needs can be controlled more evenly.

  A value between 120 and 300 seconds is recommended.

- **Minimum operating time**

  To prevent short switching on of the pump, a value, usually between 120 and 180 seconds, is pre-set as minimum operating time.

  The value has to be this great to ensure that the pump is able to humidify the pad completely. On the other hand, the value should not be too low so that the in-house humidity does not increase by too much too early.

- **Minimum pause time**

  Once the cooling turns off, it will wait for the pre-set time before it starts once again.

  This is necessary to give the system enough time to shut down and also to reduce the in-house air humidity as much as possible.

Important:

The pads **must not dry out** between the cycles because this reduces their lifetime.

In regions where humidity permits, the pads can be operated without break times.

13.3 Settings pad cooling

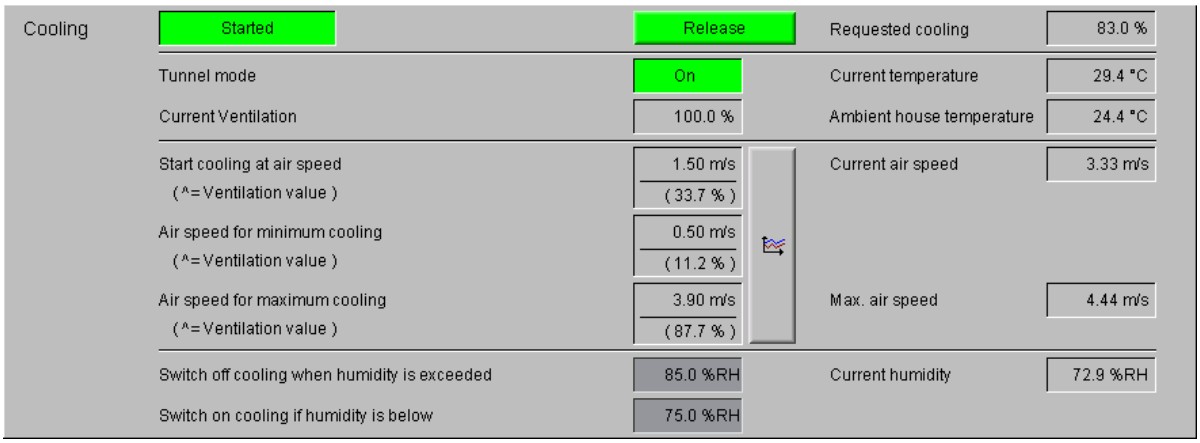


Figure 13-5: Settings pad cooling

13.3.1 Status

- **Status cooling**

  The cooling status field displays if there is a need for cooling. If the window is green and shows **Started**, the cooling has been started via the cycle. If the window is grey and shows **Stopped**, there is no need for cooling.

- **Release**

  The field **Release** has to be green to allow for the cooling to be started.

	Cooling should only be turned off if absolutely necessary.

	**Caution!** It must be possible to start the cooling system in emergencies. This means that the system should be checked for correct functioning after it has not been used for some time. A failure of the cooling system puts the birds' life at risk.

- **Requested cooling**

  The currently measured capacity (operating time in %) of the cooling depending on the air speed is displayed here.

13.3.2 Tunnel mode

- **Tunnel mode**

  The mode the house is in (tunnel or cross ventilation) is displayed here.

- **Current ventilation**

  The current ventilation in tunnel mode is displayed here. In the case of cross ventilation, - - - - is displayed.

- **Current temperature**

  The **current house temperature** displays the average temperature of all selected temperature sensors.

- **Ambient house temperature**

  The house temperature as experienced by the birds during tunnel mode is displayed here. In the case of cross ventilation, - - - - is displayed.

13.3.3 Air speed

- **Current air speed**

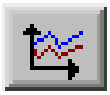
  The calculated air speed in tunnel mode is displayed here. In the case of cross ventilation, - - - - is displayed.

- **Maximum air speed**

  The system can calculate the maximally possible air speed using the profile section in m² and the installed air performance for tunnel mode. In the case of cross ventilation, - - - - is displayed.

