BO-AIR CL

AIR INLET CONTROL
FOR NATURALLY VENTILATED HOUSES

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Copyright/Disclaimer

1 About this manual

The manual is intended for the user of this device. It contains all the information necessary for operating and cleaning this product. Please read all information and instructions carefully before using the product. Symbols mark warnings, important notes, tips, etc. in this manual. This manual has been compiled with all due care. If you find any errors, please let us know.

1.1 Symbols and definitions


Risk of injury by dangerous electric shock. Danger to people and animals.


Warning indicating danger to product, people and animals if procedures are not strictly complied with.


Warning indicating damage to products if procedures are not strictly complied with.


Pressure cleaning is not allowed.


Collect as separate flows


Important note


Additional information


Example of a concrete application of the functionality described.


Example calculation


Manual control


Tips and advice


Screenshot


Application note

1.2 Customer service

If you have any questions, please contact your installer. Be sure to have all the necessary data handy. You should also always write down the cause of a fault and the circumstances that occurred during the fault. This will enable you to avoid any ambiguities and it will enable your installer to deal with any faults quickly and effectively.

2 Safety instructions and warnings

Read the general safety instructions in this chapter carefully before using the device. A certified installer must install the device and resolve any faults, in accordance with the applicable guidelines. If this product is installed and used in any other way, the warranty will not apply.

2.1 Sound, independent alarm system

Although we have designed and built our control equipment with the greatest care possible, technical faults can never be ruled out. Insurance requirements in many countries are becoming increasingly stringent. This requires the alarm contacts of the various control computers to be connected a central alarm unit.


We recommend also installing a sound independent alarm system, for example a min/max thermostat.


We advise you to manually test the alarm at least once a week.

2.2 During use

The people who operate the device have read the manual carefully. They are aware of potential hazards that may arise from improper use and maintenance of the product.


The device must only be opened by authorised personnel.


Do not switch off the control computer while the house is empty, but switch it to *Off* mode. This will prevent condensation caused by the equipment cooling down.


Check the device for any damage at regular intervals. A damaged device is unsafe. Always report any damage to your installer.


Electronic equipment is splash-proof and must not be cleaned using a pressure cleaner.


If any emergency has occurred, write down: the circumstances under which the emergency occurred, installation settings, software date, software version number and possible causes.

2.3 Disposal

The EU has set up systems for the separate collection of waste electrical and electronic equipment and batteries (Directive 20212/19/EU). If you do not dispose of the device properly, you risk a fine.


Electrical and electronic equipment must be collected separately at the end of its life.

3 Introduction

3.1 Purpose of use

Equipped with a touchscreen, the BO-AIR CL is suitable for controlling ventilation, heating and cooling in today's livestock industry.

3.2 Control functions

Sensors
- 2 Room temperature sensors for measuring room temperature for compensation of curtain positions based on ΔT
- 1 Outside temperature sensor for temperature compensation
- Weather station for rain detection and measuring wind speed and direction

Curtains
- Integrated curtain control for two winch motors (left/right)
- Possibility of connecting 1- or 3-phase motors with built-in limit switches
- Motors equipped with feedback signal (potentiometer, voltage/current-based feedback) or motors without feedback signal (time-based control)
- Possibility of connecting several BO-AIR CL computers to control additional curtain motors

Ventilation
- Ventilation chimneys or recirculation fans
- Optional ventilation curve with 4 breakpoints (temperature setpoint, minimum ventilation and maximum ventilation)
- Tunnel ventilation mode (1 fan group)

Heating/cooling
- 1 on/off heating control
- 1 on/off or modulating cooling control

General
- Logging room temperature, current ventilation, curtain positions left/right and wind speed for graphical display on the BO-AIR CL
- Multiple control modes via LMN bus communication. The BO-AIR CL can be configured in four ways to send and receive additional data:
  - Standalone controller
  - Primary controller
  - Secondary controller
  - Follower

4 Controls

4.1 General

The BO-AIR CL controller has four operational zones (from low to high temperature):

	Zone	Temperature control
1	Heating	$T_{\text{setpoint ridge ventilation}} - T_{\Delta, \text{heating}}$
2a	Ridge ventilation	$T_{\text{setpoint ridge ventilation}}$
2b	Curtain control	$T_{\text{setpoint ridge ventilation}} + T_{\Delta, \text{curtain control}}$
3	Tunnel ventilation	$T_{\text{setpoint ridge ventilation}} + \text{Bandwidth}_{\text{ridge ventilation}} + T\Delta_{\text{, tunnel ventilation}}$
4	Tunnel cooling	$T_{\text{setpoint ridge ventilation}} + \text{Bandwidth}_{\text{ridge ventilation}} + T\Delta_{\text{, tunnel ventilation}} + T\Delta_{\text{, tunnel cooling}}$

