BO-AIR PL

CLIMATE CONTROL
FOR NATURALLY VENTILATED POULTRY HOUSES

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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

An optimal house climate for your animals requires optimal ventilation. With the BO-AIR PL climate control, you can effectively control the air inlets (curtains) and achieve the ideal fresh air flow in the house.

3.2 Control functions

Sensors
- 2 room temperature sensors for measuring the house temperature for compensation of curtain positions based on ΔT
- 1 outside temperature sensor for temperature compensation
- RH sensor (relative humidity)
- CO_2 sensor
- Weather station for measuring wind speed, wind direction and (optionally) rain detection

Curtains
- Integrated curtain control for 2 winch motors (left/right)
- 1-phase or 3-phase motors can be connected, including built-in limit switches
- Motors can be equipped with feedback signal (potentiometer, voltage- or current-based feedback signal) or without any feedback signal (time-based control)
- Additional BO-AIR PL computers can be connected to control additional curtain motors.
- Additional analog outputs for left/right 0-10V motor control signal (to external curtain end stations)

Ventilation
- Curve with 8 breakpoints (temperature setpoint, minimum curtain position and maximum curtain position)
- Tunnel ventilation mode using the following settings:
  - Fan group, max. 3 on/off stages
  - Tunnel inlet control output 0-10V
  - Tunnel inlet position for each fan group stage
  - Temperature compensation for each stage relative to the ΔT setpoint of the tunnel ventilation

Heating/cooling
- 1 heating control (on/off)
- 1 cooling control (on/off) or modulating with pulse-pause variation)

Timer
- 1 timer function for lighting control (on/off)
- 4 start/stop times

Water consumption
Recording water consumption (in liter) for the past 4 days (including today).

General
- Logging the following measurements: house temperature, outside temperature, humidity and CO_2
- Multiple control modes via LMN bus communication. The BO-AIR PL 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 PL control has four operational zones (from low to high temperature):

	Zone	Temperature control
1	Heating	$T_{setpoint\ curtain}$ - $T_{\Delta,\ heating}$
2	Curtain control	$T_{setpoint\ curtain}$
3	Tunnel ventilation	$T_{setpoint\ tunnel}$
4	Tunnel cooling	$T_{setpoint\ tunnel}$ + $T_{\Delta,\ cooling}$ If tunneling is disabled, $T_{setpoint\ curtain}$ is used instead of $T_{setpoint\ tunnel}$.

4.2 Heating control

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

4.3 Curtain control

The BO-AIR PL can control two curtains (left and right). The curtain control is the main control.

A motor controls the curtain position in either feedback mode or time mode. In feedback mode, you can use a potentiometer or a voltage/current signal for feedback. For a voltage signal, you can use a 3-wire potentiometer. In this case, 12V is applied to the potentiometer, and the wiper connects to the analog feedback channel. Remember, the analog feedback channel has a maximum of 10V, so ensure the potentiometer doesn't use the full range.

Feedback type	**Current / Voltage** **J26 (motor 1) & J27 (motor 2)**	**Potentiometer / IDE / Voltage** **J21 (motor 1) & J22 (motor 2)**
Potentiometer (resistive, 2-wire)	voltage	potentiometer
Potentiometer (voltage max 10V, 3-wire)	voltage	voltage
Voltage feedback	voltage	voltage
IDE, current	current	IDE

In feedback mode, you need to calibrate the motor control once to find the minimum and maximum positions. After that, no more calibration is needed.

In time-based mode, there is no feedback signal, so the control tracks how long it has been opening and closing. Like feedback mode, it needs an initial calibration. Additionally, periodic zero-point calibration is needed because small timing errors can cause differences between the actual and expected curtain positions. This calibration will fully open or close the curtain (whichever is closest or always closed, based on the setting) and then return to its control position automatically.

If there are no limit switches, the motor uses the total running time plus a margin to ensure it reaches its minimum or maximum position. Limit switches speed up calibration. In the installer menu, you can set when zero-point calibration should happen. Zero-point calibration is done once a day in time-based mode, but only if a manual calibration has been done before.
Zero-point calibration also occurs if the controller has been turned off and on again, provided manual calibration was done before and the option is enabled.

Zero-point calibration is enabled by default but can be turned off. It can be set to always go to the closed position first or to the nearest position (open or closed).

During feedback calibration, the minimum and maximum feedback positions are found. 10% of this range is used to check if the feedback value is correct. For example, if the minimum feedback is 1.0V and the maximum is 5.0V, the range is 4.0V. 10% of 4.0V is 0.4V, so if the feedback is below 0.6V or above 5.4V, the alarm relay is de-energized (left curtain alarm icon flashes) and the curtain stops moving.

! If the margin is out of bounds (below 0.0V/above 10.0V or below 0Ω), no check is done. In time-based mode, there is no check because there is no feedback signal.

! If manual curtain control is enabled, zero-point calibration doesn't start automatically.

For the first calibration in time-based mode, the user must manually start and stop the calibration since the control doesn't know the end positions. Accurate timing is needed to set the correct open/close duration. With limit switches, this process is automatic.