- **Curve pad cooling air speed**

  The control parameters for pad cooling can be set in a curve.
  The values that are pre-set in the curve determine how high the in-house air speed has to be in order to start cooling (**Start cooling at air speed**).
  Furthermore, the curve determines how high the air speed may be for minimum cooling (**Air speed for minimum cooling**) and how much the air speed has to increase before cooling is at 100 % (**Air speed for maximum cooling**).
  The ventilation value (in %) corresponding with the settings is displayed below the respective air speed values displayed in m/s.



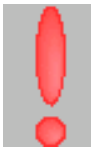
To change this value, open the curve. The curve can be opened by clicking on the button with the curve symbol. This opens a new window.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

13.3.4 Humidity

- **Switch off cooling when humidity is exceeded**

  For safety reasons, it is necessary to turn off cooling if the air humidity is too high. This value should be adjusted to the region's climate. As a general rule, it should be set to approx. 85 % RH.

  If the value is exceeded, a red exclamation mark appears behind the parameter. This indicates that the humidity in the house is too high.

If the humidity sensor reports a failure, **Switch off cooling when humidity is exceeded** is deactivated.

- **Switch on cooling if humidity is below**

  If the cooling has been switched off due to too high humidity, it cannot start before the humidity has not fallen to an acceptable value. A humidity of approx. 75 % RH should be entered here, so that the system is not switched on and off too often.

Caution!

Do not switch, e.g. via manual control, cooling to continuous operation on warm and humid summer days, as the humidity might increase to dangerously high levels.

- **Current air humidity**

  The current air humidity is displayed here.

14 Thermostats

Clicking on the button "Thermostats" opens a menu in which the free thermostats can be set.

Figure 14-1: Thermostats

	Entries can only be made if the number of thermostats has been entered during setup.

If more than eight thermostats have been configured, the settings are distributed over two screen pages.