Ridge ventilation is the main control in the BO-AIR CL controller. The temperature setpoint for this control is leading. All temperature setpoints for the other controls are calculated based on this set temperature.
The ridge ventilation can be disabled. The curtain control then takes over and all temperatures are relative to the temperature setpoint for the curtains:

	Zone	Temperature control
1	Heating	$T_{\text{setpoint curtain control}} - T_{\Delta, \text{heating}}$
2	Curtain control	$T_{\text{setpoint curtain control}}$
3	Tunnel ventilation	$T_{\text{setpoint curtain control}} + \text{Bandwidth}_{\text{curtain control}} + T\Delta_{\text{, tunnel ventilation}}$
4	Tunnel cooling	$T_{\text{setpoint curtain control}} + \text{Bandwidth}_{\text{curtain control}} + T\Delta_{\text{, tunnel ventilation}} + T\Delta_{\text{, tunnel cooling}}$

4.2 Heating control

The heating control is an on/off control with hysteresis. The starting temperature is relative to the temperature setpoint of the ridge ventilation. You enter this offset as a positive value, but it will be subtracted from the setpoint.

4.3 Ridge ventilation control

In practice, we see different forms of ridge ventilation. The settings for a fan and a curtain control are the same. The temperature setpoint of the ridge ventilation control is an absolute value (no offset value). This control has settings for minimum, maximum and bandwidth. You can calibrate the analog output used (maximum and minimum output voltage). During calibration, the output adopts the entered setpoint. When exiting the calibration mode, normal control resumes.

When the calculated output value of the ridge ventilation changes, e.g. from 25% to 30%, the actual output value will gradually (1% per second) increase to 30%. In this way, the transition is smooth.

You can turn off the ridge ventilation. In that case, curtain control takes over. All settings related to ridge ventilation are then invisible. Instead of a bandwidth factor, a bandwidth setting for the curtain control appears.

4.4 Circulation control

The BO-AIR CL has an additional circulation control. It is only available when the ridge ventilation function is turned off. Both share the same analog output, with ridge ventilation having priority. The circulation control has its own (absolute) temperature setpoint, bandwidth, minimum and maximum ventilation settings. The actual circulation may change, but it does so in increments of 1% per second, even when the calculated value differs from the current value by more than 1%.
The circulation and ridge ventilation share the same analog output. This also applies to the calibration of this analog output.

4.5 Curtain control

The BO-AIR CL can control two curtains (left and right).

A motor controls the curtain position based on position feedback or time control. Position feedback is done with a potentiometer or using a voltage- or current-based feedback signal. With jumpers on the BP04 bottom board, you set the appropriate feedback signal. For a voltage-based feedback signal, you can use a potentiometer with three wires instead of two. 12V is then applied to the potentiometer, whose 'wiper' is connected to the analog feedback input. Bear in mind that the analog feedback input has a maximum of 10V. So do not use the full range of the potentiometer.

Feedback type	**Current / Voltage J26 (motor 1) & J27 (motor 2)**	**Potentiometer / IDE / Voltage J24 (motor 1) & J25 (motor 2)**
Potentiometer (resistive)	voltage	potentiometer
Potentiometer (voltage, max 10V)	voltage	voltage
Voltage feedback	voltage	voltage
IDE, current	current	IDE

For position feedback, calibrate the motor control once to determine the minimum and maximum positions.

Time control does not work with a feedback signal. The control computer records how many seconds the control has sent the curtains open and closed over time. Here, too, a one-off calibration is required In addition, a periodic zero-point calibration is required. After all, mechanics and small deviations in time measurement cause a difference between the actual and expected curtain position. During zero-point calibration, the curtain opens or closes once and returns to the control position without manual intervention.

If no limit switches are used, the total running time + margin is used to ensure that the motor reaches its minimum or maximum position. Using limit switches speeds up calibration. In the installer menu, the installer sets the time when the zero point calibration should be done. Only when the time base mode is active and was calibrated manually, the zero point calibration is performed once a day. After all, the close-open time period must be known to perform a zero-point calibration. Zero point calibration is also carried out after switching the controller off and on, provided that in time base mode, manual calibration was carried out and the option is enabled.

Zero point calibration is enabled by default. If necessary, it can be turned off. Zero point calibration can also be set to always go to the closed position first or to the nearest position (open or closed).

During calibration with feedback, the minimum and maximum feedback positions are determined. 10% of this range is used to detect whether the feedback value is correct. The minimum feedback value is 1.0V, the maximum feedback value is 5.0V. Thus, the range is 4.0V. If the actual feedback is lower than 0.6V (1.0V minus 10% of 4.0V) or higher than 5.4V (5.0V plus 10% of 4.0V), an alarm is triggered. As long as the alarm is active, the curtain position does not change.

! If the calculated margin is lower than 0.0V, higher than 10.0V or lower than 0Ω, no check takes place. Even in time-based mode, no check is made because the feedback signal is missing.

! If you have enabled manual curtain control in the user menu, zero point calibration does not start automatically.