The curtain control adjusts the position every 15 seconds, staying idle in between. It remains stable unless the hysteresis setting is exceeded. The curtain control starts at the temperature setpoint, and operation is regulated by bandwidth, minimum, and maximum curtain openings. After calculating the new position, it's transmitted to the BP04. The curtain mechanism guarantees a smooth transition.

! When the motor controller is manually operated using the button on the housing, and time-based mode is active, the controller is unaware of the position. After manual intervention, the user should return the position as close as possible to its original state, or switch off the controller to initiate zero-point calibration.

In time-based mode, the current position is lost when power cycling the controller. Therefore, 30 seconds after booting up, a zero-point calibration is performed to restore the actual position, provided zero-point calibration is enabled. If only the HMI is power cycled, the BP04 retains the current position. However, calibration is still conducted.

Switching between feedback and time-based modes, even briefly, requires recalibrating the motor control.

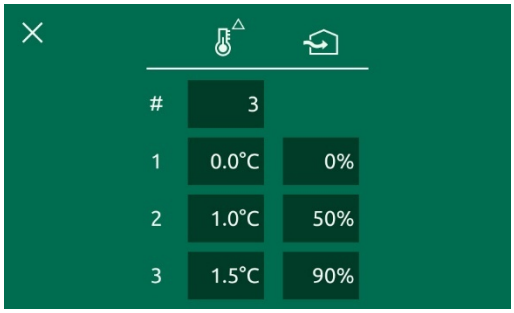
During installation, remember that for the motor control to function properly, the limit switches must be connected. If not, the magnetic switches for operating the curtains will be disabled. Additionally, ensure that the external manual switch is present and connected, or that there is a bridge on the P and Auto contacts.

4.4 Tunnel ventilation control

Tunnel ventilation facilitates airflow from the front to the back of the house, rather than from left to right or right to left. Achieving this requires the left and right curtains to be (nearly) closed.

Tunnel ventilation typically involves up to three stages of fans and a tunnel inlet. Each stage corresponds to a specific position of the tunnel inlet. Additionally, each stage has its own temperature offset setting, relative to the overall temperature offset of the tunnel ventilation.

Ensure that the stages are arranged in ascending order based on their temperature offsets. For example, stage 2 should have a larger temperature offset than stage 1.
The number of stages in use can be specified, with a minimum of one stage and a maximum of three.



Ventilation begins after a set delay to ensure the curtains are in the correct position. A fixed hysteresis of 0.5°C is maintained between each stage and before the first stage.

Once tunneling starts (when at least the first stage temperature is reached), a tunneling switch timer is initiated. Control cannot exit tunneling until this timer finishes. When tunneling stops, the timer restarts. Tunneling control cannot resume until the timer finishes.

If the controller is a secondary one, it receives information about whether the primary controller is tunneling. This allows the secondary controller to adjust the curtains to the desired position during tunneling, even though it lacks tunneling capabilities itself.

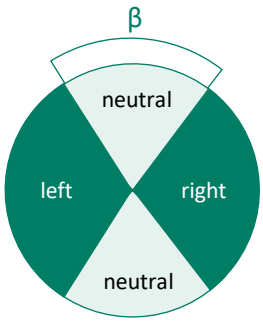
4.5 Cooling control

If tunnel ventilation fails to maintain the temperature below a certain level, cooling becomes necessary. Cooling can operate in two modes:

- *On/Off Control*
  This mode applies an adjustable hysteresis
- *Modulating cooling control*
  In this mode, a pulse-pause control is utilized, with a fixed on-time. The off-time varies based on the desired cooling level, but it's restricted within adjustable minimum and maximum limits. At the lower end of the cooling range, the same hysteresis as with the On/Off cooling is applied. The modulating cooling continues to operate at the minimum level during the hysteresis.

4.6 Wind and rain influences

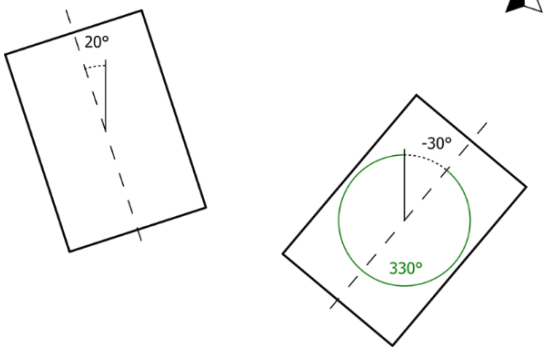
Wind influences (speed and direction) can be turned on or off. When enabled, the wind direction determines which side of the stable is affected by the wind.



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 wind direction, a hysteresis of 12° is applied, 6° to the left and 6° to the right. When the controller starts, the initial direction is set at 0° with a hysteresis of -6° to 6°. Once the actual direction reaches or exceeds 6°, the new actual value becomes this value (which can be larger) with hysteresis applied. Even though wind direction is averaged over 10 minutes, occasional fluctuations may still occur, potentially causing rapid switches between neutral and left/right. The hysteresis prevents this from happening.