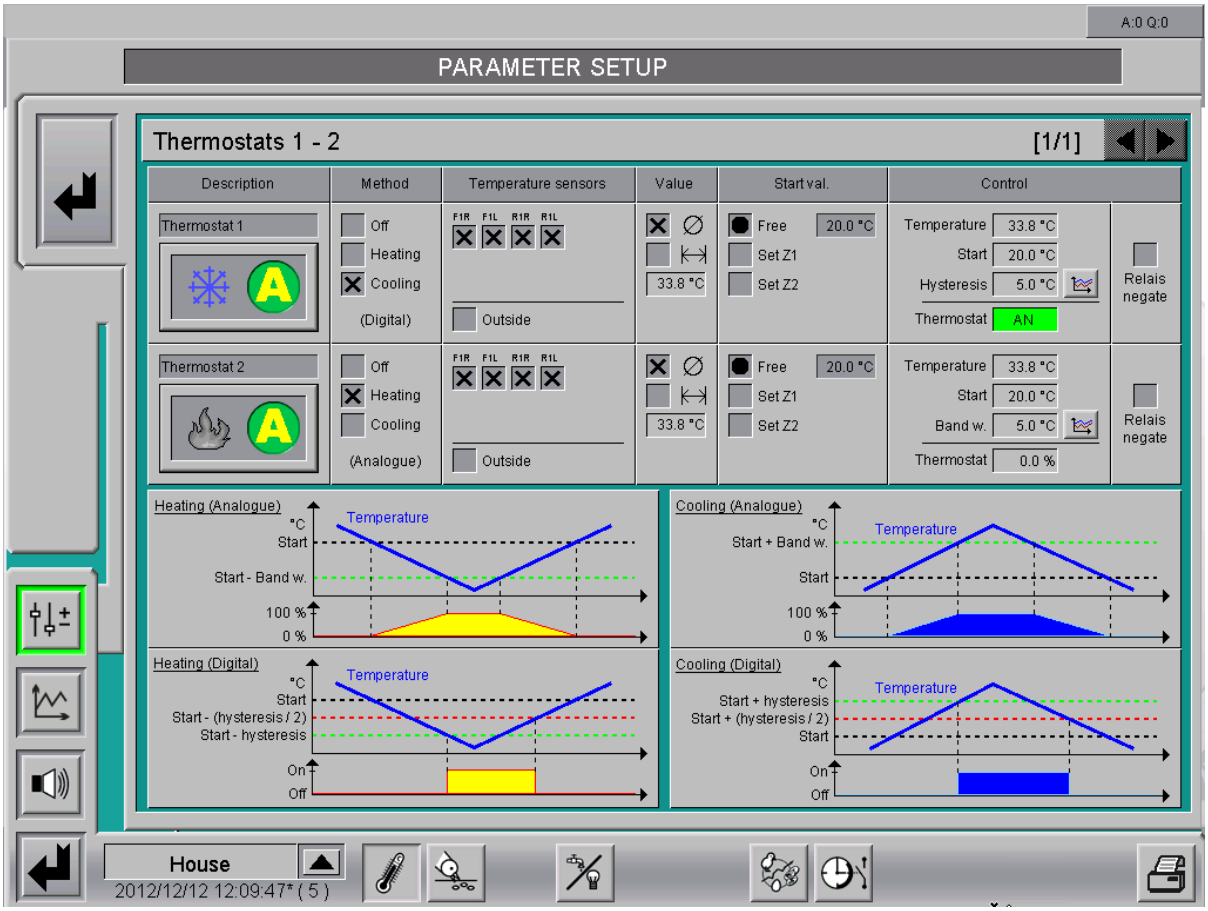


Figure 14-2: Settings thermostats

The thermostats can be used for devices that have to be activated in addition to the normal control, e.g. mixed-air fans, circulation fans, heaters and additional cooling units.

It often occurs, e.g. that mixed-air fans have to switch on when there are large temperature differences between two areas in the house. It may also be necessary to control heaters individually. It is therefore possible to select for each thermostat whether they have a cooling or a heating function.

Additionally, you can also set whether the set value of the heating should be entered relative to the set value or as a fixed switch-on value.

- **Description**

  The name of the thermostat is displayed here. However, the text can be changed at any time. The thermostats can be operated manually using the buttons below the descriptions. In addition, the mode of each thermostat is shown here. The ice crystal stands for cooling, the flame for heating.

For information on how to operate the drives, please refer to chapter

- **Method**

  The method determines what the thermostat is to control. A diagram displaying the control function of each method is shown below the last thermostat.

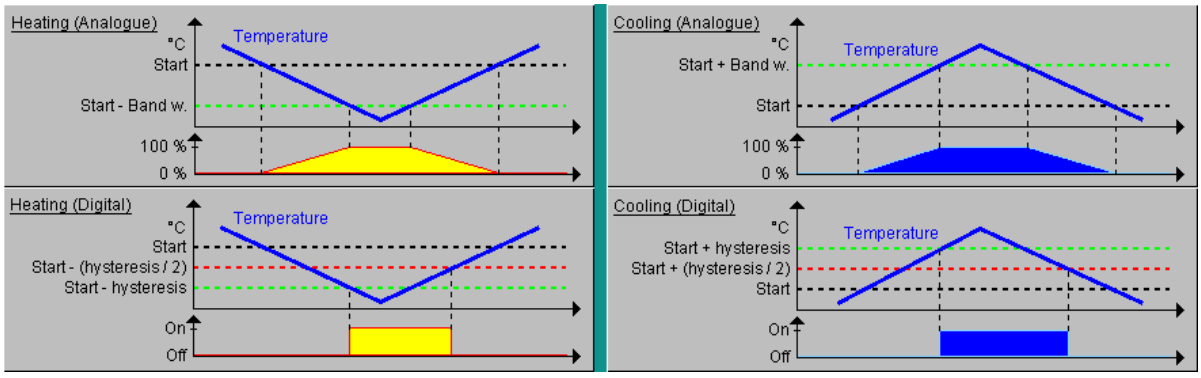


Figure 14-3: Method

- **Off**

  The thermostat is turned off.