The first calibration in time-based mode is performed manually. The user must execute the start and end calibration command manually. After all, the controller does not know when the end position has been reached. The end command should be given as accurately as possible to determine the time required for opening/closing as precisely as possible. When using limit switches, this is done automatically.

The curtain control does not continuously adjust the curtain position. Upon reaching a set position, the curtain stays in this position for 15 seconds. After that, the control checks the position again. A hysteresis setting also ensures that the position remains stable as long as the hysteresis is not exceeded.

The curtain control activates from an absolute temperature setpoint, with bandwidth, minimum and maximum curtain openings. A newly calculated curtain position is then sent to the BP04. The curtain mechanism ensures a smooth transition.

! When the user in time-based mode operates the motor control manually with the button on the housing, the position for the controller is unknown. The user should then restore the original position as best as possible or possibly turn off the controller for a new zero point calibration.

In time-based mode, the current position is lost after turning off the controller. Therefore, a zero point calibration is performed 30 seconds after start-up to restore the current position. Zero-point calibration must then be enabled. If you only switch off the HMI display, the BP04 bottom board will retain the current position. Nevertheless, calibration is also performed in this situation.

When switching between feedback and time-based mode, even for a short time, you need to reset the motor control.

During configuration, the limit switches must be connected correctly. In any case, connect the P-contact to the OPEN and CLOSE contacts for the motor control to work. Failure to do so will disable the magnetic switches for operating the curtains. You should also connect an external manual switch or at least jumper the P-contact and AUTO-contact.

4.6 Tunnel ventilation control

With tunnel ventilation, air flows lengthwise through the house. The curtains on the left and right are then (almost) closed. Ridge ventilation can remain active, if desired.

Tunnel ventilation uses an on/off fan and a tunnel air inlet. When the fan is on, the tunnel inlet is open. When the fan is off, the tunnel inlet is closed.
The tunnel ventilation activates at *temperature setpoint ridge ventilation/curtain control + bandwidth ridge ventilation/curtain control + temperature offset*. The actual ventilation starts after an adjustable delay to ensure that other controls are in their correct positions. Once the temperature drops again, an adjustable hysteresis is used to stop tunnel ventilation.

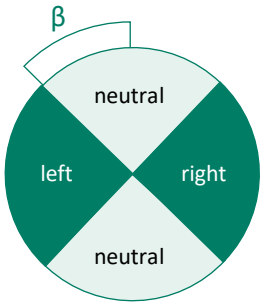
4.7 Cooling control

When tunnel ventilation is not sufficient to keep the temperature below a certain level, cooling is needed. We distinguish two ways of cooling:

- *On/off cooling control with adjustable hysteresis*
- *Modulating cooling control*
  A pulse-pause control with fixed on-time. The off-time depends on the desired cooling level, but is limited by the set minimum and maximum off-time. At the lower end of the cooling bandwidth, the same hysteresis is used as for on-off cooling. Modulating cooling controls at minimum level during hysteresis.

4.8 Wind and rain influences

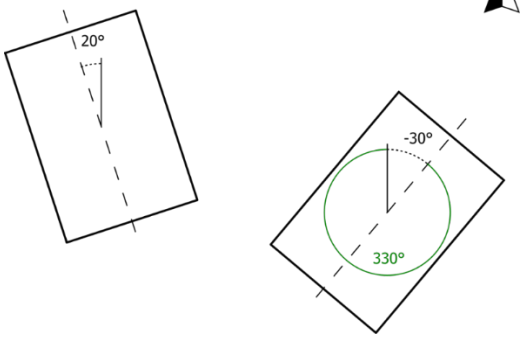
Wind influences (wind speed and wind direction) can be enabled or disabled. If enabled, wind direction measurement is used to determine which side of the barn the wind is on.



We specified a neutral zone, in which the wind comes neither from the left nor from the right. The angle of the neutral zone (β) is adjustable.

Neutral zone (β) = 40°
This means the neutral zone is 40° at the front and back.
The left and right zones are then: 180 - (2 × 20) = 140°.

To determine the wind direction, a hysteresis of 12° is used: 6° to the left and 6° to the right. At controller start-up, the direction is 0° with a hysteresis of -6° to 6°. Once the actual wind direction is 6°, then the new actual value is: this value (6° or greater) plus hysteresis.
Although the wind direction is measured on average over 10 minutes, the measured direction may fluctuate between two values, in the extreme case between neutral and left/right. A hysteresis prevents this.



If only one barn is in use, you can align the weather station with the barn: 0° is front, 180° is back.

Two or more mutually non-aligned barns with a single anemometer require an offset.
In the left example, the anemometer is oriented north-south. The required offset for the left barn is 20°, for the right barn -30°. As no negative angle can be entered, 360° - 30° = 330° must be set as the offset. The actual direction used by the controller is therefore always relative to the front-rear axis of the respective barn.