If only one house is in use, the weather station can be aligned with it, so that 0° corresponds to the front and 180° to the back. However, if two or more houses are in use and not aligned with each other, and they share a single anemometer aligned north-south, an offset is required. For example, if the anemometer is aligned north-south and the left house needs an offset of 20°, while the right house needs an offset of -30°, the actual direction used by the controller is always relative to the front-back axle of the house it controls. Therefore, the offset for the right house would be 360° - 30° = 330°, as negative angles cannot be entered.

The wind speed determines how much the curtain control reduces the position of the curtain that the wind is blowing towards, or both curtains if the wind is in the neutral zone. Starting at a specific velocity and using a defined bandwidth, the curtain position is gradually reduced. The reduction begins at 0% at the start of the bandwidth and reaches maximum reduction at the end of the bandwidth. Wind speed measurement is conducted using a moving average buffer of 40 samples, with each sample taken at a 15-second interval.

Table 1: Beaufort scale

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 independently enabled or disabled. When enabled and wind is neutral or blowing towards a curtain, and the wind speed exceeds the minimum threshold, the corresponding curtain closes to the minimum position. If wind is neutral, both curtains respond.
Rain detection operates continuously. Once rain is detected, the *rain status* remains *true* for the next X minutes, where X is adjustable from 0 to 30 minutes. Each time rain is detected, the timer restarts. If no rain is detected for longer than X minutes, the *rain status* becomes *false*.

If rain is falling and the minimum wind speed is set to 0 m/s, and the actual wind speed is also 0 m/s, the curtain affected by the wind closes. If the wind direction was neutral, both curtains close.

If the controller is secondary, it uses its own weather station data or data provided by the primary controller to adjust curtain positions. If wind and rain detection are disabled on the secondary controller (even if enabled on the primary), no adjustments are made.

The wind direction sensor outputs 0V at the top and increases clockwise. So, 0V (0°) corresponds to north, 2.5V (90°) to east, 5V (180°) to south, and so on.

Both wind speed and direction are measured using a moving average buffer of 40 measurements over 10 minutes (with 15 seconds per measurement). This means that changes in wind speed or direction take some time to be reflected in the control system.

4.7 Outside temperature offsets

In certain situations, it may be necessary to close the curtains more tightly due to cold outside conditions. This is achieved by increasing the bandwidth for curtain control as the outside temperature drops.

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

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

Outside temperature compensation is applied only to the side where the wind is blowing, or to both sides if the wind is in the neutral direction. For the wind to affect a curtain, the wind speed must also be at least the value set for *wind speed compensation start*.

If temperature compensation increases the curtain control's bandwidth, the curtain position will decrease. However, outside temperature correction only functions when wind compensation is active. Depending on wind conditions, the curtain position may decrease even further.

! If the outside temperature sensor is defective (and the outside temperature alarm is active), outside temperature compensation will not be active until this condition is resolved.

4.8 Humidity control

As humidity rises above the setpoint, the minimum ventilation increases by up to 50% of the set minimum ventilation over a bandwidth of 20% relative humidity (RH).

Minimum ventilation	10%
RH setpoint	50%
Bandwidth RH	20%
Currently measured RH in the house	60%

The influence will be calculated as follows:
(10% (ΔRH) / 20%) × 50% = 25%

So, the minimum ventilation will become:
10% × 1.25 (+25%) = 12.5%

4.9 CO_2 control

As the CO_2 level rises above the setpoint, the minimum ventilation increases by up to 50% of the set minimum ventilation over a bandwidth of 1000ppm CO_2.

Minimum ventilation	10%
CO_2 setpoint	1500ppm
Bandwidth CO_2	1000ppm
Currently measured CO_2 in the house	2000ppm

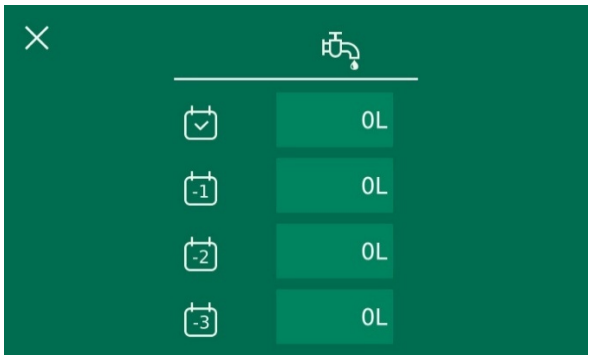
The influence will be calculated as follows:
(500 (Δ CO_2) / 1000) × 50% = 25%

So, the minimum ventilation will become:
10% × 1.25 (+25%) = 12.5%

4.10 Water consumption registration

The water consumption function monitors the water usage over the last 3 days (including today). It utilizes a counter input along with a factor that represents the amount of water flowing with each pulse. Every day at midnight, the days are shifted (yesterday becomes the day before yesterday, and today becomes yesterday), and the counter for today is reset.

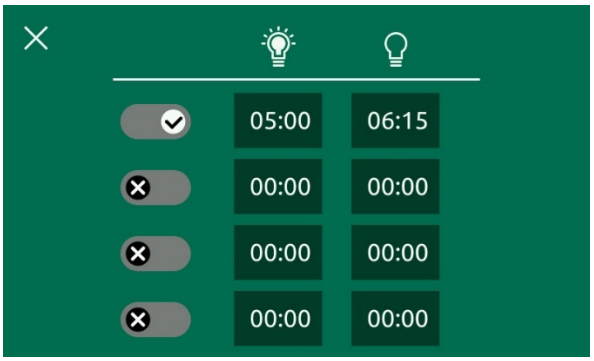
If the controller is turned off for an extended period, this downtime is factored in. For example, if the controller is offline for a day, the shift is adjusted accordingly.