- **Analogue heating**

  If this function is activated, the contact turns on if the starting value is not reached. The analogue value is adjusted up to the set temperature - band width at 100 %. The contact turns off as soon as the set temperature is exceeded.

- **Digital heating**

  If this function is activated, the contact turns on when the starting value is exceeded, and off when half of the value set at "hysteresis" is exceeded.

- **Analogue cooling**

  If this function is activated, the contact turns on when the start value is exceeded. The analogue value is adjusted up to the set temperature + band width at 100 %. The contact turns off as soon as the set temperature is not reached any longer.

- **Digital cooling**

  If this function is activated, the contact turns on when the starting value is not reached and is deactivated as soon as the value remains under the starting value minus half the value that has been pre-set at "hysteresis".

- **Temperature sensors**

  The house temperature sensor to be used for calculating the measured value can be selected here by checking the box.
  In addition, the outside temperature sensor can be selected for calculation of the value.

- **Value**

  The current value is shown either as measured average or difference of the temperature sensors, depending on the selected function.

- **Average**

  If this function (value: Ø) is selected, an average of the active sensors is used to create the measured value.

- **Difference**

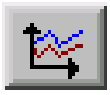
  If this function (value: <-->) is selected, a difference between the measured temperatures will activate switching of the thermostat contact. It is also possible to react to the difference between the selected inside temperature sensors and the outside temperature sensor.

- **Starting value**

  The starting value determines whether a free set temperature or the set temperature of the first / second zone should be used. If the set temperature of a zone is selected, a correction (+/-) can be entered additionally.

- **Control**

  The settings described above are listed and explained here.



The hysteresis (digital) or band width (analogue) curve can be set via the bird age for the control reaction.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Negating relays**

  The relay can be negated with this function, i.e. the relay is active when the thermostat is turned off.

  If applicable, this function may only be used if the fan groups are controlled by the thermostats and are thus turned on even if the control fails.

Important:

Never use this function in case the contact is selected for **heating.**

A control failure would then cause the heating system to be turned on, thus **overheating** the house.

15 Measuring fans

Clicking on the button **Measuring fans** opens a menu in which the settings for the measuring fans can be carried out.