The wind speed determines to what extent the curtain control adjusts the position of the curtain on the windward side. From a certain wind speed and bandwidth, the curtain opening is reduced, starting with 0% at the beginning of the bandwidth and ending with the maximum reduction at the end of the bandwidth.

Beaufort	m/s	Description	km/h
0	0 - 0.2	Calm	0 - 0.7
1	0.3 - 1.5	Light air	0.8 - 5
2	1.6 - 3.3	Licht breeze	6 - 11
3	3.4 - 5.4	Gentle breeze	12 - 19
4	5.5 - 7.9	Moderate breeze	20 - 28
5	8.0 - 10.7	Fresh breeze	29 - 38
6	10.8 - 13.8	Strong breeze	39 - 49
7	13.9 - 17.1	Near gale	50 - 61
8	17.2 - 20.7	Gale	62 - 74
9	20.8 - 24.4	Strong gale	75 - 87
10	24.5 - 28.4	Storm	88 - 102
11	28.5 - 32.6	Violent storm	103 -117
12-17	32.7 - 56	Hurricane	118 - 202

Rain detection can be enabled or disabled separately. If the rain detection is enabled, the wind is on the left or right side of the barn and the wind force is higher than the wind speed entered, the respective curtain will be closed to its minimum position. Even when the wind is neutral, both curtains will respond.
Rain detection takes place continuously. When rain is detected, the rain detection status will be 'true' for at least the next x minutes. Each time rain is detected, this timer starts again. If no rain is detected for more than x minutes, the rain detection status will be 'false'. x = adjustable between 0 and 30 minutes.

If it is raining, the minimum wind speed is set to 0 m/s and the actual wind speed is 0 m/s, the curtain on the windward side will close. With neutral wind direction, both curtains will close.

If this controller is set as 'slave', it will control the curtain positions based on its own weather station data or on the data received from the master. If you have disabled wind and rain influence on the slave controller (even if they are enabled on the master controller), no correction will be performed.

The wind direction sensor should emit 0V in the north direction and increase clockwise. 0V (0°) is north, 2.5V (90°) is east, 5V (180°) is south and so on.
The important thing is to know where the wind is coming from compared to the location of the barn. The actual, cardinal direction is less important. You should therefore always align the sensor with the barn, with the front of the barn corresponding to north.

For wind speed and wind direction, a buffer of an average of 40 measurements spread over 10 minutes is used. Therefore, it takes some time before changes in actual wind speed or wind direction are visible.

4.9 Outside temperature offsets

In some situations, such as when the outside temperature drops, you want to be able to close the curtains. In that case, you can increase the curtain control bandwidth in cold weather.

Temperature setpoint	20.0°C
Current room temperature	21.0°C
Outside temperature compensation	5.0°C
Outside temperature compensation factor	0.5°C/°C
Outside temperature	12.0°C
Bandwidth, curtain	5.0°C

The compensated bandwidth will be:
(20.0 – 12.0 – 5.0) × 0.5 + 5.0 = 6.5°C

Outside temperature compensation is only applied on the wind side. If the wind is in the neutral zone, both sides are not compensated. To classify the to-side blowing wind, the wind direction must be in the left or right zone and the wind speed must be equal to or greater than the *wind speed compensation start*.

When the temperature setpoint of the curtain control increases as a result of temperature compensation, the curtain will close further. If wind compensation is also active, the curtain will close a little more.

In case of a faulty outside temperature sensor (outside temperature alarm is active), the outside temperature compensation will not be active until this sensor is replaced.