4.11 Light timer

The light timer option allows for programming 4 on-off times to control the light timer relay. Overlapping times are merged, for example, if one setting is from 05:00 to 10:00 and another is from 08:00 to 12:00, they will combine to create a single setting from 05:00 to 12:00.

Additionally, if the start time is later than the stop time, for instance, 10:00 to 05:00, the relay will be on from 00:00 to 05:00 and from 10:00 to 00:00.



5 Operation

5.1 Screen layout

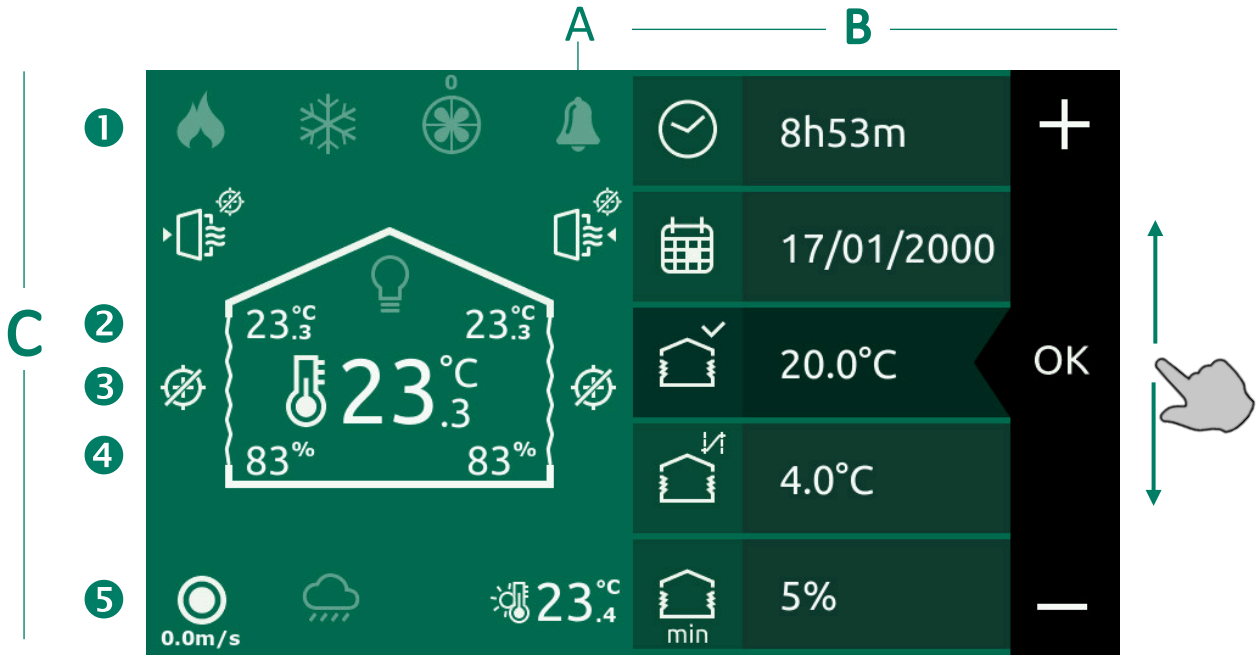


Fig. 1: BO-AIR PL screen lay-out

A Alarm bell icon. The colour indicates the alarm situation:

- No alarm active (icon colour is grey).
- An alarm is active (icon colour is red).
- Alarm is silenced, but not yet resolved (icon colour is orange).

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 The main overview screen is displayed on the left side of the screen, featuring active controls with their measurements.

1. *Heating* indicates whether heating is active. If active, the flame icon is highlighted.
   Cooling shows the cooling status. If cooling mode is on/off, the ice crystal icon is either highlighted (cooling active) or off (cooling inactive). In modulating cooling mode, the ice crystal icon remains highlighted as long as cooling is actively modulating, with the modulating percentage visible.
   Tunnel ventilation indicates if tunnel ventilation is active. If enabled but not active, the icon appears grayed out. If at least one fan is active, the icon appears white. The current ventilation stage (1 to 3) and inlet position (%) are displayed at the top of the icon
2. *House temperature left* and *right*.
3. *Temperature.* Displays the average temperature of the left and right sides of the house.
4. *Curtain positions 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 Additional features, depending on installer settings:

- *Wind direction.* Indicates if wind is coming from the left, right, or in the neutral zone;
- *Wind Speed*. Displays the measured wind speed.
- *Rain Detection*. Highlights the rain cloud if rain is detected.
- *Outside Temperature*. Shows the currently measured outside temperature.