Figure 15-1: Measuring fans

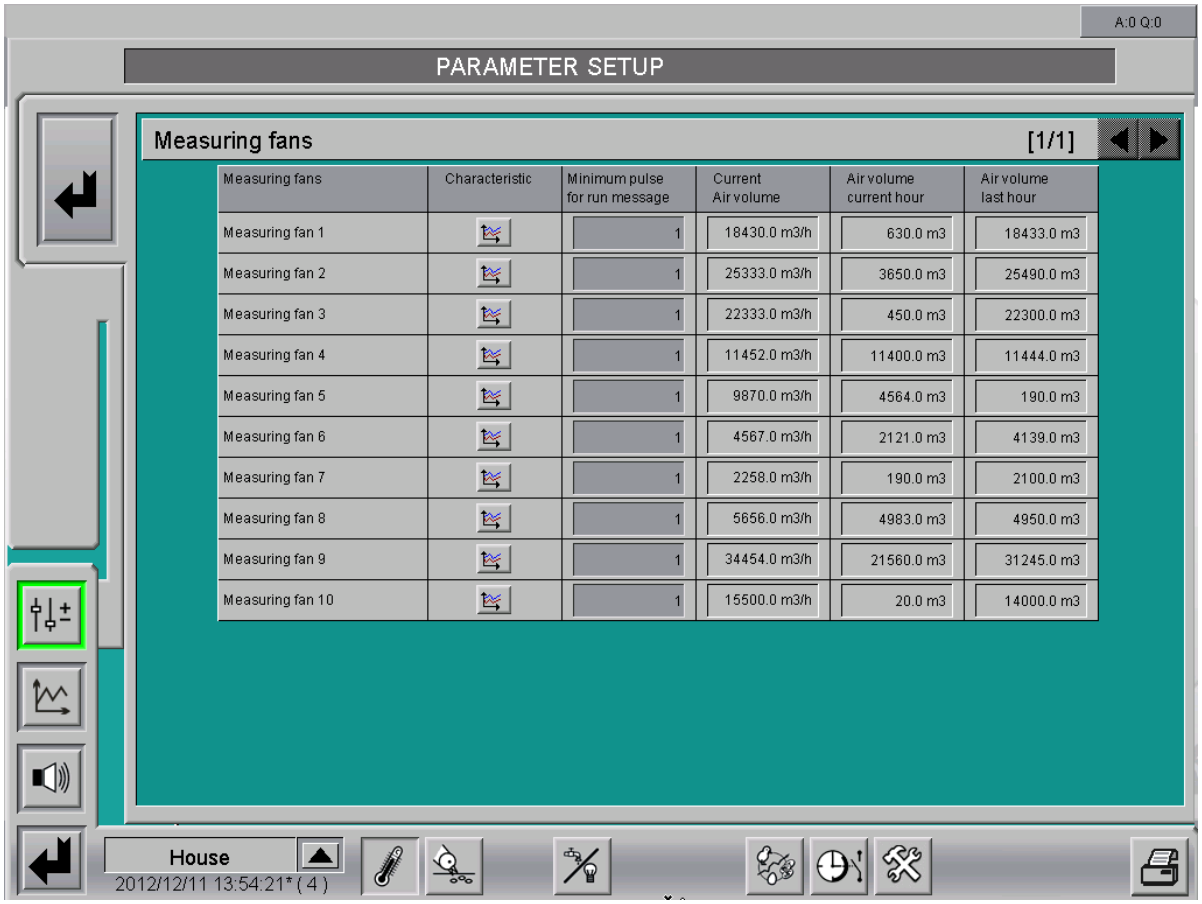
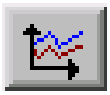


Figure 15-2: Settings measuring fans

- **Characteristics**



The curve view can now be used to set up to 20 curve points per measuring fan in the characteristics curve. Additionally, reference curves for the D64, D73 and D92 measuring fans can now be loaded.

If more impulses/second than recorded by the last curve point are measured, the values are extrapolated as soon as sensible air volumes can be calculated again.

The values in this curve are changed and stored as described in the **AMACS User manuel chapter set curves**.

- **Minimum impulse for run message**

  The impulse value determining from when a stable air flow can be measured, can be entered via the "minimum impulse". Measured air volumes below the impulses are rejected.

- **Current air volume**

  The current air volume is displayed here.

- **Air volume current hour**

  The averaged air volume of the current hour is displayed here.

- **Air volume last hour**

  The averaged air volume of the previous hour is displayed here.

16 Alarm description

In the alarm settings you can choose which alarms you require and when they should appear. In addition you can state whether the alarm is to be issued by the alarm device or sent to the users by e-mail.

Attention!

All alarms are activated as standard!
Before deactivating an alarm you should check whether it is really not required. Alarms help to prematurely recognise problems that may potentially endanger the animals' health. Alarms should not be viewed as disturbing but as a chance to be able to keep the productivity of the house at a consistently high level.

How to operate the **alarm settings** can be found in the **Amacs Operation** manual.