5 Operation

5.1 Screen layout

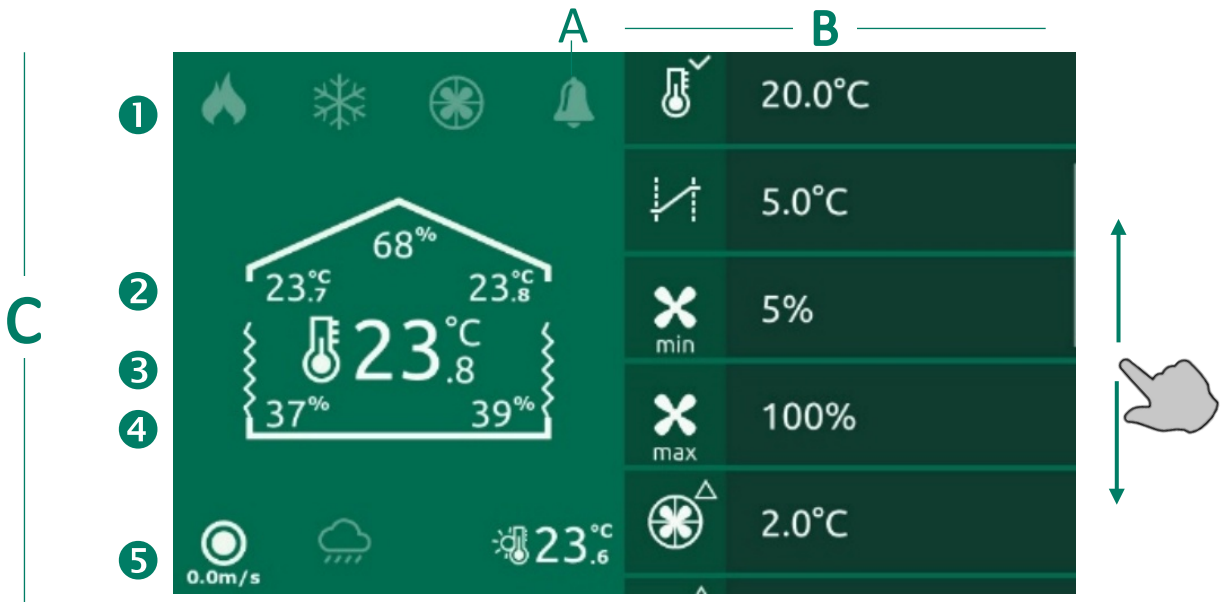


Fig. 1: BO-AIR CL screen layout

A Alarm icon. The colour indicates the alarm situation:

- No alarm active (icon colour is green and alarm bell is grey-green).
- An alarm is active (icon colour is red and alarm bell is white).
- Alarms are suppressed, but not resolved (icon colour is orange and alarm bell is white).

B In the right half of the screen, you can swipe up and down through all control icons. By tapping the icon, you can change the desired settings (see *Fig. 3*). The set values are shown to the right of the icons

C To the left of the control icons, you see the overview screen. Here you can see the active controls with their corresponding status and/or measured value.

1. Heating status indication. Active→ flame icon lights up.
   Cooling status indication. Active→ ice crystal icon lights up. During modulating cooling, a mark appears around the ice crystal icon and a percentage is visible.
   Indication whether tunnel ventilation is active. When tunnel ventilation is enabled but not active, the icon colour is grey.
2. House temperature left/right and ventilation rate of ridge ventilation or circulation.
3. Current barn temperature.
4. Position of curtain left and right.

   - *Not calibrated*: curtain motor needs full or zero-point calibration.
   - *Calibrate*: full or zero point calibration is performed.
   - *Hand symbol* means calibrated and in manual mode.
   - *Blank* means calibrated and not in manual mode.

5 Depending on the set installer settings, the following appears:
- *Wind direction*, which can come from the left, right or neutral zone;
- Measured *wind speed*;
- When *rain is detected*, the rain cloud is highlighted;
- *Outside temperature*.

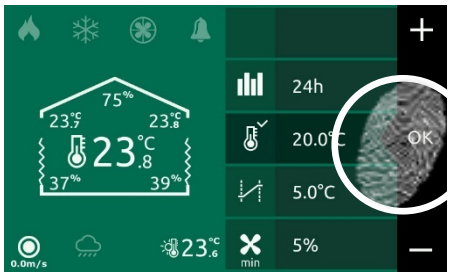
5.2 Changing settings

E

Fig. 2: Scrolling and selecting

E

Fig. 3: Changing value using plus and minus buttons



E

Fig. 4: Confirming settings by OK

E When tapping one of the control icons, the settings bar appears. You can adjust settings by tapping + (increase value) or - (decrease value). *OK* confirms the changed value.
If you want to cancel an entered value, do not tap *OK*, but tap any key in the left-hand part of the screen. The settings bar disappears again and the setting is reset to its original value.

6 User menu settings

6.1 Home screen

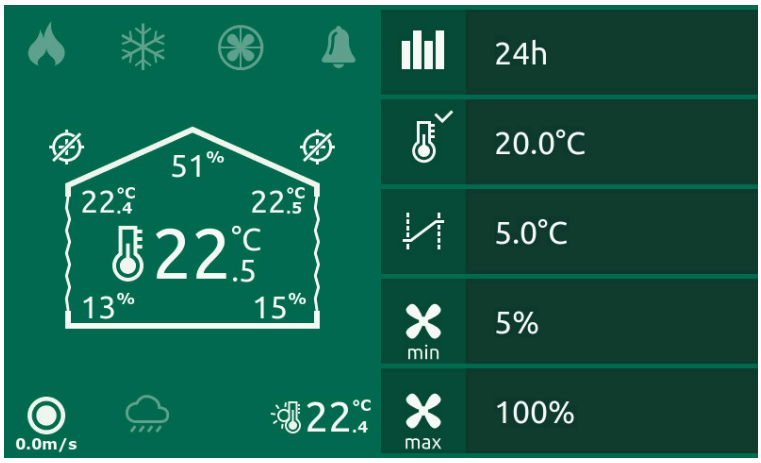


Fig. 5: Home screen

This chapter discusses all the settings visible in the user menu. The user menu can be accessed directly from the home screen.