5.2 Changing settings

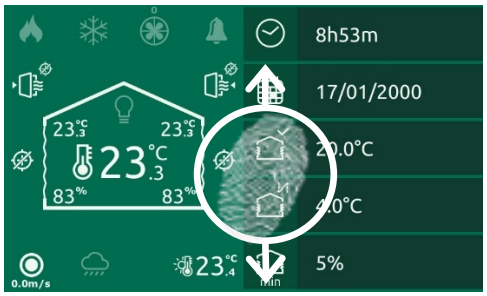


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Fig. 2: Scrolling and selecting

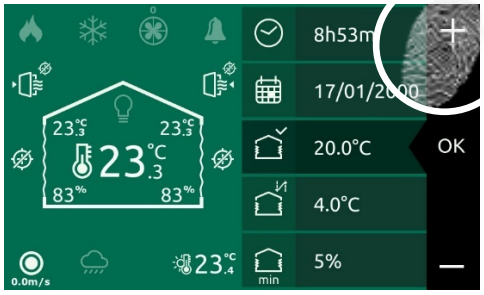

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Fig. 3: Changing value using plus and minus buttons

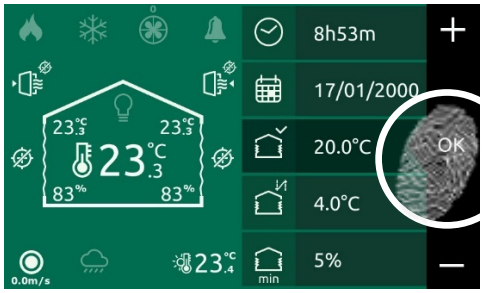

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Fig. 4: Confirming settings by OK

E When you tap on any of the control icons, the settings bar appears on the screen. You can adjust the settings by tapping + (increase value) or - (decrease value). Once you've entered the desired setting, tap *OK* to confirm.

If you want to cancel the newly entered value, simply tap anywhere on the left half of the screen. The settings bar will close, and the value will reset to its previous setting.

5.3 Display mode: Controller enabled/disabled

The Bo-Air Touch controller can be enabled or disabled as needed. Use the slider to switch between enabled and disabled modes.

If the controller is disabled:

- Sensor readings remain active.
- The temperature sensor defect alarm remains active.
- All functions return to their default positions. This means heating, cooling, tunnel ventilation, and the light timer are turned off. The curtains also close to 0%.
- Manual operation of the curtains is still possible via the menu.
- The installer menu is not accessible.

If the controller is part of a multi-controller setup:

- On the primary controller, the enable/disable option is available. A secondary or follower controller will automatically follow the setting of the primary.
- If the controller is standalone, *primary*, or *secondary*, each controller can manually control its curtains if needed. If the controller is a *follower*, it will automatically follow the position of the primary. So, if the primary controls the curtains manually, the follower will automatically follow suit.

6 User menu settings

6.1 Home screen

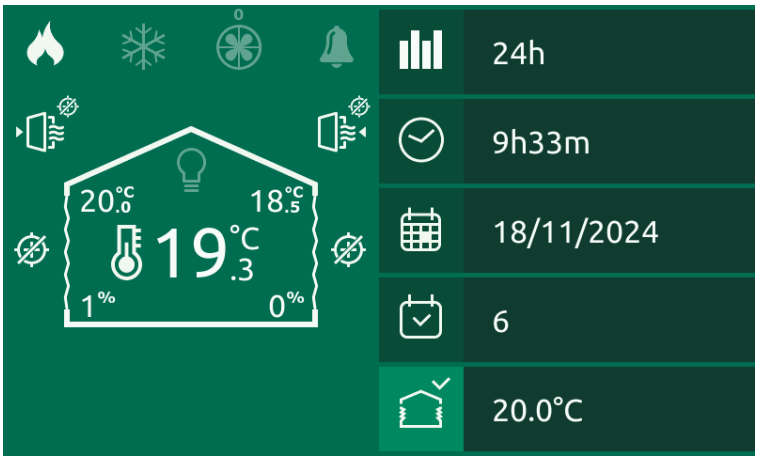


Fig. 5: Home screen

This chapter covers all settings visible in the user menu, which can be accessed directly from the home screen.

! De zichtbaarheid van verschillende functies is afhankelijk van hoe de regelaar is geconfigureerd: *Primary, Secondary, Follower* of *Standalone*.

6.2 24-hour overview

1	*Function ID: 1*

Opens the graph displaying various measurements' statuses over the past 48 hours. Different graphs can be selected using icons on the right side. To close, press the X icon in the top right corner.

6.3 Time

2	*Function ID: 2* *Input range: 00:00 – 23:59 hh:mm*

Readout of the system time which can be adjusted here.

6.4 Date

3	*Function ID: 3* *Input range: 01-01-01 – 31-12-99 dd-mm-yy*

Readout of the system date which can be adjusted here.

6.5 Day count

4	*Function ID: 4* *Input range: 0 - 999* *Default: 0*

This feature displays the current animal day count and selects relevant values from the ventilation curve. The following items can be set in the ventilation curve:

- Curtain setpoint temperature
- Minimum curtain position
- Maximum curtain position

By default, the day counter starts at day 0 and increments with each passing day. The day count number can be manually adjusted.

The day count is only visible when curve mode is enabled. Curve mode can be activated in the installer menu.