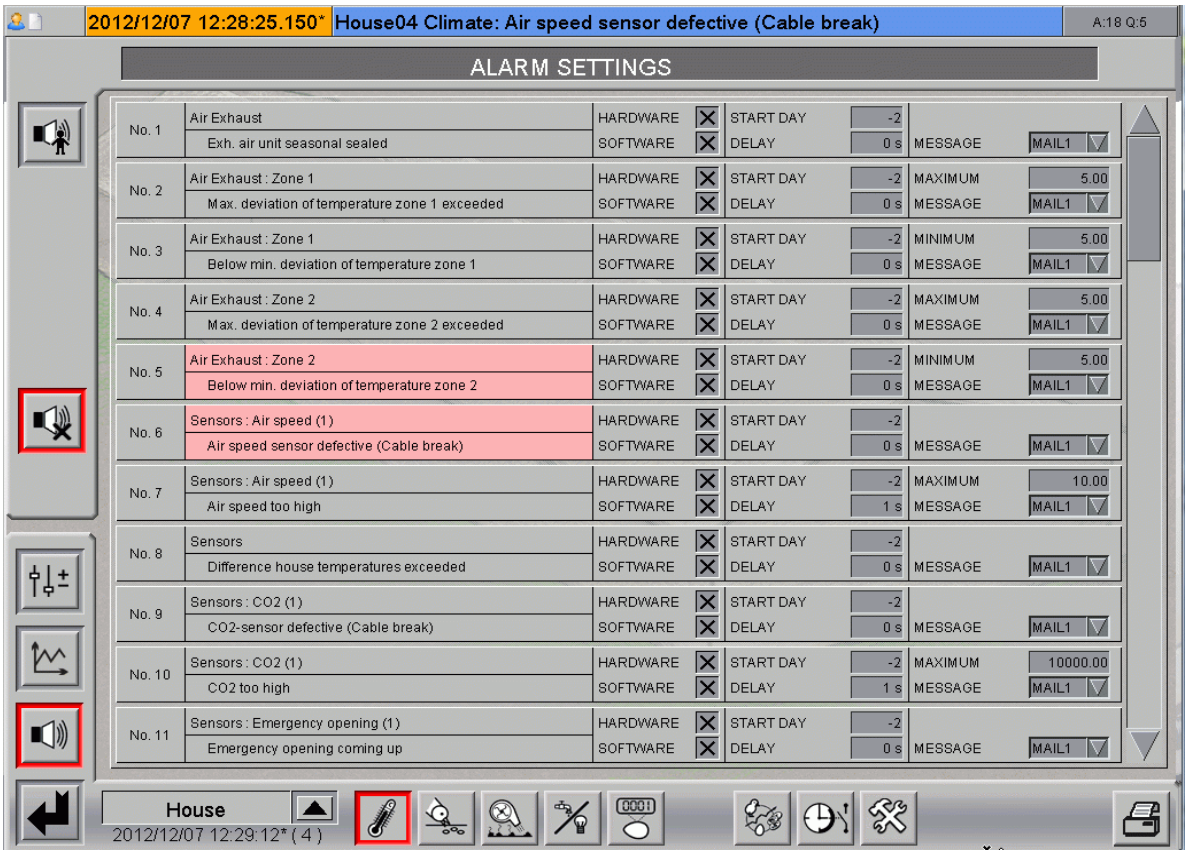


Figure 16-1: Alarm settings

This section describes the various alarms shown in the message line and their cause. You will find information regarding how to operate the message line in the manual Amacs Operation.