6.2 24-hour overview

1	*Function ID: 1*

After tapping this icon, a 24-hour graph of temperature, ventilation and additional control opens. You select the different graphs using the icons on the right side of the graph. You close the graph by tapping the cross (×) in the top right corner.
Yesterday's readings are shown with a thin, orange line. The thicker, blue line is the graph of today's measurements up to the current time.

6.3 Day counter

2	*Function ID: 2* *Input range: 0 - 999* *Default value: 0*

Displays the current number of animals per day and select the relevant values from the ventilation curve. The day counter starts at day 0 by default and is automatically incremented by 1 each day. You can adjust the day counter manually.

The day counter is only visible in curve mode. Curve mode is enabled in the installer menu.

6.4 Ridge ventilation

For functions 3 to 6, consider the following:

- If curve mode is enabled, the icon appears with a grey border. You cannot adjust this value directly now. Tapping this icon will automatically take you to the curve menu, where you can change these values.
- In curve mode, this shows the value calculated from the curve.

Temperature setpoint ridge ventilation

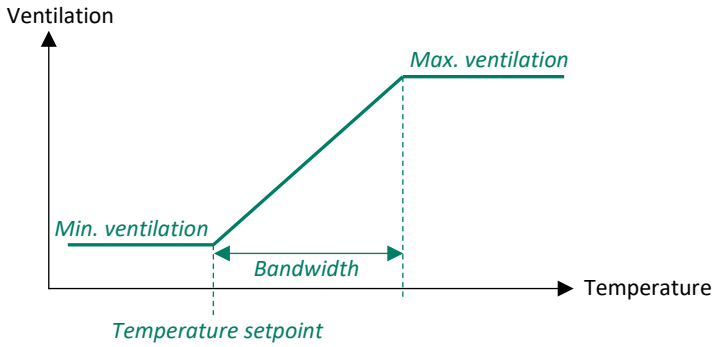
3	*Function ID: 3* *Input range: 0.0°C - 50.0°C* *Default value: 20*

Setting the desired temperature for ridge ventilation. All other settings are based on this temperature setpoint, taking into account temperature differences. The temperature unit (°C/°F) is set in the installer menu.

Bandwidth ridge ventilation

4	*Function ID: 4* *Input range: 1.0°C - 20.0°C* *Default value: 5*

Setting the desired temperature range in which ventilation is increased from minimum to maximum.



Minimum ridge ventilation

min 5	*Function ID: 5* *Input range: 5 - 100%* *Default value: 10*

Setting the desired minimum ridge ventilation. This is the ventilation percentage at which the room temperature is equal to or lower than the temperature setpoint.

Maximum ridge ventilation

max 6	*Function ID: 6* *Input range: 5 - 100%* *Default value: 100*

Setting the desired maximum ridge ventilation. This is the ventilation rate at the moment the room temperature has reached the end of the bandwidth.

6.5 Curtain control

For functions 7 to 10, consider the following:

- In curve mode, the icon appears with a grey border. You cannot adjust this value directly now. Tapping this icon will automatically take you to the curve menu, where you can change this value.
- In curve mode, this shows the value calculated from the curve.

Temperature setpoint curtain control

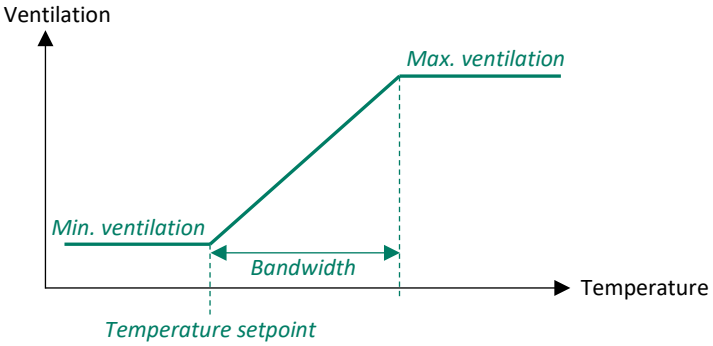
7	*Function ID: 7* *Input range: 0.0°C - 50.0°C / 32.0°F - 122.0°F* *Default value: 20*

Setting the desired temperature setpoint for curtain control. The temperature unit (°C / °F) is set in the installer menu.

Curtain control bandwidth

8	*Function ID: 8* *Input range: 1.0°C - 20.0°C / 32.0°F - 68°F* *Default value: 5*

Setting the temperature range in which the curtains open from minimum to maximum position.



Minimum position curtain control

min 9	*Function ID: 9* *Input range: 0 - 100%* *Default value: 5*

Setting the desired minimum position for the curtains (left and right).

Maximum position curtain control

max 10	*Function ID: 10* *Input range: 0 - 100%* *Default value: 100*

Setting the desired maximum position for the curtains (left and right).

6.6 Tunnel offset

Function ID: 11
Input range: 0.0°C - 10.0°C
Default value: 2.0

Setting the desired temperature offset relative to the *temperature setpoint ridge + bandwidth ridge* at which tunnel ventilation should start.