6.6 Curtain setpoint temperature

5	*Function ID: 5* *Input range: 0.0°C – 50.0°C / 32.0°F – 122.0°F* *Default: 20*

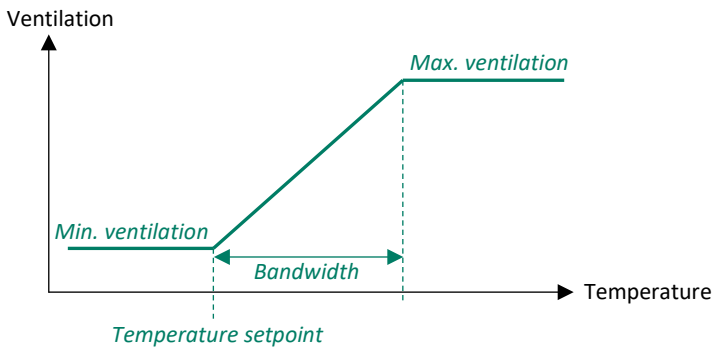
This is the set temperature for curtain control ventilation. The temperature unit (°C / °F) can be set in the installer menu.

- If curve mode is enabled, this item will show the calculated value. Direct adjustment is not possible. Pressing this icon directs you to the curve menu where values can be set.
- If curve mode is enabled, the calculated value is displayed here.

6.7 Curtain bandwidth

6	*Function ID: 6* *Input range: 1.0°C – 20.0°C / 32.0°F – 68°F* *Default: 5*

Here you can set the desired temperature range in which the ventilation increases from minimum to maximum.



6.8 Minimum curtain position

Function ID:
Input range: 0 – 100%
Default: 5

Here you can set the desired minimum position of the left and right curtains.

In *Curve mode*, this function will display the calculated value.

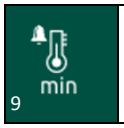
6.9 Maximum curtain position

Function ID: 8
Input range: 0 – 100%
Default: 100

Here you can set the desired maximum position of the left and right curtains.

In *Curve mode*, this function will display the calculated value.

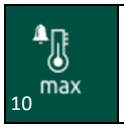
6.10 Minimum temperature alarm level



Function ID: 9
Input range: 2.0°C – 50.0°C / 35.6°F – 122.0°F
Default: 2.0

Here you can set the minimum temperature alarm level. When the house temperature reaches this level, an alarm will be activated.

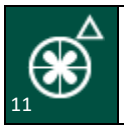
6.11 Maximum temperature alarm level



Function ID: 10
Input range: 2.0°C – 50.0°C / 35.6°F – 122.0°F
Default: 30.0

Here you can set the maximum temperature alarm level. When the house temperature reaches this level, an alarm will be activated.

6.12 Tunnel (offset) temperature setpoint



Function ID: 11
Input range: 0°C – 20.0°C / 32.0°F – 68.0°F
Default: 4.0

Here you can set the desired temperature offset at which tunneling will start, relative to the curtain setpoint temperature. Tunneling uses stages, with each stage having an offset temperature relative to the tunnel setpoint temperature.

6.13 Cooling offset

Function ID: 12
Input range: 0°C – 10.0°C / 32.0°F – 50.0°F
Default: 5.0

Here, you can set the desired temperature offset relative to the tunnel temperature setpoint when tunnel ventilation is enabled. If tunnel ventilation is not enabled, the offset is relative to the curtain temperature setpoint. Cooling will stop again after the hysteresis threshold is reached.

This icon is displayed only when cooling is activated from the installer menu.

6.14 Cooling bandwidth

Function ID: 13
Input range: 1.0°C – 20.0°C / 33.8°F – 68.0°F
Default: 5.0

For modulating cooling, this is the temperature range over which cooling increases from minimum to maximum.

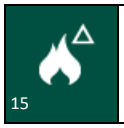
This icon is displayed only when cooling is activated from the installer menu.

6.15 RH cooling stop

Function ID: 14
Input range: 10 – 100%
Default: 100

Here, you can set the humidity level at which cooling stops. A fixed hysteresis of 2% is applied.

6.16 Heating offset



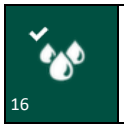
Function ID: 15
Input range: 0°C – 10.0°C / 32.0°F – 50.0°F
Default: 1.0

The heating offset can be set here. The heating offset is relative to the curtain temperature setpoint at which heating starts. The heating relay is activated when the house temperature drops below this temperature offset. The heating turns off again after hysteresis.

This icon is displayed only when heating is activated from the installer menu.

If the controller is a secondary controller and the primary controller has heating enabled, the secondary controller will adopt this setting and it will be read-only. If the controller is secondary and the primary controller has no heating, then the heating offset can be set on the secondary controller.

6.17 Humidity level setpoint



Function ID: 16
Input range: 0 – 100%
Default: 70

Here, you can enter the desired humidity level for humidity control. When the humidity reaches this level, the system starts increasing ventilation to reduce the humidity.

This icon is displayed only when humidity control is activated from the installer menu.

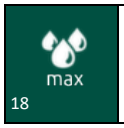
6.18 Actual humidity level

Function ID: 17

Readout of the actual humidity level.

This icon is displayed only when humidity control is activated from the installer menu.