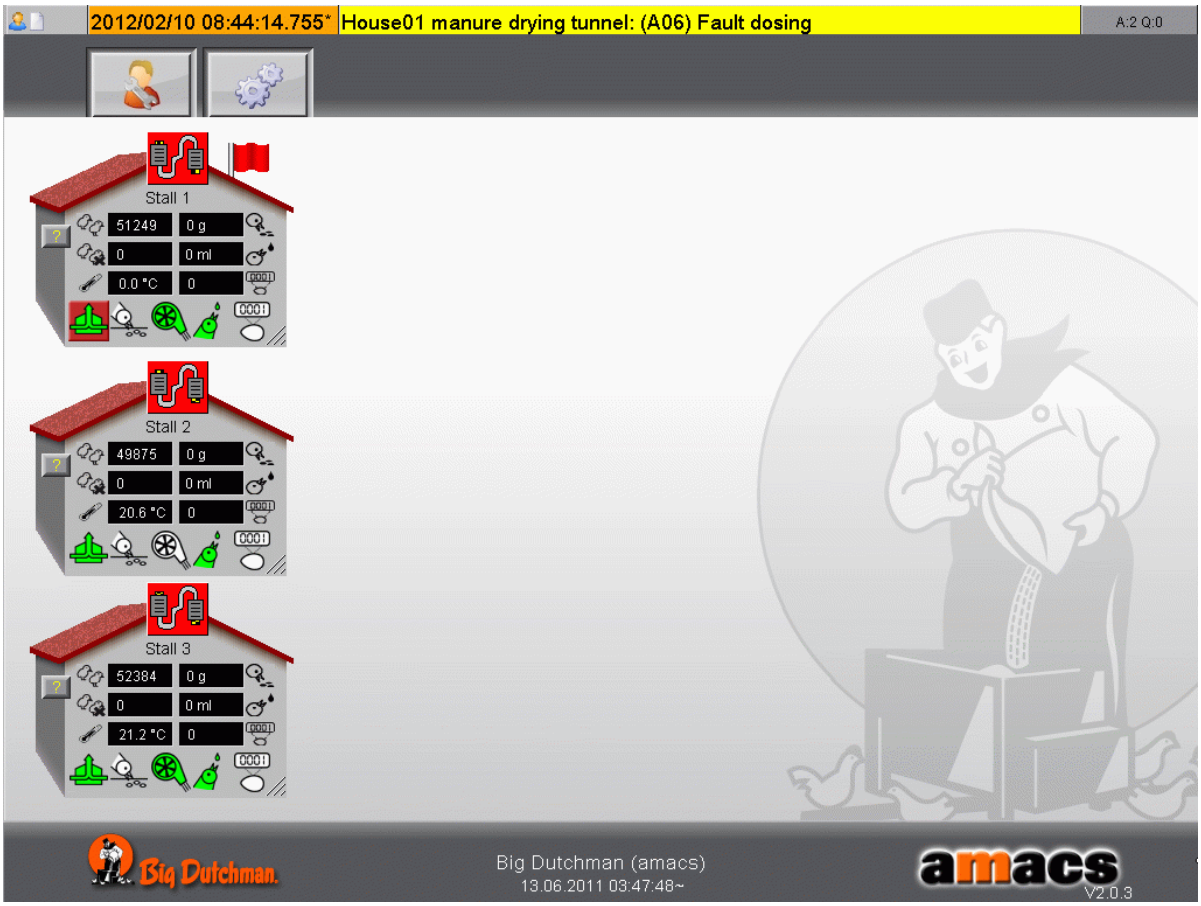


Figure 16-2: Message line

Difference house temperature exceeded
The maximally allowed difference between the different house temperatures has been exceeded.
Temperature sensor [1-12] defective (cable break)
The temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
House temperature [1-12] ([NAME]) too high
The house temperature [1-12] is greater than the set maximum temperature.
House temperature [1-12] ([NAME]) too low
The house temperature [1-12] is lower than the set maximum temperature.

Table 16-1: Alarms sensors - house temperature

Outside temperature sensor defective (cable break)
The outside temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Outside temperature sensor wrong position
The maximally allowed difference to the house temperature has been exceeded.
Outside temperature too high
The outside temperature sensor is above the set maximum temperature.
Outside temperature too low
The outside temperature sensor is below the set maximum temperature.
Outside temperature sensor not reachable (network)
The connection to the other house has been interrupted. The outside temperature cannot be transmitted.

Table 16-2: Alarms sensors - outside temperature

Negative pressure sensor missing (cable break)
The negative pressure sensor indicates an alarm after an adjustable control time has elapsed without changes.
Negative pressure too high
The negative pressure sensor is above the set maximum limit.
Negative pressure too low
The negative pressure sensor is below the set maximum limit.

Table 16-3: Alarms sensors - negative pressure

Humidity sensor [1-2] defective (cable break)
The humidity sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Humidity above set humidity (humidity sensor [1-2])
The humidity sensor is above the set maximum limit.
Humidity below set humidity (humidity sensor [1-2])
The humidity sensor is below the set maximum limit.