6.7 Circulation control

Menu functions 22 to 25 are visible when ridge ventilation is disabled. In this case, the curtain settings move from installer menu to user menu and form the primary control instead of the ridge ventilation.

Circulation temperature setpoint

Function ID: 22
Input range: 1.0°C - 20.0°C
Default value: 20.0

The absolute, temperature setpoint for circulation control.

Circulation bandwidth

Function ID: 23
Input range: 1.0°C - 20.0°C
Default value: 5.0

Temperature range, in which circulation increases from minimum to maximum.

Minimum circulation

Function ID: 24
Input range: 0 - 100%
Default value: 5

Setting the minimum position for circulation control.

Maximum circulation

Function ID: 25
Input range: 0 - 100%
Default value: 100

Setting the maximum position for circulation control.

6.8 Cooling offset

Function ID: 12
Input range: 0°C - 10.0°C
Default value: 2.0

Setting the desired temperature offset relative to *temperature setpoint ridge + bandwidth ridge + tunnel offset* at which cooling starts. Cooling stops again beyond hysteresis.

This icon appears only when cooling is activated in the installation menu.

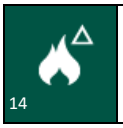
6.9 Cooling bandwidth

Function ID: 13
Input range: 1.0°C - 20.0°C
Default value: 5.0

In the case of modulating cooling, this is the temperature range in which cooling is increased from minimum to maximum.

This icon appears only when cooling is activated in the installation menu.

6.10 Heating offset



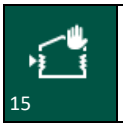
Function ID: 14
Input range: 0°C - 10.0°C
Default value: 2.0

Here you set the desired heating offset relative to the *temperature setpoint ridge*, at which heating starts. The heating relay is energized when the room temperature falls below this temperature offset. Beyond the hysteresis, the heating turns off again.

This icon appears only when heating is activated in the installation menu.

6.11 Manual mode

Manual mode left curtain



Function ID: 15

Manually activating the left-hand curtain control. If enabled, the curtain automatically takes the position displayed.

- The advantage of software-based manual control is that the position is not lost when the curtain control is active on a time basis. However, this position is lost when manually operated via the button on the side of the cabinet.
- This function appears only if the left curtain is active and the manual control option is enabled in the installation menu.

Left curtain position in manual mode

16	*Function ID: 16*

Setting the desired position of the left curtain in manual mode (see above).

! This function appears only in manual operation mode.

Manual mode right curtain

17	*Function ID: 17*

Manually activating the right-hand curtain control. If enabled, the curtain automatically takes the position displayed.

!
- The advantage of software-based manual control is that the position is not lost when the curtain control is active on a time basis. However, this position is lost when manually operated via the button on the side of the cabinet.
- This function appears only if the right curtain is active and the manual control option is enabled in the installation menu.

Right curtain position in manual mode

18	*Function ID: 18*

Setting the desired position of the right curtain in manual mode (see above).

! This function appears only in manual operation mode.

6.12 Instruction manual

19	*Function ID: 19*

Opening a QR code with hyperlink to the instruction manual for digital download. You can scan this QR code with your smartphone or other mobile device.

6.13 Enable function ID

20	*Function ID: 20*

Activating support mode to show function numbers next to each icon. This helps to easily recognise functions in case of (remote) support.

6.14 Logging into the installer menu

Function ID: 21
Input range: + or -

Logging in to access the installation menu.