6.19 Humidity control maximum alarm level

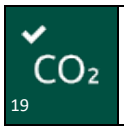


Function ID: 18
Input range: 0 – 100%
Default: 90

Here, you can enter the maximum humidity level for the humidity control alarm. When the humidity reaches this level, an alarm is activated.

This icon is displayed only when humidity control is activated from the installer menu.

6.20 CO_2 control setpoint



Function ID: 19
Input range: 0 – 10000 ppm
Default: 2000

Here, you can enter the CO_2 level setpoint for CO_2 control. When the CO_2 level reaches this setpoint, the system starts increasing ventilation to reduce the CO_2 level.

This icon is displayed only when CO_2 control is activated from the installer menu.

6.21 Actual CO_2 level

CO_2 20	*Function ID: 20*

Readout of the actual CO_2 level.

This icon is displayed only when CO_2 control is activated from the installer menu.

6.22 Maximum CO_2 alarm level

CO_2 max 21	*Function ID: 21* *Input range: 100 – 10000 ppm* *Default: 3000*

Here you can set the maximum CO_2 level. An alarm is activated when the CO_2 level reaches this value.

This icon is displayed only when CO_2 control is activated from the installer menu.

6.23 Light timer configuration

22	*Function ID: 22*

When you select this function, a popup will appear allowing you to define four periods for controlling the lights from on to off. This configuration applies to a single day, so the same schedule is used every day of the week.

This icon is displayed only when the light timer control is activated from the installer menu.

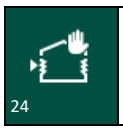
6.24 Water consumption status

23	*Function ID: 23*

When you select this function, a popup will appear displaying water consumption from today to three days ago. Every night at midnight, the values are shifted by one day, resetting the current day's consumption to zero liters.

This icon is displayed only when the water consumption status is activated from the installer menu.

6.25 Manual mode for left curtain



Function ID: 24

Here, you can manually activate the control for the left curtain. If enabled, the curtain will automatically adjust to the specified position.

An advantage of using this software's manual control over the physical manual control knob on the cabinet's side is that the position is retained even if time-based control is active!

The option is available if the controller is not a follower. If the controller is a follower, the manual mode position is adopted from the primary controller.

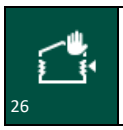
6.26 Manual position left curtain

Function ID: 25

Here, you can enter the position to which the left curtain should move when manual mode is enabled.

This function is only visible when manual mode is enabled.

6.27 Manual mode for right curtain



Function ID: 26

Here, you can manually activate the control for the right curtain. If enabled, the curtain will automatically adjust to the specified position.

An advantage of using this software's manual control over the physical manual control knob on the cabinet's side is that the position is retained even if time-based control is active!

The option is available if the controller is not a follower. If the controller is a follower, the manual mode position is adopted from the primary controller.

6.28 Manual position right curtain

Function ID: 27

Here, you can enter the position to which the right curtain should move when manual mode is enabled.

This function is only visible when manual mode is enabled.

6.29 Controller enabled / disabled

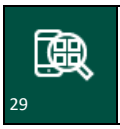
Function ID: 28

When the controller is enabled, the background color remains default, indicating that all functionalities are active.

However, if the controller is disabled, the background color switches to orange. In the disabled mode:

- All controls are disabled and set to their off-state.
- The installer menu becomes unavailable.
- Only the option to manually control the curtain position is accessible.
- Communication with other devices remains active.

6.30 User manual



Function ID: 29

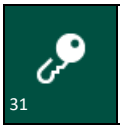
This function opens a QR code containing a hyperlink to this manual for digital download. The QR code can be scanned by any mobile device, allowing easy access to the manual.

6.31 Support mode

Function ID: 30

Activate support mode to display function ID numbers in every icon. This feature facilitates easy identification of functions, especially during remote support sessions.

6.32 Installer login



Function ID: 31
Input range: + or -

This is where you can log in to access the installer menu.