Table 16-4: Alarms sensors - humidity

Outside humidity sensor defective (cable break)
The outside humidity sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Outside humidity too high
The outside humidity sensor is above the set maximum limit.
Outside humidity too low
The outside humidity sensor is below the set maximum limit.

Table 16-5: Alarms sensors - outside humidity

CO^2 sensor defective (cable break)
The CO^2 sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
CO^2 too high
The CO^2 level is above the set maximum limit.

Table 16-6: Alarms sensors - CO^2

NH^3 sensor [1-2] defective (cable break)
The NH^3 sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
NH^3 too high(NH^3 sensor [1-2])
The NH^3 level is above the set maximum limit.

Table 16-7: Alarms sensors - NH^3

Air speed sensor defective (cable break)
The air speed sensor indicates an alarm after an adjustable control time has elapsed without changes.
Air speed too high
The air speed is above the set maximum limit.

Table 16-8: Alarms sensors - air speed

Wind velocity too high
The wind velocity is above the set maximum limit.

Table 16-9: Alarms sensors - wind velocity

Emergency opening coming up
The emergency opening is activated when the temperature measured by the emergency opening exceeds the temperature set for the emergency opening.
Setup emergency opening minimum above set temperature
The value set at the emergency opening falls below the alarm settings.
Setup emergency opening maximum above set temperature
The value set at the emergency opening exceeds the alarm settings.
Safety thermostat coming up
The safety thermostat installed in the house has been activated.
Fire alarm coming up
The fire alarm system installed in the house has triggered an alarm.
Phase monitoring coming up
The phase monitoring in the control cabinet indicates an error for the house's power supply.

Table 16-10: Alarms sensors - external inputs

Max. deviation of temperature zone [1-2] exceeded
The zone temperature is above the set temperature plus the maximum value set here.
Min. deviation of temperature zone [1-2] exceeded
The zone temperature is below the set temperature minus the minimum value set here.
Exhaust air sealed due to winter
Too many fans sealed due to winter. No sufficient fresh air.

Table 16-11: Alarms sensors - exhaust air set value

Rust protection started
The fans are started shortly to prevent rust and damage to bearings.
Damper [1-3] wrong position
The damper of the stepless fan has not reached its set position within the maximum time.

Table 16-12: Alarms - exhaust air ventilation

Heatexchanger [1-2] intake air temperature sensor defective (cable break)
The intake air temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Heat exchanger [1-2] intake air temperature sensor too high
The intake air temperature is above the set maximum temperature.
Heat exchanger [1-2] intake air temperature sensor too low
The intake air temperature is below the set minimum temperature.

Table 16-13: Alarms sensors - Earny heat exchanger

Intake air flap [1-24] wrong position
The intake air flap has not reached its set position within the maximum time.
Exhaust air flap [1-24] wrong position
The exhaust air flap has not reached its set position within the maximum time.

Table 16-14: Alarms - intake air

Heating [1-6] fault
The heating indicates a heating fault via an external signal.
Return temperature sensor heating [1-6] defective (cable break)
The return temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Return temperature sensor heating [1-6] too high
The return temperature is above the set maximum temperature.
Return temperature sensor heating [1-6] too low
The return temperature is below the set minimum temperature.
Pre-run temperature sensor heating [1-6] defective (cable break)
The pre-run temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Pre-run temperature sensor heating [1-6] too high
The pre-run temperature is above the set maximum temperature.
Pre-run temperature sensor heating [1-6] too low
The pre-run temperature is below the set minimum temperature.
Floor temperature sensor heating [1-6] defective (cable break)
The floor temperature sensor indicates an alarm after an adjustable control time has elapsed without changes and when reaching the end of the measuring range.
Floor temperature sensor heating [1-6] too high
The temperature at floor level is above the set maximum temperature.
Floor temperature sensor heating [1-6] too low
The temperature at floor level is below the set minimum temperature.

Table 16-15: Alarms - heating