7 Curve mode

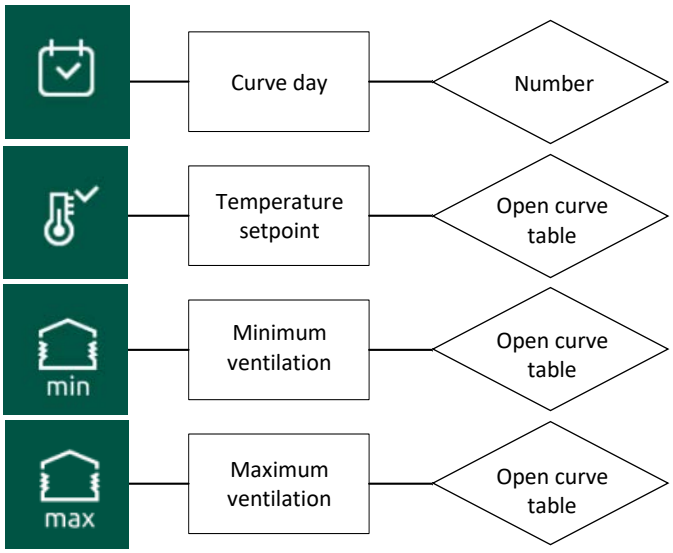
7.1 General

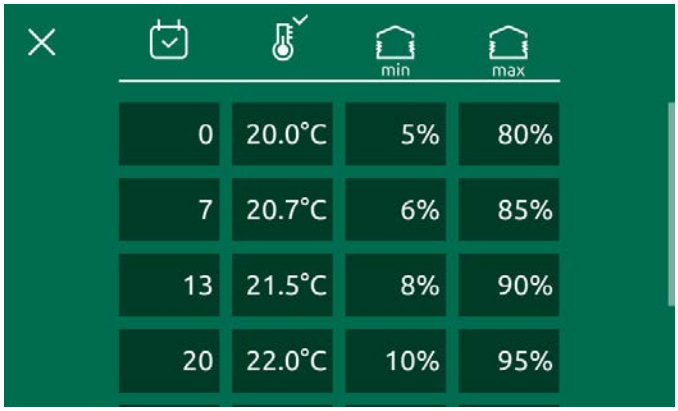
The curves menu pop-up window shows the ventilation curve settings. Curve mode is enabled in the installer menu. In the user menu, tap the *Curve* menu item.

The curve contains four breakpoints. For each breakpoint, you can adjust the temperature setpoint and ventilation values according to the age (in days) of the animals. The transition between the breakpoints is linear over the number of days.

If the temperature setpoint drops from 30°C to 20°C between day ten and day twenty, it means that the temperature setpoint will be 30°C at the beginning of day ten and 29°C at the end of day ten. At the beginning of day twenty, the temperature setpoint will be 20°C.

The curve settings are applied in the following two situations:
1. Ridge ventilation is enabled. Ridge ventilation control is based on the curve settings.
2. Ridge ventilation is disabled. Curtain position control is based on the curve settings.





7.2 Curve Day

	*Input range: 0 - 999*

Selecting curve day for the following values.

7.3 Temperature setpoint

	*Input range: 0.0°C - 50.0°C / 32.0°F - 122.0°F*

Setting the desired temperature on the specified curve day in that specific row.

7.4 Minimum ventilation

	*Input range: 5% – 100%*

Setting the minimum ventilation on the specified curve day in that specific row.

7.5 Maximum ventilation

	*Input range: 5% – 100%*

Setting the maximum ventilation on the specified curve day in that specific row.

8 Alarm overview

8.1 General

This chapter discusses the possible alarms of the BO-AIR CL.

- **No alarm active**
  If the alarm icon is grey, no alarms are active.
- **One or more alarms active**
  If one or more alarms are active, the alarm icon flashes on a red background. The display of the alarm icon alternates with the icon of the respective active alarm. The alarm relay also deenergizes.

8.2 Resolving alarm situation or silencing the alarm

When you want to deactivate an alarm, tap the alarm icon displayed on the start screen. The alarm relay will be deenergized.
After the alarm situation is cleared, the alarm icon colour changes to grey. If the alarm situation is not cleared, the colour of the corresponding icon changes to orange to indicate that the alarm in question is disabled. As soon as the BO-AIR CL detects within 5 minutes that the alarm is still active or a new alarm situation occurs, the active alarm icon reappears and the alarm relay deenergizes again.

The various alarm icons are displayed only if the relevant control is active and an alarm occurs with respect to that control.

	**No alarm** There are currently no alarms.
	**Warning** One or more alarms are active but have been silenced for 5 minutes.
	**Alarm** One or more alarms are active and the alarm relay has been deenergized.
IO	**IO alarm** Communication between the printed circuit board (PCB) in the cover and the bottom PCB is interrupted.
	**Alarm left temperature sensor** The measured temperature by the left temperature sensor is outside the measuring range.
	**Alarm right temperature sensor** The measured temperature by the right temperature sensor is outside the measuring range.
	**Outside temperature sensor alarm** The measured temperature by the outside temperature sensor is outside the measuring range.

	**Left curtain control alarm** During calibration, the time required to move the curtain from closed to open position is measured. In operational mode, if the desired position is not reached within this time plus 10 seconds, the motor control will give an alarm signal and stop all activity for 2.5 minutes. After that it will clear the alarm and tries again. An alarm will only be possible in case of a feedback motor control, because in a time-based motor control it is not known whether the motor is operating correctly. In that case, only a fault in the motor control can be detected, e.g. due to a rising temperature.
	**Right curtain control alarm** See *Left curtain control alarm*.
	**LMN communication alarm** If a control computer is configured to receive data from another BO-AIR CL, but does not receive this data, then an alarm is signalled on the receiving controller. This may be due to a hardware problem or a misconfiguration, such as not having a BO-AIR CL configured to send data. If a control computer is configured to send data while another BO-AIR CL in the same time slot is also sending data, an alarm is raised on both control computers. The user must then intervene to solve the problem.

! When a temperature sensor (left, right or outside) fails due to a wire break (≤ 60°C) or due to a short circuit (> 130°C), the last, probably correct reading is used to continue controlling. As long as the sensor alarm is active, this value is used.

This is a temporary solution. You should solve this problem as soon as possible. Once the alarm is cleared and the temperature sensor is functioning correctly again, the control computer resumes control based on the current temperature readings after a manual reset.