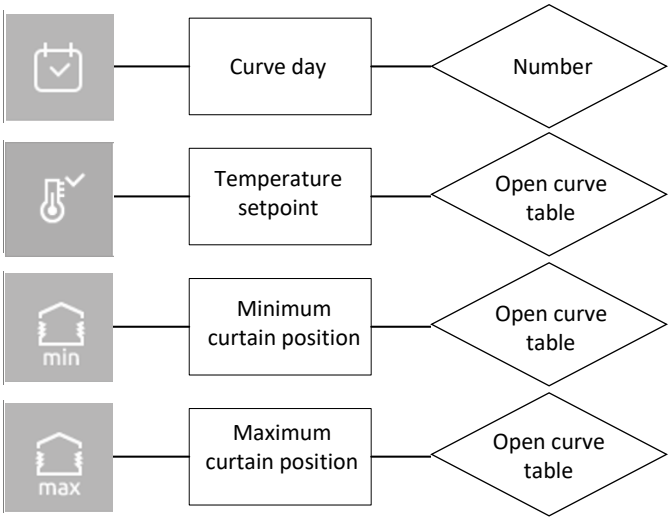
7 Curve mode

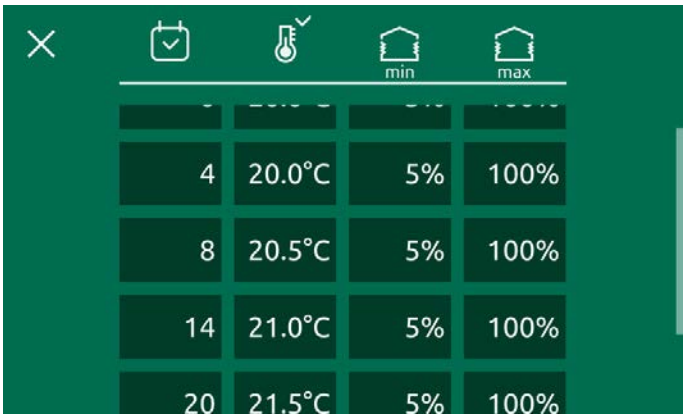
7.1 General

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 supports eight breakpoints. At each breakpoint, the temperature setpoint, minimum curtain position, and maximum curtain position can be adjusted to meet the needs of the animals at a specific age (day). Transitions between breakpoints occur linearly over the number of days between them.

For example, if the set temperature decreases from 30°C to 20°C between day 10 and day 20, the temperature setpoint at the beginning of day 10 will be 30°C and 29°C at the end of day 10. At the beginning of day 20, the set temperature will be 20°C as configured.





Curve table

7.2 Curve Day

	*Input range: 0 - 999*

Select the curve day for the following values.

7.3 Temperature setpoint

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

Enter the temperature setpoint for the specified curve day in the corresponding row.

7.4 Minimum curtain position

	*Input range: 0 – 100%*

The minimum curtain position for the specified curve day in the corresponding row.

7.5 Maximum curtain position

	*Input range: 0 – 100%*

The maximum curtain position for the specified curve day in the corresponding row.

8 Alarm overview

8.1 General

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

- **No alarm active**
  If the alarm icon is grey out, 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

To deactivate an alarm, just tap on the alarm icon shown on the home screen. Once the alarm is resolved, the icon will automatically turn grey. If the alarm persists, the alarm bell icon will turn orange, indicating that the alarm has been muted. However, if the BO-AIR PL detects that the alarm hasn't been resolved properly within 5 minutes or if a new alarm arises, the display will revert to showing the active alarm bell icon

The different alarm icons will only appear if the corresponding control is active and an alarm relating to that control occurs.

	**No alarm:** No alarms are currently active.
	**Warning alarm:** One or more alarms are active, but they have been silenced for 5 minutes
	**Alarm:** One or more alarms are active, and the alarm relay has been triggered.
	**IO alarm:** Communication between the front and the IO board has been disrupted. No communication between BP04 and the E4 board has been established.
	**Left side temperature sensor alarm:** The measured temperature on the left side is out of range. See note 1 below.
	**Right side temperature sensor alarm:** The measured temperature on the right side is out of range. See note 1 below.
	**Outside temperature sensor defect alarm:** The measured outside temperature is out of range. See note 1 below.
	**CO_2 sensor alarm** If the measured CO_2 value is smaller than 200ppm or larger than 8000ppm, the sensor is considered to be defective.

	**RH sensor alarm** RH sensor alarm will be triggered if the measured relative humidity (RH) value is smaller than 10%. There is no check for high RH sensor readings as the maximum possible value is 100%, which is rare. Similar to the temperature sensor alarm, the RH sensor alarm will be signaled even if the controller is deactivated.
	**Maximum CO_2 level alarm** If the measured CO_2 level exceeds or equals the set maximum level, an alarm is triggered.
	**Maximum humidity alarm** The measured humidity level is higher than or equal to the set maximum level.
	**Left curtain control alarm:** During calibration, the time required to transition from the closed to the open position is measured. If, during operational mode, the desired position is not achieved within this time frame plus a 10-second margin, the motor control will signal an alarm and cease all activity for 2.5 minutes. After this period, it will clear the alarm and attempt the operation again. An alarm is only possible with feedback motor control because in time-based motor control, there is no way to verify if the motor control behaves as intended. In such cases, it is only possible to detect a malfunction in the motor control, such as when the temperature begins to rise.
	**Right curtain control alarm:** The operation of the right curtain is similar to that of the left curtain.
	**LMN communication alarm:** If the controller is configured to receive data from another BO-AIR PL but fails to receive it, an alarm is triggered on the receiving controller. The reason could be hardware-related, but it's also possible that a faulty configuration (e.g., no BO-AIR PL configured to send data) might be the cause. Additionally, if the controller is configured to send data while another BO-AIR PL is sending data in the same timeslot, an alarm is raised on both controllers. User intervention is required to resolve this issue.

When a temperature sensor (left, right, or outside) fails due to a wire break (≤ 60°C) or a short circuit (> 130°C), the last known accurate reading is utilized to continue controlling. This value persists as long as the sensor alarm remains active.

This is considered a temporary workaround. It's imperative to resolve this issue promptly. Once the alarm is cleared and the temperature sensor functions correctly again, the control computer will resume control based on the current temperature readings after a manual reset.

It's worth noting that the temperature sensor alarm will be signaled even if the controller is deactivated.